

Two Stations Halt FMX Tests

by David Hughes

Stamford CT . . . Two stations that had been conducting on-air tests of the FMX FM stereo coverage extension system have discontinued them. However, there are mixed reasons why tests at each station have, at least temporarily, been halted.

Chicago classical music station WFMT and New York City adult contemporary station WLTW have stopped tests of the FMX system, which allows listeners in the fringe areas of an FM station's coverage area to receive a clean FM stereo signal without the hiss that normally accompanies distant stereo signals.

FMX was developed by Emil Torick, VP/audio technology with the CBS

Technology Center, and Thomas Keller, head of NAB's Science and Technology Department.

An article published in the *Chicago Tribune* 1 August and headlined "FMX system shows its stuff then fades back to the lab," quoted WFMT CE Alfred Antlitz as saying the FMX system was flawed and needed refinement.

The article indicated Antlitz said the FMX system "seems to cause increased multipath distortion for listeners." He added that a "compatibility problem" existed between the system and receivers.

The *Tribune* account said that the "WFMT engineering staff vetoed any further FMX broadcasts."

While Antlitz could not be reached by RW, WFMT Transmission Supervisor Jim Addie said the station received be-

tween 20 and 25 "unsolicited complaints" from listeners during the five-day test in early June. Most complained of multipath distortion on their car radios.

He also said that the station received "a handful" of other complaints during the tests, including several from members of the Chicago Symphony Orchestra complaining about shifting stereo imaging during a taped broadcast of their concert.

CBS claimed that the problems were caused by FMX "equipment alignment," according to Addie. CBS has since taken the gear back for further work, he said. He did not rule out the possibility that more FMX tests may take place at WFMT in the future.

Torick maintained that the WFMT test, which he said was underway for on-

ly a few days during the Consumer Electronics Show (CES), was stopped because of a "blown power supply." He added that he hoped to resume the WFMT tests.

John Dahl, manager of product planning for NAD Electronics, a firm that will have FMX tuners on store shelves by early September, said he had heard of FMX problems with the Chicago test.

However, he maintained that the WFMT experiment "was not a proper test" because the FMX generator did not work properly and that the test was not conducted over a long enough period of time.

"Some people did hear a problem, but what it all means is still undecided," Dahl said.

Some critics of the FMX system claim that certain receivers produce a multipath-type interference because they do not provide enough rejection of the FMX quadrature subcarrier signal.

Torick acknowledged that there is a quadrature rejection problem in some receivers but he indicated that it was not a severe concern. He said CBS tests conducted for more than a year at NPR-affiliate WPKT, Middlefield, CT, have resulted in virtually no listener complaints.

However, Addie said the problem may be more serious since multipath is present to some degree in all but the most ideal listening situations.

WLTW tests

Much different results were reported by WLTW. Even though the New York City station has temporarily shelved its tests, CE Robert Tarsio said listeners did
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Engineering: The Bottom Line

by Alex Zavistovich

Washington DC . . . In 1985, radio station chief engineers earned an average salary of \$21,665, technicians earned \$19,527, and contract engineers earned \$7,010.

That is according to the NAB's Radio Employee Compensation and Fringe Benefit Report, which also indicated that the average salary expense for a station's engineering department was \$25,076.

The biennial report, released in July of this year, includes 32 tables compiled for various station and market sizes, and for various station types: AM fulltime, AM/FM combination, FM, and AM daytime. The document provides information on fringe benefits and average salaries for departments, department heads, and support and sales staff.

This year's report had a much higher response rate than in years past, according to Cindy Stanley, a research analyst for NAB's Research and Planning Department. Over 1,240 radio stations nationwide contributed to the survey.

The NAB study showed that, in addition to the \$25,076 for engineering departments, average 1985 departmental salary expenses included \$119,634 for program and production and \$44,477 for sales. Advertising and promotion departments had average salary expenses of \$26,454, while expenses for administrative departments were \$82,293.

A similar study conducted by NAB for television stations in various market sizes indicated salary expenses by department of \$465,162 for engineering, \$393,597 for program and production and \$786,573 for news.

Although average compensation for

radio station employees increased in dollar value between 1983 and 1985 on the whole, some interpretations of the report suggest a drop in the categories of news, sports, business, engineering and research.

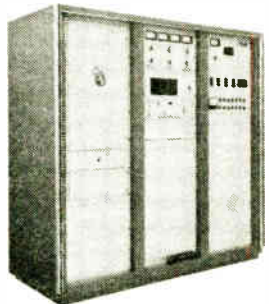
But Stanley said she hesitates to compare the findings of the 1983 and 1985 reports. The reports are a census, she said, not a sample, and it would there-

fore be "wrong to say there are statistical differences."

Stanley added that some discrepancies in salaries could also be accounted for by the cost of living in certain responding areas.

Other findings of the survey indicate that the most common fringe benefit for radio station employees was major medi-
(continued on page 2)

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Regulatory News

FCC/EPA RFR Study Finished

by Alex Zavistovich

Portland OR . . . The results of a joint study by the FCC and the Environmental Protection Agency (EPA) of RF radiation levels in the Healy Heights/Sentinel Hill section of Portland should be available by October or November, according to FCC Office of Engineering and Technology Physical Scientist Robert Cleveland.

Neither Cleveland nor Richard Tell, chief of the EPA's Office of Radiation Protection, would comment on the results of the survey, which was conducted 28 July through 1 August. Steve Gerber, city planner for the Portland Bureau of Planning, said he requested not to be informed of preliminary findings until an official government statement had been made.

Gerber said the study was undertaken at the request of the city of Portland and local citizens' groups, including the Committee for the Preservation of Residential Livability Values (CPRLV) and the Southwest Hills Residential League. The groups were concerned about levels of RF radiation emanating from the Healy Heights antenna farm, the site of two broadcast towers which support a total of seven high-power FM station antennas.

Other sites studied were Sylvan Hills,

Mount Scott and Council Crest Park.

Tell said that during the Healy Heights survey one FM station was converting from an old antenna to a new one, positioned higher on the tower. Measurements taken before and after indicated the transfer resulted in reduced RF exposure levels, he said.

He added that, while the tower climber was making the changeover, FM stations with antennas on that tower and the one immediately adjacent to it voluntarily reduced their broadcasting power to approximately 5% of their normal output.

Finding out "what's up there . . ."

"We have a unique situation here, of the City of Portland condoning or possibly supporting a concentration of towers in residential areas," said Bill Conley, co-chairman of CPRLV.

Conley said that residents of Healy Heights have been subjected to a number of "nuisance problems" resulting from proximity to the antenna farm, including loss of FM reception.

These nuisances, along with concerns over possible hazards of RF radiation, prompted Conley and his group to file a petition for a moratorium on additional towers. City officials have granted the petition several extensions, most recently to February 1987.

"We've found it necessary to find out what's up there, what the various power densities are, what the aggregate situation is," Conley added. He said he believes the FCC-EPA survey of the area will be a "key factor" in any future action undertaken by Portland's City Council.

Not the first time

This is not the first time the EPA has visited the city. In 1977, spot-checks were made of approximately 50 locations around Portland. Measurements at that time indicated power densities of 153 $\mu\text{W}/\text{cm}^2$ for areas within the antenna farms, said Gerber.

Gerber said he expects the survey to provide "confirmation of the environment, (to) establish a data baseline, and give the city council better information on regulations for broadcasters."

Portland has adopted a policy guideline which limits power density readings to less than 100 $\mu\text{W}/\text{cm}^2$ in public areas,

Gerber added. In other areas, levels up to 1,000 $\mu\text{W}/\text{cm}^2$ have been adopted, with the understanding that the city will implement any federal standard lower than that.

Gerber said Portland's exposure standard for radiation in the 30 to 300 MHz band is "virtually identical to the Massachusetts standard," which is 200 $\mu\text{W}/\text{cm}^2$.

A new study

The FCC, along with the EPA, which has conducted similar surveys of its own in Seattle and Hawaii, are scheduled to begin another RFR survey the week of 22 September in Denver, Cleveland said.

The study will examine radiation levels emanating from Lookout Mountain, a major antenna farm servicing Denver's broadcast community. Cleveland said the study, like the Portland survey, comes at the request of city officials and concerned citizens' groups.

He added that preliminary measurements of the Lookout Mountain farm made by the EPA in the late '70s and early '80s showed "higher than average" RF levels.

But Cleveland stressed that these earlier tests were not conclusive.

For additional information, contact Robert Cleveland at the FCC, 202-653-8169, or contact the EPA's Office of Radiation Programs at 702-798-2440.

FCC Clips

Russell Resigns

William Russell, Jr., director of the FCC Office of Congressional and Public Affairs, announced in early June that he is resigning, effective 4 August, to start his own government and public relations firm in Washington, DC.

Russell became director of what was then known as the Office of Public Affairs in May 1981. In 1984, the department was reorganized to include the Commission's legislative affairs activities.

For more information, contact the FCC news media information office at 202-254-7674.

Captain Midnight Caught

The FCC is cracking down on uplink operators that interfere with satellite transmissions.

"Captain Midnight," the video bandit who disrupted Home Box Office's satellite feed in April, had been "unmasked" in July, following a three-month FCC investigation.

John MacDougall, 25, an Ocala, Florida man who operates a retail satellite dish dealership and is a part-time teleport technician, admitted in federal court 22 July that he was the culprit who interrupted the satellite transmission.

Immediately after the April incident was reported, the FCC's Field Operations Bureau began an examination of its database of more than 2,000 uplinks. More than 500 uplinks had the power to jam the HBO feed.

The FCC has said it is cracking down on intentional and accidental satellite interference. For more information, contact Bill Russell or Sally Lawrence at the FCC: 202-254-7674.

Long Filings?

The FCC has released an order spelling out the guidelines for those who file documents that are longer than 10 pages.

The order covers whether to include a table of contents and summary in certain applications, transcripts, letters and comments.

The Commission said the objective in the docket is to provide the FCC "with an easy tool for analyzing and retrieving filings expeditiously and effectively."

"Documents such as petitions to deny, applications for review, petitions for reconsideration, and rule making comments are often lengthy and contain numerous arguments," the FCC said. "Our purpose is to require summaries generally for all documents exceeding 10 pages."

The FCC added that FCC forms do not need summaries.

For details contact Joseph McBride of the Commission's Office of General Counsel at 202-254-6530.

NAB Survey

(continued from page 1)

cal, followed by surgical benefits and hospitalization. Tuition reimbursement, dental plans and profit sharing were also offered by some stations.

The NAB said it plans to publish its compensation report annually, beginning next year. Stanley said next year's reports will include state-specific and metro-area-specific tables for regions that request them and that have high response rates to the study.


Copies of the Television and Radio Employee Compensation and Fringe Benefits Reports are available from NAB Station Services Department, 800-368-5644. The price is \$40 for members and \$80 for nonmembers.

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

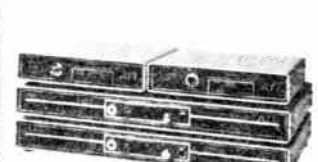
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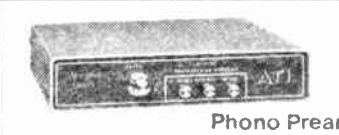
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Regulatory News

Final Mexican Accord Awaited

by David Hughes

Washington DC . . . More than a year after the preliminary agreement was signed, some NAB and FCC officials are optimistic that the final broadcasting accord with Mexico will be signed in the very near future.

An NAB statement, released 20 August, indicated that "the agreement (has been) cleared for signature" by the Mexican government. The announcement comes after the NAB held its an-

nual meeting earlier the same week with the Canadian Association of Broadcasters (CAB) and the Mexico's National Chamber of Radio and TV Broadcasters (otherwise known as the CIRT).

The statement indicated that Mexican government officials were waiting for a senior US embassy official in Mexico City to make arrangements for the formal signing ceremony with the Mexican foreign office. The NAB said that Mexico wanted to have the ceremony held "quickly," although no date was set.

According to NAB, Jorge Rodriguez, president of the CIRT, said his colleagues supported the earliest possible signing of the agreement.

Once signed, the final agreement would allow US daytimers on Mexican clear channels to operate at night. It would also authorize increased post-sunset operations for other daytimers.

The preliminary agreement was penned in August 1985, with the final agreement originally predicted to be signed by fall of that year. However, a

September 1985 earthquake destroyed many of the Mexican communications authority's offices, thereby delaying the pact. That was followed by a downturn in political relations between the two nations.

Most recently, rumors were flying that the final agreement would be signed when Mexican President Miguel de la Madrid visited Washington in mid-August.

For more information, contact the FCC Mass Media Bureau's International Branch at 202-632-6955, or Sue Kraus at NAB: 202-429-5480.

AM Stereo Conversion Urged

Washington DC . . . The NAB, joined by broadcasting associations in Canada and Mexico, have signed a resolution to encourage all AM stations in their countries to go stereo.

The resolution was announced after a joint meeting of the NAB, the Canadian Association of Broadcasters (CAB) and the Mexican National Chamber of Radio and Television Broadcasters (known as the CIRT) held 18-19 August in Pebble Beach, CA.

The three organizations agreed that the technical quality of AM must be improved in order to keep it "competitive," and a "significant part" of that improvement involves the switch to stereo.

So far, only about 10% of US stations have made the switch. Some of the majority who have not converted say they are awaiting the development of a single AM stereo standard. The FCC has relied on a "marketplace" approach, which has

resulted in a battle between Motorola's C-QUAM system and the Kahn-Hazeltine ISB system.

The joint resolution urges all AM broadcasters in the three nations to switch to AM stereo and to promote the production of AM stereo receivers "as critical elements in improving the ability of AM broadcasters to provide the best possible service to the public."

In other AM stereo news, Texar Inc. officials said that, as of RW's late August press time, they had not yet filed a petition for rule making that will ask the FCC to abandon its marketplace approach and select one AM stereo standard.

Texar officials would not comment on when the petition was scheduled to be filed.

The petition, he said, will not specify which system the FCC should choose.

NAB officials have said they would

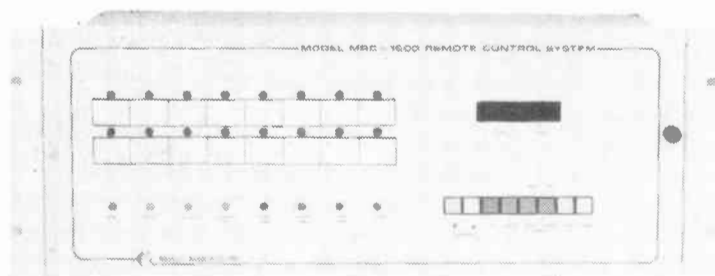
study the Texar petition when it is filed, but would not comment until then.

For more information on the NAB/CAB/CIRT resolution, contact Susan Kraus at NAB: 202-429-5480. For more information on the AM stereo petition, contact Texar at 412-856-4276.

As this issue was going to press, RW learned that the Mexican agreement was signed. According to NAB Counsel Barry Umansky, daytimers on Mexican clear channels can add night hours as of 28 August. More details in the next issue.



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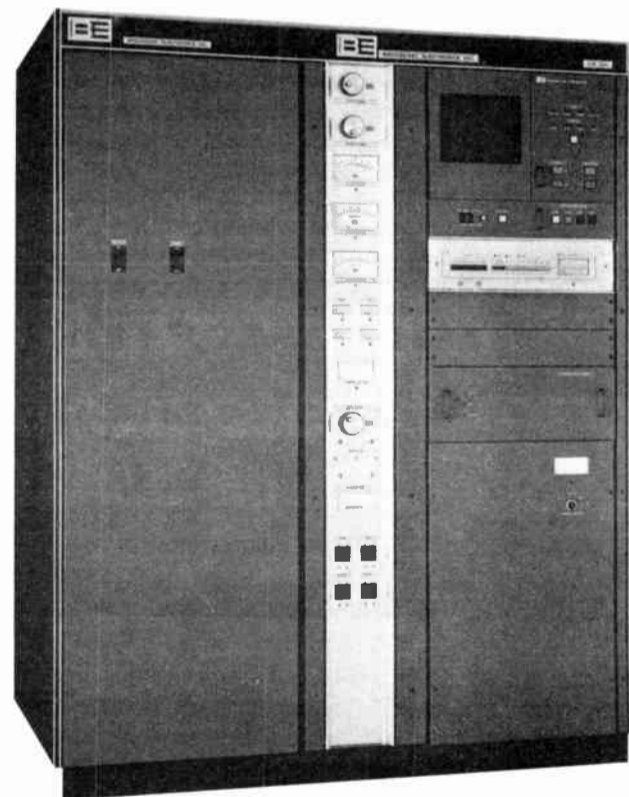
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Opinion

Why and How It CAN Be Done

by Mike Callaghan

Los Angeles CA . . . The 31 August 1984 issue of *Radio & Records* carried an article by Brad Messer that deeply bothered me when it was published, and it still bothers me.

Titled "Why It Can't Be Done," the article explored a perspective of engineers that many station managers share. I was moved to try to write a rebuttal to the author—until I realized he was more right than wrong.

Messer boldly divides engineers into two general groups: the 2% who achieve what he calls the "necessary results," and the other 98%, whose skills "lie mainly in the area of explaining precisely why nothing can be done about the problem at hand."

Brad jokes about the possibility of his lips being "fried by a hot microphone" in retaliation, but his point certainly comes through . . . there are times when engineers do deny the possibility, or even the practicality, of certain proposals before we've explored all the options.

Enthusiasm: a process

Any endeavor or solution starts as a germ of an idea in someone's mind. As the idea is nurtured and grows, the positive points offered escalate enthusiasm as they come to mind. Other people are consulted about it. Their eagerness and input can add to the excitement. As the

Mike Callaghan is CE at KIIS-AM/FM, Los Angeles, and a frequent contributor to RW. He can be reached at 213-462-6211.

advantages of the concept become less elusive and are solidified, a virtual frenzy of anticipation and excitement can begin to snowball.

Now, a lot of this process often happens *before* any checking is done to make sure the scheme is practical or possible. After all, it's only human to emphasize the positive advantages before worrying about the chances of success, the consequences or, to some extent, even the cost.

So now that all the exciting plusses—like increased ratings, higher billings, easier operation, lower costs, etc.—have

Guest Editorial

been mulled over and over, the person who thought of the concept, his technical consultant and the person whose expertise he needs to make his plan a reality approach you with the idea.

You, absorbed in your own little set of problems, and probably unaware of how much this means to him, tolerate the interruption and listen (patiently, we hope) as the scheme is outlined.

Then, do you, without taking more than just a few seconds to contemplate the idea he's spent hours getting excited about, decisively tell him in more or less words that it just simply "won't work?" Or that it "hasn't been done?" Or that "it's a bad idea," or "simply isn't worth the effort?"

This, my fellow engineers, isn't the way to win friends, keep jobs, or get rich or famous.

First, you both know it hasn't been

done. If it had been, you'd probably be trying to copy it from someone else . . . and looking stupid for not having come up with the idea first.

Second, unless you possess infinite wisdom, it's unlikely you should be making instant decisions about what an idea is worth, what the effort it would involve is worth, or whether the concept is really a bad one. It would be prudent to look the idea over for a while before labeling the concept impossible, worthless or absurd.

But returning to the present case, now you have a crestfallen disc jockey, program director or, worse yet, maybe your general manager walking out of your office after hearing his idea is impossible or futile. But wait—do you think he really believes that?

He knows that in the past he's been handed some sales or ratings goals he felt were totally impossible at the time.

Yet, somehow, through some herculean effort, he accomplished those goals. So, in his mind, he knows the real meaning of the word "impossible."

Then you, his engineer, just told him his idea was impossible or unreasonable and, without missing a beat, turned back to your soldering iron or cup of coffee.

What level of confidence have you instilled in this person? How soon will he be back after hearing that type of response?

What will he do now? Discouraged, maybe he'll confide his idea to a friend from another station and explain how you said it was impractical. After all, it sounded like such a good idea . . . he may as well get credit for thinking of it.

Then suddenly, an engineer over there with more creativity or enthusiasm finds a way to do it. The idea is worked out and goes on the air.

Wham! Where does that leave you—explaining to anyone who will listen why you *thought* it wouldn't work? So much for your credibility!

Or maybe you reconsider and do find a way to implement the idea. Great! Now you get to reap the rewards, and you're in much better shape than if nothing happened, but your credibility is still a little tarnished. After all, your immediate conclusion, and the one that will be remembered, was negative.

So what's the answer? It goes back to remembering the way you feel when you get hastily turned down. That initial angry sensation is well known to us all. It's natural to react more to the tone of the response than to the response itself.

I'm as guilty as anyone of this sort of reaction. Stuck in my ways, I've brashly verbalized more than once my personal and philosophical opposition to mic reverb, RF boosters, multiband processing on FM, using stereo matrixing with cart machines, and a number of other concepts that are common now.

Opposition not justified

I've learned that opposition to change isn't really justified. Sure, experimenting with and installing new gear is a lot of work. But there's nothing you can put in that you can't take out later—not to mention that you won't know how it works if you don't try it.

So, when you are approached with an idea, the best response is to let some of the excitement and enthusiasm rub off. Develop a positive attitude about it. Decide you'll give it the best you have and then do it.

Remember Victor Hugo's famous quote, and consider then the strength of "an idea whose time has come."

If you're in the midst of coping with a major disaster when approached, explain your priorities and then look forward to the request as something creative you can get involved in afterward.

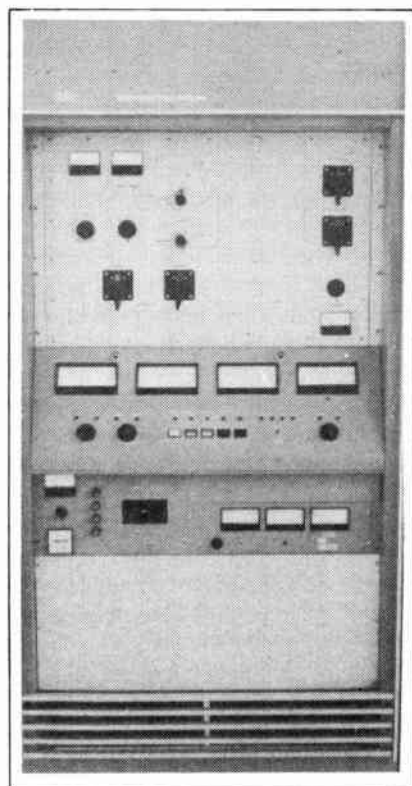
However, be sure to do your absolute best to avoid being negative about the concept before you really explore all the angles—and I mean *all* of them. As ridiculous as any idea may seem, it must have had merit to someone, or you wouldn't be hearing about it.

Following up

Once you've decided to go ahead and explore the possibility, make sure you keep the person who first asked you about it posted. If it means spending some money to research the idea, let them know what the costs will be, along with any other ideas you have about making the tests, and let them decide to make the investment.

Above all, let them be the one to decide when to lose interest if things don't work out. We all have bad ideas, and ad-

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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).

Desperate need

Dear RW:

In the 1 April issue, reader John Gaborou wrote that he would very much like to see a "decent AM receiver." You replied: "Unfortunately as long as it's feasible to *build and sell* poor AM receivers, they will be built and sold."

That was a pretty wishy-washy answer, and for all your uninitiated readers I would like to give my interpretation of what you should have said—as long as we have an incompetent and chicken-hearted FCC, they will be built and sold.

The FCC can require synchronous detectors as opposed to envelope detectors, but unfortunately it has left that decision to the marketplace, along with AM stereo.

The fact that the FCC is so good at not doing its job shows how desperately we need an industry regulatory commission.

John Pagano
WLVR-FM
Bethlehem, PA

FM intermod, revisited

Dear RW:

Your series of articles on FM intermod earlier this year seemed incomplete. First, I'm not convinced ETRs are the answer—they just have that many more semi-conductors for the RF to get into and foul things up.

Rather, some basic changes can be made to conventional receivers without the prices going through the ceiling and without requiring an Einstein to make the

changes.

The main culprits of intermod are the RF and mixer stages. The RF stage functions (or should function) primarily to develop enough signal to overcome mixer noise. Many receivers have too much gain in the RF stage and it overloads easily.

The bulk of the amplification should instead be left to the IF stages. The RF gain should be lowered, a few stages of preselection possibly added, and lower noise mixers should be developed.

I know Mr. Grosjean (RW, 1 February) would disagree with the second-to-last suggestion, but I say hogwash. If Motorola can put half a dozen tuned circuits ahead of any amplifying device in their two-way radio gear, who is he to say it can't work in a broadcast receiver? And they have ten times the sensitivity of a BC receiver.

The second culprit is the mixer stage. Or should I say those ubiquitous (and lousy) bipolar transistors used. Instead, J-FETs could be used, as they are less prone to intermod even without a sophisticated circuit. I know—I knew a guy who rebuilt the front-ends of aircraft radios using J-FET conversion and the difference was phenomenal.

These changes have to be made. I have the unfortunate fate to live within the 0.25 V/m contour of eight FMs and five VHF TV stations. Unfortunately, those of us who like the lower power minority/community stations suffer. Trying to listen to anything other than the big eight while driving around is almost futile unless your radio costs over \$600.

These changes could be made for only a few dollars extra.

Too bad the receiver industry is too cheap to do it. And to think these bozos picked the AM stereo standard for us to boot! (I'm a Harris die-hard).

Scott Todd
Technical Advisor
Skyward Communications

Radio Shack clarification

Dear RW:

Several months ago I expressed my interest in the continuing need to promote professionalism in the industry specifically by not advocating the use of "Radio Shack" components.

Since originally published, I have been asked to clarify my position by both Radio Shack dealers and industry concerns.

First and foremost, of course I never had any intention of slandering the product name or component quality; in fact, I am impressed by the general representation of various manufacturers at a more than reasonable price. I am not afraid to admit that many times I have utilized both products and components, many of which are in use to date, with a high rate of success.

Despite the tone of the article in the *Chicago Tribune* covering FMX testing at WFMT in Chicago, the testing is apparently proceeding amicably, and with an eye toward keeping broadcasters up to date on FMX's progress.

The companies involved—representing both the broadcasting and receiver industries—have shown they are willing to share information, though sometimes sketchy or generalized, with broadcasters.

The result is that, when FMX is ready for the marketplace, receiver manufacturers, stations and the public will know the nature and behavior of the technology—enough so to know its application at stations with various types of processing and modulation, and perhaps enough to know its behavior with particular makes of gear.

FMX: The Right Way

By end of tests, broadcasters will also be aware of the effects of FMX on existing receivers, though currently this is the area under the most intense study in the tests. The testing has thus far exposed potential problems in that multipath-type interference is being generated within some receivers.

The remaining elements of the tests apparently showed temporary bugs with transmission and generating equipment that are being worked out in preparation for further testing.

Field testing of FMX at a variety of stations and under varying equipment conditions and differing signal coverage areas is perhaps the only sure method to establish its behavior before release to the industry. Such testing almost ensures FMX's acceptance by broadcasters at that point.

The willingness of the participants to discuss, first, that problems have been uncovered, and second, what those problems are (even if only generally), shows that the industry is capable of establishing a forum for the exchange of information without retribution and to the benefit of radio.

The cooperative testing is to everybody's benefit. FMX will, if all the bugs are worked out, prove to be a revolutionary force in FM radio, and could forever alter the dynamics, economics and future technical development of the FM marketplace.

—RW

Perhaps the biggest fault to be found with your corner electronic retailer is that it is all too convenient and reasonably priced, resulting in the temptation for some pretty irregular designs, repairs and modifications.

Maintenance engineering is often challenging enough without finding a menagerie of incorrect components obviously installed in haste after a shopping spree at the corner supplier.

Poor engineering practices cannot be blamed on Radio Shack or any other convenient supply house. I still advocate prudent selection of quality components wherever they come from, along with professional design and installation.

R. Michael King, CE
KVMT-FM
Vail, CO

A valid approach?

Dear RW:

In your 15 July Opinion column, you state that "choosing a (AM stereo) system based on the number of receivers out there is a valid approach based on economics," yet an article written by senior RW columnist Bill Sacks in the same issue describes how he got stuck with a Delco C-QUAM radio that wouldn't receive one of his favorite AM stations in stereo, which "is firmly committed to the Kahn system."

Mr. Sacks goes on to say that "this was not a cheap (inexpensive) radio, and multimode chips are available."

I would say Bill Sacks has just presented a very valid argument to your premise of choosing an exciter based on a lot of bad radios in the market. I'm not sure why more manufacturers aren't producing multimode receivers, but it may have something to do with Leonard Kahn insisting on wider bandwidth and higher frequency response before he'll license a manufacturer.

My station isn't AM stereo yet, but when we go, my choice of exciters will partly be based on whether you can tune us in and get quality stereo, instead of just one additional channel of poor sound.

It is amusing that Texar would run a full page ad opposite the Sacks column imploring the AM broadcasters to push the FCC for a national standard, yet Texar doesn't say a word about which system they support. This is an obvious marketing ploy to make them look like stereo proponents.

I don't care which system they prefer, but if they want us to take a stand, they should do the same. I'm sure Texar's engineers have an opinion; let's hear from them.

My preference for a solution? Automatic switching wideband multimode receivers. That way every engineer can make the choice of exciter for themselves, just as I have selected the Kahn system for my application.

John A. Buffaloe, CE
KSON
San Diego, CA

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Two Stations Halt FMX Testing

(continued from page 1)

not notice when the FMX system was up and running.

"We received no complaints about FMX, no documented calls," said Tarsio. The Viacom-owned adult contemporary station performed the unannounced tests in May and June, but "temporarily suspended" them in July.

The prototype FMX generator supplied by CBS "does what they say it does," he said. However, Tarsio admitted that it is "not a panacea for all stations" especially those, unlike WLTW, that utilize heavy audio processing.

"It does work," he said. However, some quadrature rejection problems are evident in older receivers that do not utilize a phase-locked loop (PLL) circuit.

"But we were hard-pressed to find receivers that would have a problem," Tarsio added, since most of them were manufactured before 1974 and are a declining minority in the overall receiver population.

However, he emphasized that the problem is "minor."

"If a severe problem has occurred, we would have heard about it," he said. "We have a very responsive audience."

Tarsio said WLTW has no immediate plans to continue the tests but that it is still in possession of the FMX equipment and is conducting bench tests.

Dahl added that CBS has contended

"all along" that in some cases FMX "will have a (negative) effect on existing multipath incidents," but that the system has not been shown to create new multipath incidents.

Tests that CBS is now quantifying show that, he added.

Generator production continues

Jim Wood, president of Inovonics Inc., which will have its "X-tra" FMX generator on the market in November, said recent on-air tests of his gear caused no significant compatibility problems with non-FMX receivers.

"So far the tests have gone okay—in fact, very well," Wood said.

"We know that multipath (distortion) can be aggravated by the quadrature subcarrier, but we've seen no big problems," he said. Inovonics has tested the unit at four stations not far from its Santa Cruz, CA, headquarters, but Wood would not identify them.

Wood did point out that he has had to delay the date—from August to November—that the "X-tra" unit would be available. CBS, he said, "changed the ground rules" when it discovered "some overmodulation problems for heavily processed signals."

Besides Inovonics, three other firms have announced plans to manufacture FMX generators: Orban Associates, Circuit Research Labs (CRL) and Aphex

Systems.

A spokesman for Orban Associates said his firm was taking a "wait and see" approach regarding any on-air FMX tests of its new generator, the 8150A.

"We haven't done any on-air testing yet," the spokesman indicated. "It's on hold pending the results of CBS's testing."

He said he had "heard that there are some problems" with the FMX tests, but he "hopes it gets off the ground."

CRL said its SG-810 FMX generator may be available by late 1986. CRL Senior Engineer Chuck Adams said tests of the unit have been conducted at two Phoenix area stations, but he would not reveal any details.

"We're still doing tests. If the testing goes okay, we should have our unit available by the end of the year," he said.

Aphex Systems has said in the past that it is eyeing KIIS in Los Angeles for tests of its Model 902 FMX generator.

According to Marvin Caesar, president of the firm, Aphex plans to have a working prototype on display at the October SBE show in St. Louis. He would not reveal details about on-air tests of the unit.

Other questions

Besides the multipath problems, some critics say that the FMX system is not needed because, with closer spacing of

FM stations in many areas of the country, the signal range, and thereby the stereo coverage, is limited not by the strength of the signal, but by the presence of co- and adjacent channel stations.

However, Torick maintains that many weak stereo reception pockets within the main listening area of a station that can be improved by FMX.

The WFMT and WLTW tests are not the only tests that have been halted. In another FMX test earlier this year, Boston classical station WGBH pulled its FMX generator off the air after RF interference affected a prototype FMX generator, according to Torick. He maintained that the problem was "not FMX related."

Torick said the overall FMX study is now in a "quiet phase," with on-air tests continuing only at the original Connecticut station. He said he will have more on-air tests to announce by the fall.

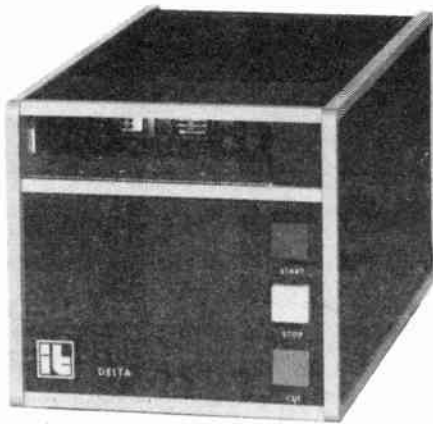
Meanwhile, NAD's Dahl said that besides the new 4300 receiver, which should be on store shelves by September, four other FMX receivers are in "the development stage."

He predicted strong sales of the 4300, despite the lack of FMX stations now on the air. The unit, Dahl said, will attract audiophiles interested in its other features.

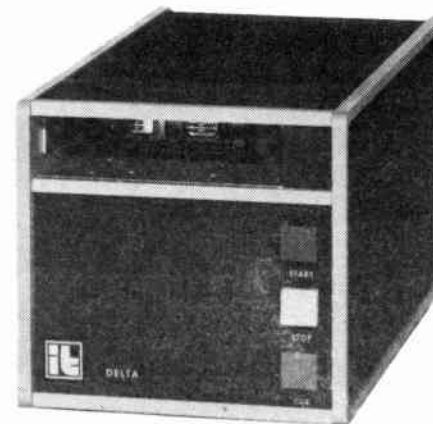
Other receiver manufacturers are expected to jump on the FMX bandwagon in the near future, Torick added.

For more information on FMX, contact Emil Torick at the CBS Technology Center in Stamford, CT: 203-327-2000.

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NAB Seeks NPRM on 'Arizona'

by David Hughes

Washington DC . . . The NAB has asked the FCC to begin a Notice of Proposed Rule Making (NPRM) proceeding to study whether to remove or modify its rules on main studio location and station program origination.

The NAB's request, filed in late July, comes slightly more than a month after a group calling itself the Arizona Justice Committee (AJC), an ad hoc group of 14 radio licensees, petitioned the FCC for the removal of rules mandating that the majority of a station's programming originate from within its city of license.

Existing FCC rules, formed to ensure that the local community has access to a station's main studio, require that a station's main studio be located in the city of license.

However, the AJC maintains that the rules are outdated and are contrary to providing the best radio service to the listening public.

In its recent comments, the NAB said the FCC has not reviewed its station location rules (73.1125) and program origination rules (73.1130) since their adoption in 1950.

"Through the initiation of a rule making proceeding, the Commission will have the opportunity to explore the issue

as well as other arguments in support of elimination, modification or retention of these rules," the NAB said.

The association said the FCC should also examine "the effect of increased competition in markets brought on by tremendous growth in the number of radio stations," along with "new technological advancements coupled with changes in the radio marketplace (that) have necessitated a revision of these rules."

"These rules were designed to assure that a license maintains a presence in the community," the NAB commented. "It could be argued that in today's competitive marketplace, a broadcaster will fulfill this requirement without a government mandate on studio location or program origination."

In addition, the NAB and the AJC pointed out that the FCC had questioned the continued need of the studio and program rules in its AM improvement report, which was released in April.

The AJC added that stations should only have to maintain an office that is

accessible to its community of license and should be allowed to operate a studio anywhere within its prescribed service area.

"The studio location requirement is unnecessary because members of the listening public do not generally contact their local radio station by dropping in at the main studio, but will instead express their views or seek an appointment with management by phone or by mail," the AJC petition said.

Stations can, however, obtain an "Arizona waiver" and build studios outside their city of license if they agree to provide at least 51% of their public affairs and news programming from within the city of license. Pre-recorded music programming is exempt from the 51% requirement.

Stations found to be in violation of the studio and programming rules face a \$10,000 fine.

For more information on the NAB's comments, contact Bob Hallahan at 202-429-5350. The AJC contact is Greg Skall: 202-861-1500.

Westar Jointly Run

by Alex Zavistovich

Upper Saddle River NJ . . . A letter of intent signed by Western Union Telegraph Company and Unilease Aerospace Corporation to form a joint organization which will operate Western Union's Westar satellite system is still pending FCC approval.

According to Western Union spokesman Warren Bechtel, the move, which was proposed in May, will "ensure and enhance the future of the Westar communications satellite business."

Earlier, in a statement filed with the FCC, Western Union said that, in order for it to remain active in the satellite business over the long term, provisions must be made to obtain replacements for the Westar satellites, as necessary.

The letter of intent proposes a transfer of title of the Westar system to a new corporation jointly owned by Western Union and Unilease, in which Unilease would provide financing. The new company would operate the current system and may launch additional satellites for which Western Union has received auth-

orization. Western Union plans to lease time on the system for its own communications services.

Members of Western Union's staff presently engaged in operations, engineering, and marketing of the satellite system would be transferred to the new company.

Unilease VP Mark Dietrich said the move was a "way of better capitalizing the Westar system."

Western Union has been engaged in a comprehensive financial restructuring, to improve a "liquidity crisis" which occurred at the end of 1984, Bechtel said. The new venture would release Western Union from the obligation of financing further satellite expansion.

Westar users include PBS, World Communications, and a number of "occasional use" TV and radio broadcasters.

Negotiations of final terms of the arrangement, third party consents, and FCC approval are still pending. For further information, contact Warren Bechtel of the Western Union News Bureau at 202-825-5790. Contact Unilease at 212-265-1040.



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Ray McMartin Starts 2nd Firm

by Alex Zavistovich

Gunnison CO ... Ray McMartin, president of McMartin Industries, Inc., the Omaha-based FM-SCA company that filed for bankruptcy under Chapter 11 in 1985, recently announced the formation of a new firm.

New "McMartin International" has hired "almost 30 people" since starting operations in Gunnison, according to Financial Administrator Robert McMartin. Staff members include assemblers, technicians and administrative personnel.

McMartin Industries had long been a player in the field of commercial sound, producing subcarrier equipment as well as audio amps, compressors, transmitters and related products. In May 1985 the company was placed in involuntary Chapter 7 bankruptcy, which was converted on 13 September 1985 to Chapter 11.

According to Director of Communications Jane McMartin, McMartin International plans to offer a product line similar to that of McMartin Industries, including amplifiers, field strength meters, tone generators, relay receivers and line amps. The first products, an SCA tuner and a tabletop SCA radio, are expected to be available by the end of August, although production has not been completed.

The company also intends to honor service contracts for McMartin Industries equipment. According to an announcement issued in July, "products returned from customers for repair are presently being shipped to Gunnison from Omaha."

"We feel a moral obligation to our customers," Robert McMartin said.

City officials reportedly actively solicited McMartin's move from Nebraska

to Colorado, and expect the company to bring Gunnison 100 new jobs and a payroll of over \$1 million dollars within two years.

In a related story, Jay McMartin, former VP of McMartin Industries, has announced the formation of SMC International, headquartered in Omaha.

He said he chose to remain in Omaha to draw from the "large pool of human resources in commercial sound and SCA" areas the town has to offer. He noted that, although his company "has a num-

ber of ex-McMartin employees working with and for (him)," it is a new venture.

SMC International produces a conductor/identification tone generator which mounts on vertical telephone frames. The firm also produces a SCA tuner which McMartin said employs a new type chip.

He added that SMC International will be ready to produce a 10 W and a 25 W audio amplifier by the end of August, and projected the line will develop to include a 120 W amp by the first quarter

of next year.

The McMartins all refuted recent implications that a family rift prompted Jay McMartin to strike out on his own, and further maintained that there was no ill will among them.

"We wish Jay all the luck in the world," said Jane McMartin, "what else would we do?"

For more information, contact McMartin International at 303-641-5500. Contact SMC International at 402-896-1262.

IEEE to Cover New Designs, RFR

by David Hughes

Washington DC ... New designs for AM antennas and the latest in RF radiation standards are just two of the topics scheduled to be discussed at the 36th annual Fall Broadcast Symposium, sponsored by the IEEE Broadcast Technology Society.

The symposium, to be held 18-19 September at the Washington Hotel in Washington DC, is expected to attract a record number of engineers, according to event Chairman John Kean, of Jules Cohen and Associates.

The two-day event opens with a "radio engineering" session featuring papers on a variety of AM and FM improvements. One paper, Kean said, will feature a computer modeling study of two designs for AM reduced skywave antennas that are the focus of recent NAB-sponsored tests.

Other radio engineering papers will deal with improving radiation characteristics of FM antennas, controlling noise

and vibrations in broadcast transmitters, a voltage-matching method for feeding two-tower arrays, and status reports on various AM and FM improvement development work, he added.

A session on the afternoon of the second day will focus on "general engineering," Kean said. Topics include the IEEE's efforts to develop RFR standards. Other papers will deal with RF and microwave exposure, PCBs in the broadcast environment and optical fiber applications.

Two TV oriented sessions will also be held, with papers on topics such as satellite and electronic news gathering.

Other events are planned besides the papers, according to Kean.

Two luncheons will be held. On the 18th, Jason Shrinsky of the Washington, DC consulting firm of Shrinsky, Weitzman and Eisen will address an IEEE/AFCCE-sponsored luncheon. PBS Broadcast Operations and Engineering Senior VP Richard Green will address another luncheon on the 19th.

An AFCCE dinner cruise up the Poto-



mac River on the evening of the 19th is also scheduled.

Registration for the full program, except the cruise, costs \$150 for members of the IEEE Broadcast Technology Society, \$160 for other IEEE members, SMPTE, and/or SBE members, and \$185 for all others. Arrangements can be made to attend only particular events, and sign-ups can take place the day of the symposium.

For more information, contact John Kean at 202-659-3707.

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Circle Reader Service 32 on Page 39

World Radio History

How & Why

(continued from page 4)

mitting it isn't easy. But if you are the first to drop the ball and let the issue die, the person with the concept will never forget it, and your lack of response may come back to haunt you when you least need it.

Energy expended in such fruitless projects isn't wasted. You'll most likely find that the one part you needed that wasn't made yet will be, or the information you've gathered will help you in another area. Don't presume that any time, money and effort devoted to these ideas is ever totally lost. It just doesn't work that way. Dividends will return when you least expect them.

Remember, if you've helped your co-worker with his ideas, you can be sure he'll be more likely to go to bat for some of your pet projects—like a new transmitter or test equipment.

Thomas Alva Edison said that genius was "2% inspiration and 98% perspiration," so don't discount the value of someone's brainstorm until you've put a little of your own 98% into it!

KSJR-FM Minimizes Downtime

by Tim McCartney and Dan Sis

Collegetown MN ... KSJR is the radio station where both Minnesota Public Radio (MPR) and Lake Wobegon's most famous resident, Garrison Keillor, began their success stories.

Today, KSJR is part of the MPR system, with its primary task being that of delivering network programs originating from KSJN in St. Paul. KSJR's central location is critical to the terrestrial off-air linking of signals to northern Minnesota stations (see Figure 1).

Tim McCartney and Dan Sis, both KSJR engineers, may be reached at 612-363-7703.

A variety of KSJR local programs originate from its studios at St. John's University in Collegetown, amounting to about 5% of the total program schedule. Meanwhile, the SCA channel carries the "Radio Talking Book Network" from Minnesota State Services for the Blind. "Talking Book" audio is inserted into the composite signal in St. Paul by KSJR for terrestrial distribution to the MPR system.

In an environment of network program relays and minimum staffing, certain backup systems have been evolved in an effort to eliminate downtime.

Three choices for network programs

When broadcasting network programs, complete with SCA, KSJR has three options (see Figure 2).

First, KSJN's composite signal can be received directly off the air from the FM

tuner at the studio and routed to the STL.

Second, KSJR can receive MPR programming via satellite. In this mode, audio from the left and right satellite demodulators directly feeds the limiter and stereo generator. At this point, the composite output (minus SCA) from the stereo generator is routed to the STL transmitter.

(continued on page 10)

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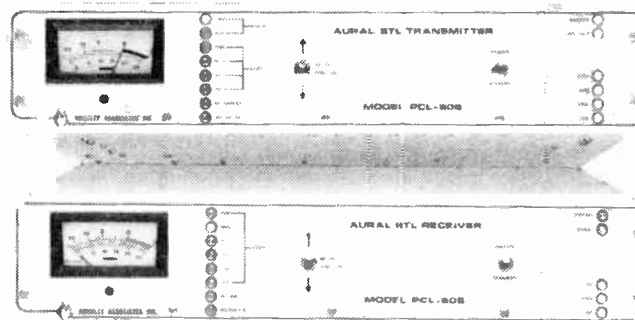
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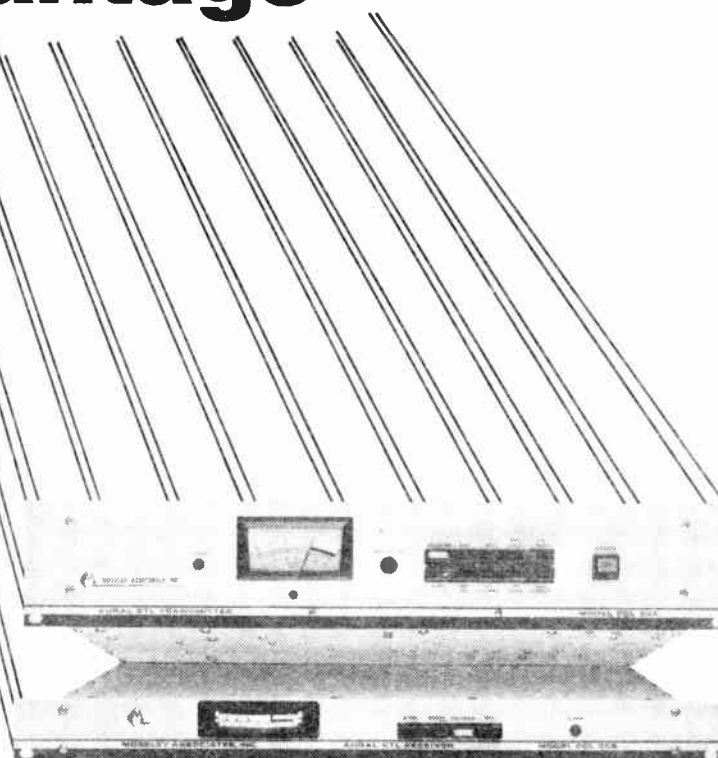
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KSJR-FM Minimizes Downtime

(continued from page 9)

Third, an FM tuner receiving KSJN stands ready at the transmitter site, located 12 miles from the studio. In the event of an STL failure, KSJN's composite signal is automatically routed to the exciter input from the backup FM tuner (see Figure 3). Not only does this eliminate downtime from STL failure, but it allows the engineers to maintain all equipment in the broadcast chain right up to the STL output—a real Nodoz saver!

Local and relay

When using the console, satellite or ID cart machine, the station operates in a "local" mode. This results in KSJN's total composite signal no longer being "re-layed." Rather, KSJR generates its own composite signal consisting of KSJR's main channel audio and KSJN's SCA carrier.

SCA stripping is accomplished by a band-pass filter isolating the SCA from KSJN's composite signal, and inserting the 67 kHz carrier at the STL transmitter (Figure 2).

Beyond the various backup sources for

programming, two important AC power sources are available.

At the transmitter site, local power cop outages are covered by a 90 kW diesel generator. This addition has been instrumental in maintaining service, particularly during electrical storms.

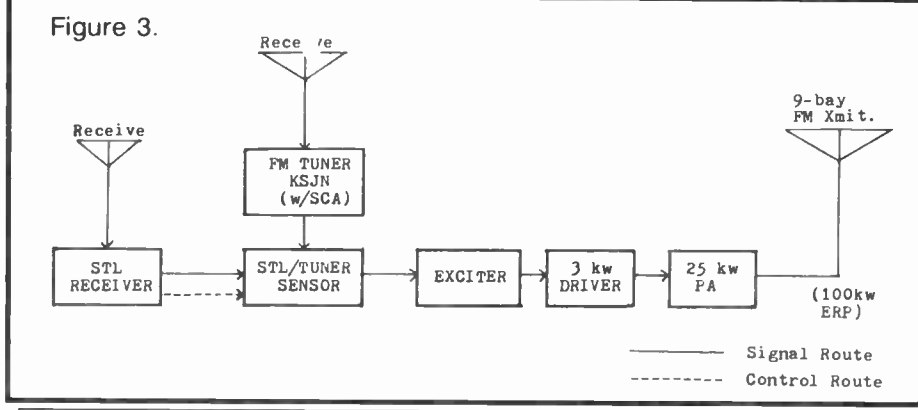
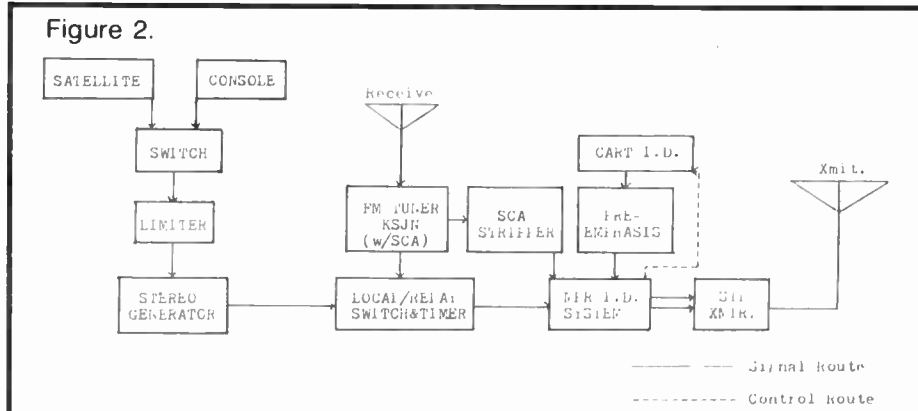
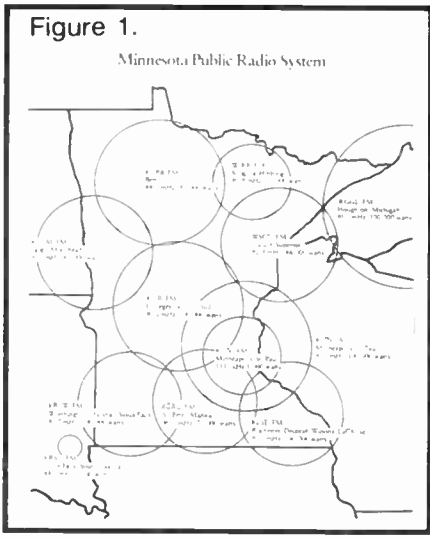
A secondary power source for essential studio equipment was the logical next

step. After all, a transmitter with no audio has nothing to say! It just so happened that St. John's University is equipped with a generating plant fueled by coal and garbage. So, KSJR installed

a sensor to detect local utility outages and switch over to university power.

Incidentally, regular staff working around the clock every day at the generating plant have contracted with KSJR to read remote meters, monitor EBS, alert engineers of problems and in general to keep things legal.

(continued on page 14)



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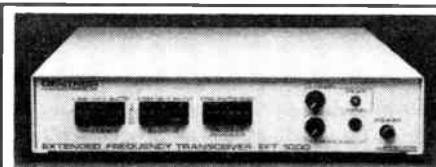
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Grounding Design Aids TIS Use

by Karen Kellow

Harbor City CA . . . Running late to the airport? Stuck in a traffic jam, wondering which parking lots are full? Dial 530 AM (or 1610) on your car radio and get the answers.

This kind of helpful information is available to travelers at many airports across the country, thanks to the advent of localized radio.

The use of frequencies immediately adjacent to the AM broadcast band to advise or inform motorists is recognized as a useful part of the broadcast industry. With improvements in design and technology, Travelers Information Systems (TIS) have become increasingly popular. These unique systems help growing airports and their surrounding communities cope with increasing traffic and parking problems more effectively.

Los Angeles International Airport was the first airport to incorporate an induction cable radio system, anticipating such growing traffic problems. With plans for airport expansion, added airline service and the 1984 Olympic Summer Games, the City of Los Angeles Department of Airports was able to prepare for these challenges and meet them successfully.

One contributing factor to the much-publicized success of LAX's construction program is their efficient cable-and-antenna radio systems. Travelers can tune in for current information around the clock, saving them time and minimizing the confusion and frustration often experienced at large metropolitan airport terminals.

The author is a marketing specialist at XIT Grounding Systems. She can be reached at 213-530-8000.

Two California companies responsible for the rapid expansion and popularity of localized radio are LocRad, Inc. and Richard W. Burden Associates. The combined talents and experience of these two companies—and the men behind them—resulted in another highly successful, first-of-its-kind project.

It came as no surprise when Burbank Airport managers and city officials selected LocRad, Inc. and Burden Asso-

ciates to design and install a state-of-the-art TIS vertical monopole system for their airport.

The Burbank-Glendale-Pasadena Airport has experienced continual growth in the past few years as a result of added airline carrier services. Plans for future terminal expansion are in the works for this popular and busy airport as well.

A TIS system would streamline the flow of airport traffic. A deadline of

spring, 1986, was set for the new, low-power radio station to be fully operational.

"We, with our sister company, LPB, Inc. of Frazer, PA, have designed, built and maintained more localized radio facilities than any other group in the broadcast industry," said Bill Jackson, president of LocRad, Inc. LocRad has been the operating company for LAX's
(continued on page 13)

RADIO *Classics*

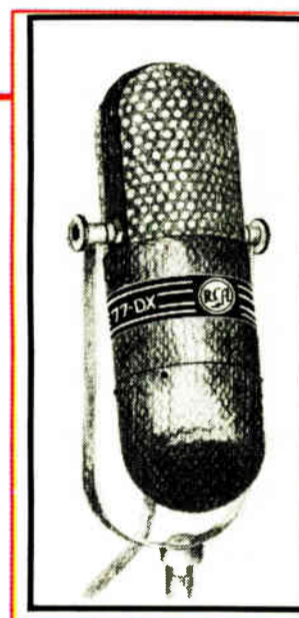
What makes a *Radio Classic*? Timeless design, flawless performance, outstanding value, and above all — bullet-proof reliability. Because, in radio, we don't coddle our classics.

The RCA 77DX is one such product. It set new standards in microphone performance. Even now, decades later, its quality still endures. Arrakis Systems' SC audio consoles are *Radio Classics* too. Introduced in 1980, the SC series set new standards in design, performance and value. Today, Arrakis SC consoles are the choice of more radio stations worldwide than any competitive unit in their class. Shown below is the 2000SC, an outstanding value at \$4695. Like all Arrakis audio consoles, the 2000SC is ultra-reliable. And it will continue to deliver outstanding performance as the years go by. After all, that's what it takes to be a *Radio Classic*.

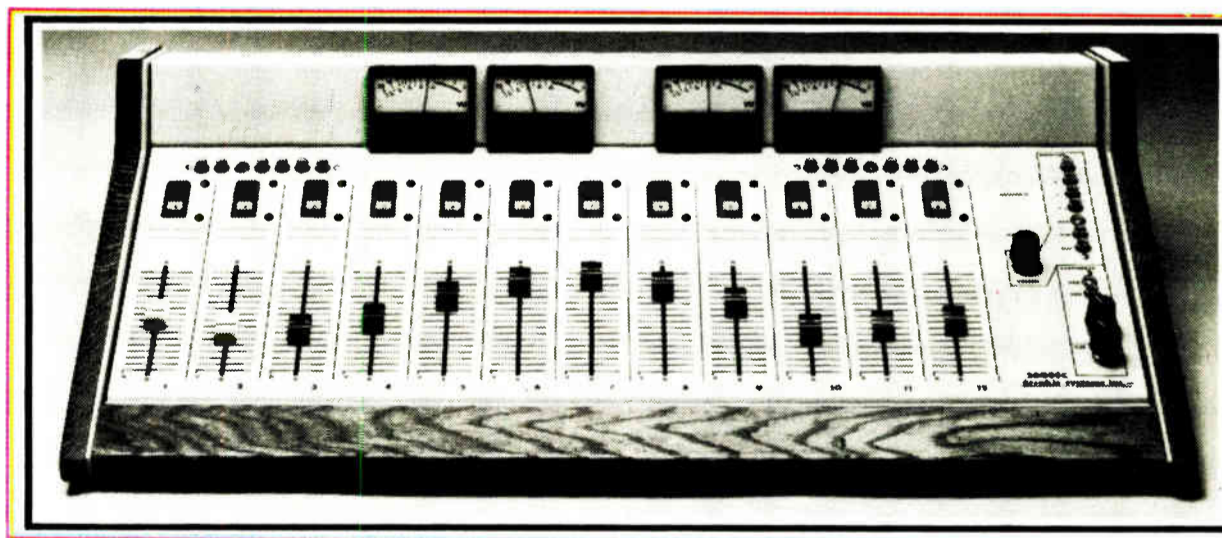


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Circle Reader Service 6 on Page 39

Circle Reader Service 41 on Page 39

Use 'Price-Itemizing' in Radio

Editor's note: In addition to running articles on engineering and technology, RW occasionally covers other aspects of radio station operation. In this vein, RW is pleased to run the following article by radio-veteran Bill Weaver.

by Bill Weaver

San Francisco CA . . . Of all retail advertising, newspapers get more advertising dollars than any other medium. It's no wonder retailers love newspaper advertising; they occasionally see dramatic results the very next day.

Because newspapers use the "price-item" approach to retail advertising—featuring as many as 80 items per ad—it reaches large numbers of potential buyers who are "in the market" for at least one of the items. The resulting next-day heavy foot traffic almost guarantees impressive store sales because the excitement and emotional climate generated by large numbers of shoppers creates even higher sales per capita.

Faced with the immediate and heavy-impact results that newspaper advertising can produce for the retailer, what has the radio industry done? Over the past 25 years, most radio salespeople have advocated "image" and "sell" advertising while pursuing a negative campaign against newspaper circulation figures and ad readership. I believe we should change that approach and learn from newspa-

Bill Weaver is a partner in the Davis/Weaver Broadcasting Group, which includes KLOK-AM and FM in the San Francisco Bay Area, KWIZ-AM and FM in Orange County, and KFIG-AM and FM in Fresno. He can be reached at 415-788-2022.

pers' success in the retail arena.

The average person spends approximately 30 minutes a day reading the newspaper. In that half-hour, people read what they're interested in—and that goes for advertising, too. When people are "in the market" for an item, they'll read the ads; if not, they'll skip over them.

To capitalize on this "in the market" mood, newspapers sell full page or double-truck retail ads which include scores of items and associated prices. Again, the theory is that the more items listed, the larger number of readers that will be attracted and the greater the results. The newspaper advertising formula is to have the right item, at the right price, at the right time.

Why not do the same?

When it comes to the retail market, radio advertising has been losing the competitive battle. We need to undo years of emphasizing sell and image advertising with schedules stretching throughout the week. It is my belief that radio can get the same next-day results as newspapers by attracting "in the market" listeners the same way—with large doses of price-item advertising concentrated in shorter periods of time.

At KLOK, we recommend that retailers buy as many spots as necessary to list ALL the items, even if there are 80. We propose buying only one-minute spots; no :30s. Approximately five items can fit into the 60-second commercial with time remaining to incorporate some of the traditional image or sell message.

It is also important to saturate the airwaves with one spot an hour, 24 hours a day, instead of making buys in strips over the week. This strategy is designed to create the same impact as newspapers in generating the next-day results.

Critics have long believed that radio can't manage price-item advertising successfully. However, my stations have tested this concept for years and it works, thus creating impressive results for the retailer. By featuring the same number of items in a concentrated period of time, we can generate the same amount of retail traffic as newspapers.

I also believe it's important for radio to stop criticizing print advertising in its pursuit of increased sales. One of the ways we do this is by using the "Starch

“Radio can get the same next-day results as newspapers.”

Report," which is really a tool to measure newspaper readership, not circulation. Radio salespeople use it to sell advertising to retailers and to create negative impressions on newspapers' effectiveness.

But this is the wrong tactic. Why? Because the "Starch Report" doesn't recognize how newspaper retail advertising really works—by appealing to those readers who are "in the market," and who are looking for the right item at the right price at the right time. Totally missing with this approach is the recognition that each medium—radio, TV and newspapers—possesses particular strengths and weaknesses.

To create the greatest impact for retailers, my stations sell a media-mix approach, tying radio, TV and newspaper advertising together. We suggest a radio buy to do the job where newspaper

advertising leaves off.

For example, if a newspaper's circulation reaches 50% of the available "in the market" audience, we suggest a radio buy to reach the other 50% of the potential buying audience. These people who are "in the market" are the best buying source for retailers—the more of them reached through price-item advertising, the more sales that result.

Therefore, our approach is not to discredit the respectable job that newspapers do in reaching a certain percentage of the market, but to advocate that a retailer use radio to find the rest of the market. As a result of this combined media approach, you get 100% of the "in the market" audience.

Again, that's why it's pointless for radio salespeople to sell against a newspaper's weak points. Instead, they should focus on tying the radio station in with the concept of reaching as many people as you can who are "in the market."

That is also why we emphasize cumes in our retail proposals and not quarter-hours. It's the total audience that's important.

The best way for radio and newspapers to complement one another is to use the same approach. Again, price-item advertising in both media is the most effective retail tool. We often suggest scheduling radio spots two days before newspaper ads in order to increase the readership of the ad.

This synergism produces greater traffic, more excitement and per-person sales far beyond what either medium can produce by itself.

Thinking retail

Presently, the Radio Advertising Bureau has two divisions: one for small market stations and one for large market stations. I'd like to make a suggestion to the RAB: why not create two separate categories—a national category and retail category.

The national category should have a sales manager and salespeople concentrating on the agencies in the national fields.

The retail category should have a sales manager and staff selling to the retail community, and it would be trained accordingly. My rationale for this is simple. A salesperson who sells to large retailers faces a different set of challenges than the agency sales person. Retail is a vital and lucrative area for radio and we should be training people to effectively sell to it.

The only way that radio will win large advertising budgets is to create the same "right-now" results as newspaper. To do that, radio must change its traditional approaches.

We need to stop selling negatively and convince our retail clients that they need radio in their media mix to reach all the people who are "in the market" for their products. And we must become experts in round-the-clock price-item advertising. When we start getting those heavy hits, the dollars will follow.

With our Automatic Remote Control System your transmitter – and your personnel – will operate with increased efficiency

Have you ever wondered if your night operator will remember . . . to switch patterns at sunrise? . . . to periodically check critical levels? . . . the correct transmitter restart sequence? You'll never have to worry if Potomac Instruments' RC16+ is on the job. Because it'll do all these tasks for you. Plus a lot more. Automatically.

With its microprocessor based control logic, the basic RC16+ provides 16 telemetry channels with automatic out-of-tolerance alarms and remote raise/lower controls;

plus 16 status channels. The automatic functions — pattern shift, transmitter restart, power control — are pre-programmed in accordance with station license requirements and controlled with an accurate master clock.

The RC16+ is also expandable. In 16 channel increments, up to a total of 64 channels. With the remote video display option your chief engineer can get a detailed readout of all measured parameters. It's updated every 30 seconds and connects to any standard telephone. The optional plug-in automatic logger provides a permanent record of all transmitter activity. Log intervals, sequence, and alarm flags are user-selectable.

And, best of all, the RC16+ is cost effective. No other unit on the market offers these features and capabilities at this low price.

Basic System	\$4,995.00
Additional 16 Channels	1,865.00
Plug-In Automatic Logger	2,499.00
Remote Video Display Unit	650.00



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(301) 589-2662



XIT Ground Saves Day for TIS

(continued from page 11)

station since 1972. "We were confident we could provide Burbank with a quality radio system."

Other TIS projects Jackson and Burden have been involved with include airports at Phoenix and Tucson, and the State Transportation Departments in CA, IL and TX.

Jackson predicts some 623 million air travelers are expected to fly annually by 1996, nearly double the number carried by US airlines last year.

"The need for additional reliever airports and TIS systems like Burbank's will be essential to serve the aviation industry and traveling public more effectively," stated Jackson.

The Burbank job site presented Dick Burden, consulting engineer, with an interesting set of restrictions and problems. The immediate requirement was for a stable low-resistance ground system for the low-power AM radio facility.

"Generally, the grounding system would consist of 12 100' #10 conductors extending outward from the base of the antenna at 30° intervals," explained Burden.

"This would require a large area of real estate to accommodate a diameter of

slightly better than 200'," he said.

Unfortunately, the necessary land to meet this particular requirement was not available at the airport location.

It became mandatory to seek another method of providing an adequate ground. It would have been impossible, not to mention expensive, to cut paths across the busy surrounding highways for the radials.

"I had become intrigued with the possibility of installing a single rod as the ground for the antenna. I knew of only one grounding electrode capable of meeting the project's requirements," said Burden.

A new concept in electrical grounding had caught Burden's attention—a self-contained, chemically-charged grounding electrode manufactured by XIT Grounding Systems in Harbor City, CA. This patented device seemed to offer the solution to his project's grounding needs.

"The electrode's chemical action could complete a low-impedance web, approximating the normal ground radial system usually installed," he said.

Burden and Jackson consulted with XIT's Consulting Engineer, Betty Robertson, to help calculate the length of rod needed for this unique installation. An

electrical engineer, Robertson has extensive training on the subject of grounding, bonding and shielding.

A 40' rod was designed and built by XIT Grounding Systems, using their standard materials. The electrode was manufactured of hard-drawn type K copper and filled with a patented formula of non-hazardous metallic salts.

"The XIT device draws moisture from the air through 'breather' holes drilled near the top of the rod, causing condensation to form. This condensation eventually trickles down through the coarse salts, creating its own 'electrolyte.' The solution then leaches into the surrounding earth from the base of the unit, via its 'weep' holes. This rooting action occurs at a rate of seven-to-eight drops per day," Robertson explained.

"This grounding system can be used effectively both indoors or out, in extreme climates and terrains, and in any soil type, with equal results," she adds.

Installation of the 40' long grounding system required special considerations. Because the XIT electrode cannot be driven into the earth, a crane and a large auger were needed to complete the job.

PD&E Drilling of Sun Valley, CA, were contracted to do the installation at

the airport. The location for the antenna and its ground was small and surrounded by busy thoroughways, making maneuverability of a large crane and drill limited, but not impossible.

After the 40' hole was prepared, five gallons of saline solution were poured into it, thoroughly saturating the earthen well. The saline solution serves two purposes: to condition the poor, sandy soil, and to prime the grounding system for continuous operation. Earth was back filled and firmly tamped around the rod.

"I am pleased to report that the concept of using one grounding device worked to our expectations," said Burden, "and we met our deadline. In fact, we had to reduce the power output of the transmitter to contain the coverage of the facility within the specified limit."

Travelers Information Systems like the one at the Burbank Airport require a license, which can only be granted to a government entity. This license precludes any kind of advertising and allows for operation only at 530 or 1610 kHz. Most TIS stations use antennas because of the broader coverage they afford, but induction cable can be and sometimes is used.

Parts 15 (unlicensed operations) and 90 (TIS rules) of the FCC Rules and Regulations cover limited-range broadcast facilities. These stations provide road, weather and traffic conditions, and guide people around air, rail or bus terminals.

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4, 6, 8, or 10 Seconds Of Stereo Delay.
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Available Now! See how easy talk shows can be — Call your Eventide dealer to arrange for a demo.

Or call Eventide direct at 1 (800) 446-7878.

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Or other "live cued" event, with no timing or monitoring hassles. Just push the WAIT & EXIT button. The Eventide BD980 makes the "impossible" switch easy!

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BD980's Manual mode lets you set delay in one millisecond steps, from zero to 10 seconds. Ideal for vocal doubling, echo, and other effects.

9 Large Alphanumeric Display.
Shows amount of delay, "safe" reading and operating mode at a glance. BD980 operating functions are fully remoteable and plug-compatible with our BD955.

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Marketing Includes Sales Skills

by John M. Cummuta

Chicago IL ... There's a story of two salesmen coming back to the office at the end of the day.

"Boy, I sure had a lot of good interviews today," the first one said.

"Yeah ... I didn't make any sales either," came the reply.

The point is that, unless you get the signature on the dotted line, you have nothing. Sure, you might have laid some groundwork for a future sale, but at that point you have nothing.

The purpose of sales is selling, and if you don't come back with signed contracts, you're nothing but a professional visitor.

This article will wrap up our exploration of the marketing process for business; next month we'll return to more traditional management topics. However, this subject of sales definitely comes under the "last but not least" category. Unless you make the sales, all the prior marketing efforts were just so much dust-raising.

How does this relate to you?

Well, many of you have commented to me that you're interested in making the not-too-frequent transition from engineering to general management, while others of you are in your own "side" or fulltime consulting business. Still others reading this are already GMs or sales managers, and this concept is at the heart of your job.

As the saying goes, "Nothing happens until the sale is made." Without sales (and this applies even if you're a PBS station trying to sell the audience on sup-

John Cummuta is RW management editor and GM at WCFL, Chicago. Call him at 312-963-5000.

porting you), there's no need for talent, engineering, management or equipment.

As in any other endeavor, if it is to be successful, goals must be firmly established. Don't just say, "We want more sales." Set specific percentage increases and dollar amounts, and specify that these are to be met within specific time frames.

Then break the long-range (one year) goals down into monthly, weekly, daily and per-salesperson pieces. Let each salesperson see what's expected of them,

Engineering- Manager

on a daily and weekly basis, for the company to be on course toward its sales goals.

These goals should, by the way, be set by the salespeople themselves, not arbitrarily dictated by management. There are two good reasons for this: the salespeople know the potential of their prospects and themselves, and people naturally work harder toward the accomplishment of goals that they "own."

If you mandate your goals, the salespeople don't own them. If they set the goals themselves, they are theirs.

This is not to say that management can't encourage a salesperson to challenge himself more, but resist handing down goals you've established on your own.

The point of the sale

All the marketing efforts we've discussed in past columns should have gotten us to the point of having good, qualified leads. These are people who have expressed an interest in whatever we're trying to get them to buy. This could be our

engineering services, commercials on our station, or a commitment to be a regular supporter of our nonprofit station.

At this point, someone has to close the door and invited people in; they've ventured inside a bit, and now someone has to convince them to let the door be closed behind them. This is where the real selling begins.

Depending on the level of detail given in your previous marketing efforts, there is either little or great need to further explain the product or service being offered. If you've already told the prospect a lot about what you're offering, you can usually go directly for the close.

If details have intentionally been sketchy, to lure the prospect in, then this is where the details can be laid out, because now you're face-to-face, where you can handle any questions or objections.

This is a critical point. Unless you're selling a small-ticket item for just a few dollars, you're probably going to have to complete the sale in person.

That means that you must avoid, throughout your marketing campaign, giving the prospect enough information to make a decision—before you're in front of him. If you try to tell your whole story in advertising and the prospect comes up with one mental objection that your advertising doesn't cover, you've lost him.

It's better to tell less in the advertising, get more people to respond because of the vagueness, but have a better chance to close those who do respond.

The sale starts when they say "no"

Here's the key to real selling. Hardly ever will a prospect say, "Boy, am I glad you finally got here. This money's been burning a hole in my pocket, and I think

I would've gone crazy had you not shown up to take it away from me."

In most cases, the prospect's normal state of mind will be that they're interested in seeing if there would be some benefit in purchasing whatever you're offering but, at your initial point of contact, they know that they've gotten along for quite a few years without your product or service, and likely could continue to do so. You will have to expend some effort showing how their life or business can be materially improved by buying what you're selling.

After you've laid the groundwork, ask for the order. If you never get to this point, you're going to have a hungry family. If they say "yes," you had an easy one. If they say "no," be grateful because you can now get down to selling them.

"Apparently you"

When prospects say "no," I have a technique designed to help me through the selling maze successfully. You simply say, "Apparently you have some reason for feeling that way. May I ask what it is?"

They'll come up with some kind of answer like, "It costs too much." You then say, "If you weren't concerned with the cost, then would you agree that this (whatever you're selling) would be a good investment for you?"

Now you've got him (or her). If the objection they initially raised was a "real" objection, they'll stand by it. They'll say something like, "Yes. If it wasn't for that high price, I'd buy."

If they were giving you a smoke screen, they'll come up with another objection. It might sound like this. "Well ... I don't know ... I never listen to the radio. Nobody ever sold me anything over the radio. I don't believe your advertising commercials will sell my product to anyone else."

Now you've found that the price wasn't the real objection. Is this new objection the real one? We don't know yet. Try the "apparently you" technique on this new one.

You may have to phrase it a little differently, but you can, one-by-one, remove fake objections until you get to the real one. The real one is the only one a prospect will stand on. It is also the only objection you can overcome to the prospect's satisfaction.

That means that their real objection is the only one, once you've successfully answered it, after which they'll be ready
(continued on page 20)

Simply the Best.

The PA-1 was the first high fidelity phono pre-amp. And it's still the best!

Uniform high-speed circuitry and input overload protection ensure flawless tracking of the fastest music peaks. Solid circuit design yields incredibly low noise and distortion performance specifications. Input and output RF suppression allows the PA-1 to perform in RF environments where no other pre-amp will work.



Try the pre-amp that sets the standards—the PA-1 from Radio Systems.

Specifications:

IM and THD: .01% @ +18dBm

Frequency response: $\pm .25$ dB RIAA

Channel separation: 90dB

Signal to noise:

92dB (12mv @ 1kHz-A weighted)

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Call 800/523-2133 (in PA call 800/423-2133)

Downtime

(continued from page 10)

The MPR network demands a predictable, reliable level of service. KSJR, the first MPR station, seeks 100% reliability through regular maintenance and the development of backup support systems. The approaches outlined here represent years of cooperation between management and engineering toward this shared goal.

Although most stations don't enjoy all of these options in their situations, it may be possible to see similar ways to strengthen weak links in their station's broadcast chains.

Calls, Letters Carry Memories

by Floyd Hall

Crestline CA ... DID YOU KNOW THAT ... ?

I am something of a sentimentalist? Well, I am, especially when it comes to old-time radio, friends and old-brass pounders!

I expect that some of my readers, at least, have begun to suspect this. In that vein, I want to read a letter to you from one of these old friends received just the other day. He, by the way, is an old friend, not yet really an old friend. He is, however, becoming something of an "Old Timer." Here it is:

Dear Floyd:

Your column in Radio World regarding "Radio Parentage" (RW, 15 August) was interesting, but Tesla stands about as much chance of ousting Marconi as the exploring Vikings do of taking credit from Christopher Columbus!

Your recollection of haywire modifications reminds me of the Northern Michigan station that had a transmitter rewired with "lamp cord."

Old Timer

On the other hand, my best-friend and ham of yesteryore, W5EEV, built receivers with components hanging over the edge of the table, batteries with no discernible voltage, and homemade variable condensers. I, on the other hand, built equipment that was beautiful and neatly wired—"ARRL Handbook" perfect. The irritating part was that his stuff always seemed to work much better than mine.

Finally, your story of the 4CX300Bs that were full of insects merely confirms that when transmitters don't work properly, they have to be de-bugged.

Best wishes to Frances, and isn't it time you came East again?

Yore ol' pal,
Julian

Even at the risk of embarrassing this "Semi-Old Timer," I must tell you a little about this guy. He is—and has been for "quite some time"—a prominent Washington radio attorney.

Mama and I have known him and his wonderful family for many years. Now, I'm sure at least some of you have gathered from his letter that he possesses not a little technical knowledge.

The truth is, he started out as a graduate engineer. When World War II came along, he got himself an officer's commission in the Signal Corps. His first assignment was to a hot, dirty, little California desert town, where he was ordered to erect a radio tower. This he accomplished with considerable personal satisfaction, but two days later the damn thing fell down!

This convinced him at once of the futility of pursuing a career as a radio engineer; so, he went back to school and got

Floyd Hall is a regular RW columnist and an engineering consultant at Consulting Radio Engineers, Crestline, CA. Call him at 714-338-3338.

himself a law degree! He and I have worked together for a "long time," and his engineering background has kept me out of trouble more than once!

While I am still in this nostalgic mood, I must tell you about a couple of phone calls I received recently. The first came from Miles Anderson at WLNG in Sag Harbor, Long Island, NY. He had an FM transmitter that was giving him a bad time; his consultant had more or less given up, and he wondered if I could

"shoot trouble" over the phone!

First, this was a little flattering, coming from an "Old Timer" reader so far away. However, I didn't tell him that I do that very thing practically every day, for my clients out here in the "Wild West."

The first thing I asked him was, if the output was down as he said, "Do you have plenty of drive on the PA?"

"Yes" he said, "I think there is plenty."

Then I told him that there must be

something wrong with the load on the final. I recommended a man, and asked him to give me a call and let me know how he came out. A couple of days later he did, and told me that he had found a coupling condenser gefunkt in the IPA, and so the drive on the PA was insufficient!

Now, it seems that the multimeter position for the PA grid current had not been working! All my working life, I have walked up to a strange transmitter and tuned each stage by the grid current on the following stage. In a solid-state transmitter, the indications are a little dif-

(continued on page 16)



Introducing
the all-new
35 kW FM transmitter
by Harris.

Much more than
just new paint.

You want long-term reliability, maximum operating efficiency and superior audio performance in your high power FM transmitter. With the all-new Harris FM-35K, you get it...and more!

Representing the latest in FM broadcast technology, the FM-35K uses a highly advanced single tetrode tube design to give you unbeaten 80 percent PA efficiency over a broad power range of 14 through 35 kilowatts. This translates into longer tube life and AC power cost savings of thousands of dollars over the life of the transmitter! Because the FM-35K provides output power from 10 through 35 kilowatts, you're free to select tower height, antenna power gain and power levels that best meet your coverage goals—using a single transmitter.

Peace-of-mind is important, and you get it with the FM-35K. The

automatic VSWR foldback circuit gives you confidence of continued safe operation under heavy antenna icing conditions, and the built-in Flex-Patch feature can bypass the RF preamplifier, IPA, or even the final PA for continued on-air operation in an emergency.

You won't find a high power FM transmitter that's easier to operate, maintain or service. Harris' exclusive Color-Stat Signal Flow Diagram alerts you to operating problems at a glance. When detailed operating information is required, Harris' Status-Plus Alpha-Numeric Display gives you precise operating values—including the actual date and time an overload occurred!

Backed by a solid 63 year tradition of quality radio products and a service department with a proven record of exceptional assistance day or night, the FM-35K is the logical choice for high power FM broadcast operators who want more than new paint on their next transmitter.

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Circle Reader Service 17 on Page 39

'Shooting' by Phone

(continued from page 15)

ferent, but nevertheless the same considerations apply. You have to drive each stage if you expect to get some output to the load.

Oh yes, the other call I mentioned was from Dave Carmine, of WKMM in Harrison, MI. When he called he got my phone answering tape. I couldn't quite make out his name, but he said he was having some trouble with his transmitter. So, I looked him up in the handbook, and this is what it said:

"Dave Carmine; Owner; Pres; Mgr; Prog. Dir; Chief Eng." I haven't been able to reach him at this writing, but I can't help but think that a man with those qualifications could not help but find the trouble! (Dave, if I haven't reached you by the time you read this, give me a call!)

Speaking of fixing stations by telephone, many years ago I realized the problem, and installed a telephone within easy reach beside my bed. I wish I had kept count, but many, many, times that phone has rung around 0500, and the duty announcer/engineer says, "I can't

get on the air."

At my questioning, he says the transmitter parameters are OK; the VU meter on the board is working, but no audio is coming out of the transmitter.

Now, I'm only half awake, but I ask this kid to look at the far right corner of the board. "Do you see that key over there which is labeled 'Line Out?'"

"Yes."

"Put it to line one."

"Hey, it's working." About this time he hears a click, and I was then back to sleep!

Sometimes these calls are not quite that simple, and after a lot of questioning, there is nothing left for me but to crawl into my cold pants, and go down and fix it. Like the old-time GPs, I still make "House Calls!"

You know, I go so far back, that ingrained in me is the old show-business cliché, "The show must go on." Whenever I work on a station, I do so with a strong concern to never lose any air time. . . . Which reminds me—I don't know why—but in the old days, if you were in the control room, with the sta-

tion manager, the CE, and even the PD, looking over the operation, with everybody yakking more or less at once, suddenly the announcer would yell "Mike!"

Instantly, there would be dead silence in that control room. Nowadays, these young kids don't know what to do in this kind of situation.

I was recently in just that same kind of situation, and this kid kind of held up his hand, looked worried, and allowed about 30 seconds of dead air! I noticed him, waved the group to silence, and pointed to the kid, who opened his mike and nervously read a spot.

After, when he got a record started, I said, "Look buddy, you are the boss in this room, and when you get ready to talk on the air, you just yell 'Mike!' and I mean yell!" From years and years of this kind of work, that yell will freeze me right in the middle of a word!

Now, I've got a beef! This business of advertisers, columnists and pedagogues of every stripe who only speak with a string of acronyms, with no definition, give me a pain! I don't care if you have two doctorates in all-comprehensive science, you can't keep up with every branch and all the associated acronyms.

While looking up a word I saw one in my dictionary that caught my eye, and

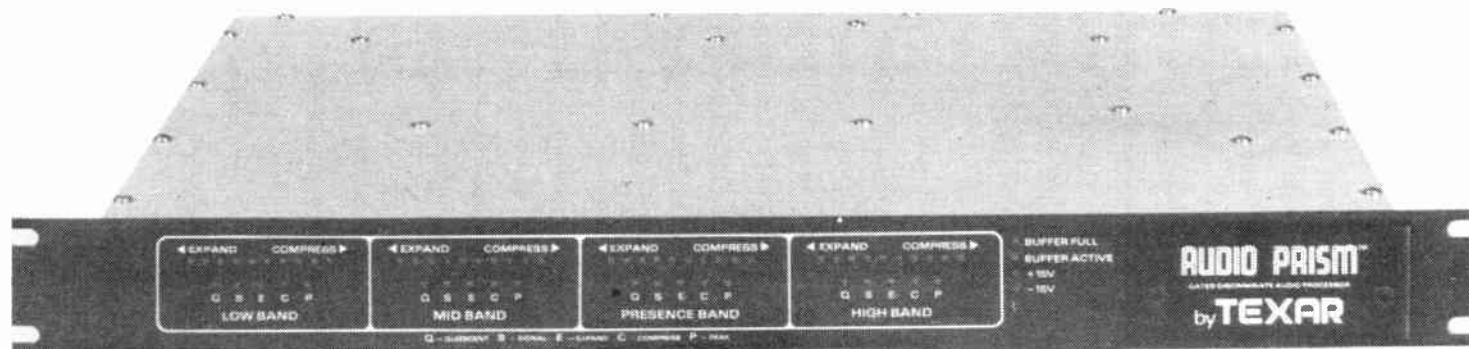
I was curious as to what it might stand for. In capital letters, it is ACTH. You know what that means? I don't either, but let me tell you what the dictionary said: (*adrenocorticotrophic hormone*) A polypeptide hormone of the anterior part of the pituitary gland that stimulates hormone production of the adrenal cortex!

You think that's bad? Heck, every time I pick up a new catalogue or equipment flyer—which I think must be about electronic gear—it takes me 10 minutes to figure out what kind of device they are talking about. Oh, it's a Melnox L-O AMCDS-A3F; 24 for \$36 + Freight. Or a technical treatise on X-Band IMPATT technology, with examples of hardware! Or Plasma Process GaAs. Who cares?

By the time I have scanned the headings full of VLS:MOS Modeling, I'm already against the product, no matter what it may be! I doubt it would cost much more to describe the thing in plain English, or at least to stick in a definition of the acronym now and then.

This has been one of the hottest summers the West has experienced for a long time, and I have been confronted with a batch of heat problems. Next time I will have some constructive information for you, for next summer.

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* Summer and Fall 1985, and Winter and Spring 1986 Arbitron Ratings. Total Persons 12+ Share, Mon-Sun, 6A-12M. (Used with permission.)

Preparing for New Promotion

by Ty Ford

Baltimore MD ... As the dog days of summer fade and become dried sweat stains on the hatband of the overworked production director's cap, radio stations across the country are gearing up for another Fall Book. For the production director, this usually means a new series for the Fall Book promotion.

Even if you're not in a rated market, the period after Labor Day usually marks

Producer's File

the return of the retail season. Before you jump off into a production frenzy, ask yourself a few questions that, if answered correctly, will save you time and energy, as well as improve the sound of your station.

Questions:

- Are you effectively delegating the production work?
- Does your audience perceive your station's promos as just another commercial because *your* voice is also on the majority of the station-cut copy?
- Are there at least one or two members of the airstaff who could be cutting more of that copy?

If your answer to the last question is "No," you have a problem or a great challenge, depending on why you said no.

If you said no because you're an insecure, egocentric perfectionist who thinks that no one can ever hope to

Tyree S. Ford, a radio audio production consultant, helps stations optimize their use of production equipment and airstaff skills. Call him at 301-889-6201.

achieve the level of professional sheen that you have, you may be right. However, that still doesn't help the station sound better.

As difficult as it may seem at first, the more you help others by teaching them what you know, the better you come to know the subject yourself. Verbalizing your production instincts may not come easy at first, but having to explain equipment, systems, techniques, and even the audio chain in the production studio will really firm up your own concepts.

I learned this first-hand a few years ago when I was honored to be asked to teach a semester of production at Towson State University here in Baltimore.

Before you start looking around the station for likely "students" upon which to bestow your brilliance, there are a few things to consider. Some airpeople have never considered production to be part of their job. They live only for their airshift.

Some of these folks were hired with the assurance that they would not have to do production. It's always best to check with the PD and the GM before proceeding.

You may find talent in unlikely places. In some smaller markets, where management is agreeable, account executives sell time, write and often cut copy. I've seen this work well, especially in cases where the A/E was previously on the air.

In general, try to dissuade friends of the GM (or even worse, family) who sound terrible, from voicing their own spots. Try alluding to listener complaints.

Tell them the studio is too busy right now. If that fails, have one of your best staffers cut the same piece of copy and play both of them for the ultimate decision maker, the GM.

If that doesn't do it, your first fallback position is to rotate both versions so that the negative impact will be reduced.

Let's say you do have a potentially good airstaff. The production studio itself intimidates many new producers. It's your job to show them how to get the most out of what you have.

Spend some time with your PD talking about your ideas to improve production. The PD might be a great on-air coach, but may have difficulty in providing guidance for production work.

PDs may know what they want a promo or commercial to sound like, but they may not have the time to fully develop the production talents of members of the airstaff.

A good PD should be able to work with members of an airstaff, helping the lesser experienced ones while presenting new ways to stimulate and challenge those who are more experienced.

One caution here—there are unexplainable things that can backfire, despite your best attempts to move the station forward. Egos and power trips may surface. It's best to proceed lightly, and only after you get the nod from the GM.

If you feel strongly that improvements in the performance and operation of those doing production can be made, but you can't seem to put your idea across, consider the "Health Spa Psychology," as applied to a radio station.

Nobody really needs to tell us that we need to exercise. We know it's good for us.

There are plenty of ways to get the exercise we need without spending money. Most of us, however, perceive that the value of our exercise is greater if we pay for it—especially if we pay professionals to tell us if we're doing it right.

If the pro is an expert in his or her field, they have become that by amassing considerable knowledge and by practical success. The cost of the information may be cheap compared to the in-house resources necessary to achieve the same effect.

As I look to the near horizon of production, I see more and more air people improving the sound of radio by improving their production skills. These folks are just now tapping into the massive technology that is constantly filtering down from the more sophisticated recording studios.

Just as in the field of research, where computer technology is proving itself invaluable, the new-era production specialists are finding *their* new tools will make the difference between a radio station and a superstation.

This fall I am planning to hit the road to speak at various statewide and regional broadcast meetings. If you have not yet booked a speaker for your next meeting, give me a call.

As usual, your comments, suggestions and calls are always welcome. The home office is at 3804 Ednor Rd., Baltimore, MD 21218. The phone is 301-889-6201.

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Contract Engineering

Ramko Mods Mean Heavily Used Mixer

by Thomas L. Vernon

Harrisburg PA . . . Fall is now upon us, and at many stations this brings thoughts of high school football and basketball sports remotes.

If you're just getting into the game, or have decided that your old remote remote unit won't make it through another season, it's time to begin shopping for a portable mixer. On a cost/features basis, the Ramko PM-42 is a worthy contender, and warrants your consideration.

The mixer is contained in a sturdy

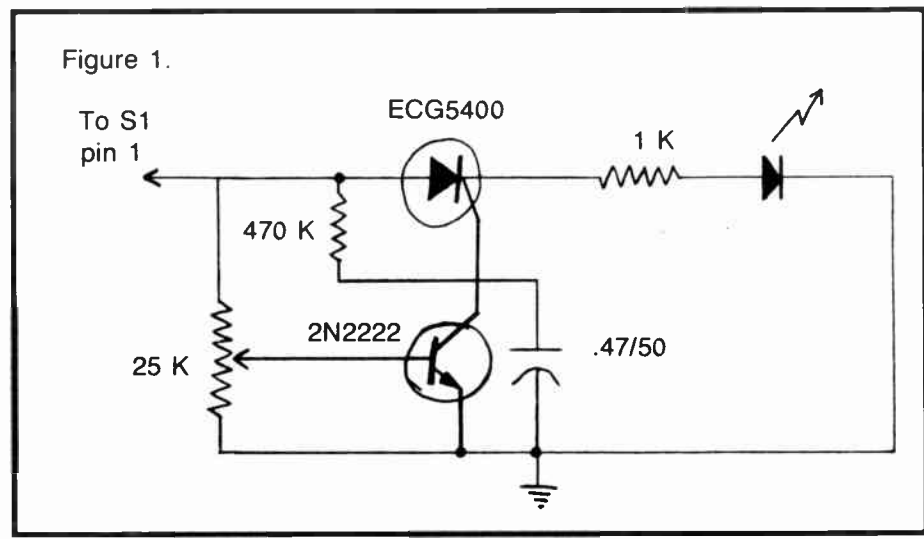
Tom Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-249-1230.

2½"×5½"×7" aluminum case and weighs in at 2½ lbs. All front panel knobs are metal and secured with set-screws. Removal of two thumbscrews allows the unit to be removed from the case for service and battery replacement.

A belt clip and leather shoulder strap are provided with the PM-42, and a well-constructed, all-leather carrying case with strap is available as an option.

Power is provided by two 9 V batteries. A third 9 V battery is used for A-B powering of microphones on channels 1 and 2.

Access to the batteries is gained by removing the mixer from its case. Two fresh alkaline batteries provide about 10 hours service, while fully charged NiCads yield approximately 3½



hours.

A switchable limiter will hold the output to +7 dBm, or may be switched out of the circuit.

A built in intercom can be used simultaneously with the mixer. For remote talkback applications, the incoming source is routed into one of the mixer's four inputs. That input is then placed in cue, and the incoming signal mixes into the headphone amp for two-way communication.

The front panel is uncluttered, and includes four input pots, all with detented cue, a master gain pot with detented battery check position, headphone volume control, power switch, flashing LED power indicator, and screwdriver-adjustable cue level control.

There's also a VU meter, with additional scales stenciled above it for alkaline and NiCad battery hours left, and a tone switch.

A 1 kHz line tone and 400 Hz slate tone (momentary) feed directly into the mixer bus, and are controlled by the master gain pot.

All input/output connectors are located on the rear panel. This includes the dual low impedance XLR output connectors, four input connectors, mic/line input switches for channels 1 and 2, and 1¼" phone jacks for intercom in/out and headphones.

There's also an in/out switch for the built-in limiter and a jack for the optional battery charger.

Circuit description, manual

All circuitry is contained on two double-sided PC boards, which are interconnected with a short section of ribbon cable. All ICs are mounted on sockets. Controls are PC-mounted AB mod pots, which may be opened up for a squirt of cleaner, should they become noisy (see photo).

Most of the circuits are conventional opamp design, with LM 833s used as preamps and LF 353s in all other audio applications. Channels 1 and 2 are switch selectable for dynamic, phantom or A-B type microphones. Input levels on all channels may be easily modified by changing the socket-mounted gain select resistors.

A CA 4049 is employed as a CMOS switching charger when the optional Ni-Cad batteries are used.

The Primus PM-42 comes with a

12-page instruction manual. Contained in it are specifications, drawings of the front and rear panels with numbered references to all features, one page of operating instructions, and drawings showing case removal and battery/adjustments placement.

The schematic is clearly organized and includes component values and designations. Component location diagrams for the upper and lower PC boards are included, along with a parts list. Pictures of the president, along with a customer service manual add a personal, "small-business" touch to this manual.

The operating instructions are clearly written, but intended for engineering types. They would not be easily understood by nontechnical personnel. The manual states that Ni-Cad batteries should be recharged "overnight."

Overnight is a little nebulous, but a call to Ramko reveals that the minimum recommended time is 14 hours.

Performance

Our PM-42 was used for about six months to cover football and basketball remotes. Early in the season we experienced some problems with premature battery failure during the games, and this was traced to the charger jack configuration.

Customer service via Ramko's 800 number was swift and courteous. Operator response to the mixer was positive, and once the charger problem was cleared up, we had no difficulties for the remainder of the season.

A rather unscientific test of RF susceptibility was performed on the mixer. The PM-42 was operated with an EV-635 and a 25' microphone cord about 200' from a 1 kW AM transmitter. Listening through headphones revealed no signs of interfering RF.

Modifications

While the PM-42 is a good mixer out of the box, a few simple field modifications can make it even better. All changes can be performed in an afternoon.

The first modification you should make is to the battery charger circuit. As it comes from the factory, the outer ring of the charger jack is positive. Since the case is at ground potential, there exists the potential for short circuiting the charger if the paint is worn off the hole

(continued on next page)

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Contract Engineering

Transponder Switch 'Flawless'

by Ira A. Wilner

Putney VT ... In response to the article "Circuit Switches Transponder" by Phillip H. Ramsey in the 15 February issue, I want to comment upon my experience with the Scientific Atlanta DAT-32 satellite receiver.

I am a contract engineer and consultant serving broadcasters in the Connecticut River Valley of VT, NH and MA.

One of my clients, WTSL in Hanover,

Ira Wilner is president/owner of Wilner Associates, Putney, VT. He can be reached at 802-869-2681.

NH has a dual-network affiliation ... CBS and ABC. So they switch transponder crystals four or more times an hour!

When I specified the original Scientific Atlanta hardware, I ordered their crystal switch. After about a month, it became painfully obvious that SAs switch was too fragile for such intense use. It became unreliable; the slide switches were wearing out and the entire circuit card kept on loosening up.

Although WTSL did not require remote control, the crystal switch had to be "ruggedized."

Crystals are cut to frequency based upon the reactances of the circuit in

which they will reside. Thus, it is important to minimize changes in circuit reactances caused by the additional components.

Therefore, I attempted to procure low-capacitance, miniature RF relays, but they were not readily available. I went to the local Radio Shack store and found 5 V in-line, reed relays with SPST (form A) contacts.

This style relay consists of a glass tube with switch leads on either end. This type of construction minimizes inter-electrode capacitance. These are not to be confused with DIP style relays, which will add stray inductance and capacitance to a circuit.

By removing the third crystal and all three slide switches from the crystal board, I was able to add two reed relays in such a manner as to make the remaining two crystal circuits equal in length. The trimmer built into the downconverter can be used to compensate for any

offset caused by the alterations of the circuits.

Since both crystal circuits were altered equally, they will trim together. This is the key to making the modification work.

This is also why the crystals used in the switch must be factory matched for reliable performance. Several syndicators have supplied crystals for their West Coast transponder and many of these crystals will not work unless you turn the trimmer all the way to one side! Then you chance knocking the remaining crystals too far off frequency.

I completed the modification by bringing power from the rear connector of the downconverter to the switch. Five volts DC, which are not used by the downconverter module, are available on that connector. I mounted a high quality miniature toggle switch on the access door to the crystals, and then put two LEDs in

(continued on page 20)

Ramko Primus Popular

(continued from previous page)
in the back panel through which the charger jack protrudes.

Ramko has enlarged this back panel hole in recent production runs to alleviate the problem.

A somewhat nicer solution is to cut the foil traces to the charger jack and install jumper wires to reverse the polarity. Then, be sure to change the polarity switch on the charger.

Speaking of the charger, it's a good idea to cover up the polarity and voltage switches on this unit to prevent tampering by your station's "electronics experimenters."

If you're planning to interface the PM-42 with phone lines, it's necessary to install some form of DC isolation, since the mixer's dual low impedance outputs are transformerless. We found that 100 μ F 50 V electrolytics in series with R83-87 will do nicely.

Unless you possess a fair amount of mechanical dexterity, changing the batteries in the field can be a traumatic experience—because components mounted on the upper PC board near the battery clips are vulnerable to breakage when the batteries suddenly snap out of place. The tone generator IC may also become dislodged.

On my mixer, we removed C17 and 18 from the top of the board and soldered to the bottom. Then the IC socket for U3 was removed, and the chip was soldered directly to the board. These modifications eliminated component damage during battery changes.

We found the dual NiCad/alkaline "battery hours left" scale above the VU meter to be reasonably accurate. However, having to put the mixer "off air" by throwing the master gain pot to the detent position is a little awkward during long broadcasts. My solution was to construct a low voltage indicator on a scrap of perf board, with the LED positioned to shine through the plastic VU meter case (see Figure 1).

Audio perfectionists may find the presence of ceramic disc capacitors objectionable, but with this mixer's published specs, this would only be an issue if it

were to be used for concert music broadcasts.

The two small thumbscrews which secure the mixer to the case can be easily lost. The mechanically inclined engineer may opt to remove the threaded rods from the case and install some form of captive thumbscrews.

Summary

While our old remote mixer sat in the closet until the football season began, the PM-42 is used throughout the year. The news people take it out to press conferences. The jocks use it for record hops.

When sports broadcasts begin this fall, everyone will be after it. Scheduling use of the mixer may turn into a hassle. If that happens I'll probably buy another one.

Sec Tone Guaranteed

by Jim Lucas

Montrose CO ... Ever have the DJs say that they are only getting sec tones about half the time?

I have an old ATC machine in the AM control room. The unit has a habit of not laying down the sec tones. But when I check the problem out, I find that the

Jim Lucas is CE at KUBC-KKXX, Montrose, CO. He can be reached at 303-249-4546.

unit is working like it should.

I know that my DJs are not all that technical, but they should be able to push a button.

The cure, as I see it, is that the relay that turns on the sec tone oscillator has a dirty contact. Only one set of contacts are used on the 4PDT relay.

I first bridged two of the unused contacts together. The fourth contact I used to operate an LED, which I placed on the front panel on the amplifier unit.

(continued on page 20)

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Sales Skills Needed

(continued from page 14)

to buy. Once you've isolated the real objection, you can only hope that you have a good answer for it. This comes under the heading of "Product or Service

Knowledge."

Once you've answered the last objection, say, "Well, now that we've solved that problem, shall we begin the schedule tomorrow or on Monday?" Never give

the prospect a choice between something and nothing; instead, always offer him a choice between something and something. Once you receive a satisfactory answer to the above question, begin filling out the contract.

As you're filling it in, if the prospect is giving you the information such as mailing address, etc., you've got them.

Simply slide the contract over, say, "Please review everything I've filled in to make sure it's correct, and sign by the X."

That should be the close, unless another objection comes up. Answer it and move right back for the signature.

The most important rule

Far too many salespeople mistakenly think that the client's signature signals the end of their job. These are the unfortunate salespeople who must constantly be uncovering new clients. This is because the service after the sale is the heart of a true sales professional's job.

Taking good care of a client helps to ensure that you'll get future business from him, and that he'll likely be sending you referrals and giving you leads in the future as well.

'Flawless'

(continued from page 19)

series with the reed relay coils so that the same current can do double duty, pull in the contacts and visually indicate the crystal in use.

All wiring and power is self contained. The relay board can be unplugged and removed with only one wire to unsolder from the rear downconverter connector, should the module need replacing. By reworking an SA crystal switch board, rather than rolling your own, you get an installation that is mechanically and electrically more secure. SA's board has special clips to hold it in place on the downconverter and improve ground plane stability.

Now operators do not have to reach into the satellite receiver to change transponders. The LEDs can be read from across the control room.

Does it work? It has been working flawlessly since installation over two years ago. That's about 60,000 switch cycles so far!

Sec Tones

(continued from page 19)

But I didn't stop just there—in the play unit, I located the relay which operates on the sec tones. The relay originally supplied a 2PDT relay.

I changed the relay to a 4 PDS unit (P&B #KHU17D11). I only used the P&B relay because it was available, but any equivalent relay will do.

I ran a wire from the positive side of C1 to the NO contact of one of the spare contacts. The center I connected to another LED, which I mounted to the front panel.

Any light of the proper voltage will do for either light, but LEDs have a low current drain and long life.

With this second light, the working DJ doesn't have to listen for a relay click and will provide a positive indication of laying down the sec tone. It also lets the DJ check to see if there is a sec tone on any cart, whether recorded on that machine or not.

The results are excellent; you'll no longer have to worry about whether the old cart machine has done its thing on you again, since the DJ will know before stopping the cart if the sec tone is on the tape.

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 Thursday-Oct.16...9:00a-3:00p

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1986 BROADCAST[®] engineering CONFERENCE

TENTATIVE SCHEDULE

Tuesday, October 14, 1986 Combined Sessions

- 10:00am Opening remarks, John Battison, Conference Chairman
- 10:30am The new FCC/FAA tower marking and lighting rules, Lew Wetzel, Flash Technology
- 11:05am The Travelers Information Service, Richard Crompton, LPB
- 11:40am Audio Specifications--What do they really mean? Irv Joel, Irv Joel & Associates, Consulting Engineers
- 12:30pm Lunch
- 1:30pm The FCC Answers Back, John Reiser, FCC and Chris Imlay, SBE Council
- 2:45pm Coffee break
- 3:00pm Consultants Round Table, Moderator, John H. Battison
Panelists: Don Markley, John F X Browne, Lawrence Behr, Wally Johnson, Irv Joel
- 4:00pm Engineering Management Forum
- 5:00pm SBE National Membership Meeting
- 6:00pm Ham Radio Reception (Door prizes to be awarded. Ends at 8:00pm)

Wednesday, October 15, 1986 Radio Sessions

- 8:30am The Care and Feeding of Folded Monopole Antennas, Lawrence Behr, Consulting Radio Engineers
- 9:00am Exhibits open
- 9:05am Fine Tuning FM Final Stages, Geoffrey Mendenhall, Broadcast Electronics
- 9:40am Tuning and Adjusting Pulse-Modulated Transmitters for Optimun Performance, Steve Claterbaugh, Continental Electronics
- 10:15am Coffee break
- 10:30am Grounding to eliminate hum and RFI, L. Scott Hochberg, Logitec
- 11:05am Synchronizing AM Transmitters, Oscar Reed, PE, Consulting Radio Engineer
- 11:40am Digital Audio Basics, John Woram, Digital Audio Reports
- 12:30pm Luncheon - Speakers will be Tom Keller, NAB and Jim McKinney, FCC
- 2:00pm Questions & Answers - Jim McKinney, FCC
- 5:00pm SBE Chapter Chairman Meeting
- 6:00pm Exhibits Closed
- 7:00pm SBE Member Reception

TV Sessions

- 8:30am Switchless RF Combiner for TV, Greg Best, Harris
- 9:05am Recent Developments in Klystrode Technology, including practical applications, Nat Ostroff, Colmar, Pa.
- 9:40am A Review of Video Tape Formats, Jerry Bauman, 3M
- 10:15am Coffee break
- 10:30am Tuning & Adjusting TV Antennas with a Spectrum Analyzer, Don Markley, PE, Consulting Engineer
- 11:05am Stereo TV Measurement Techniques, Mike Coleman, Tektronix
- 11:40am Enhanced NTSC Transmission & Spectrum sharing with the Land Mobile Service, John F X Brown, PE, Consulting Engineer
- 12:30pm Luncheon - Speakers will be Tom Keller, NAB and Jim McKinney, Chief of Mass Media Bureau, FCC
- 2:00pm Questions & Answers - Jim McKinney, FCC
- 3:00pm Zero Set-up Forum
- 5:00pm SBE Chapter Chairman Meeting
- 6:00pm Exhibits Closed
- 7:00pm SBE Member Reception

Thursday, October 16, 1986 Combined Sessions

- 8:30am Transformer Rewinding Techniques, Peter Dahl, Dahl Transformer Company
- 9:00am Exhibits Open
- 9:05am RF Radiation and the Broadcaster, Richard Tell, EPA
- 9:40am FM allocations and application processing, Harry C. Martin, Attorney and Chris Imlay, SBE Council
- 10:15am Coffee break
- 10:30am The Effect of Antenna Bay Spacing on Downward Radiation, Robert Surette & Peter S. Hayes, Shively Antennas
- 11:05am A Variable Speed CD Player, Bill Sacks, Straight Wire Audio
- 11:40am Computerized Engineering Information, Robert Kircher, Dataworld
- 3:00pm Exhibits Closed

For Additional Information Contact: SAM CAPUTA, at (314) 725-2184

Xpdr Allows Network Hopping

by Ronald F. Balonis

Wilkes-Barre PA . . . Ask anyone who is in radio—from the manager to a programmer to an engineer—why they're in it.

Regardless of what they say, you know it's not for the fame or the fortune because, as everyone knows, there is a much greater chance for fame and/or fortune in other businesses and professions.

But there's no business exactly like radio. It is a unique business, operated by and for people. Even though few will openly admit it, most are in radio for the same selfish reason. Being in radio gives you something that money or fame can't buy.

Radio is a synergistic business. It thrives, whatever the market or size of station, on the synthesis of diverse, individual skills to make and create its unique product. It is one of the few businesses where individual contributions, however small, can't get lost in the packaging of the product; your part is always there.

That, regardless of the current FCC rules, is what a station's engineering should be about—a contributing part of the synthesis.

Sometimes, more often than not, it's just a minor part or project, but then there are some, the kind worth writing about, like WILK's satellite transponder switch.

It started with a question that led to a synthesis of skills at WILK (program-

Ron Balonis is CE at WILK, Wilkes-Barre, PA, and a frequent contributor to RW. He can be reached at 717-824-4666.

ming, traffic and engineering) to create, in a most efficient way, an innovative radio product. (As a plus, it was also the first in our market.)

Question on transponder

In June of 1985, WILK's GM, James Morgan, came to me with a question: Is it possible to somehow electronically switch the transponder on our ABC network satellite system? My answer, after some trial and error, was yes. Figure 1 details the results of my design effort.

A little background: WILK is a long-time ABC network affiliate and the satellite system was installed for that network. However, NBC provides stations with the most popular talk-radio program in the US: "Talknet." When WILK was presented the opportunity to carry it in our market, it also presented the problem to WILK of how to do it while meeting all network requirements.

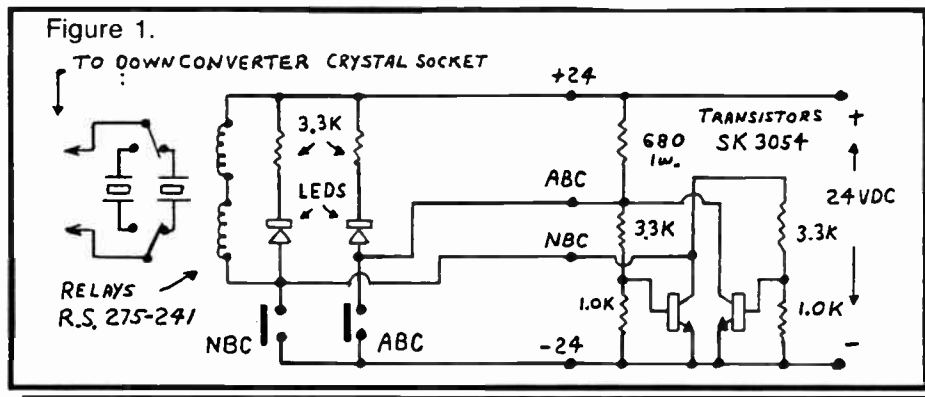
Though ABC and NBC are on the same satellite, they are on different transponders: ABC is on transponder #23. NBC is on transponder #19.

Fortunately for us, the Scientific Atlanta Digital Audio Terminal comes with three transponder crystals: #15, #19 and #23.

Unfortunately for us, the Scientific Atlanta Digital Audio Terminal is only a single, one-at-a-time transponder receiver.

A second system was out of the question. Besides the expense, we just barely had room for the ABC dish. That was what led to the question of whether the crystals could be remotely switched from the control room.

Well, they can and do. So, the transponder switch makes it possible for



WILK to efficiently carry the hottest talk radio programming in the US, NBC's "Talknet." But that, in itself, is not the creative innovation.

It is the ingenious scheduling and sequencing that was devised to make the programming concept work—that is, the procedural software, so-to-speak, the timed cue carts and the to-the-second switching. That's the creative innovation. It also enables WILK to carry ABC network news in the "Talknet" top-of-the-hour newsbreak, both live!

Mine is not the only way to do it; see the 15 February issue of RW for Phillip H. Ramsey's way. And, I suspect that a version of the transponder switch has been replicated by many engineers at many stations. It is the kind of project real radio engineers like to work on.

For WILK's version, I personally prefer pushbuttons and latching circuits, because I think they make life easier for the announcers who actually have the task of making things such as this work.

Key to switch design

But, whatever the circuit arrangement, the real key to making a transponder crystal switch work is to use very short connections and a relay with very low capacitance. My final design uses two Radio Shack #275-241 relays connected with their coils in series.

The relays are mounted on a small piece of PC perfboard, along with two crystal sockets and a crystal plug made from an old crystal. The relay-crystal assembly plugs directly into the crystal **(continued on page 22)**



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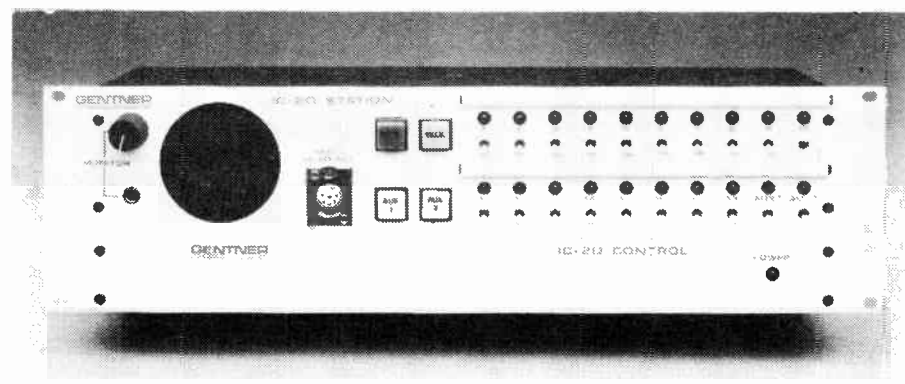
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Circle Reader Service 19 on Page 39

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Circle Reader Service 29 on Page 39

Spectrum Analyzer Low Budget

by Neil Swanson

St. Paul MN . . . How many times have you said you needed a spectrum analyzer to check out the FM rig, the STLs, the two-way radio system, RENG radio equipment or the competition?

"How much, the GM asks?"

You say \$25,000 oughta cover it. End of discussion.

I have come across a 100 kHz to 1 GHz spectrum analyzer with little or no sticker shock. The IFR Model A-7550 does a good job at a base price of \$5995. The list of options available makes the A-7550 very versatile. The unit I had in our shop had the internal battery, tracking generator and FM/AM/SSB receiver, just to mention a few options installed.

Helpful options

The A-7550, with the rechargeable battery, will run for about an hour. Every 10 minutes the unit will shut off to conserve the battery power (just in case you went to the hamburger stand and forgot to turn the unit off). To restart, you just hit the "on" button. It will

Neil Swanson is CE at KSTP-AM/FM, St. Paul, MN. He can be reached at 612-642-4141. For further information on the A-7550, contact IFR, Inc. at 10200 W. York, Wichita KS 67215 or call 316-522-4981.

come up with the setting you had on the screen before it turned off.

Another nice option is the tracking generator, for use when checking tuned circuits and such. We have several two-way radio repeaters in use, and I could see this option being used for tuning up duplexers. It sure worked "slick" on my amateur 440 MHz repeater tuneup.

Would you like to hear what you are looking at? Order the AM/FM/SSB receiver option. Because the display is digital, you cannot look and hear at the same time, but there is a TSR (time shared receiver) mode. In the TSR mode, the unit switches between the receiver section for audio and the spectrum analyzer display. This takes place about once every two seconds.

Menu choices

The A-7550 uses a menu for selection of different displays, receiver, filters, mode and setup. In the mode menu you can select AVE, which averages the last four sweep traces, or, COMP, which compares and displays the current trace with one that is stored in memory.

In the STORE mode the unit stores the current trace and setup parameters into memory. The RECALL mode recalls the trace and parameters stored and displays them on the screen.

Last but not least is the LIVE mode. The display selections are LINE or

BAR. I like the bar mode, as it seems to me to be easier to look at with my tired eyes.

Continuing with the main menu, we come to the receiver selections. They are AM1, AM2, FM1, FM2 and SSB. In the AM1 and SSB mode the receiver bandwidth is 6 kHz. In the AM2 and FM1 mode, the bandwidth is 15 kHz, while the FM2 receiver bandwidth is 200 kHz. Audio bandwidth on all modes is 8 kHz.

Returning to the main menu, the FILTER menu selections are none, 30K or 300. These selections set the desired amount of peak video filtering. There are

other menus available to the user depending on what options are installed. Check with your sales rep or the factory.

Highlights from the spec sheet look impressive. Amplitude input range is from -120 dBm to +30 dBm. Frequency response from 10 MHz to 1 GHz is ± 2 dB. IF gain has from 0 to 65 dB in 1 dB steps, while the input attenuator has 60 dB or range in 10 dB steps.

I feel the box is very solid and well built. I was impressed by the very crisp raster scan display of the screen graticles. With the front-mounted pushbuttons for frequency and setup inputting, a beep to acknowledge your entry (which can be turned off) and the menu system, the A-7550 is, all in all, a spectrum analyzer worth looking at. I was impressed.

Xpdr Switches Networks

(continued from page 21)

socket on the downconverter. The two relay coil wires run to the buttons and LEDs which are mounted on the downconverter's crystal cover.

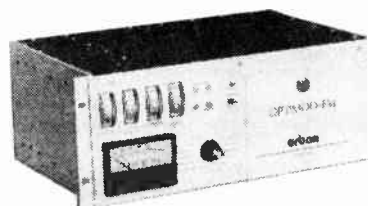
A four-wire twisted cable then runs from the cover to a minibox containing the power supply and transistors. The transistors form a high current RTL latch with the relays and LEDs as collector loads. At WILK, a remote control box duplicates the front-panel LED and push-button circuit and is mounted near the control room console.

Even with short connections, the switch assembly adds some capacity to

load the downconverter crystal oscillator—indicated by a lower carrier reading and audio dropouts—but the loading's not so much that it can't be compensated for by adjusting the crystal trimmer control. It is the screw slot just below the crystal socket, and is reachable through the cover latch hole.

The transponder switch has been in daily use since August 1985. On the air, the program flow is so smooth that nobody can tell we're switching transponders to do it. And, as a bonus, it lets us get double duty, and double the return, from the satellite system investment.

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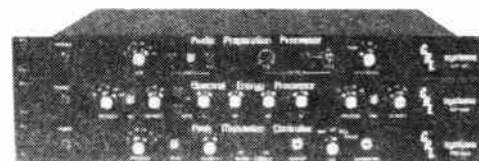
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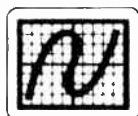


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Frequency Response Surveyed

by Dave Frost

Binghamton NY ... I consider AM receiver bandwidth to be a much more important issue than whether a receiver is mono or stereo.

I have long appreciated and enjoyed the fine article which ran in RW 15 July 1984, written by Bob Orban and Greg Oganowski, which included frequency response runs of various receivers. We need more information like that in order to evaluate and compare the various wideband AM receivers.

I own several wideband AM receivers and decided to plot the high frequency response to verify what my ears have been hearing. I used two RF signal gener-

ators, one fixed at 1610 kHz and the other varied in frequency to produce a beat note. Each receiver under test was tuned to 1610 kHz, and the output of each receiver was monitored by a VU meter and a frequency counter.

The sound of the Sony SRF-A100 is very smooth and peak free. For my frequency response runs, the receiver was set to mono and the tone control was turned fully clockwise. A notch filter might have been a nice addition to this receiver, but it might have created some other problems.

On the subject of 10 kHz notch filters, I have found that they can create their own set of problems, as exhibited by the Sony STR-AV370 35 W per channel receiver. After driving to Canada to buy this receiver, I was a bit disappointed with its "ringy" high end response. (I was unable to receive any strong AM stations at the shopping mall where I bought the receiver, so I had to wait until I got the unit home.)

After plotting the frequency response, my suspicions regarding the notch filter were confirmed. There are sharp high

Dave Frost is CE at WRSG/WAAL, Binghamton NY. He can be reached at 607-772-8850.

frequency peaks at 9 kHz and 11.5 kHz. Any interference received is accentuated by this problem.

In addition, stations employing large amounts of preemphasis can sound very harsh and ringy. It is interesting to note that, according to the Sony manual, the high end response is down 6 dB at 8 kHz.

The next receiver I tested was a Fisher Model 80-T, manufactured in the late 1950s. It incorporates a two-position bandwidth switch and a 10 kHz trap coil.

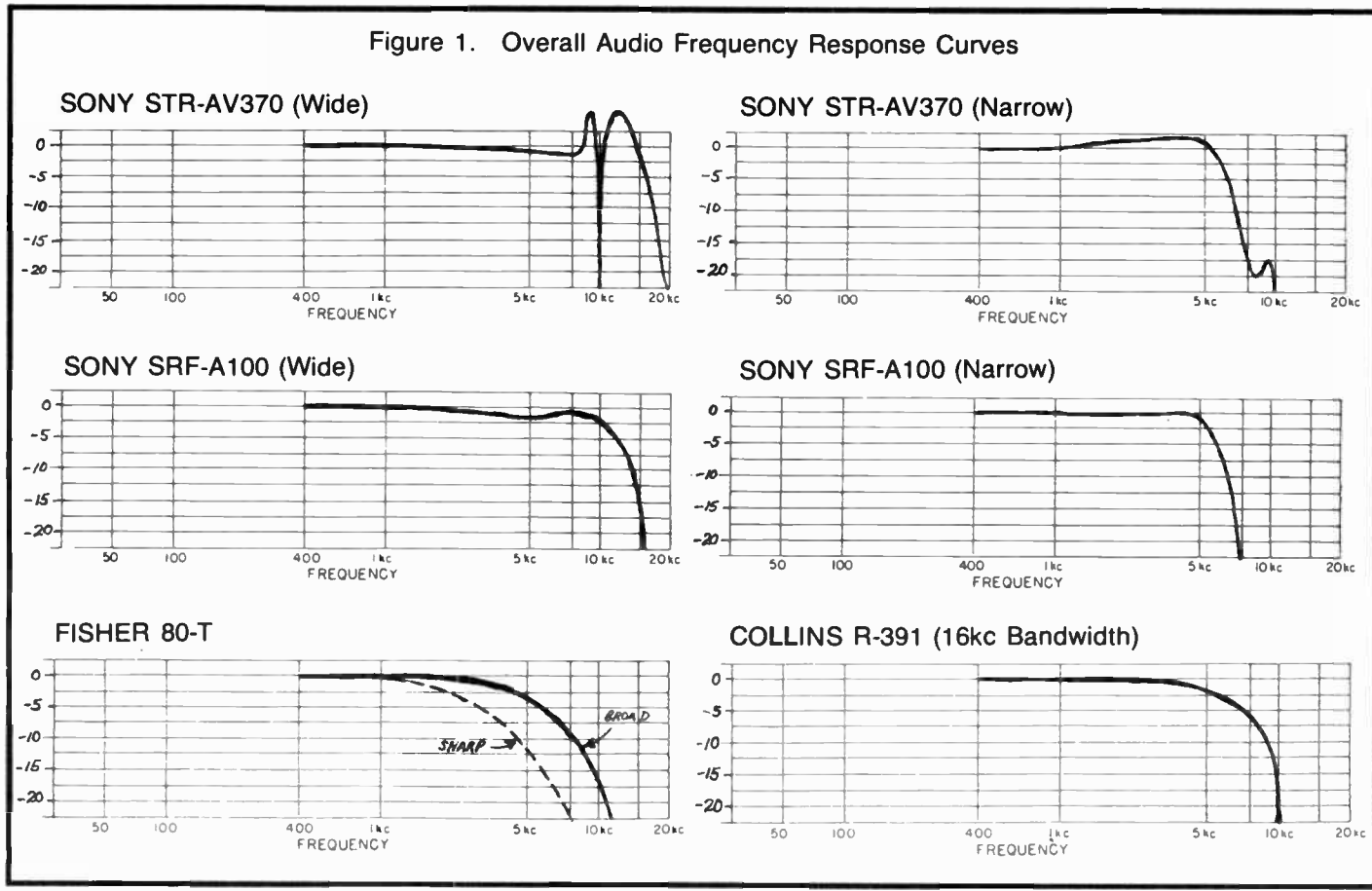
I added a switch to disable the whistle filter at will. This receiver is very pleasant to listen to and has a smooth rolloff characteristic.

My favorite receiver is a military surplus Collins R-391, recently purchased at a Hamfest. It covers a frequency range of 500 kHz to 32 MHz. It features a mechanical digital readout and a large selection of bandwidths among its many excellent features.

I did a frequency response run of the

bandwidth labeled 16 kc. This receiver sounds very smooth and peak free in its wideband mode. If one encounters interference, the bandwidth is simply narrowed to the necessary compromise of frequency response versus selectivity.

I undertook this experiment to satisfy my own curiosity as to why my various receivers sound like they do. If anyone else has done similar work, I am sure others would share my interest in the results.



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New Products

Conex AS-101 Audio Switcher

Conex Electro-Systems' AS-101 audio switcher allows any one of 10 stereo sources to be switched to the stereo output. Switching is activated by simply pressing one of the illuminated buttons on the front panel.

Instantaneous switching or a smooth transition audio overlap can be accomplished. Switching can be activated by remote control from a distance of 1,000'. Several remote control units may be connected in parallel.

The AS-101 has versatility in audio-switching management, including program line source selection from multiple studios, recorder input selection, DJ live-assist, newsroom control operation and general audio routing applications.

A compact rack-mount auxiliary package houses a variety of optional boards, including an RS-232/422 interface for use with your choice of personal computers, a relay board allowing tape deck remote start control, and a system board allowing the AS-101 to be transformed into a simple automation system when interfaced with an inexpensive PC.

Two AS-101 audio switchers may be connected to provide 20 stereo inputs switchable to one stereo output. All audio and remote control connections are made with plug-in screw-clamp terminal blocks. No soldering or crimping tools are needed.

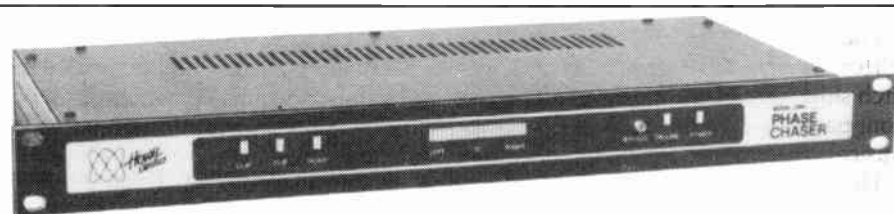
I/O level controls are easily accessible from the front panel. All inputs can be individually switched for 10K bridging or 600 ohm loads. Solid state design makes distortion less than 0.01% THD and noise at -80 dB. The AS-101 provides audio gain of 10 dB available throughout the system.

For more information, contact Bob Iria, Conex Electro Systems: 206-734-4323.

Lexicon Time Compressor/Expander

Lexicon's Model 2400 is a stereo time compressor/expander which incorporates a time-coder reader and reference output. The Model 2400 was designed to change the running time of video, film or audio program material while maintaining the original audio patch.

The 2400 replaces the 1200C audio



Howe Series 2300 Phase Chaser

Howe Audio Productions recently introduced its Series 2300 Phase Chaser, a complete standalone audio time base/phase corrector.

The unit has three principal functions:

1. It can detect and correct time skew up to $\pm 150 \mu\text{sec}$ between the left and right channels of a stereo signal.
2. It can detect and correct 180° channel inversion, employing a 30 msec "soft cross-fade" technique, which eliminates switching transients.
3. It can detect and correct a mis-

sing channel condition, using user-preset parameters for dropout level and mono fill-in attack and release times.

Market research has shown that a significant majority of broadcast stations transmit stereo signals which exhibit channel-to-channel time errors of up to $100 \mu\text{sec}$. According to Howe, the 2300 Phase Chaser quickly and accurately corrects these errors.

For more information, contact Bill Laletin, Howe Audio Productions, Inc.: 800-525-7520.

time compressor/expander. It is a completely new design incorporating advanced digital signal processing techniques to produce artifact-free time compression and expansion of any type of audio signal.

Audio encoding is full 16-bit linear PCM, providing low-noise, wide-dynamic-range performance for broadcast and post-production applications.

The front panel, which is ergonomic-

ally designed for ease of operation, features a 40-character alphanumeric display, 10 storage registers with battery backup for saving complete front panel setups and "soft" knob control for changing expansion/compression parameters.

The 2400 provides compression/expansion sequence automation and has built-in programmable relays to provide contact closures for external switching.

(continued on next page)

DELTA's Impedance Measuring Products

INDUSTRY-STANDARD

RG-4



The RG-4 combines high level output (10 VRMS) capacity with a sensitive receiver (5 micro V) and more than 120 dB receiver/generator isolation.

Frequency increment and decrement keys sweep the operating frequency in 1, 10, 100 or 1000 kHz steps.

- Frequency range: 100 kHz to 30 MHz
- Receiver/generator isolation: >120 dB
- Generator output: to 10 VRMS into 50Ω
- Modulation: 400 Hz, 90% AM, 50 Hz square wave
- Receiver sensitivity: 5 micro V nominal

OIB-1

The Operating Impedance Bridge measures the impedance of networks, radiators, and the like while they operate under full power. VSWR as well as complex impedance of up to 400 ohms $\pm j300$ ohms can be measured.

- Frequency Range: 500 kHz to 5 MHz
- Through Power Rating: 5 kW Modulated 10 kW Carrier only
- Accuracy: R and X, 2%, ± 1 ohm
- Direct Reading in R: -400 to +400 ohms, standard -1000 to +1000 ohms, optional
- Direct Reading in X: -300 to +300 ohms, standard -900 to +900 ohms, optional
- Measures VSWR: $Z_0 = 0$ to 400 ohms



OIB-3



The OIB-3 Operating Impedance Bridge provides extended resistance and reactance ranges, measuring up to $1000 \pm j900$ ohms. The bridge has a built-in carrying case and RF amplifier for improved nulling.

- Frequency Range: 500 kHz to 5 MHz
- Through Power Rating: 5 kW Modulated 10 kW Carrier only
- Direct Reading in R: -1000 to +1000 ohms
- Direct Reading in X: -900 to +900 ohms
- Accuracy: R and X, 2%, ± 1 ohm

CPB-1 (5 kW), CPB-1A (50 kW)

The Common Point Impedance Bridge is designed for permanent installation. It allows continuous monitoring of the common point, thus facilitating network adjustment. This model can be provided with one of Delta's TCA ammeters mounted in the front panel.

- Frequency Range: 500 to 1640 kHz
- Power Rating: CPB-1, 5 kW CPB-1A, 50 kW
- Resistance Measurements: 30 to 100 ohms Range $\pm 2\%$, ± 1 ohm accuracy
- Reactance Measurements: ± 50 ohms (1000 kHz) range $\pm 2\%$, ± 1 ohm accuracy



DELTA ELECTRONICS

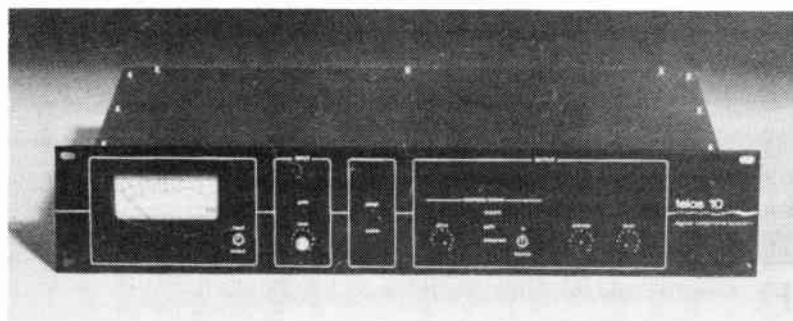
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New Products

(continued from previous page)

The 2400 also can perform as a pitch shifter with adjustments made by the pitch shift ratio control on the machine's front panel. Entries can be made in either musical interval or pitch ratio formats.

The frequency response of the 2400 is



Eventide BD980 Broadcast Delay

Eventide's BD980 broadcast delay line provides stereo delay of up to 10 seconds, offers delay exit-entry modes, has faster delay catch up and adds audio time compression capability.

Network programs, traffic reports, news spots and other events that must start exactly on time can be joined on cue with the BD980's "WAIT & EXIT" feature.

The "RAMP TO ZERO" mode allows an operator to "go on with the show" while the BD980 gradually subtracts delay, until it reaches zero. No user intervention is required.

The Timesqueeze™ time compression allows the user to input the amount of time to be deleted from the audio segment. A variable speed tape recorder is not required.

The frequency response of the 16-bit linear PCM unit extends to 20,000 Hz, and a high 50 kHz sampling rate is used. The BD980 is a two-channel stereo device, in a single 3½" high chassis.

For more information, contact Terry Wedin, Eventide Inc.: 800-446-7878.

20 Hz to 15 kHz +0.25 dB, -0.50 dB typical; +0.50 dB, -1.00 dB maximum. Dynamic range is greater than 90 dB typical, unweighted. Total harmonic distortion plus noise is less than 0.012% typical at 1 kHz and at 100 Hz, while at +18 dBm unity gain. Pitch shift range is +33.3% to -25% at 1× speed factor ratio. Pitch correction accuracy is ±0.005%.

For more information, contact Virginia Casale at Lexicon: 617-891-6790.

New Vector Phaser Line

Vector Technology recently introduced a new line of phasing equipment for AM directional broadcast stations. The new "Spartan" line is designed to offer an economical alternative to the broadcaster.

The Spartan line makes use of certain manufacturing economics which can save a station 15% over the cost of a standard Vector phaser, which for a small station could make the difference

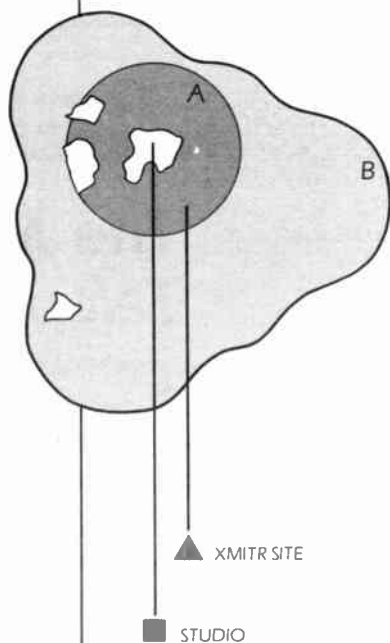
on whether to build build new array.

The new phaser line will offer upgrade options and will be available in power levels up to 5 kW. While not recommended at 10 kW, there are certain conditions under which Vector will build at this level. Fifty kilowatt phasers are offered only in Vector's standard line.

For more information, contact Melvyn Lieberman, Vector Technology: 215-348-4100.

IF TRANSMITTER FAILURE HAS CAUSED YOU TO LOSE REVENUE, LET US INTRODUCE OUR INEXPENSIVE EMERGENCY TRANSMITTER.

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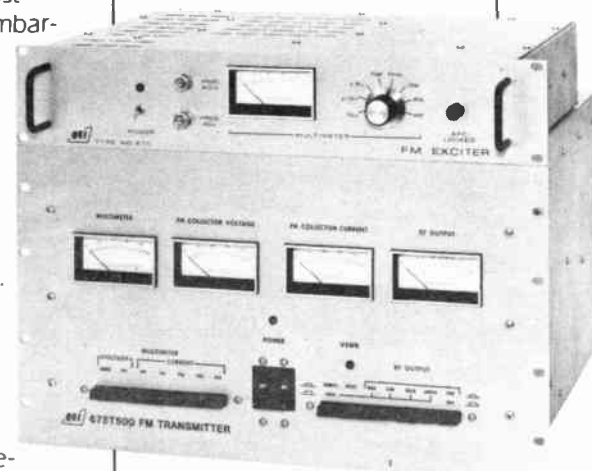
For a small investment your station will gain protection against lost revenues and the embarrassment of discontinued service.

QEI's low-power transmitters are all solid-state and are available in 150w, 300w or 500-watt power output levels. No warm-up is required. They are on the air in less than 10 seconds... and have hundreds of thousands of trouble-free hours. Virtually silent in operation, all our transmitters use QEI's famous 675 synthesized exciter.

So cover yourself with a QEI low-power FM transmitter located at your studio site...

Solve the problems caused by an STL or main transmitter failure... and do it on a modest budget.

For more information contact John Tiedeck at 609-728-2020. He will put a package together to meet your station's needs.



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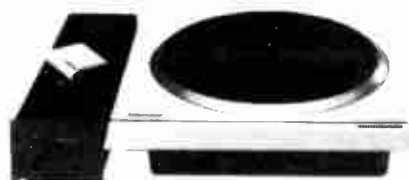
TURNTABLES



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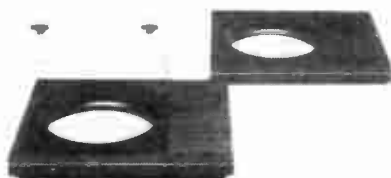
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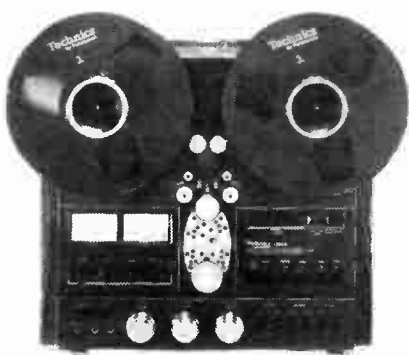
SL-1200MK II \$325



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RS-1500US \$1,350
RS-1520 1,695

Due to the ever increasing attention to digital audio throughout the United States Technics decided to no longer import their fine reel-to-reel products into America. The great workhorse machines, the RS-1500US and the RS-1520, are still available. If you have ever wanted one of these machines, now is the time to act! Once they're gone, you will have to go to Europe or Japan to buy them. Today you can buy them from KIDD COMMUNICATIONS right here in America!



RS-B100 \$649

Quartz-locked direct drive stereo cassette deck. Dolby B and C, phase compensation system, bias adjust, includes rack mount handles.

Back in 1978 KIDD COMMUNICATIONS sold its first turntable system, a QRK/Rec-O-Kut to KRVM, Eugene, Oregon. Since that time we moved on to sell many Russco turntables and Micro-Trak audio systems.

By 1982 the Japanese had won the war, so we decided to join them and became an authorized Technics dealer. Our inventory and sales of Technics products has continually grown. In fact, we have over a ton of Technics turntables and tape recorders in stock. We'd like to ask for:

HELP AMERICA!

Find us homes for these turntables and tape recorders today! Although Technics has increased prices three times this year, KIDD COMMUNICATIONS has slashed prices to the bone to save you money!

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Buyers Guide

Reel-to-Reel Recorders

MX-5050s are Hard Workers

by Randy Schell, Pres/Owner
Schelectronics Tech. Serv.

Houston TX ... I remember, a number of years ago, rummaging through the cartons of equipment that had come in for a new class A FM that I had been asked to construct.

"Wait a minute. What is this? He bought a Space Invaders game? Damn, he bought a couple of them! No, that's

User Report

not Atari. That's Otari. I think I've heard of them."

That's pretty much the way it went ... fear and trembling over the thought that some equipment supplier had a couple of these oddball reel-to-reel machines sitting on the shelf from a company no one had ever heard of, and wrote them into a package for a new radio station to get them out of his warehouse. I had a feeling I was in for a lot of trouble, and that the MX-5050s were in for a lot of downtime.

As it turned out, though, the darned things worked pretty well. Their specs seemed to be okay, they held up to operator abuse with some degree of tenacity, and they had most of the features neces-

sary for an operation the size of his. They didn't even look too bad.

Maintenance was a little scary, though. At first I thought Otari didn't realize that station owners actually made their engineers repair stuff. That would explain the fact that the manual had no schematics.

But when I called them for some help and the technician answered in Japanese, I decided it didn't matter about the schematics. I can't read Japanese. Luckily, there were no failures in the first couple of years that required reading print to repair.

By that time, the station had expanded and bought two more MX-5050s. These came with documentation and, though an "improved" version, they were close enough to the original 5050s for the schematics to be helpful.

Well, Otari must have been selling quite a few of these things by then. Because now they had developed the MX-5050BII, which is the actual subject of this article.

I don't think, by this time, that anyone reading this is totally unfamiliar with Otari's most modest reel-to-reel machine. It has become something of a standard with the "production-on-a-budget" crowd, and rightfully so.

The 5050BII has almost any feature the average production room might need.

The most obvious improvement over the earlier models is an LED display real time tape clock. The predecessors had mechanical tape counters with no actual correlation to time.

Also new to this model is a dual frequency (1 kHz and 10 kHz) test oscillator, with "push on/push off" activation for each frequency. With the machine in the "source" mode, the oscillator appears at the outputs, making it usable as a handy, albeit simple, test device for the whole room. The second generation

machine had an oscillator, but it was single frequency (1 kHz) with momentary activation.

As with the other two versions, the MX-5050BII has an extra ¼ track playback head (for editing down the phone bits you've been recording on that old machine you dug out of the attic), individual sel sync for the left and right channels, separate mic and line inputs and level controls, switchable standard reference level on the reproduce amplifier and
(continued on page 32)

Technics' RS 1500s Bear Wear and Tear

by Hank Landsberg, Dir Eng
Drake-Chenault Enterprises, Inc.

Sierra Madre CA ... In the late 1970s, Technics introduced the RS 1500 series of reel-to-reel tape recorders.

In 1979, I was designing a completely new real-time tape duplicating system for Drake Chenault, and these new machines appeared to be very promising. Just from looking at the RS 1500, it was obvious to me that Technics had done its homework to design a "better mousetrap."

Low phase error

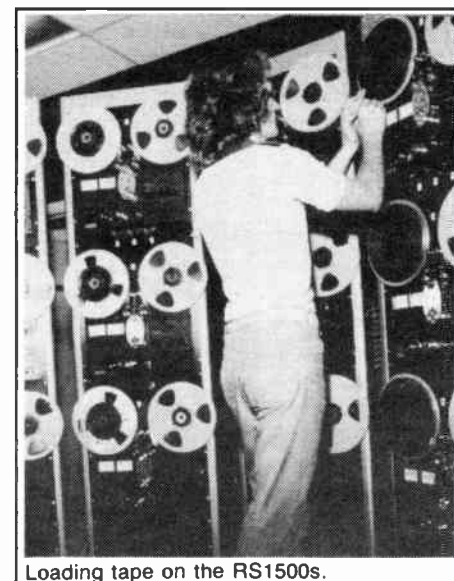
The 1500 utilizes an "isolated loop" tape drive system, which is what impressed me most with the machine. The transport uses a single large diameter capstan with opposing pressure rollers on either side for driving the tape around the headblock loop via a reversing idler at midpoint.

User Report

This method of tape drive both pushes and pulls the tape past the heads at a very even and constant rate, while dramatically reducing flutter and modulation noise.

The real advantage is *extremely accurate* tape movement. The isolated loop drive system inherently eliminates vertical tape movement simply because the drive capstan and the reversing idler are precisely perpendicular to the tape edge. The result? *Unbelievably* low phase error in stereo tapes!

Broadcasters have been keenly aware of the potential phase problems in stereo tape systems due to the resultant loss of mono compatibility. When I was designing the tape duplicating system for Drake Chenault in 1979, excellent phase coher-



Loading tape on the RS1500s.

ency was a prime criteria.

After testing a Technics 1500 for a few weeks, I was convinced that this machine was the ultimate answer to out-of-phase tapes! The machine tested would reliably produce recording with less than 10° or phase error at 15 kHz, even at 7½ ips.

I built the entire duplicating system with RS 1500s. I bought 25 machines which have been in constant use since then.

At the risk of sounding like a commercial for Technics, the other features of the machine are definitely worth mentioning.

The 1500 is a three-motor recorder, and is built on a cast aluminum machined frame. The construction is robust, quite unlike other semi-pro decks.

The capstan is direct driven from a low speed DC servo motor, which is crystal locked. A massive 8" diameter, 15 lb flywheel on the motor produces nonexistent flutter specs.

The reel motors are also DC servomotors, and each uses a speed tachometer to produce constant spooling tension regardless
(continued on page 33)

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Buyers Guide

Reliable Tascam 52 Improved

by Mike Callaghan, CE
KIIS-AM/FM

Los Angeles CA . . . When I last wrote about the Tascam 52 NB, it was in September of 1984. The machine was fairly new on the broadcast market, and KIIS was using just one of them.

User Report

Since then, we have added seven more. Their versatility, performance, and relative lack of problems have made them a mainstay of our syndication operations.

We use three of them in the studio where we master the "Rick Dees' Weekly Top Forty" show. In that role, they are in continuous use more than 40 hours a week—and with the deadlines that come with syndication, we can't afford much downtime.

We have one extra machine that we bi-

cycle through the station to allow the necessary routine checks and adjustments.

For the most part, we find the Tascams require little maintenance. When they do need help, parts are readily available at a very reasonable cost.

Few repairs

The difficulty of making a repair depends on the problem. Most of the control and audio circuitry is fairly accessible through the front panels.

However, the circuit board that bal-

ances the inputs and outputs for professional use is secured to the inside of the rear panel, and can't be reached from the back. Working on that board approximates pulling someone's tonsils out through the back of their neck, but it can be done.

Fortunately, our eight Tascams have an excellent reliability record, but, of the four times they have had component failures, three instances have been noisy output devices on that board.

The wires that interconnect the internal boards are inexplicably tight. When

pulling out on the front panels to reach down into the back, it's easy to pull too hard and crack or damage the record pushbutton circuit board.

I felt terrible when this happened, but two things made me feel better—the board only cost \$25 (a bargain, considering its complexity), and my parts supplier told me it wasn't an uncommon occurrence.

The alignment procedure is a little tricky—the two rows of internal trim pots for bias, level and meter calibration are unlabelled, so constant referral to the manual is necessary. Accidentally turning the wrong control can negate a lot of previous work.

(continued on page 34)

A810 Performs Without a Flaw

by Bill Lemmon, CE
WMEE/WQHK

Fort Wayne IN . . . Recently we decided to replace the tired Ampex 440B workhorse in our main production studio. We had always intended to get a duplicate

of our four-track machine in a two-track configuration, but we decided to look at alternatives.

The choices seem to be a semipro/high-end consumer machine for around \$2,000 or again spend the bucks for a high-end professional machine. The number of agencies that use our facilities continues to increase, so the choice had to be a top-quality pro machine.

After numerous calls to check prices and specs, we ordered a Studer A810 through Audio Broadcast Group.

Because there are 24 possible variations of this German beauty, make sure you discuss your needs with your dealer. You can get everything from full-track, 4 speeds to 2 tracks, with time code and 4 speeds. Add the choice of six options, such as varispeed, test generator switching and noise reduction, and you get a

User Report

large headache picking the one that best fits your needs.

Our choice was the A810 2/2 VUK HS, all of which means that it is a 2 track stereo with VU meters, four tape speeds (3.75-7.5-15-30 ips) and rollaround console.

Once we placed the order, I kind of forgot about the machine . . . but not for



Studer A810

long. In less than two weeks it arrived. I was surprised that it came in two boxes which weren't very big. The last three machines I had bought came fully assembled, including the rollaround consoles.

Assembly

Just two small boxes? Must be the console is missing. Check the shipping invoice. No, it's all here!

One box (the heavy one) contained all the electronics. The other contained the console, shipped knocked down.

At first I wasn't too excited about putting it together and I was somewhat skeptical that it was going to be strong enough.

(continued on page 30)

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Buyers Guide

Nagra Recorder Proves Its Worth

by Paul Stewart, Oper Mgr, CE
WOR-AM

New York NY ... When an important interview or program segment must be recorded outside the studio complex and the popular audio cassette recorders are not adequate, a good, portable reel-to-reel tape recorder is needed.

In order to obtain an audio recording comparable to studio quality, WOR uses the lightweight, rugged Nagra reel-to-reel tape recorders.

One for every need

Kudelski of Switzerland manufactures a complete line of Nagra professional audio tape recorders for radio, television, film and scientific instrumentation. Their approach is to build the basic machines with a long list of accessories, permitting the user to purchase only those options needed for a particular application.

User Report

Four models are suitable for broadcasters: the Nagra models 4.2 and E for mono, model IV-S for stereo, and the miniature model SN, which is no larger than a paperback book.

The most economical model is the Nagra E, a full-track, single-speed 7½ ips recorder using simplified speed stabilization. The model 4.2 is a three-speed recorder.

The Nagra model E weighs about 12 lbs and is easily carried with a shoulder strap. It can handle 5" reels of ¼" tape with the see-through cover closed, or 7" reels with the cover open. Power is supplied by 12 standard D-cells.

Precision tuned

The Nagra line of portable tape recorders is built with the precision of a Swiss watch, and is easily adjusted and maintained.

The specifications provided are superior to most portable tape recorders.

The Nagra model E lives up to the published specifications of frequency response of 50-50,000 Hz within ±2 dB, S/N of 62 dB weighted, wow and flutter ±0.1% and THD of less than 0.9% at 0 dB. The recorder features separately controlled microphone and line input mixing with an option to adapt the line input to a second microphone.

Both dynamic and condenser microphones can be used by flipping a switch. Adjustments and maintenance are facilitated by simply raising the hinged tape deck, providing access to the interior controls

and circuitry.

The VU level meter doubles as a volt-amp meter to set tape bias levels and for field maintenance.

The circuit board is screened for ease of maintenance. The circuit diagram, probe and spare parts are stored internally.

If size is important, the miniature Nagra model SN has comparable specifications and is only 5¾"×4"×1" in size. This pocket-size marvel uses 1/8" tape, operates at 3¾ ips, uses two 1.5 V batteries and weighs only 1.3 lbs.

Quality, precision and durability (we are still using our 15-year old model III)

do not come cheap. The basic model E with the options needed costs around \$5K.

Editor's note: For more information, contact Nagra Magnetic Recorders, Inc. at 212-840-0999. Readers may contact the author at 212-764-7000.



Digital Voice Announcer

Model MMUI

- Works with any telephone system
- Replaces cart machines or other tape devices
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- Multi message capability
- 100% solid state - no moving parts (maintenance free)
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Buyers Guide

A810 Performs Without a Flaw

(continued from page 28)

However, I had forgotten that this was a precision German "techniworks." It went together in about 15 minutes, and was strong enough to hold up a horse (me).

In less than 30 minutes, we had the entire machine out of the boxes, as-

sembled, checked out and in the production room.

Our dealer had also rechecked the machine after all the factory tests and calibrated the electronics for Ampex 456 Grand Master tape, as we requested. (Incidentally, Audio Broadcast Group benchchecks all the merchandise that it

sells before it leaves the store.)

I was impressed! I had worked in the physical standards lab at Cape Kennedy AFB for six years. I have worked on, and have seen some of the finest machinery that money can buy. The Studer is right there among the best. Mechanically, the machine is better than a fine watch.

Microprocessor controlled

The overall operation of the machine is controlled by a microprocessor, which self-tests on startup and intervals thereafter. It features very smooth tape spooling and the fastest return-to-zero locator I have ever seen.

The LED tape timer is programmed in real time, and is also used as a readout device while setting up the machine.

You can change many function and operating parameters from the front panels. For example, there are three extra keys on the tape controls. These can be used as extra tape location points, tape lifter defeat, tape dump and time code record. We have chosen to use the keys as extra tape locations.

You can also program how many keys are needed to start recording on the fly. Pick one for RECORD only, or two for RECORD and PLAY simultaneously. If

your operators are used to doing it one way, you can change the machine to suit the operators.

Calibration of the recorder is also done using the microprocessor. You can set levels, high and low EQ, bias and record EQ for two different tape types.

All parameters are done in 1/256 increments, so there are a lot of numbers. All of them are stored in the machine's memory.

These parameters can also be downloaded to tape for external storage using an optional serial remote control port and some simple connectors. Play the tape back into the machine and you can automatically recalibrate the audio for your particular choice of tapes.

The serial remote control is one option that I recommend you buy. It will save you time manually duplicating your original setups in the event that you have to reset the microprocessor.

We have been using our machine now for more than four months. Already the production department is wanting another pair of A810s for the other production room. They love it. It has worked without a flaw. Try it—you'll like it, too.

Editor's note: Bill Lemmon can be reached at 219-447-5511. For more information on the Studer A810, contact Bruce Borgerson at Studer Revox of America: 615-254-5651.

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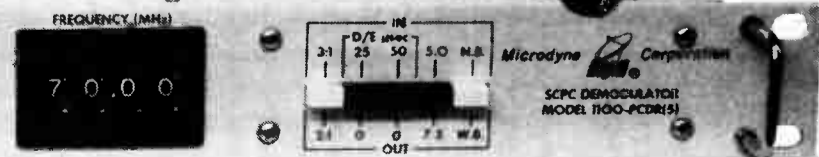
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Buyers Guide

JH110B Is Still Going Strong

by Ted Sims, CE
WHUR-FM

Washington DC ... Whatever happened to the MCI two-track reel-to-reel tape deck? As in the JH110B?

MCI, based in Ft. Lauderdale, FL, made the JH110 reel-to-reel deck for approximately 12 years before it was taken over by Sony Corporation of America in 1982.

We purchased 10 MCI machines, including one eight-track deck in 1982.

JH110B user friendly

The JH110s were, and are, excellent machines—especially the ones that were sold in 1982, with the original bugs flushed out of them.

User Report

The JH110s were offered with a choice of swivel deck (the company calls it a variable profile), or a fixed deck with overhead electronics (high profile).

I chose the swivel deck type (except for the eight track, which comes only in the high profile style). Our producers like the swivel type best because they can adjust the slant of the deck to fit their individual tastes.

I like the low profile of the swivel type deck because it allows easy eye contact between operators in the production studios and the announcers in the booths.

Some of the other features of the JH110 that the operators like are the real-time counter with LED readout, the automatic cue locator that allows storing of up to four separate cue points, and the joystick—all of which make editing a breeze.

The tape sensor took some time to get used to, as did the little pair of scissors at the end of the tape path (the razor blade is a hard habit to break). We mounted editing blocks on all of our machines to give the users a choice.

One of the first things a maintenance person or a sensitive producer notices about the JH110B is that it is quiet. There is virtually no tape hiss, even with the fader pushed all the way up.

Also, the frequency response at 15 and 30 ips is almost perfectly flat out to 20 kHz. This can be easily verified with a Sound Technology Model 1510 Audio Analyzer.

The technical manual is very good (a rarity these days) and can be followed to the letter when aligning and testing the machine.

DC tach motor improvement

The only real problem that we have had in the four years we have been using the JH110 has been the tachometer motors. One is attached to the supply motor, one on the capstan motor and one on the take-up motor. They develop a glitch which causes the tape transport to

jerk the tape.

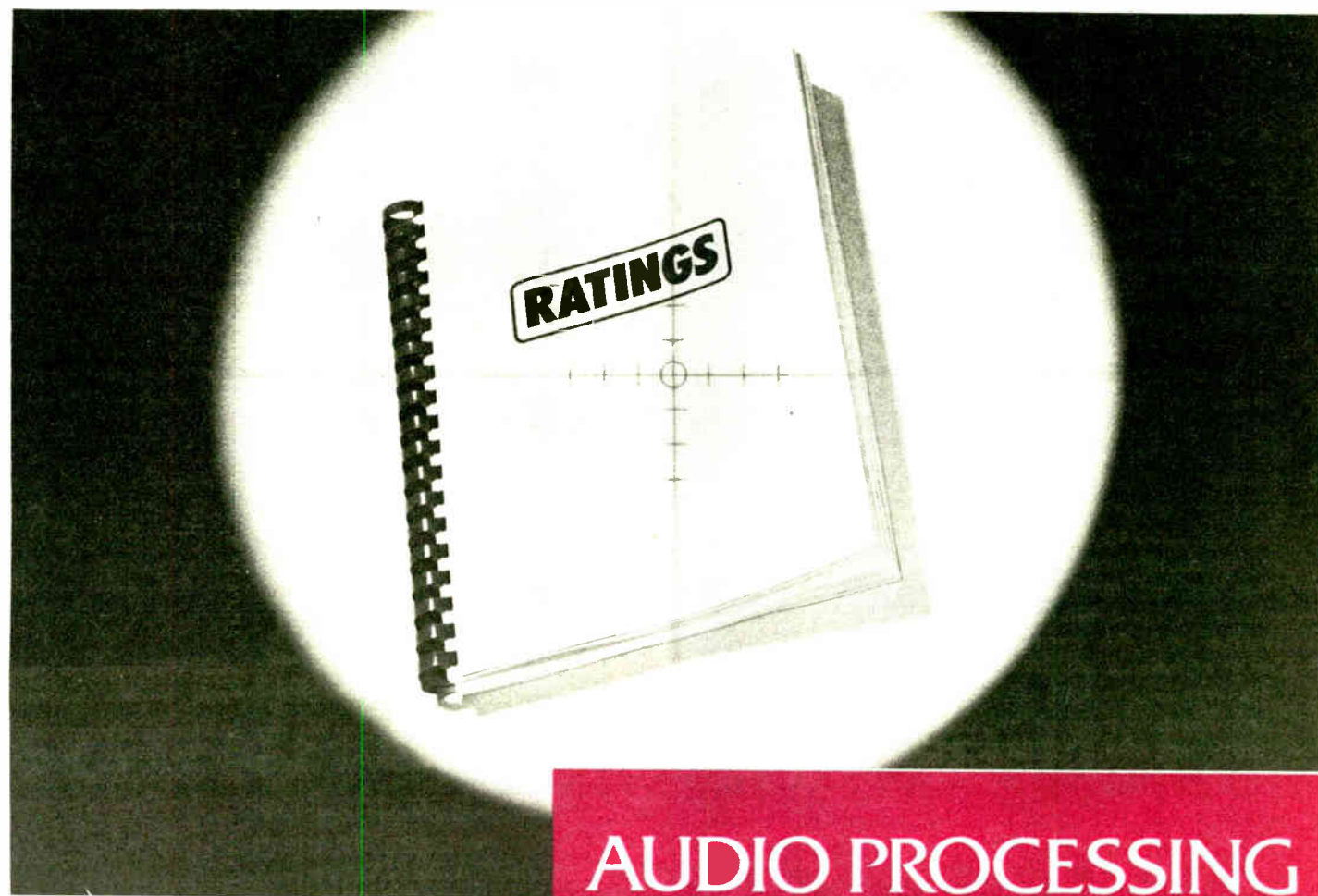
There are some other minor problems: the tape sensor requires frequent adjustment and can be affected by the overhead lighting if not perfectly adjusted; the variable speed control on the machines

is erratic and difficult to set because the knob has too much "play" in it; the tape marker, mounted below the head, uses black ink, which is almost impossible to see in normal light; and the capstan motor starts when the transport is started,

which can cause a wow on tight edits.

The new Sony machine has 1 msec delay between the start of the capstan motor and the start of the transport when the play switch is activated. This

(continued on page 32)



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Buyers Guide

Keep Your JH110Bs

(continued from page 31)

allows the capstan motor to get up to speed before the tape starts moving.

The one departure from the setup pro-

cedure (as described in the manual) that we have made is to adjust the position of the capstan to be closer to the pinch roller. This eliminates the annoying click

that can be heard when the transport is started.

All of the "faults" that I have described in the JH110B are minor, with the possible exception of the glitching tendency of the DC tach motors. After all, these motors are time consuming to replace and they are continuing to escalate in price.

Considering the amount of usage we get out of these machines (most of them put in 12 hour days during the week and four to six hours on the weekends), they hold up very well. At WHUR we use Agfa-Gevaert PEM 468 tape exclusively, which allows us to use one bias setting.

I like the machines, and have no intention of getting rid of them or purchasing new ones within the next 10 years. They are rugged, easy to maintain, and meet or exceed all of the manufacturer's specifications with respect to noise, wow and flutter, distortion and frequency response.

In fact, the reason we purchased a Sound Technology Tape Recorder Test System (the Model 1510) was because we needed test equipment that could meet the specs of the JH110B. Our former test oscillator and distortion analyzer were not good enough.

A spokesperson at Sony Corporation of America says that Sony plans to continue making parts for the JH110B for the next seven years, and that they will continue to make the four-track and the eight-track versions of the machine (the JH110B-4 and the JH110C-8).

Pro Audio General Store says that they will continue to supply replacement parts for the JH110B, including tachometer motors, lights, knobs and switches.

Sony now makes a new two-track machine called the APR-5000, which replaces the JH110B-2 in their product line.

Editor's note: For more information, contact Sony at 201-930-6341. The author can be reached at 202-232-6000.

MX-5050BII

(continued from page 27)

an edit dump.

Maintenance is simplified with a swing out record/play amplifier, accessible when the machine is on its back. Equally as crucial to ease of maintenance is improved documentation, including real schematics, circuit board layouts and exploded mechanical diagrams. Record bias, level and equalization are adjustable from the front panel.

Mechanical editing is probably the MX-5050BII's weak point, but it's a minor one. The heads are a little hard to get to, particularly if you have short, fat fingers, and the splicing block occasionally lets go of the tape. Nothing a longer grease pencil and \$17 won't cure.

The other thing I'd like to see on this machine is a SMPTE center track. But that would take it out of the \$2,300 price range, and that's one of the unit's best features. The cost versus features and quality make the MX-5050BII one of the best bargains on the equipment market.

And if you know a licensee, studio owner, or advertising agency that isn't looking for a great bargain, tell them to give me a call. I'll build them a studio they won't believe.

Editor's note: For more information, contact John Carey at Otari: 415-592-8311. The author may be contacted at 713-558-5121.

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to fit right and stay put. For a long time. Modular electronics simplify maintenance and servicing.

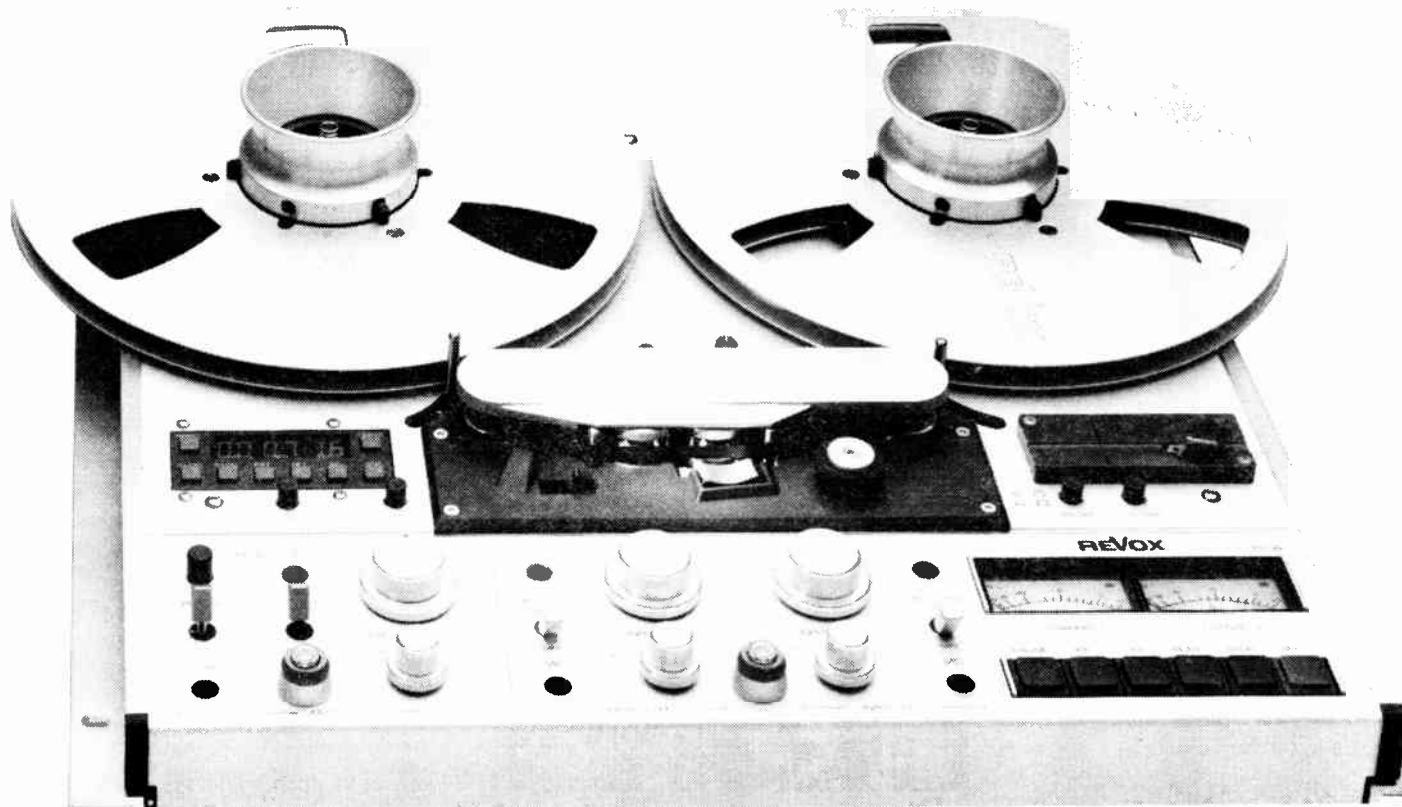
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Purity of sound reproduction has long been a hallmark of Studer Revox recorders, and the PR99 MKII is no exception. Noise, distortion, and frequency response specs rival those of recorders costing far more.

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Buyers Guide

MR-1 Bridges the Quality Gap

by Paul Montoya, Corp Dir of Eng and John Stevens, VP Programming Serv Surrey Brdcstg Co./Surrey Consulting and Research

Denver CO . . . Cassette decks have always been strange beasts to the broadcast industry. While not readily accepted at radio stations initially, I don't know of a production room around anymore that doesn't have one.

One thing that has slowed their acceptance in the production rooms has been the lack of true broadcast-quality equipment in the industry. Most decks have been "semi-pro" at best.

Nakamichi has taken a step toward

bridging this gap with their model MR-1 deck. Unlike other decks, this unit has line level (+4 dBm) balanced XLR input and output jacks and an 8-pin DIN remote control jack.

User Report

We decided to review this deck from both an engineering and operations standpoint. (We all need a deck that is going to stand up to the day-to-day uses as well as enable us to reduce the day-to-day abuses.)

The front panel is very well laid out,

with operating controls to the left and level control and tape selection to the right. Useful features include an electronic digital counter, which samples what the capstan motor is doing, and front panel accessible 1/4" input jacks for quick temporary audio patches.

A headphone jack with its own level control provides more than enough drive for most headphones used. The input levels are controlled by a pair of slide pots, one for the right channel and one for the left.

The output, however, is controlled by only one slide pot. We do wish there were either two output controls or a balance control for the output—we can't

remember the last time we had to play back a tape recorded on another deck that didn't need the channels balanced.

Nakamichi uses vertical 2 dB per step peak LED metering on this unit. It would have been nice for them to use yellow LEDs for segments -20 to 0 rather than all red.

On the right half of the unit is the noise reduction and tape selection switches. Dolby B and Dolby C (boy, that sounds good!) noise reduction is available.

If you are a dbx fan or if you have designed your own noise reduction system, patch points (RCA type) are available on the rear of the unit, along with switches for 120 μsec and 70 μsec equalization. The unit is set up for normal, high and metal tape. A switchable subsonic filter and pitch control also is provided.

There is an 8-pin DIN connector on the rear of the deck, primarily provided for Nakamichi's own RM-200 remote control unit. But, if you look hard at the Japanese schematic, you'll find the correct "to ground" connections labeled. (Why do they crowd so much on one page?)

The real beauty of the Nakamichi MR-1 is its sound. The unit truly does rival the quality of reel-to-reel decks when using good tape and noise reduction. From the standpoint of quality, this deck is an outstanding performer.

to edit a lot, don't use a Technics.

I have nothing but good things to say about the 1500. It produces excellent audio quality recording and is exceptionally reliable.

As if that weren't enough, the entire machine will operate from 24 VDC, ideal for on-location recording where there isn't any AC (a pair of motorcycle batteries works fine).

The 1500 series is available in several configurations: two track (model 1500US), quarter track (1506US), quarter track with autoreverse (1700US) and the pro version with balanced XLRs in and out (1520US).

Editor's note: For more information, contact Panasonic at 201-348-7471. The author may be reached at 818-355-3656.

Editor's note: For more information, contact Michael Wuellner at Nakamichi: 213-538-8150. The authors may be contacted at 303-989-9980.

Technics RS 1500s Withstand Wear

(continued from page 27)
of reel size or operating speed.

The machine operates at three speeds: 3 3/4, 7 1/2 and 15 ips. The transport control is fully solid state with no relays, and can be remotely controlled in all modes. A varispeed control can be used to vary the capstan speed by about 20%.

The headblock contains four heads: two track erase, record, and play, plus an auxiliary quarter-track stereo play head. A small switch on the headblock selects the PB head in use. The entire headblock unplugs for easy service, e.g., replacing heads.

The electronics of the machine are straightforward and very clean in audio performance. The 1500 has three-position bias and EQ switches, while the "pro version" 1520 has front-panel-mounted bias and EQ trimpots for record calibration, plus a test-tone oscillator built in.

Hard workers

How well do they work? Spectacularly! A finely tuned 1500 will produce recordings that have flat frequency response to about 30 kHz, with no flutter, wow or other mechanically induced anomalies.

Modulation noise is very low due to the closed-loop transport, which effectively isolates the critical tape path from

spooling tensions. Also, the very short unsupported tape length within the headblock eliminates the need for a scrape flutter idler.

When I installed all 25 machines in Drake Chenault's duplicating system in 1979, my only uncertainty was how long these semi-pro machines would last in constant daily usage. Answer: A long time.

The Technics 1500 is probably the most reliable tape machine I've ever worked with. All 25 of our machines are actually pulling tape at least 15 hours per day, five days a week, 52 weeks per year.

Over the past seven years, I have replaced two transistors in the entire system! No other components have ever failed . . . only tape heads have worn out.

Incidentally, the only modification to these machines was the installation of Nortronics Duracore heads in place of the original Technics units.

I fabricated my own head adaptors from aluminum U-channel stock. Due to the very low and even tape-to-head contact pressure, the Duracore heads have lasted longer than expected: nearly three years of constant usage.

The only negative aspect of the 1500 is that the isolated loop headblock design makes for poor editing ease. If you need

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Buyers Guide

Reliable Tascam 52 Improved

(continued from page 28)

Aside from these infrequent annoyances, the audio performance and frequency response of the machines are virtually the same as when they were new. The original heads show minimal wear, the level controls are still quiet, and the brakes haven't needed adjustment.

The transports have always done a superior job of handling and spooling tape. The varispeed system is reliable and easy to use.

The only operational bother is a very infrequent tendency of the tension rollers to flutter when recording or playing back. This is aggravated by small reels, and correction requires just a slight readjustment of the tape tension.

The Tascam brakes are smooth and have excellent feel. As shipped, however, the deck mutes the audio output when the tape is stopped.

Because we like to cue by rocking the reels back and forth against the brakes, we added a front panel push on/push off "mute-defeat" button to most of our 52s to disable it.

The Tascams do an excellent job of holding alignment and equalization. They require far less adjustment and repair than the old machines I grew up

with.

The microprocessor-controlled circuitry has been totally without problems, even during power fades. It's a pleasure to have a set of machines that is so dependable.

Tascam makes a tiltable rollaround

“ ”

The audio performance and frequency response of the machines are virtually the same as when they were new.

” ”

rack unit for the "50" series machines, the model CS-607B, which lists for \$349.95. After the deck is mounted, there is still 1-7/8" of space left for auxiliary electronics or a filler panel.

The rack uses two locking systems for the tilt mount. A large friction knob on each side can be tightened down, or a

small spring-loaded pin can be snapped into holes drilled in an arc about the pivot point.

These pins have a tendency to lock in place and are hard to get loose. Aside from that, the stands are sturdy enough for a number of uses beyond just holding tape transports.

We built a portable interview package with a 52-NB, including one of these racks with a pair of Fostex amplifier/speakers bolted to the base, and some mics and booms.

It was kept in a closet at Paramount studios and was rolled out to interview celebrities appearing on television there. The operating ease of the Tascam made it a natural for that role.

Upgraded model

Tascam has built a commendable machine. Even so, they have listened to requests that the 52 be upgraded to include such contemporary features as center channel time code and separate audio electronics. Their response was the introduction of the ATR-60 series, sort of an evolutionary step forward from the 52.

The new series has addressed all of the shortcomings we found and more. The electronics now feature easy-open panel

access, reel servo response has been improved, the control pushbuttons have been changed for better "production feel" and transport operating noise has been diminished.

The new rollaround rack now has air-dampened shocks to hold the deck in position rather than the irksome spring pins. It also has extra rack space in the base and may be ordered with a fixed overbridge for the new electronics.

The new models are available in NAB and DIN equalizations, with the SMPTE time code track, and in a specialized 1/2" 30 ips version for mastering. As might be expected, there has been an increase in price. A two-track 15 ips Model 52 listed at \$3,995. The equivalent Model ATR-60-2N is \$4,995.

The changes represent improvements over the Tascam Model 52. In reality, our original 52s have fewer problems than most any tape machine we have.

The improvements have come about as the result of Tascam's listening and responding to user feedback. Even without these improvements, the 52 is a great machine. As a direct descendant, the new 60 series should offer the same exemplary service and performance.

Editor's note: For more information, call Dave Warren at Tascam: 213-726-0303. The author may be reached at 213-466-8381.

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Buyers Guide

Revox Eliminates User Laments

by Bruce J. Borgerson, Dir PR
Studer Revox America, Inc.

Nashville TN . . . Have you heard comments like the following around your station?

"It doesn't sound very good because it's on cassette."

"We don't have that news report because the cassette deck ate it."

"I can't use this tape because our cassette deck isn't set up for it."

The new Revox B215 is made to eliminate such excuses and give the cassette deck more respect.

In fact, the B215 has more in common with a full-grown Studer open reel deck than it does with most consumer cassette machines.

Microprocessor controlled

For long-term reliability, the B215 is built around a massive die-cast aluminum alloy transport chassis. Four direct-drive motors are used for tape handling: two for the twin capstans and two for the spooling motors. Guided by microprocessor control, the spooling motors wind tape gently and quickly (50 sec. for a C60), and automatically cue past the leader to the exact beginning of recordable tape.

Infrared servo sensors monitor tape motion, and if a cassette jams, the B215 stops. A B215 will never lurch on your news reports.

The B215 not only moves tape quickly and smoothly, but it also finds your cue points with uncommon ease.

The B215's real time counter relates your cue points to the rest of the real world. It even computes elapsed time on partially wound cassettes. Once you find your exact cue points, you can enter them into two autolocate memories for a quick and accurate search-to-cue. Whenever you go into RECORD, the time is automatically entered into the first autolocate memory—perfect for flubbed starts!

Music to the ears

The B215's sound quality is what sets it apart from most other "professional" decks (e.g., any deck with rack ears). Its low noise, extended frequency response and absolute minimum distortion have won rave reviews from practically every audiophile magazine.

Revox employs several features to achieve this performance. An exclusive pivoting headblock maintains perfect azimuth stability for the separate record and playback heads. Dolby HX Pro extends headroom and reduces high frequency saturation while Dolby B and C NR push noise levels down to a conservative 72 dB.

Aha!, you may be thinking, do I have to use one specified brand of tape to achieve this performance?

No. Nor must you attack the innards with a screwdriver. The B215 tweaks itself. Simply insert the tape of your choice, press the "align" button and, in

a 20-second automatic procedure, the B215 does the rest.

Using three test tones (400 Hz, 4 kHz, 17 kHz), the dedicated alignment microprocessor calibrates the bias, record sensitivity and equalization for optimum performance. Once complete, the data can be stored in memory for instant re-

call of up to six different tape formulations.

Other B215 features include automatic or manual level setting, loop function, amply powered headphone output with volume control, automatic tape-source switching and serial data port. Wired or infrared remote options

are available.

With this combination of features, reliability and performance, the B215 stands apart as the "no excuses" broadcast cassette deck.

"Hey, I can't tape-cut edit this because it's on cassette!"

Okay, the fewer excuses cassette deck.

Editor's note: For more information, contact the author at Studer Revox: 615-254-5651.

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Buyers Guide

Figure 1. Proper Relapping Procedure Insuring Optimum Performance

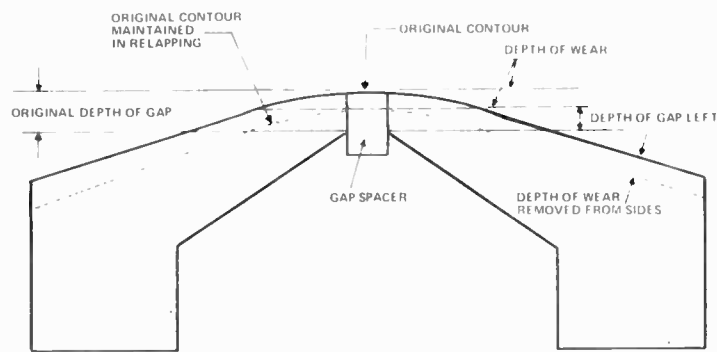
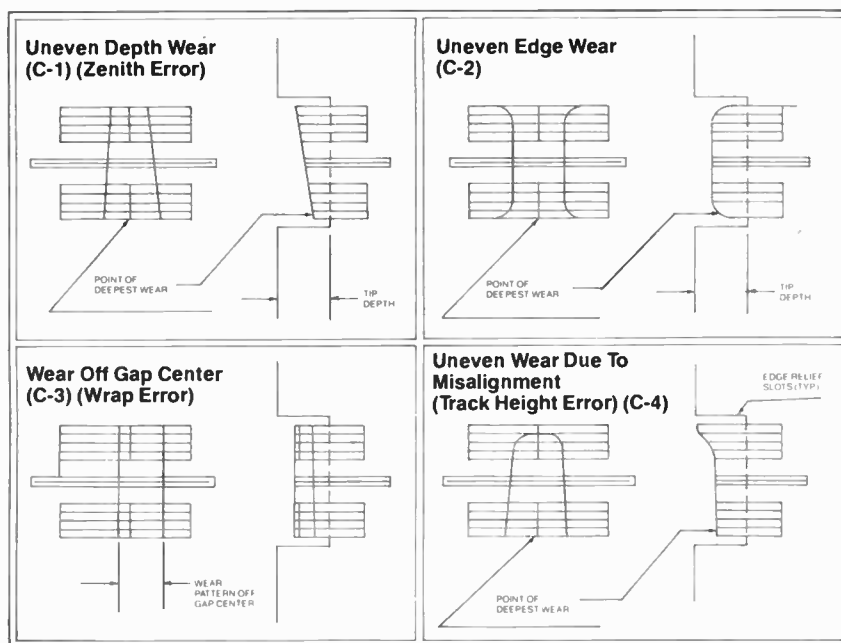


Figure 2.



Do Your Heads Need A New Lease on Life?

by John R. French, Pres
JRF Magnetic Sciences

Landing NJ . . . Tape recorders are designed around the operational characteristics of new magnetic recording heads. However, the overall effects of normal head wear and minor tape path misalignment result in the tape machine being unable to meet specs.

Magnetic heads and assembly tape guides on many tape machines are the only nonrotating contact surfaces within the tape path. As tape passes over the heads with sufficient wrap and tension to ensure intimate stable contact, the inevitable result is head wear.

Causes of head wear

Head wear in one form or another, is a gradual, long-term, but continuous process. Therefore, a good maintenance program is essential in preserving optimum performance.

To aid in even and consistent wear (edge to edge), all metal heads manufactured today incorporate edge relief slots, located outside the edge tracks and within the minimum width tolerances of magnetic tape specifications.

In both metal and ferrite head design, careful consideration is given to the choice of materials which comprise the critical tape contact area. Equal hardness and abrasive resistance is of major importance to ensure even wear characteristics.

Head wear is directly related to tape

passage (in feet), tension, path cleanliness, tape abrasiveness and environmental conditions (temperature and humidity).

As a magnetic head wears in normal operation, certain conditions and minor problems develop, indicating a gradual deterioration in performance. On metal heads, the symptoms are a result of minor changes in contour and tape-to-head contact loss due to wear. These include signal amplitude instability, slight loss of high frequency and unstable tracking or tape path.

Because of the extreme hardness and composition of the core material, ferrite heads do not wear as conventional metal heads do. Slight losses in high frequency response are generally the early indications of core surface and gap deterioration caused by material erosion.

Variation or change in performance caused by wear is usually very slight. Normal EQ and/or minor transport alignment compensation will maintain operational consistency and spec.

Head wear symptoms

When is it time to refurbish tape heads?

As a general rule, heads and assemblies should be refurbished at, or prior to, the point at which maintaining performance spec is in question.

If wear is allowed to continue, minor problems usually become major ones, and alignment is no longer possible. Major symptoms include: oxide shedding and excessive buildup; dropouts; loss of high frequency response; midrange bump; distortion; noise; unstable signal and tape path; tracking error; edge track instability on multitrack heads and insufficient erasure.

In most cases, by the time any of these symptoms appear, others are present as well, resulting in a serious overall deterioration in quality.

Since wide variations exist between tape machines, the materials used in head manufacturing, and the quality of maintenance, an expected head life calculation based on hours is very difficult. The data accumulated in our studies, however, indicates that in most cases magnetic heads failing to meet operational spec exhibit wear patterns less than 50% of initial tip depth.

Ferrite wears, too

It should be noted that a ferrite record or playback head in serious need of refurbishing will show no obvious wear pattern, groove, or change in contour (compared to metal heads).

Upon inspection of the tape contact area, a matte or dull finish is noted, as compared to the high-polish noncontact area. Under a microscope, the dull finish reveals a surface deterioration and pitting at and around the gap area.

(continued on next page)

ANALOG METERING WENT OUT WITH SLIDE RULE HOLSTERS.

If you've decided to go digital this year, why not do it now? You'll not only save money, you'll prevent all the hassles brought on by misreading your existing analog remote controls.

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pictured: TEL 171 for the Moseley TRC-15A \$800
TEL 172 for the Moseley PBR-30A \$920

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Buyers Guide

Maintenance Prolongs Heads

(continued from previous page)

This surface breakdown alters the surface gap length and definition (sharpness). Ferrite erase heads are often regarded as indestructible, but a worn head is a major source of oxide shedding problems.

The procedure of relapping, performed properly, restores a magnetic head to its original specs. Strict adherence is paid to maintaining original contour, ramp angle, gap/crown centering, and end-to-end crown radius consistency. Zenith or tilt 90° reference to mounting surface, and precision finishing, are essential (see Figure 1).

Because of the close relationship between core geometry, head contour, wavelength and EQ design characteristics of the electronics, variations or alterations to the original head contour will usually result in changes to the low end response curve of the tape machine.

Head wear patterns

The diagrams shown (Figure 2, C-1 through C-4) illustrate the most common wear patterns found on metal heads. Assuming that the contour is consistent end to end, the widest wear area is always the deepest.

Most uneven wear conditions (as noted in Figure 2, C-1, C-3, C-4) are the direct result of tape path problems and/or head misalignment. Generally, metal heads will wear slightly deeper at the edges, due to tape tension and the curl effect of magnetic tape (Figure 2, C-2).

There are countless combinations which can include any or all of the above wear patterns within a single head. The longer a head is allowed to wear unevenly, the more material or usable life is sacrificed in refurbishing to correct the condition.

Electrical and mechanical analysis, consisting of inductance, DC resistance, Q, measured gap depth, wear depth, and pattern and initial contour must be performed prior to and after relapping. This information, coupled with documented wear and design data, enables accurate performance and expected life estimates. Considering that the cost of refurbishing ranges between 5% and 25% that of replacement, savings are substantial.

Exact procedure

Since a large percentage of head problems stem from tape path and/or initial head misalignment, an important part of the refurbishing procedure includes the precision head mounting and optical alignment of the entire head assembly.

The optical alignment procedure is a highly magnified visual and digital measurement process referencing industry specifications on tape widths, track placement locations, and specific tolerances adhered to by the equipment manufacturers.

The reinstallation of a properly refurbished and optically aligned head assembly usually requires only a minor azi-

muth adjustment (for phase alignment) and the standard electrical calibrations. Tape tension must be checked and adjusted (reduced) to the minimum acceptable setting. The engineering time saved in the studio for mechanical reinstallation is substantial.

Often the true rewards of a good

maintenance program can be overlooked in the day-to-day activities of a radio station. Equipment downtime, maintenance under emergency conditions, pressure and fatigue, quality, and the bottom line—money—are all affected by the level of maintenance performed on a periodic basis.

Awareness and the appropriate attention paid to the conditions of your magnetic heads will substantially reduce the chances for those sudden surprises and the panic that usually follows.

Editor's note: For more information, call the author at 201-398-7426.

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3.8 Meter Antenna Installation

Buyers Guide

Howe 10000 Gets High Rating

(Editor's note: RW was unable to include the following article in last month's BG review of audio consoles.)

by Lynn Osburn, CE
KBPI-FM

Denver CO . . . Trying to choose a new audio console for your facility is a big responsibility, and the wrong decision can come back to haunt you time and time again.

When KBPI was preparing to move to its new location in downtown Denver last winter, they had made the decision to install the very first Howe Model 10000.

Now, I tend to err on the side of caution as a rule, but it is always tempting to get serial number 001, especially when it could give you an edge on the competition!

Installation

The audio portion of the installation went well, with our model of the console having front access to the Molex I/O connectors. I'm told that the later models allow you front/rear access as a factory option.

User Report

The 6-pin audio connectors use one Molex shell per input, which makes a future audio source change simpler. All of the I/O on this board is through Molex connectors.

We are using dbx noise reduction for playback of carted music selections. The dbx shelf is located in the wire room, so we brought the cart outputs directly to the rack room for decoding, then back to the console as an input. More on that later.

The logic hookup was just a bit more drawn out, as we wanted the console to have control of our 99s, Deltas and two CD players. Our board uses TTL logic throughout. (Howe has switched to CMOS since we took delivery; the board you order will have it.)

The problem then became one of interfacing TTL with CMOS and with 24 V logic. Our solution was to use current relays to provide the necessary control signals to the source machines without the need to common the logic grounds.

Shakedown

The studio/office move was to be completed in three phases: first the FM operation, then the AM, then the general offices. Because of the critical timing of the impending studio move, we really didn't have the luxury of extended run-in on the board after installation.

The KBPI control room was the first room completed, and we moved the on-air operation just hours after we had done the preliminary testing.

Right away we noticed that we were getting some false "start" signals to the cart machines and CD players, and found that static electricity was the culprit.

We bought a static mat (such as those used in CMOS assembly areas) and tied it to the board ground, but that wasn't enough. We used commercially available

the 8-track was housed in the same powered shelf as the dbx cards for the control room.

We had been careful to keep the grounds in each room separate, bringing them all back to a single point for connection to the building's ground, but found that we had inadvertently created a ground loop between the two rooms

“

I like the console well enough that I'm considering trading mine in for a new version of the 10000.

”

static treatments on the carpet, as well as humidifiers (Denver gets really dry in the winter months), but finally ended up with an additional grounded copper strap across the bottom of all the fader modules.

Gerald Ellis at Howe says they are switching to CMOS gates with Schmidt triggers, using relatively slow response times. This should eliminate false firing from transient signals.

Eliminating crosstalk

Next we found that we were getting some crosstalk and buzz into the cue channel. Some detective work here revealed that the crosstalk was from the 8-track studio. After some head-scratching and quizzical looks, it finally dawned on us that the dbx processing for

with the dbx shelf as the common point. Lifting that ground cleared the problem.

A few weeks later a problem cropped up when our afternoon talent claimed that the board channel was intermittently turning on but the cart machines weren't firing.

A quick call to Howe solved that one, as we found that the START output is present only as long as you press the channel ON button. You've probably never heard of this, as most talent tend to mash the button *through* the board, but our afternoon talent had a light, quick touch—so quick that she was off the button before the relay had completed its mechanical travel!

Howe says they are designing a 250 ms one-shot output into the modules, which will be available as a strapped option,

along with a latched output (on as long as the channel is on) so you won't have to deal with this.

A method of resetting the internal clock without disassembly of the overbridge would be nice, and it is worth noting that this board uses only one ground reference throughout. The audio, logic and signal grounds are all the same. The one ground didn't cause us a great deal of trouble in our installation, and Howe has redesigned their interfacing using separate grounds for each.

The Lexan module surfaces clean up well, but are difficult to label. Later versions of the 10000 incorporate a nice oak strip across the middle of the console, and can be used as a labeling location. Custom switchcaps can also be ordered with the console.

We experienced a minor inconvenience since all of the modules were harness wired instead of using some form of edge connector. However, Howe is now using DIN connectors for most I/O from the cards with a minimum of harness wiring.

All things considered, the unit has performed well under fire. The audio sections have shown little tendency toward overload, which is important with our talent!

Most of the problems we've encountered are addressed in the later production versions of the console; overall, the Howe people were pretty good to work with when problems cropped up. I like the console well enough that I'm considering trading mine in for a new version of the 10000.

Editor's note: For more information, contact Jeff Michael at Howe Audio: 303-444-4693. The author may be reached at 303-572-6200.

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Buyers Briefs

Mitsubishi Electric

With the age of digital audio upon us, many broadcasters have expressed an interest in digital studio recorders. Mitsubishi's X-850 is one such recorder.

Featuring a full 32 digital-audio channels, the X-850 has two auxiliary analog tracks to allow tape to be scrubbed over the heads for precise editpoint location. It also offers the flexibility of cut-and-splice editing.

The error correction capabilities, with automatic cross-fading techniques, give audibly smooth splices.

The 32 channels are divided into four groups of eight channels. Each group is recorded on eight tracks, with two additional error-correcting tracks, making 10 tracks in all, for a total of 40 tracks.

The remote control layout features all event and locating functions under mi-

croprocessor control.

Digital audio dynamic range is over 90 dB (unweighted RMS), typical 81 dB (weighted according to CCIR 468, peak). Digital analog distortion is less than 0.5% at 50 Hz to 20 kHz (reference input level). Wow and flutter is limited only by the quartz crystal oscillator accuracy. Digital dubbing to and from Mitsubishi's X-800, X-850, X-80 and X-86 EBU interface will be provided in the future as an option box.

For more information, contact Ralph Moss at Mitsubishi: 212-713-1600.

Ampex Corporation

Ampex Corporation has expanded its line of 467 U-Matic digital audio cassettes with the introduction of 75- and 30-minute play lengths.

The series is a product of extensive re-

search into digital machine requirements. Ampex found that the highest level of PCM performance comes from those cassettes that have been qualified using PCM converters.

No realignment or special adjustment is required to realize the full potential of 467 cassettes.

The special packaging of the cassettes makes them convenient for use by studio professionals. The label is specifically designed for digital recording. Check-off boxes are provided for important recording information.

For more information, contact Al Fisher, Audio Video Division, Ampex Corporation: 415-367-4161.

Tandberg

Tandberg's TD-20 series of reel-to-reel tape recorders can be converted to balanced XLR capability with the use of its adaptor, the TBU-20.

The TBU-20 is an "in-the-field" retrofit accessory. Its inputs are transformer-balanced XLRs and unbalanced RCAs, with transformer-balanced XLR outputs.

The accessory fits flush into an existing recess on the back of the Tandberg TD-20 series of reel-to-reel tape recorders. It can also be used with other brands of reel-to-reel decks.

The TBU-20 is a cost-effective way to transform an unbalanced RCA configuration to one with balanced XLR

capability.

For more information, contact Peter Wellikoff at Tandberg: 914-273-9150.

Nortronics

Nortronics Company, specializing in the manufacture of advanced technology magnetic recording heads, also makes recorder care products.

Among their products is a head demagnetizer with a powerful 290 gauss field intensity to ensure complete demagnetization of all types of heads, including Duracore®, ferrite and other "long-life" heads. The probe is specially angled for easy access to even the most concealed heads, and covered with soft Plastisol™ to prevent damage to delicate head faces. A thermal fuse guards against overheating.

A related product is Nortronics' professional handheld head degausser. The PF-208 is ideal for degaussing large multi-track heads, guides and capstans. Its highly focused magnetic field prevents stray field from damaging delicate meters on the recorder. The high-flux coil core completely demagnetizes all tape heads and guides. An auto-reset thermal protection device maintains a safe operating temperature to prevent coil burnout or damage.

For more information, contact Kay Black or Ken Lubitz at Nortronics: 612-545-0401.

Otari's Gone Digital

by Jeff Phillips, Prod Spec
Otari Corporation

Belmont CA ... In November 1985, Otari tossed its hat into the digital audio ring by announcing both its endorsement of the "PD—Professional Digital" recording format, and its ambitious plans to introduce a 32-channel digital machine for summer 1986.

Summer 1986 is here, and the first DTR-900-32 is in place!

Otari chose to build its digital tape machines to the "PD" standard because "PD" accommodates 32 tracks, lower linear data density, higher physical dispersion, and the most powerful error detection and correction algorithms currently available. Tapes made on Otari digital machines are compatible with tapes made on other "PD" format machines, such as those from Mitsubishi and AEG.

The DTR-900 is also available in 16-

and 24-channel configurations, which are upgradable to 32 channels, the new standard for studio and post-production applications.

Standard features on the DTR-900 machines include electronically balanced outputs, meter bridge, remote control with built-in autolocator, SMPTE time code generator/reader, two auxiliary digital tracks, two analog cue tracks, dedicated time code track, varispeed, serial and parallel control ports and ferrite heads.

Otari plans to offer a two-channel "PD" format mastering machine in mid-1987. This machine, called the DTR-200, will operate at 7.5 or 15 ips, and will feature razor blade editing to suit the needs of quality and time-conscious broadcasters.

Editor's note: For more information, contact the author at Otari: 415-592-8311.

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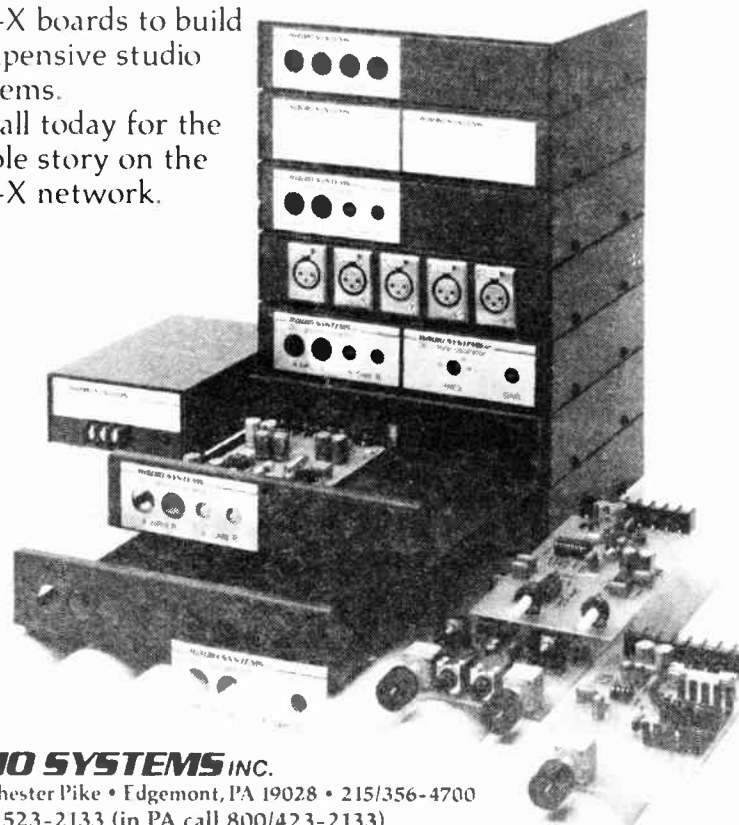
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