

Filings Urge Caution on DAB

by Charles Taylor

Washington DC Initial comments on the FCC's inquiry into digital audio broadcasting (DAB) generally expressed zest for radio's future with the new technology, but noted concern over the impact on existing AM and FM.

A full round of comments was not due until 13 November, the new deadline after the Commission granted a 30-day extension. Reply comments are due 14 December.

A number of early filings on Gen. Docket 90-357 cautioned the Commission to move slowly, including that of KKOR/KYVA in Gallup, NM, which wrote: "We are not opposed to improve-

ment in present-day broadcasting. We are opposed to moving too quickly on an issue when all aspects have not been thoroughly explored."

The station encouraged DAB delivery using existing facilities, instead of a system not compatible with current technology. "The correct technology just has not come along yet. If the Commission waits patiently, the correct one will come along."

While engineers say they are working on alternative approaches, only one DAB system has been tested: the European-developed Eureka 147. In addition to tests in Europe, it was demonstrated this summer across Canada and is expected to be on the air at the 1991 NAB conven-

tion in Las Vegas.

Other comments noted a fear that digital would deem current AM and FM service obsolete. Some asked that a transition period be established, in which existing broadcasters are given first dibs at DAB allocations.

"If fair and prudent standards are not adopted to ensure the orderly development of DAB service, it can be expected

that current radio broadcast stations will face significant audience attrition and will find it difficult, if not impossible, to continue to furnish needed service to the public," wrote United Broadcasting.

The West Virginia Broadcasters Association agreed that current broadcasters should have rights to the new digital stations. "To place that technology first into

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DAB Study Launched

by John Gatski

Washington DC The NAB has awarded a joint contract to two engineering firms for a digital audio broadcasting (DAB) spectrum study, based on a recommendation by the association's Digital Audio and Satellite Sound Broadcasting Task Force.

The \$40,000 contract was given to Jules Cohen and Associates, Washington, DC, and DATEL Inc., Arlington, VA, according to NAB Science and Technology Senior VP Michael Rau. The NAB hopes to have the study completed by year end.

"We hope to find out how much spectrum will be needed to accommodate

AM and FM licensees," Rau said.

The study will play a key role in the NAB's DAB decision making, Rau said.

Task Force Chairman Alan Box, President of EZ Communications, said the study will be undertaken to find the best possible use of spectrum for digital broadcasting, including whether to use existing FM spectrum or higher frequencies to accommodate the "superior" digital sound.

DAB has become a much-talked-about technology in 1990 and events leading to an implementation plan are progressing very quickly to make sure the US does not fall behind, as it has with HDTV. The

(continued on page 10)



Should one FCC Commissioner be an engineer? The SBE says "yes."

Reactions Mixed on FCC Engineer Plan

by John Gatski

Washington DC The Society of Broadcast Engineers (SBE) has proposed that the FCC require at least one "engineer" among its five commissioners, a move that has garnered mixed response from broadcasting engineers.

The SBE believes the FCC needs an engineering-trained commissioner to ensure against what it considers mistakes that have been made with past policies and decisions that may have been altered if an engineer were there to raise a red flag.

The SBE has not yet asked for support from the NAB, but NAB Science and Technology Senior VP Michael Rau said the association is "unlikely" to endorse a mandatory engineer on the Commission.

The FCC should have "qualified individuals" serving as commissioners, but not of any particular profession, Rau added.

Rau said an engineer on the Commission is unnecessary. "My experience is that the Commission has been well briefed on technical issues," Rau said. "The Commission does not make decisions in a technical vacuum."

Rau said the commissioners seek technical expertise and advice from FCC

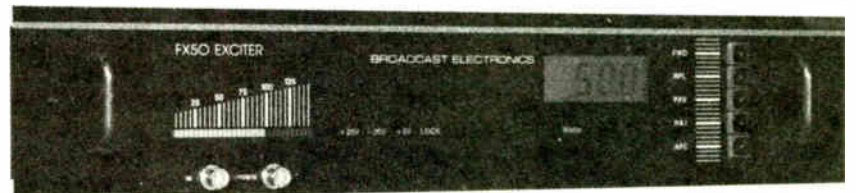
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Hopes and Fears in AM

Petitioners Ask for Expanded Band Preference, Suggest New Opportunities

by Charles Taylor

Washington DC Nearly 100 commenters in early filings to the FCC addressed personal hopes and concerns regarding the agency's encompassing effort to bring about massive reform to the ailing AM band.

Proposals suggested in MM Docket 87-267 make aggressive moves toward reducing AM in-

terference on the band by changing protection limits and making plans to reduce the number of stations, while suggesting stereo and non-simulcasted programming.

It also queried broadcasters about allocation and protection of the additional 10 channels—from 1605 MHz to 1705 MHz—planned for the AM expanded band.

Among those filing were 45 radio stations that petitioned for preference in being awarded one of the frequencies in the expanded band. In its April inquiry, the Commission asked for interested stations to file a letter of intent.

Reasons for relocation

A majority of the stations indicating reasons for wanting to relocate on the dial referred to current limited coverage areas and interference from adjacent stations.

Fifty other broadcasters, companies and organizations filed comments primarily praising the FCC's efforts to reduce interference on the band, with a number of special interest groups pointing out their wishes for future opportunities.

The National Association for the Advancement of Colored People, the League of United Latin American Citizens and the National Black Media Coalition, for example, asked that the Commission request comment on the use of "creative approaches," short of a set-aside, to encourage minority ownership in the AM expanded band. Crawford Broadcasting Co.

agreed that "the maturing of the AM broadcast service indeed calls for sweeping changes of the nature of those proposed by the Commission." But, it warned, changes must be consistent with current market conditions, audience preferences and good engineering practice.

Bad for smaller stations

Some complained that the proposal to strike out the simulcasting of AM and FM signals would be detrimental to small market stations.

"With the influx of many new 80-90 FM stations, the ability of AMs to stand alone with music programming and survive economically is substantially diminished," wrote 3-D Communications Corp., licensee of WDDD-AM in Johnson City, IL.

"However, if large amounts of the broadcast day (and overnight) are simulcast, it does allow operators the opportunity to offer specialized programming on their AM station," it said. "Sports broadcasts, special events broadcasts, additional news coverage and other programming may be eliminated if the ban on simulcasting is instituted."

Comments on the proposal were due 16 November, a 30-day extension from the original comment deadline of 15 October. The reply comment deadline now is 17 December.

The extensions were granted following a request by the Association of Federal Communications Consulting Engineers. The organization explained that, given the complexity of the various proposed changes to the AM technical rules, additional time is required to perform the "requisite analyses necessary for developing a comprehensive response."

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Broadcasters Delve into DAB

Study Groups Formed To Gather Information

by Alan Carter

Washington DC From the Corporation for Public Broadcasting (CPB) to commercial stations in Los Angeles, broadcasters want to know more about digital audio broadcasting (DAB) and are taking steps to obtain as much information as they can about what will be a new era for radio.

LA engineers have formed the LA Digital Broadcasting Committee, an outgrowth of the local Society of Broadcast Engineers (SBE) chapter.

KLIT-FM Engineering Supervisor Steve Blodgett, who chairs the LA committee, said the group's objectives are to have "real world" testing in the city and act as a clearinghouse on DAB information for local stations.

"We really need some real tests here," Blodgett said. "We're told it will work."

In the real world

Blodgett said he was impressed with the Canadian DAB testing he observed in Vancouver this summer. "There were some amazing results," he said.

Blodgett said that while some LA broadcasters are excited about the prospect of DAB, others are apprehensive.

Nevertheless, the general response is, he said, "Either we embrace the technology and get on the bandwagon, or it's going to run us over."

That general idea may be what's leading senior management at CPB to request a presentation on DAB from National Public Radio, whose lead engineers are active in research on the developing technology.

Also, NPR will make a similar presentation to members of the National Telecommunications Information Administration's (NTIA) committee that awards grants for public telecommunications, the Public Telecommunications Facilities Program (PTFP). Recipients of such money includes public radio stations.

Standards setting

On a different level, the North American National Broadcasters Association (NANBA), whose membership includes broadcasters from Canada, Mexico and the United States, has formed a subcommittee of its technical arm to prepare a position statement for the 1992 World Administrative Radio Conference (WARC).

The subcommittee is to investigate frequency spectrum and competition with terrestrial broadcasters, according to Carl Girod, VP of satellite technology for the Public Broadcasting Service (PBS) and

NANBA technical chairman.

Members of the subcommittee are: Chairman Ralph Justus, NAB; Bob Donnelly, ABC; David Garforth, Canadian Broadcasting Corp.; Don Lockett, NPR, and an yet unnamed representative from CBS.

"We're in the initial drafting stages," Justus said.

One issue the position statement will address is whether the NANBA will support terrestrial, satellite or hybrid DAB transmission.

Justus cannot vote on the issue because

the NAB is an associate member of NANBA and does not hold voting rights.

Asked how he would coordinate NAB's opposition to satellite transmission with NANBA members who may find it in their best interest, Justus said, "That remains to be seen."

Justus declined to reveal specifics in an initial draft report he took to the organizational meeting that sources said was strongly slanted against satellite transmission and against allocating broadcast authority in auxiliary frequencies for DAB.

DAB Comments Cautious

(continued from page 1)

the hands of (AM and FM broadcasters) would be the most logical as well as the most sound public policy that could be adopted."

The Recording Industry Association of America, in line with its viewpoints on most digital advances, complained that the new service would allow the "cloning of prerecorded music, representing an entirely new threat to the recording industry."

The organization said digital services should have to pay copyright fees if playing more than one track from a disk.

Meanwhile other groups and companies currently using spectrum in various

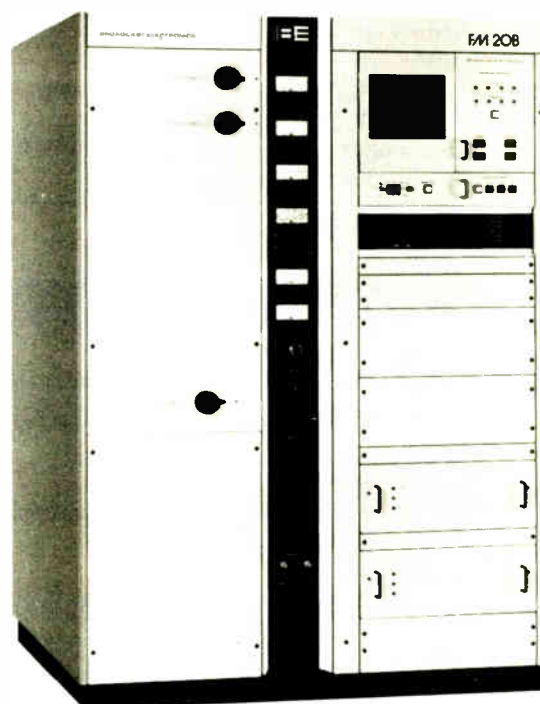
areas of the band asked the Commission to direct DAB elsewhere.

The 30-day comment extension followed a request from the NAB, the Association of Independent Television Stations, the Association of Maximum Service Telecasters, Bonneville Corp. and Tribune Broadcasting.

"The Commission has undertaken nothing less than a broad re-examination of the provision of radio services in the United States," the groups said. "A modest extension of time will enable commenters to provide the Commission with more refined and specific input with respect to the issues raised in the digital audio radio services proceeding."

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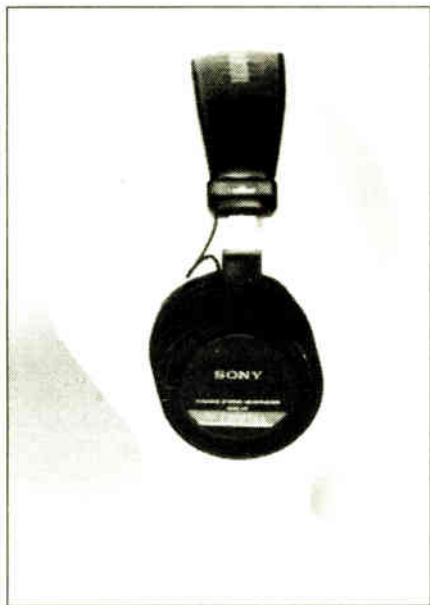
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Where Service and Engineering Make the Difference

CD Audio In The Deep Freeze

by Judith Gross

Falls Church VA It kind of m-makes me sh-sh-shiver to think about it, but there's another brilliant idea to get better quality out of your compact discs being tossed about.

Those audiophiles are never satisfied with the way anything sounds when you buy it off the record store shelves, you know?



Anyway, according to an article in *Stereophile* magazine by Robert Harley, folks are now freezing their CDs. That's right.

Now, before you go racing to your fridge and throw in a couple dozen discs, let me explain that we're talking cryogenic freezing, here. You know, the process those wacky sci-fi stories claim will let you live for a couple of centuries?

The way it works is, according to Harley, a CD is placed in a cryogenic freezing chamber. Via the work of liquid nitrogen in an eight hour time period the temperature goes down to 75° Kelvin or 300° Fahrenheit. Br-rrrr. Wouldn't want to be anywhere close.

It's supposed to relax the lattice structure of the polycarbonate from which the disc is made. According to Harley, A-B listening tests of frozen and non-frozen CDs reveal that the popsicle variety sounds better. Harley says some subtle sounds were vivid and more apparent. He claims the sound is fuller and more enriched.

I say if it works, like painting the disc green, or now they say black is good too, then do it. But if it's such a hot idea (or cold, in this case), why aren't the CD

manufacturers putting the discs through it before they hit the stores?

The whole idea brings me back to those sci-fi stories I mentioned. Can't you just see it? Two centuries from now, way up in the Arctic, a glacier will explode and a team of dedicated scientists will uncover "The Thing With Audio." Our luck, it'll probably be Bon Jovi or Prince.

Speaking of things digital, it seems no sooner than a technology sets the industry on fire than some spoil-sport comes along with a problem. The potential for digital audio broadcasts over the air has the copyright protectors up in arms.

Spearheading the fight is (who else?) the Recording Industry Association of America, the folks who have been the bugaboo in consumer DAT ever since it was talked about.

The RIAA is looking forward to a time when your local music station is digital, coming through loud and clear with Madonna's latest release picked up nicely on a digital receiver.

Not only that, but they see some sinister listener actually hooking up a digital recorder, say DAT, for instance, and taping the new release all the while preserving the digital quality. Now, that's not too far-fetched a scenario.

Already there are digital cable radio services providing CD quality through cable; it won't be long before somebody figures out a way to tape off them digitally.

The RIAA is worried that there won't be a need to go out and buy the actual recordings if you can just tape them over the air and get the same quality.

Now, let's forget for a minute that if you turn that statement around, what it could be interpreted as saying is: "We believe in the current inferior quality of AM and FM compared to CDs, and we make our living from that. So don't go upgrading the quality of audio coming through your radio or anything, or else Stevie Wonder and Madonna will starve to death or not be able to afford the limousine or something."

I really don't think the good people

the air broadcasts are at least a few years down the road. In the meantime, maybe it's time to revamp the way music is disseminated to the public.

Maybe the recording industry needs to figure out where the technology is going and be one step ahead of it with a system that provides fair compensation to the artists even if listeners don't need to actually go out and buy a disc.

The recording giants have a notoriously bad track record on keeping up with things; it took them years to realize that CDs would replace vinyl. But you'd think they could figure out how to do something else besides try to stop a new idea whose time has come.

Ran into John Heimeri, a technical advisor from Virginny, at the SBE show and he told me about an old, I mean old, old, old RW he has. I have a few here myself, they're from the 1920s and really have no relation to this newspaper you're reading.

Anyway, he sent one along and I loved seeing the hot technical topics from 13 March, 1926. Can you believe it, 64 years ago? There are such nifty articles as "Is Crystal Purer Rectifier Than Tube?" "My Experience with Super-Heterodyne Sets" and "How To Cure Squealing."

It was a time when listening to the radio meant first you had to build yourself a set and then put on the old headphones and try to tune something in. Another article touted the features of the KB-8, a non-regenerative Brownings-Drake set shown here with its designer M.B. Sleeper.

This magazine was no sleeper, I'm glad to say. And if anyone else has an old RW in his or her collection, or knows anything about the old-time magazine, I'd get a kick out of knowing about it.

Isn't it amazing? Radio's been around for more than 70 years and it just gets more exciting as you go along.

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



A "sleeper" of a radio from long ago.

at RIAA mean that at all. They do have a point though. If we have an economy in the music world that is based on royalties and that relies on mass media (i.e., radio) to generate just enough excitement over a new release to get listeners to go out and buy it but doesn't go as far as providing the full gratification of CD-quality audio for reproduction, then digital over-the-air broadcasts would be something just short of a disaster.

So what to do? Well the copyright protection people are looking into the whole matter for now. And the first digital over

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EBS works!

Dear RW:

Does *Radio World* have a "secret agenda" to completely discredit the EBS system? For months now, I have read stories of broadcasters wanting to shorten the tones, change the mode of transmission, etc.; yet, I have yet to read a single story about how EBS works successfully!

Our radio station is the closest facility in our market to two nuclear power plants. We are also located in Wisconsin, which is affectionately referred to as "Tornado Alley."

Granted, you will always have a story of an earthquake shutting a station down; a grassfire taking out a Sheriff's Department repeater, or a person of minimal experience at the controls when an emergency occurs. But when you realize that every week, there are probably 7500 EBS tests sent accurately and correctly, these small stories of disaster are tragic . . . yet in the minority.

Perhaps, municipalities (meaning Mayors and County Board Chairmen) who hire their golfing buddies for Civil Defense Directors and Emergency Government Managers could take on the responsibility of spearheading responsible government, when the public's safety

is at risk.

I am open minded to new options and changes, but my pocketbook will not accept another \$750 hit . . . when the EBS system in our part of the world works so well.

Mark Heller, President
WTRW
Two Rivers, WI

Before you take this tip

Dear RW:

This letter is in reference to Jim Wenstrom's 26 September *Workbench* article, "Silver Plating Ploy."

Before using Cool Amp on contacts in tube sockets, one should first determine whether the spring-tension has been lost, a common problem in the inner filament contact collets in tube sockets where 5 kW or greater tubes are in use.

Made from beryllium copper, these contact fingers gradually lose their tension, so whether or not the plating is shiny, they will have a high resistance and the resultant spot heating due to I-R losses will cause arcing with possible damage to the tube. In this case, the best cure is replacement of the contact collet itself.

Reid Brandon, Applications Eng.
Varian Associates
San Carlos, CA

More on EBS

Dear RW:

Frank Beacham's otherwise excellent article on EBS (RW 10 October) takes a good point too far when it alleges that " . . . state officials are questioning whether local government is even capable of providing useful information to the public during an emergency."

Nonsense! Local government can and does provide a great deal of useful information during emergencies. Whether they have a monopoly on useful information, and whether EBS is always an appropriate or workable tool to deliver that information, are separate questions.

Local government is the best source for certain kinds of emergency information. Other kinds are more readily gathered and disseminated through the news media's own resources. Neither broadcasters nor government can carry the whole burden alone.

The SBE's plan to lobby Congress to change the Communications Act of 1934 requiring that one FCC commissioner be an engineer is an idea fraught with good intentions.

However, the massive effort of getting a change such as this enacted is impractical and may not even be constitutional for the narrow specification it would impose on the choice of a qualified individual to serve on the Commission.

In fact, only a small percentage of the decisions the FCC faces each term are technical ones. The engineering expertise required to render these decisions is supposed to be provided by technical support staff.

There is also the sticky question of what type of engineer to require: civil; PE; practicing; one skilled in computers, telephone, video, radio, or an infinite number of other classifications? Plus, is it unreasonable to ask Congress to focus so narrowly on one aspect of the regulatory system?

The hope inherent in the SBE's proposal is that if it were enacted, engineering concerns would be better addressed in decisions involving technical issues or where technical and non-technical issues are in conflict.

A far better way to accomplish that goal would be to encourage more comments on proposed rulemakings, even more petitions for rulemaking, from engineers and engineering groups.

A majority of the comments filed with the Commission come from lawyers and management, but it is rare to find a coalition of engineers filing separate comments on technical issues.

The engineering community should also take it upon themselves to initiate and maintain better contact with not only the commissioners but the FCC staff on all its levels.

By keeping the lines of communication wide open, engineers could insure their interests are better represented on those issues which affect them.

There is no need to seek out an answer by changing "big government" when the solution is only a series of letters and phone calls away.

—RW

EBS is defined in federal regulations, and operates through the voluntary participation of the broadcast industry. Local governments have very limited say about the setup of EBS, yet they're the ones expected to use it. It would be unfair to blame local government either for flaws in the design of the system or for inflated expectations for its use.

EBS is not an end in itself; it's a means toward the ends of public warning and public information. The challenge is not to belabor the shortcomings of EBS, but to develop the other tools we need in addition.

Art Botterell, Asst. Chief,
Telecom. Div.
Office of Emergency Services,
Region 2
Pleasant Hill, CA

Frank Beacham replies: I stand by my origi-

nal article. Jim Gabbert, who is California's EBS Coordinator, president of the California Broadcasters Association and owner of KOFT-TV, San Francisco, said of government response to the Santa Barbara emergency: "If we had really needed the (EBS) system the last people who seem to know what's going on is government. The problem we have found in post disaster areas is the officials don't have the foggiest idea what the hell is going on. Santa Barbara had its plan and it totally fell apart at the government level."

Mr. Botterell, in his report on the fire, praised the good work of Santa Barbara stations KTMS and went on to say that the station's good performance "calls into question the traditional model of warning and public information as being a one-way street from government to media. In fact the opposite was closer to the truth during the first few hours of the emergency."

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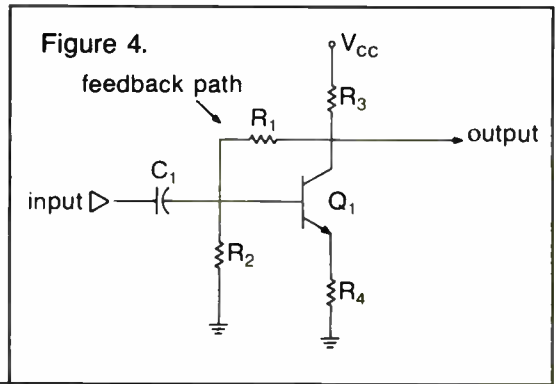
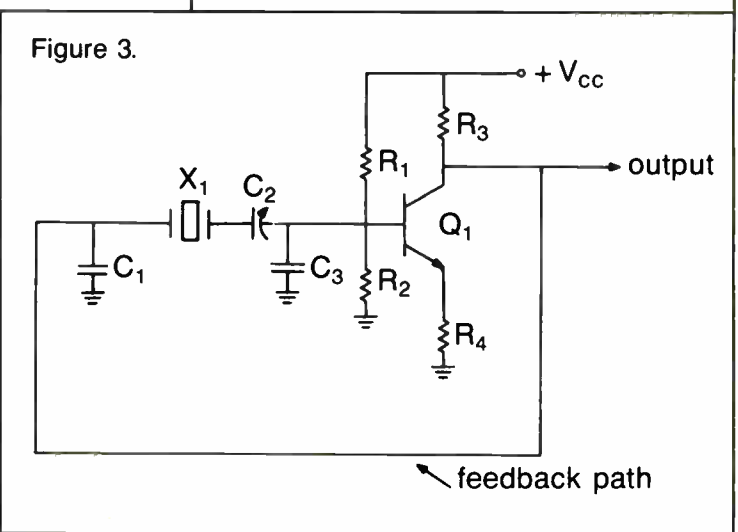
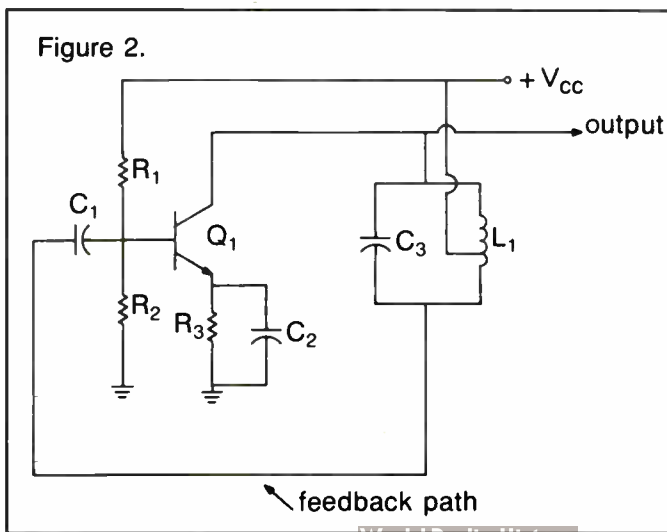
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**Next Issue
Radio World
December 12, 1990**

Correction:

In Part IV of Ed Montgomery's series on Amplifier Fundamentals, elements were left off the accompanying figures. In the interest of accuracy, we are reprinting the figures as they should have appeared.



SBE Proposes Engineer on FCC

(continued from page 1)

engineering staffers and other sources when deciding technical issues.

He also noted that technical issues comprise only a small portion of the decisions faced by Commissioners.

Serious effort

Although NAB support may not be forthcoming, SBE is serious about pushing its proposal through Congress, SBE President Brad Dick said. The SBE Executive Board unanimously endorsed the move, he noted.

"We think the Commission has gotten away from the technical needs of the in-

dustry," Dick said.

Dick said two past decisions that had a negative impact on broadcasting may have been avoided if there had been a commissioner with engineering expertise.

Dick referred to the broadcast deregulation that occurred in the 1980s. He said the deregulation sent a message to radio stations, through less paperwork requirements and fewer inspections, that technical consideration were not as important as before.

"The result was that we had loudness wars," Dick said.

Another decision that did not take into account technical implications was the

elimination of the three-year ownership rule, which led to a radio station buying-selling frenzy in the 1980s, Dick explained.

Owners did not realize that the quick-buck lure of buying and then selling a station for profit created a lot of debt, forcing them to delay capital improvements, such as new transmitters and other equipment, he said.

Fewer engineers

SBE Board Member Dane Eriksen, who formally proposed the idea of an engineer-commissioner said an engineer on the Commission could only help in its deliberations.

Prior to 1962, the FCC had a history of being comprised of engineers or those who had engineering experience, according to Eriksen. Since then there have been very few engineers, but more lawyers on the Commission, he added.

Eriksen also countered the argument that the commissioners do not need an engineer among their ranks because they are surrounded by technical staff persons.

Of the five commissioners, James Quello is the only one that has a staff assistant experienced in engineering, he noted, and there are not as many engineering personnel in FCC's lower ranks as there used to be.

Most of the commissioners' staff personnel are lawyers, Eriksen emphasized.

Broadcast engineers' reaction to the SBE proposal has varied from support to skepticism, although no engineers interviewed outright rejected the idea of an engineering-trained commissioner.

Many believe the proposal has merit considering the number of technical decisions that are made by the Commission.

FCC is technical

"I think there should be an engineer on the Commission. You are talking about a Commission that is dealing with technical matters," said Herb Squire, CE for WQXR AM/FM in New York City.

Ron Sweatte, CE for KLUV-FM in Dallas, said an engineer on the Commission would reduce the uncertainty commissioners have about technical issues.

"I think it is important to have somebody in there with technical knowledge," Sweatte said. "They more or less speculate (on unfamiliar technical issues) and make it a guessing game. Engineering is not a guessing game."

Other engineers are uncertain about the proposal's merits.

Former FCC mass media bureau chief Lex Felker, now a technical engineering consultant with Wiley, Rein & Fielding in Washington, said an engineer on the Commission may add some technical perspective, but is unlikely to affect the decision-making process.

"I'm sympathetic (to the proposal) but I'm not convinced anything will change," Felker said.

Engineer not necessary

Felker said there are technically-qualified staff persons within the Commission's ranks to advise on technical decisions. However, he was not sure why the Commissioners don't have more technical people on their staffs.

"I'm a little surprised that more commissioners don't take advantage of it," he noted.

Warren Schulz, CE for WLS-AM/FM Chicago, said he was uncertain whether a mandatory engineer on the Commission would produce better decisions.

"I think it is a noble cause, but would we gain anything from it?" Schulz asked.

An engineer on the Commission could bring on more stringent regulation, he added.

Although it may sound promising, National Public Radio Senior Engineer Mike Starling said an engineer on the Commission probably would not affect its decisions.

CBS Radio Technical Operations Director Tony Masiello agreed. "They do have engineering people on the staff. I don't see any advantage," he said.

Instead of adding an engineer to the Commission, Masiello suggested the Commission add more technical staff people to bolster its engineering expertise.

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Stereo Enters Third Dimension

by Frank Beacham

Part II of II

Los Angeles CA The year was 1881 and Clement Ader decided to use the Paris Opera House to conduct a demonstration of 3-D sound reproduction. He set up closely-spaced telephone transmitters on the stage linked to individual receivers in the lobby. When a listener held receivers from each microphone to the ears, the result was stunning binaural stereo sound.

More than a hundred years later, in a cavernous concrete convention center in downtown Los Angeles, dozens of companies—armed with millions of dollars in research funding—are still chasing the elusive dream of stereo audio with a third dimension.

In addition to dozens of new 3-D sound processors displayed at the recent meeting of the Audio Engineering Society (AES), microphone manufacturers also are jumping on the bandwagon to offer devices that capture more realistic and satisfying stereo sound for sale to consumers.

On everyone's minds

Binaural sound is still a hot topic in 1990, according to the technical papers and products shown at the AES confab. Microphone configurations—shaped like the human head—are offered by such respected manufacturers as Neumann and Sennheiser.

Neumann's \$5000 KU81 dummy head binaural microphone is lovingly referred to as "Fritz II" by company representatives. "Klaus," a nickname for the \$12,000 microphone dummy head and torso manufactured by Head Acoustics, was on display on the AES exhibit floor.

Binaural microphones use a dummy head with a microphone in each ear. The idea is if a sound is recorded in this fashion and played back on headphones, the listener will experience the same acoustic pressures at the eardrum position as would have occurred naturally. Thus, the recording technique yields a dramatic spatial quality not found in traditional stereo recordings.

Sennheiser's MKE 2002 binaural microphone (\$649 list) comes with a dummy head or can be worn like stethoscope earphones by the user. Two omnidirectional condenser microphone capsules act as ear drums by being placed by the user's ears. Due to the spacing of the microphones, the density of the human head and the shape of the ear, localization of the sound source is preserved, resulting in a form of 3-D sound.

Though binaural sound offers the 3-D experience on headphones, the movement in the industry is toward bringing the binaural effect to a pair of loudspeakers. This trend is reflected in a variety of new microphone models derived from stereo recording techniques developed earlier in the century.

On the other side

The biggest revival is in Mid-Side (M-S) recording, a technique that stems from experiments in the 1930s by Alan Blumlein and his colleagues at Electric and Musical Industries (EMI) in Great

Britain. A key reason for the popularity of M-S is its simplicity and excellent mono capability.

Though two microphones can be used for M-S recording, the trend is toward a single microphone with two capsules installed. One forward facing capsule (Mid) is coupled with a bidirectional (Side) capsule facing to the sides. A sum-and-difference matrix is used during or after the recording process to decode the material. This matrix allows adjustment of the stereo width by a simple knob adjustment.

Until recently, professional quality M-S microphones were very costly, delicate and generally designed for studio use. Now manufacturers including Sony, Shure, Neumann, Sanken, AMS, Beyer, Fostex have introduced new generation models for a wide range of recording or broadcast applications.

Other companies have diverted from the M-S technique to offer new designs or variations on older ones.

One new design is the Crown Stereo Ambient Sampling System (SASS), a near coincident PZM array designed by Vermont sound producer Michael Billingsley and manufactured by Crown International. About the size of a shoe box, the SASS microphone uses controlled polar patterns and human-head-sized spacing between capsules to create a well-focused, natural stereo sound image.

At a price less than \$900, the 17-ounce microphone is designed for applications ranging from classical music recording to stereo electronic news gathering. A popular use for broadcasting has been the pickup of crowd reaction and ambience at sporting and other public events.

Capsule mic

Another new stereo design—recently developed by the research arm of Bavarian Radio—is being manufactured by

Schoeps and distributed by Posthorn Recordings in New York. Dubbed the Schoeps KFM-6, the new dual capsule microphone is a sphere about the size of a bowling ball and can be hung from a ceiling or mounted on a stand. The new microphone, not shown at AES due to a shipping snafu, will be available for purchase at \$5300 by year's end.

For those wishing to experiment with enhanced stereo recording without mortgaging the farm, Josephson Engineering of San Jose, CA, offers two devices—both under \$300—that will turn ordinary omnidirectional microphones having a diffuse-field response into a single-point stereo pickup system.

The Jacklin and Schneider disk systems resemble small flying saucers attached to a stand with clamps for microphones on each side. Developed in the 1970s at the Swiss national broadcasting organization, the idea was to develop a microphone pickup system that would produce an open, airy stereo image like that of the spaced-omni technique, while maintaining enough phase coherence in the left-plus-right mono mix for acceptable broadcast in mono. The two-disk systems differ slightly and should be chosen according to the acoustics of the recording space.

And finally, there's the legendary microphone you cannot buy. Making the rounds at the 1990 AES was Hugo Zucarelli, inventor of the Holophonics system that took the audio world by a storm in the early 1980s. (Remember those two hour waits in line just to hear a demo?)

Holophonics is touted as "an exciting new recording process that encodes audible phonic impulses in a manner which requires only the human brain for decoding." In addition to that claim, the process also supposedly evokes a phenomena called synesthesia, a stimulation of other sensory perceptions such as sight, smell, touch and taste.

Now operating under the banner Zuc-

carelli Holophonics Inc., of Los Angeles, the inventor said he offers Holophonics recording services for a fee of \$1500 per day.

More than a century after that early binaural test at the Paris Opera, the search for three-dimensional sound has moved into the computer age. New digital processors, new microphone designs and millions of dollars in research and development efforts are being mounted throughout the world for a single purpose: to bring a third dimension to the stereo listening experience.

Is 3-D sound smoke and mirrors or serious scientific achievement? Only time, or commercial success, will tell.



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Tuning In to the Desert Shield

by Charles Taylor

Somewhere in SAUDI ARABIA Imagine writing down a list of your favorite songs and taking it to a drive-through at the local radio station instead of calling in your requests.

Or how about tuning into Shadoc Stevens' *American Top 40* countdown in the morning, *American Country Countdown* in the afternoon and an oldies show in the evening—all on the same station?

Sounds like radio from out of this world?

More likely, it's just a day in the life of the Desert Shield Network, a low-power local radio service set up for the nearly 200,000 American soldiers stationed in Saudi Arabia.

Three radio stations have been established in the country as of 12 August by the Armed Forces Radio and Television Services, a division of the Department of Defense. Each delivers information, news and entertainment programming 24 hours a day.

"Our mission is to get news and local information out to the troops," said Lt. Col. Ray Shepherd, operations officer with the Armed Forces Radio and Television Service, who helped set up the station overseas.

But the broadcasts also serve another, equally vital mission. According to Shepherd, they help boost morale.

"The main purpose is getting out whatever the commander in the field wants to," he said. "But morale and entertainment are the hooks in terms of getting people to listen to the information."

The stations broadcast out of 8'x12' standard military shelters, capable of transmitting both radio and television, according to Robert Young, director of engineering for Navy Broadcasting. The air-conditioned units can be transported by truck or airplane.

Most are equipped with Studer CD players, Broadcast Electronics cart machines, Teac reel-to-reel players and turntables, along with 1/2" Beta equipment for TV, he said.

Most Armed Forces remote stations are processed through a 50 W transmitter (100 W for television), using a 120' transportable tower that reaches a seven- or eight-mile radius.

"For some of the locations, we've been putting antennas on anything we could mount them on," Young said. "We had one in a soccer stadium in the middle of the grandstands. It's not the greatest coverage in the world, but we're getting it to the troops."

For the largest of the three Saudi stations, however, the signal is pumped through a 1.5 kW transmitter to an existing 1000' radio tower. This station, which reaches the majority of the troops, covers 100 miles. The two smaller Armed

Forces stations there operate under the traditional guidelines.

Each employs three broadcasters and one engineer. Equipment and some of the staff are provided by Navy Broadcasting. Staff also are contributed by the Army and Air Force, Shepherd said.

The stations also air one- and two-hour programming blocks provided by stateside stations across the United States. Submitted shows are reviewed and approved for troop consumption in Los Angeles and sent to Saudi Arabia.

Collins said the broadcasts geographically reach about 90% of the troops now. "We're in the process of upgrading the services, and should be able to reach 98% with no sweat."

One obstacle, however, has been get-



by Brad Gebhart

Each of the stations must obtain permission from host countries to sign on, and frequencies are assigned as available. In all, Armed Forces Radio is transmitted in 130 countries.

A weekly broadcast in Saudi Arabia typically consists of about six or seven hours of original programming daily, including local news and announcements, and rock, urban and country music played from records, reel-to-reel and Century 21 packaged compact discs.

Non-original programming includes regular national news fed by satellite, along with such pre-recorded domestic staples as *American Top 40*, *Rick Dees Weekly Top 40*, *American Country Countdown* and a syndicated oldies show.

ting radio receivers to the troops. AIR/LIFT, a public service campaign mounted by domestic radio stations nationwide, so far has provided donations of more than 11,000 radios and batteries from Sony, other manufacturers, broadcasters and their listeners, according to the NAB.

Apparently, the word is getting through to the troops. According to Shepherd, listener requests flow steadily into the stations, each of which has an announced telephone number, along with the drive-through request service.

"When we first went on the air, we weren't sure how far we were reaching," he said. "We found out when one of the far-off locations called in with a request."

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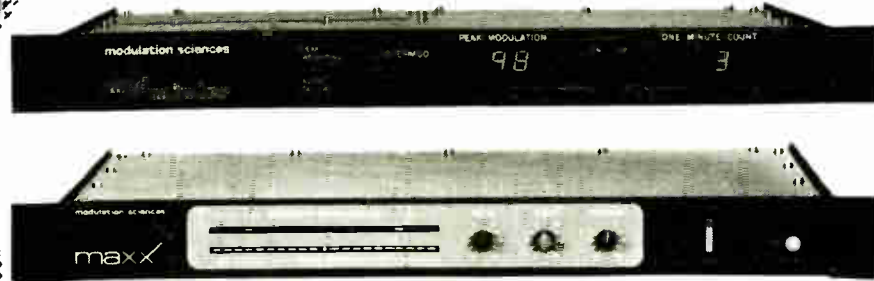
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Vegas Facelift a Boon to NAB

Plans for Major Renovations to Convention Center Mean More Space for Exhibitors in the Long Run

by Charles Taylor

New York NY Amid the profusion of innovative technology that usually accompanies the annual NAB Convention and Engineering Conference, there will be something new this year—construction dust.

Major renovations to the Las Vegas Convention Center will create some inconvenience for the coming show, NAB show officials admitted, however, the nuisance ultimately will allow more space in the future for what they said

was an already tight show.

The issue, among others, was discussed at an NAB show planning meeting at the Society of Motion Picture and Television Engineers (SMPTE) show here in September.

The NAB show will be held 15 to 18 April, 1991. The engineering conference will begin 14 April. The show's estimated 450,000 square feet of show space already have sold out, according to an NAB public affairs official.

In all, 15,000 square feet from the center's rotunda, located at the west side

of the arena near the Las Vegas Hilton, will be lost to the construction during the 1991 show. Four meeting rooms, traditionally used, also will be under renovation.

But for the future, attendees will have plenty of opportunity to see the fruits of the convention center improvements. According to Pete Rightmire, chairman of NAB's exhibitor advisory committee and Midwest marketing and communications manager, the NAB show already has been booked in Las Vegas for the

news that labor costs are expected to be less in 1991, because of intense competition for convention business in the city. NAB has signed a contract with one firm that will provide most of the labor for negotiated rates "at less than in the past five years," he said.

Valley Realigns

Franklin TN Valley International President Norman Baker has announced a realignment of the company's sales, marketing and development departments with two promotions.

Jason Dunaway was named VP of product development and marketing, and Jay Nelson was appointed VP of sales and operations.

According to Baker, the promotions were in recognition of excellent work by Dunaway and Nelson in developing and evolving new manufacturing resources for the 21-year-old company.

"We have worked hard to overcome our previous supply problems," he said. "It is now time for us to aggressively pursue increased sales, and we decided the best method of achieving our goals was through consolidation of management responsibilities, thus resulting in a more cohesive team exhibiting a very coherent outward approach."

... the nuisance ultimately will allow more space in the future for what they said was an already tight show.

Spectrum Contract Award

(continued from page 1)

only working transmission system was developed by an European consortium, Eureka, and the system was tested this summer in Canada.

"We learned a lot from HDTV and AM stereo," Box said. "Some people think we are moving too quickly. I don't think so."

The eight-member task force and 12-member technical advisory committee were formed in June to help guide the NAB's policy toward DAB, a technology that Box believes is inevitable.

"It's a real exciting time, but is also real

serious. This is not like quad (quadrasonic). This is a for-real technology that cannot be held back," Box said.

In addressing the study, Jules Cohen and Associates President Bernie Segal said the study will establish DAB spectrum requirements, but he said it would be "premature" to go into detail on how the firm will approach it.

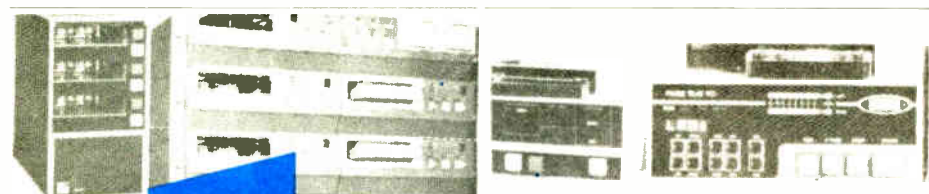
Jules Cohen and Associates will do most of the analytical work and DATEL will provide the computer modeling software and other support for the study, according to Segal.

1991, 1992, 1993, 1994 and 1996 shows. Under consideration for the 1995 show are Las Vegas and Atlanta.

NAB has first option rights to the center for every year through the end of the decade, Rightmire said.

Housing for the 1991 show will be more plentiful, he added, because of an additional 5000 rooms over past shows in the city. This occurred because of the show's scheduling on weekdays. While it usually runs over a weekend, this year, it will run Monday to Thursday.

Rightmire also passed on the good



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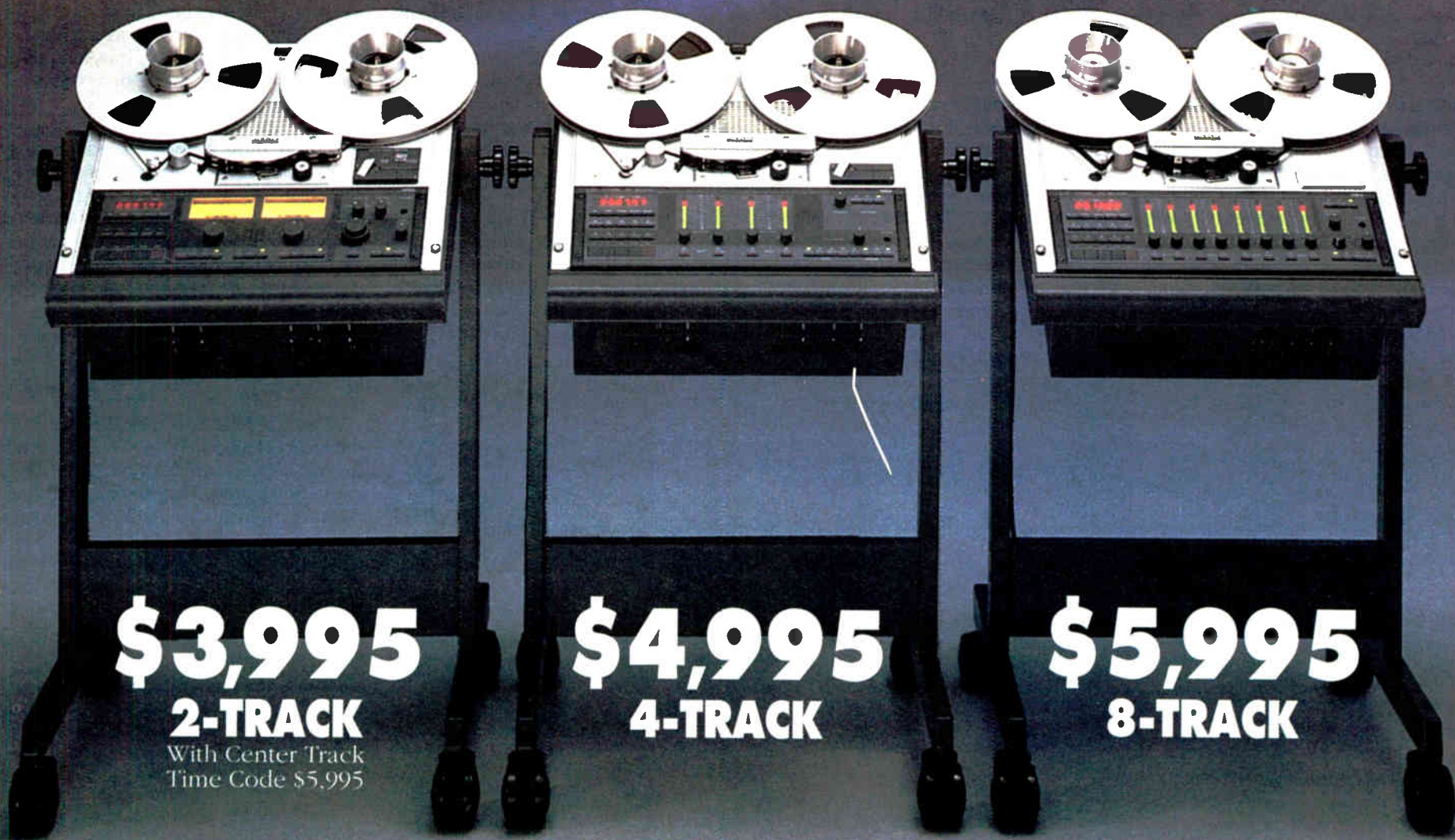
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Translator Sites and Antennas

by Howard L. Enstrom

Mount Dora FL "Location is Everything." Those words hang framed on the wall of a successful real estate investor's private office. The reminder also applies to translators.

Up at the site receive antenna, we sniff wave energy radiated by a particular FM station. As little as 8 trillionth of a watt may be conveyed to the equipment below.

The signal is processed, first by down-conversion to 10.7 MHz, routed and amplified through discrete bandpass IF stages, then up-converted to a different FM channel. Control, regulation, power

amplification and protective circuitry finally provide RF output to be radiated toward a community or area to be served.

The output signal is a replica of the input, including all subchannel modulation information. If an input signal strength varies, the translator provides a stable power output. But it cannot strip a signal accompanied by noise, or waveform echoing caused by multipath signal reception. In short, the translator faithfully processes whatever it's handed.

Tracing defective signals

If a signal is defective, the problem is likely site- or receive antenna-related,

due to excessive distance from the primary station, insufficient antenna height, design or gain, shadowing by terrain profile or multipathing.

Higher frequency sound waves travel in a straighter path than low ones. This is all the more true in VHF, where wave energy striking a reflective surface changes its course, as in billiards. In the vertical plane, the earth's curvature limits the distance for interception to what is termed, in practice, the "radio horizon," somewhat longer than the optical horizon.

Obviously, higher transmit and receive antennas lengthens the transmission

distance. But terrain profile in the signal's path can block, or shadow, a signal. An object or mass with certain physical properties may be located off the direct signal path, and act as a passive reflector of wave energy. Thus, a receive antenna may "see" more than one signal ("multipathing").

Ways around signal blockage

As for an unmovable mass blocking a signal, increasing antenna height may help, but a better site may be needed. Where a second signal arrives at an angle of say, 20° or more off the direct path, an antenna array having a narrower aperture is needed.

The major lobe width of two horizontally-stacked Yagis, electrically in phase, is about 50% that of a single Yagi, measured at half-power points.

What if a reflective mass lies behind the receive antenna? Use a higher front-to-back signal ratio antenna, such as a log-periodic type. They have a 25 dB ratio, or rear sensitivity 1/18th of the front. A technique to deal with a multipath or co-channel signal is to mount two identical receive antennas co-linearly, facing the desired signal direction. Spacing of the antennas is critical, calculated using at-hand conditions.

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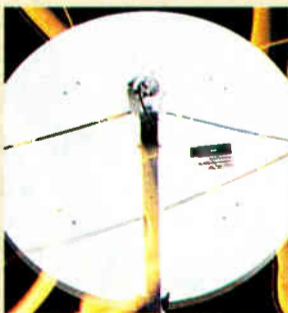
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LOWPOWER LOWDOWN

Nearly all FM stations use circularly-polarized radiation, but it is unnecessary to use the heavier, more complex CP antenna for receive. Yagi or log periodic antenna arrays are mounted for either vertical or horizontal polarization mode, in single or multiple bays, depending on gain and directionalization needs.

Beware of sites near the radio horizon. A test site may seem fine at 8 AM, using only a portable receiver with a pull-up antenna. At high noon, no signal.

The next morning, we go back to the site and set up a Potomac FIM-71 field intensity meter and strip recorder. After lunch, we return to inspect the printout. We see: At 9 AM, signal field wavy, average around 80 $\mu\text{V}/\text{m}$. At 10 AM, field oscillating rapidly between 10 and 30 $\mu\text{V}/\text{m}$, sharp spikes, occasional drop-out. At 11 AM, in and out of noise, short bursts. By 12 noon, no signal; ripple and bursts of something else.

Interpretation: Aircraft act as reflectors for the desired and other co-channel signals, adding and subbing the signal, causing sharp spikes and drop-outs. Declining field average is caused by the sun warming upper ionized atmosphere layers, which rise higher above earth.

Dropout, because the signal travels a very long path, is reflected back to earth far away and is extremely weak from being fanned out. Tomorrow will be the same.

Topographical concerns

Another phenomenon is atmospheric "ducting" and "coastal effects." This makes for an interesting propagation study, but sporadics are deceptive, and one must understand this before building a system at a distant site.

Regional land topography also determines practicability in FM translator plans. That's why we do feasibility studies. Further, it is neither proper nor fair to compare translator system performances. Every system is different,

(continued on page 17)

Amplifier Specification Primer

This is the sixth in a 12-part series called Amplifier Fundamentals. Northern Virginia Community College will offer 1.2 CEUs (continuing education units) to registered students who successfully complete the course and an examination mailed at its conclusion.

Successful completion of the course and the final exam will also earn 1.3 professional credits toward recertification under the maintenance of certification provisions of the SBE Certification Program. To register, contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, VA 22003, or call 703-323-3159. The fee for the course is \$35.

by Ed Montgomery

Part VI of XII

Annandole VA When you read the data sheet on transistors or any other active device used for amplification, an

characteristics can be found in the solid state basics chapter in the ARRL Handbook or in chapters five and six of Schuler's *Electronics Principles and Applications*.

In Figure 3, the amplification factor or beta can be calculated to be 44. A change of 25 microamps on the base emitter circuit will create a 1.1 milliamp change in emitter-collector current, flow or a current change 44 times greater than the change on the base.

If beta is a specified value, then why doesn't the amplifier using the transistor amplify the signal the same amount beta is? The reason is because the transistor is only part of the amplifier.

Figure 3 illustrates typical values for a transistor amplifier. These values are not

and r_E is the AC resistance of the emitter. Further study of this analysis can be found in chapter 6 of *Electronics Principles and Applications*.

Voltage and power gain, and signal-to-noise ratio, are often measured in decibels. This measurement originated with determining audio levels in

termed a volume unit and the "VU" meter established 0 as its optimum operating point.

VU meters in broadcast service rarely conform to this standard anymore. When consoles read 0 on their meter, they are often producing an output of +8 dB over 1 milliwatt. Specifications on audio processing equipment will tell you what the output of the equipment actually is.

The record level on tape recorders, often a VU meter, corresponds to the strength of the magnetic field placed on the tape during recording rather than standard line levels. Playback levels on tape machines usually have multiple outputs to correspond with the desired input level of the console.

Ed Montgomery currently is an electronics teacher in the Fairfax County school system. He has taught broadcast engineering at Northern Virginia Community College and

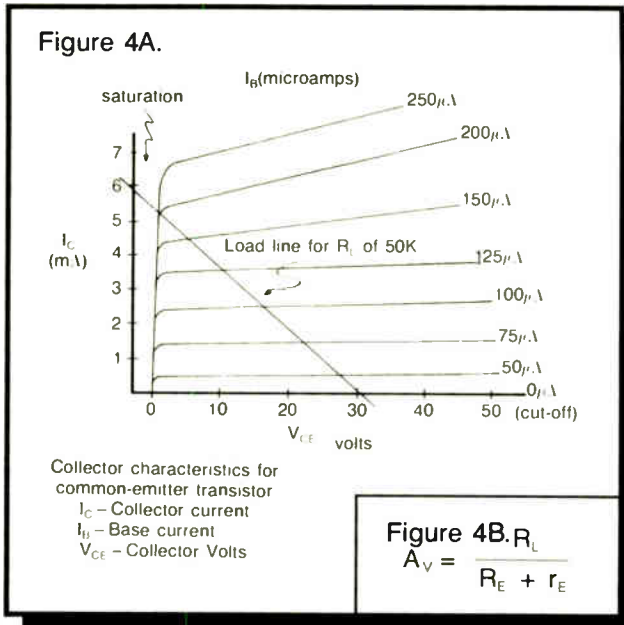


Figure 4A. Collector characteristics for common-emitter transistor
I_C - Collector current
I_B - Base current
V_{CE} - Collector Volts

Figure 4B. $A_V = \frac{R_L}{R_E + r_E}$

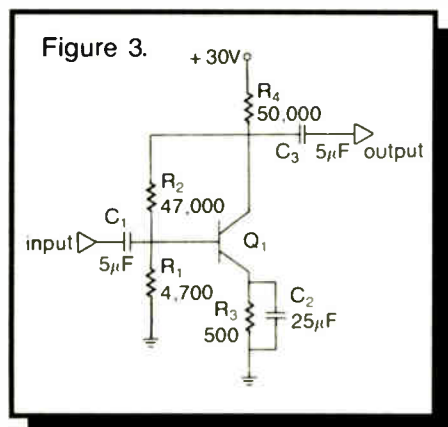
Figure 1A.
$$\alpha = \frac{\Delta I_C}{\Delta I_E}$$

 ΔI_C = Change in collector current
 ΔI_E = Change in emitter current

Figure 1B.
$$\beta = \frac{\Delta I_C}{\Delta I_B}$$

 ΔI_C = Change in collector current
 ΔI_B = Change in emitter current

amplification factor is published. "Alpha" designates the current gain of a transistor with the base grounded. Current gain is the amount of collector current changed for a change in the emitter current. This is illustrated in Figure 1A.



considered when the family of curves are drawn. The amplification an amplifier can produce is the output signal divided by the input signal. The output must be established across R_4 , the load resistor.

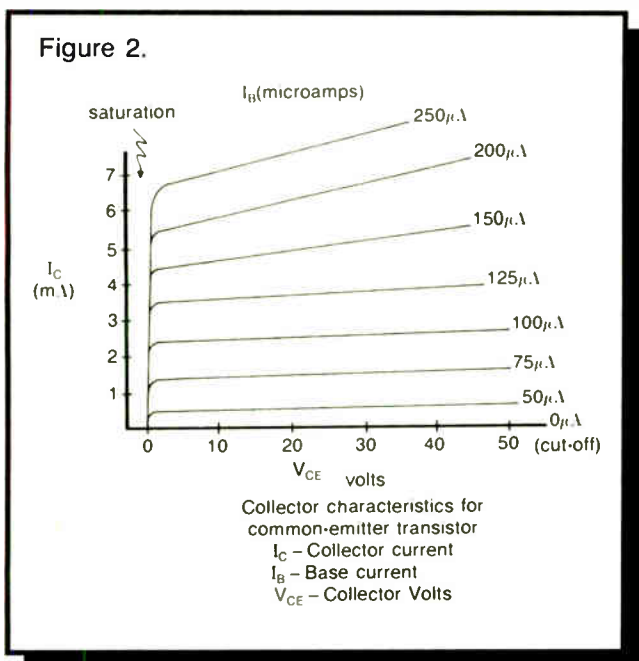
Simply put, a series circuit exists which includes emitter resistor R_3 , Q_1 , and R_4 . Thus the total voltage drop on the load will be somewhat less than the beta value of the transistor.

Figure 4A illustrates the family of curves with a load line added. In this circuit, 30 volts is applied. R_3 and R_4 will limit current flow to 6 milliamps. A load line connects these two points. Now the current amplification can

be determined.

If the base bias for the transistor is established at 100 microamps and the input signal varies ± 25 microamps, the collector current change will be 2.15 milliamps, as illustrated. The amplification of the circuit is 43 and not the beta value of the transistor.

Amplification can also be calculated as shown in Figure 4B, where R_L is the load resistance, R_E is the emitter



When the transistor is in the common emitter configuration, current gain is defined as "beta" and is the change in collector current caused by a change in base current. This is illustrated in Figure 1B.

Figure 2 is a family of characteristic curves for a transistor in the common emitter mode. Since the common emitter configuration is most used, it will be the only example used in this installment. Further studies of other transfer

Figure 5
$$\text{dB} = (10) \left(\text{LOG} \frac{P_{out}}{P_{in}} \right)$$
 Power Gain
$$\text{dB} = (20) \left(\text{LOG} \frac{\text{Current out}}{\text{Current in}} \right)$$
 Current Gain
$$\text{dB} = (20) \left(\text{LOG} \frac{\text{Voltage out}}{\text{Voltage in}} \right)$$
 Voltage Gain

Figure 6
VU
-20 -10 -7 -5 -3 -2 -1 0 +1 +2 +3
This is an illustration of the VU meter face with its logarithmic scale measured in decibels

the early days of electronics. The human ear does not hear in a linear fashion. That is to say, doubling the power delivered to an audio amplifier will not make it sound twice as loud. To experience the doubling of power requires a 3 dB increase. To double current or voltage requires an increase of 6 dB.

The human ear does not hear in a linear fashion. That is to say, doubling the power delivered to an audio amplifier will not make it sound twice as loud.

Decibels are a measurement using common logarithms. Logarithms are a way to reduce the size of numbers. For example, the log of 10 is 1, the log of 100 is 2, and the log of 1000 is 3. Today's desktop computers and pocket calculators make working with logarithms easy.

Decibels are one-tenth of a Bel, a standard measurement that is a very large value. Decibel gain can be calculated as illustrated in Figure 5.

Decibels have been standardized to meet specific needs over the years. The telephone company established their optimum level to be one milliwatt across a 600 ohm audio line. Originally this was

worked as a broadcast engineer for several radio stations. He can be reached at 703-971-6881.

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The Expanded AM Band Blues

by Steve Crowley

Washington DC One way to reduce interference among AM stations is to move a few to the 1605-1705 kHz expanded band. The FCC has proposed rules to do this.

Stations that would be eligible for such a move (under the proposal) would conform to a model of full time operation, in stereo, with 10 kW of daytime and at least 1 kW nighttime power. The stations must use non-directional antennas, or simple directional arrays; 400-800 kilometer separation would be required between co-channel stations.

CONSULTANTS CORNER

Like FM and TV, expanded band technical assignment criteria will be based largely on distance separation. Unlike FM and TV, there will be some flexibility in order to accommodate the need for more stations near urban areas.

The model is intended to provide for 25 to 30 stations per expanded band channel. The Commission has deemed the preferred expanded band occupants to be those stations causing the most nighttime interference to other facilities.

The Commission intends to develop a sample allotment plan in response to de-

mand as demonstrated by non-binding letters of intent filed by existing AM stations interested in migrating. Stations filing letters will be ranked based on the amount of service improvement that would result if they change frequency.

The Commission will publish a sample allotment plan based on these letters; the actual plan will be based on actual petitions filed after final rules are adopted.

Complex and cumbersome

A petitioner will be ranked based on the amount of service improvement that would result by the migration of the station. Specifically, the Commission proposes to use the ratio of nighttime interference caused by a station to the amount of nighttime service that station provides as the ranking factor.

To determine interference caused, the coverage of each station receiving interference from the petitioner would be evaluated. The petitioner's interference would then be excluded from the interference calculations and the expanded coverage areas of the other stations would then be recomputed.

It's a complex and cumbersome process that has the effect of favoring the migration of those stations providing the best coverage today. In its discussion accompanying the proposed rules, the Commission puts forth the example of WOW, Omaha, NE. WOW operates on

590 kHz with 5 kW using a non-directional antenna. It now contributes to the nighttime interference level of many stations, as do most stations that have been on the air since the beginning of radio.

Yes, if WOW moves to the expanded band, those stations will receive less interference. But what happens overall?

No real gains

The existing WOW nighttime normally-protected 2.5 mV/m contour encompasses 57,918 square kilometers. If

A way around this problem is to assign stations based solely on the protection of service contours.

WOW were to move to 1650 kHz, its coverage, assuming the Commission's proposed 2 mV/m protected contour (optimistic, as discussed below) with 1 kW power, would be 5731 square kilometers—a loss of 52,187 square kilometers, or 90% of WOW's present nighttime service area.

Other stations on 590 kHz now serve a total land area of 106,659 square kilometers at night. With the move of WOW from 590 kHz, the reduction in interference from WOW would increase the total service area of these stations to 122,790 square kilometers for an increase of 16,131 square kilometers—several times less than the area lost by WOW.

(This discussion ignores the hit WOW would take during the day; because of the poor propagation characteristics of the expanded band, over 200 kW would be required for WOW to have equivalent 590 kHz coverage.)

An alternate migration criteria should be adopted. Those stations receiving, not causing, nighttime interference should be encouraged to migrate to the expanded band.

High ratio preference

One method would be to ratio the land area within the normally protected contour to the land area of existing nighttime interference-free coverage. The stations with the highest ratios would receive the preference. Under this plan, a station like WOW would have unity ratio since its normally protected contour and interference-free contour are the same.

Though the FCC intends to protect the 2 mV/m contour at night in the expanded band, coverage won't be that good. It can be shown that interference levels in the expanded band will be relatively high using the Commission's allocation plan—the interference free contour would be as high as 17 mV/m for some stations in the most densely populated areas of the country.

The percentage of night coverage will be far less than the 15% goal the FCC has for the present band. Expanded band stations would be similar to today's Class IV stations, with high night interference and very small service areas.

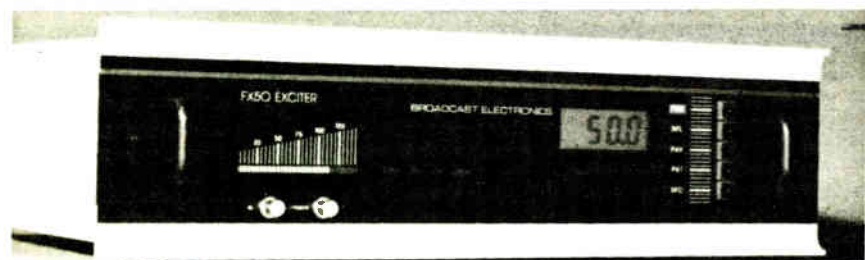
Why would interference be so great? Because of the plan to have evenly spaced stations using non-directional or simple directional antennas: everyone interferes with everyone else.

A way around this problem is to assign stations based solely on the protection of service contours. It means using more complex directional arrays than envisioned by the Commission, but today there are more sophisticated methods of designing and monitoring directional antenna systems. This would be a pro-service approach resulting in better AM for the public.

■ ■ ■

Steve Crowley is a registered professional engineer with the consulting firm of du Treil, Lundin & Rackley, Inc., 1019 19th Street, NW, Suite 300, Washington, DC 20036. He can be reached at 202-223-6700 or by FAX at 202-466-2042.

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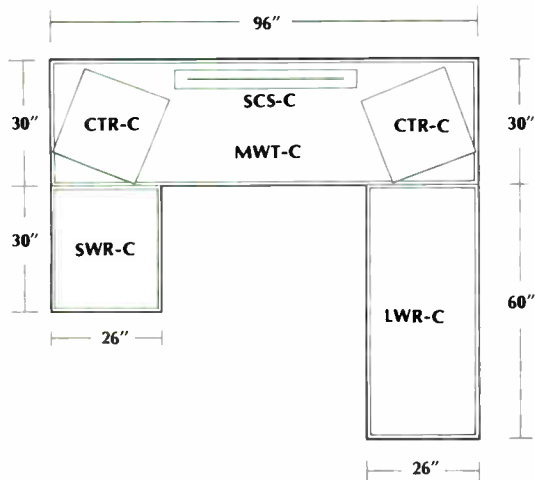


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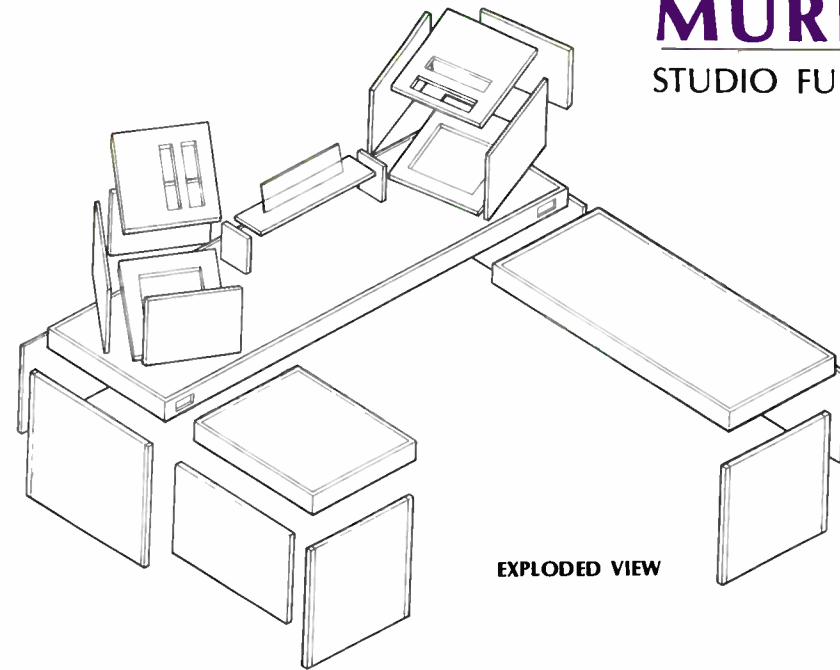
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Hurdle Your Mental Barriers

by John Cummuta

Downers Grove IL Most of the articles in this column deal with management, but every now and then I like to examine an issue that is individual and personal—something that each reader can use for his or her own self-assessment and development. That's what I use them for and it helps. The ideas I offer this month could revolutionize your life.

ENGINEERING MANAGER

There have been many limits that have bridled man's progress through the centuries: the "edge of the flat world," the sound barrier, the four-minute mile, and a host of others. What they all had in common is they only existed in people's minds. Yet to that extent they were real, because those people lived their lives as if these barriers were fact.

Another thing these limits had in common was that as soon as each of them were proven false they were broken repeatedly, until it was nearly forgotten that they ever existed.

These historical perspectives on mental barriers are important to you and me for two reasons: They show that we have the ability to break through any road-

blocks that exist only in our minds, and they show that once we've broken through a barrier we can do so continually and more dramatically.

Taking responsibility

However, there is a back side to this truth. That is the fact that you are singularly responsible for the existence of your barriers. They cannot be blamed on the world, society, your parents, your neighborhood, or "Them."

Certainly it's true that you may have grown up in a stifling environment, but you still have the unrestricted choice to let that baggage forever limit you or not. You choose to accept your barriers, and the more you accept them, the more real they seem.

Columbus chose not to accept the flat-world barrier, therefore it was not real to him. While it seemed absolutely real to those who did believe in the barrier, their beliefs did not make his ships fall into the abyss. He could not change the criticisms and disbelief that existed outside himself, but he could control how it affected him.

Neuropsychologists call this concept "framing." They say that you can choose to frame outside circumstances as either good or bad, and they become what you choose. Columbus chose to frame the question of the world's shape according to his beliefs, and he was therefore free to function based on reality as he per-

ceived it.

You and I have that same choice. We cannot always control what goes on outside ourselves but we *can* control what goes on inside ourselves. We can accept the world's (and our own) limits on ourselves, or we can make different choices.

Make better choices today

Do you feel you're too fat, too tired, too far behind technology in your profession, in too small a market, under-appreciated, under-paid, under-utilized? Start choosing to change those mental barriers. That's right, *mental* barriers.

If you believe that you're too old to ever have a chance at being a big-market VP of engineering, that barrier exists *only* in your mind. Just ask yourself if it might be possible for *any* engineer your age, anywhere in the country, to properly prepare and position himself or herself to be accepted for a big-market position. If you have to admit that it is theoretically possible, then it is possible for you.

You're just presently laboring under apprehensions that you have chosen to accept for yourself. You simply have to make better choices.

You see, right now—*where* you are, *how* you are—is the sum total of the choices you have made up to now. If you had made different choices, you would be in a different reality now. If you make different choices starting now, you will be in the reality of your choosing in the

future.

Make no mistake about it, there are costs in making new choices, but the benefits always outweigh the costs when better choices are made.

For example, if you choose to make the effort to eat better and exercise more, those are the costs. The benefits are better health, better self-image and increased attractiveness. Don't those sound like benefits worth the cost?

Choosing goes both ways

What a wonderful power it is to be able to choose the course and quality of your life; and, it can be used to both increase the positive elements and reduce the negative elements of your reality.

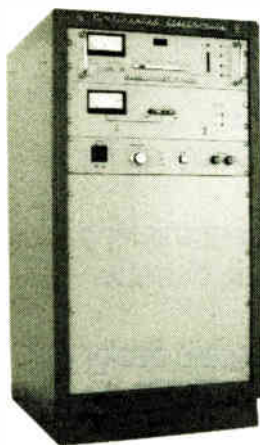
What I mean by that is that you can choose to add specific, positive facets to your life, and you can choose to eliminate specific, negative facets.

For example, let's say that you consider yourself shy and unable to talk effectively in front of groups. Yet you know that research has shown the ability to make group presentations to be a key element in achieving professional success. You can choose to join Toastmasters, attend Dale Carnegie courses, or register for courses offered at your local community college, to acquire the skills necessary to be an effective public speaker.

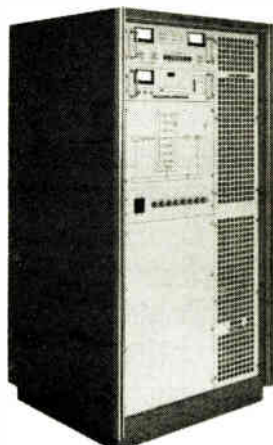
There is no such thing as a person born doomed to never be able to speak to crowds. You can choose to take the steps necessary to eliminate that mental barrier, and to acquire the positive ability to do what you could not do before.

(continued on next page)

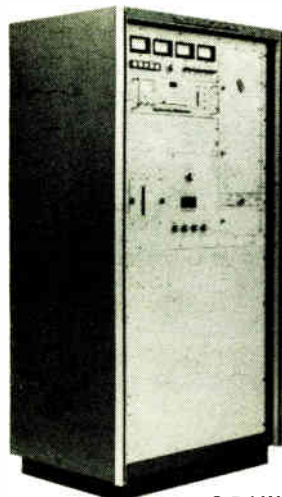
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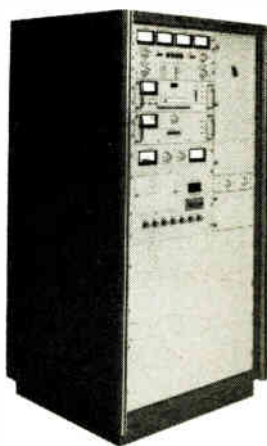
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Translator Sites and Antenna Hardware

(continued from page 12)
designed for its particular service.

Western states use natural terrain elevation sites, so reliable signal paths can be tremendous. But flat land, such as Florida's, limits site distances to 60-70 miles, based on a 100 kW, 500' HAAT antenna primary station and a 100' foot translator receive antenna.

In site testing, be sure the primary signal is stable. If variations are due to aircraft, not atmospheric reflections, the system's AGC will act on it. Even a signal field as 20 dBu (10 μ V/m) is useful, if reliable. When intercepted using a Scala CA5-150 Yagi antenna (9.0 dBd gain), and conveyed by 100 feet of Andrew 1/2" LDF4-50A Heliax line, we deliver 26 μ V to the translator input, a margin over the required 15-20 μ V.

Site suitability

Site decisions include another consideration: suitability for signal transmission. Will the service area be effectively illuminated? The answer is easier.

Imagine you're perched at the transmit antenna. If the area is seen, good.

The best sites are elevated above the center of population density. We may use a simple, two bay, circularly-polarized omni-directional antenna array.

If the site area is surrounded with many close-in listeners, we may use a little downward electrical beam tilt, so as not to overshoot the signal—the "umbrella-effect." A peripheral site would likely use a directional array, two or four bays of circularly-polarized Yagi arrays.

If necessary, skew the mounting to broaden coverage pattern. The idea is, don't radiate energy in useless directions. Discretely, electrically focus the radiation in the vertical and polar planes, toward the target area. Such design enhances intended coverage, and minimizes interference to other services.

■ ■ ■

Howard L. Enstrom is a broadcast consultant. He has owned and managed an AM station, and is president of FM Technology Associates, Inc., specializing in engineering design and sale of FM translator equipment. He can be reached at 904-383-3682, or by FAX: 904-383-4077.

Removing Mental Limits

(continued from previous page)
It only waits for your decision.

Conversely, let's say that you are carrying a grudge against someone. Unless you've been living under a rock you've undoubtedly heard that carrying a grudge hurts the grudge carrier far more than it does the person against whom the grudge is held.

So carrying that grudge is hampering your personal mental freedom, and could well be manifesting in many other negative symptoms in your life. Indeed, severe diseases have been traced to the poison of hatred and anger.

But you can choose to throw that grudge away. It's not doing you any good—why keep it? But the reality is that, right now, you are choosing not to forgive. You are choosing to wallow in the negative feelings, and it is damaging you far more than the other person. Let it go. It's your decision.

These truths can be applied to any positive or negative aspects of our lives. Want to quit your job and become an entrepreneur? Only mental barriers (probably untrue) are holding you back. Want to lose some weight, or even become a marathon runner? Only mental barriers are holding you back. Don't think you have enough time? If I offered you \$100,000 to train for and run in just one marathon,

think you could find the time?

See, it's choices. We have the authority to choose, within reason, the character and quality of our lives. That's far too wonderful a right to ignore. All that's left now is to choose which limit you'll remove from your life first.

■ ■ ■

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



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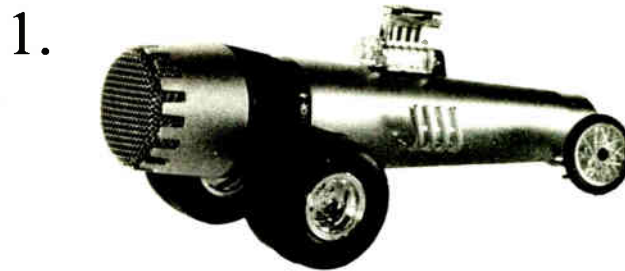
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FROM THE TRENCHES

by Alan Peterson



Look Out For...Oops!

Dear JG:

Ah, that holiday time o' year again ... here's hoping it brings health, happiness and continued success for

everybody back there in Falls Church (and naturally to everybody reading this). Happy Thanksgiving to all.

This year I've got something to be especially thankful for: I still have sight in my right eye, following a stupid accident that was so insignificant it was nearly invisible. A few nights back I was putting in a little "Oh-Tee" to get a project in under the wire. A couple of hours in, I took a break to clean the heads and guides on my trusty 5050Bs.

When I dunked a swab into some isopropyl and flicked the excess off, a big drop hit me square in the eye. Nobody heard me yell when the sting kicked in and nobody would have come that late at night anyway. Add to that the realization that certain kinds of alcohol love to absorb water, and the potential for disaster was quite severe.

I don't care how silly it looked sitting under the station cooler flushing my eye with Danbury's finest bottled H₂O—I don't look good in eyepatches. And was determined not to wear one. That kind of Pirate Radio I can do without.

Later, while packing a compress over my 90-proof optic, I began to think about the reaction some readers of my notes to you would have ...

"What is it with this guy? He almost goes blind from a Q-Tip, he can't figure out a sequencer (RW 25 July '90). He watches bats all night long ... How'd he ever get a job?"

My credentials notwithstanding (and

leave my bat alone), it was an accident. A damned stupid accident that should not have happened, but did. My concern isn't what those folks think of my incident, but what kind of exploding cigars are waiting for them at their own stations.

How about that old bulk eraser that's "starting to smell funny"? The tell-tale aroma of a Cajun-cooked fluorescent ballast? The outlet that feels "a bit warm"?

How about a corner of carpet frazzled enough to catch the Traffic Manager's high heel? That's the very last person you want hurt; ever do traffic when she's out? I'd rather unicycle a tightrope over a tankful of hungry AEs ...

Check out that tangle of cables put under the console by the last engineer, especially the random lengths of zip-cord tacked up as "AC Supply Lines." Great ... even older tube consoles with

Sidestepping electronics, even mechanical thingies need a check now and again.

the power supply mounted remotely—how well protected is the B+ line coming in?

Sidestepping electronics, even mechanical thingies need a check now and again. How well is that speaker mounted? We had one monitor which came down a few years back, hit a turntable, splintered a Micro-Trak tonearm and almost did a Mr. Bill on KC Palmer's head, mid-show.

What I'm trying to say is, where my incident was one-of-them-things, all of these other potential nightmares are preventable. They're visible. Hopefully, so are the extinguishers at everybody's stations. Are they charged? Does everybody know how to use them?

Is there anything in the First Aid box? Who knows CPR (we read the PSAs often enough)? Are emergency numbers

posted or entered in the speed-dialer? Are the wet-cell batteries in the emergency hall lights up to speed?

I won't even address what to do during a fire involving PCBs. Everybody's fire department should know and enough should already be on file at the station.

Despite care and good intentions, some things are always "just gonna happen," no matter what. The overnight guy will find new and creative ways to start microwave popcorn fires, squirrels will always jump across to the wrong wire on the phone pole and knock a station off the air. And somewhere, somehow, a guy with a new razor blade will slip and get cut. If he's lucky he'll only have a scar; I understand tendon repair is quite difficult, as a severed tendon snaps away like a vacuum cleaner cord.

My ex is a fine example of what I'm saying. She's a technology teacher (what we once called "shop"), stands 5'2" and owns several frighteningly large wood-working machines big enough to scare away seasoned lumberjacks. She's worked this gear half her life and still has ten fingers, two eyes and good hearing. Careful, meticulous and safe, she's instilled me with an appreciation of how important industrial safety is and how it can apply to the radio station.

Does this mean I'm advocating eye-wash stations every fifty feet for somebody who'll make the same bozo move I did? No. But what harm could a little safety tweak-up do? In many parts of the country it's getting too cold to do much outdoor work, so maybe now's a good time to see what's got to be done inside.

Maybe it's like Chicken Little screaming about the sky falling, but whether it comes as a toxic splash in the eye or a 3000 volt surge blue-flashing through the chest, one's perspective can be turned around in one second.

The word "Thanksgiving" has two "it's" ... thank God so do I.

Talk to you 'round Christmas,
—Al

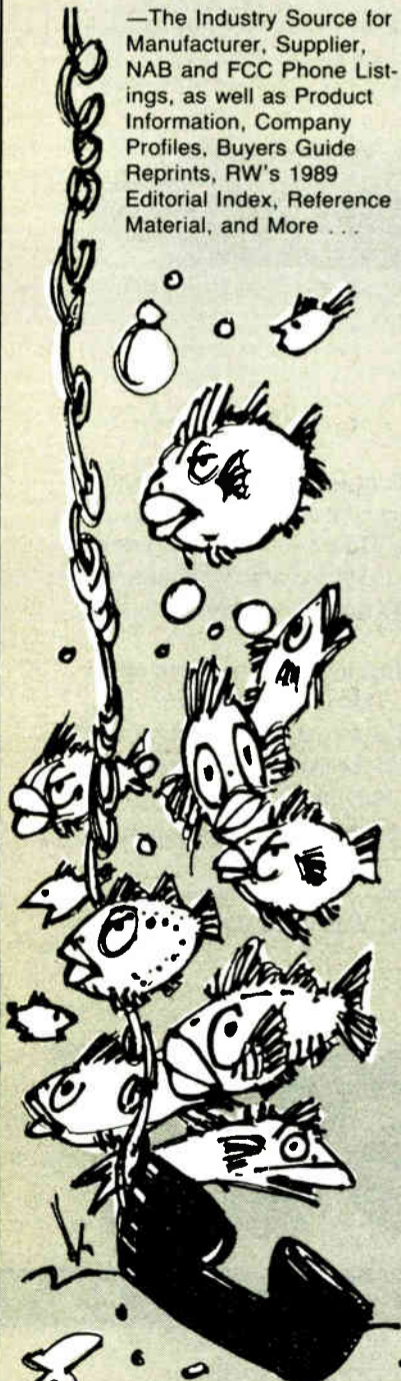
Al Peterson is earning his merit badge in Advanced Studio Safety Practices. Contact him c/o RW.

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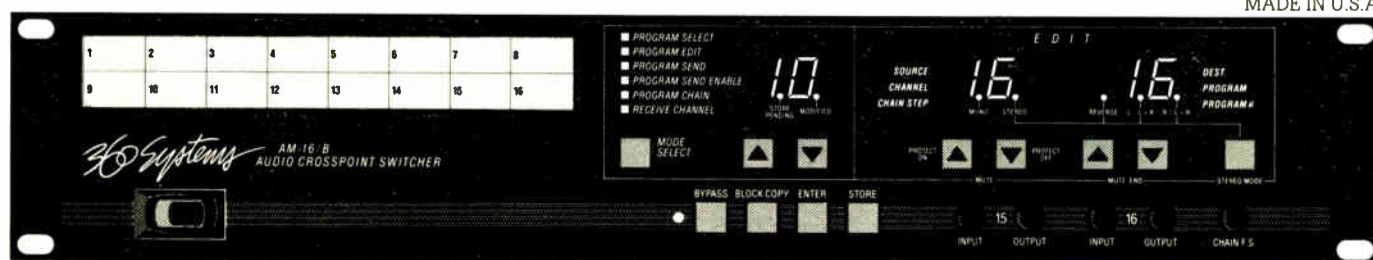
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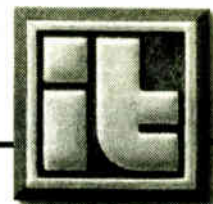
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De-icers: Curing the Big Chill

by Thomas Vernon

Harrisburg PA Winter is bearing down on us quickly here in central Pennsylvania, and one of the often overlooked items on the autumn checklist at many stations is antenna de-icers. Their failure in cold weather can mean VSWR shutdowns. If de-icers remain on in warmer weather they can burn out.

STATION SKETCHES

In either event, unscheduled winter tower work can be very costly. This month we'll look at de-icer installation and maintenance. I'll also describe a simple but reliable de-icer control system.

Design and installation

Typically, de-icers are installed along with the FM antenna. Usually they consist of a resistive element inserted in the radiating arms of the antenna, although other schemes are occasionally used.

While the antenna manufacturer will supply pigtailed, junction boxes, shielded interbay power cable and fittings for the tower, the user must supply power to the

center of large arrays, or to the bottom of smaller antennas. There's usually plenty of work for the engineer in planning the installation and sometimes fabricating a control device for transmitter shack.

The manufacturer's blueprints and notes are the final word on de-icer installation, but a few generic comments are in order. Be sure that the tower crew is experienced with de-icer installation, and has experience with the brand of antenna you're installing.

Making a list, checking it twice

Make a checklist of the necessary supplies you'll need before the antenna goes up. Some possible items would include enough outdoor Romex to run from the transmitter building to the antenna, and 12" black cable ties to secure the Romex. Usually the blueprints or notes will have a chart showing required wire size by length of the run and number of antenna bays.

You may also have to supply outdoor junction boxes and a length of conduit to shield the Romex in the radiating area of the antenna. Failure to do this could result in arcing from the antenna to the cable during rainy weather.

De-icers are usually controlled by a

thermostat. This can be something as simple as a device with contacts that close below a certain temperature.

Low power devices may be controlled directly by the thermostat, while high wattage installations require solenoid control. If your de-icers are controlled by a solenoid, plan on enough outdoor cable to run from the antenna, where the thermostat should be located, to the transmitter building.

Thermostat installations at the base of the tower or on rooftops don't usually reflect the weather conditions several hundred feet in the air, and will result in improper de-icer operation.

The AC power feed for de-icers should be fed from a dedicated circuit breaker of the appropriate capacity.

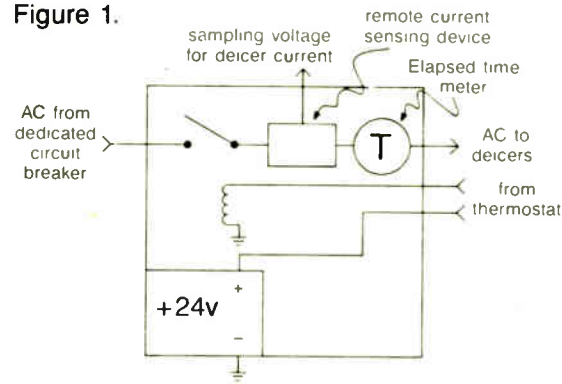
De-icers on the same circuit with other equipment can be a problem when they need to be serviced at a later date.

When planning the installation, don't forget that the power and control lines to the de-icers can be a source for lightning surges to get into the building. Use cable ties to fabricate 12" inductive loops in both these lines at the tower base. It

might also be wise to route the lines through a weatherproof box with surge protectors as well.

As part of the antenna checkout, turn on the de-icers and have the tower crew verify that all the bays are getting warm. Also use a clamp-on ammeter and measure the de-icer current in the transmitter building. Knowing the current drawn by each bay, and adding the resistance for the wire run up the tower, you should get a reading close to theoretical. Write this number down for future refer-

Figure 1.



An easily constructed control box for antenna deicers. Elapsed time meter helps plan maintenance/replacement schedule.

ence. If you are using a relay or solenoid to turn the de-icers on and off, you'll probably have to fabricate your own control box/remote interface. A simple circuit is shown in Figure 1. It includes a hefty 24 V power supply, control relays, de-icer current sensing device, and an elapsed time meter (continued on next page)

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Solutions for Computer Clutter

(continued from page 15)

ran demonstrably faster. And, to my technically-oriented ears, it was nice to no longer hear the heads "thrashing" about as they moved from fragment to fragment.

Version 5.0 now allows a "defrag only" command, so the program can do this chore much more quickly, leaving a full optimization run for another time. Like some of the task specific utilities, Speed Disk can be run from the command line without invoking the entire Norton package.

Other defraggers

PC Tools, now in Version 6.0, also has a defrag mode. Like Speed Disk, it allows some user input as to how you want your disk packed.

A program that I've used in several facilities is Vopt. As mentioned before this program is *fast!* While the first time you use it may take five or six minutes, it will usually run in less than one to two

minutes.

Many people put Vopt in their autoexec.bat file and it will race through the job at the start of the day. The few seconds it takes will usually not even be noticed, but the hard disk never builds up a forest of fragments.

One note of caution. Most of the defraggers tell you not to run them from inside another program. DOS or TSR (terminate and stay resident) programs can get confused by the way defraggers relocate directories and programs.

By the way, Vopt comes with a series of small utilities that display the mechanical performance of each part of your system, including a neat little program, Vtsr, that tells you what TSR programs are sitting up there in memory.

This comes in handy when the dreaded "insufficient memory" error pops up. Often this happens when too many TSRs get loaded or if batch files keep reloading the same TSR modules until there isn't enough memory left.

And in these days of Windows 3.0 and

other programs allowing you to "shell" out to DOS, it is easy to forget what is loaded underneath you. With Vtsr you can quickly find out what is happening.

Whichever defragger you find meets your needs, use it regularly. If you do, especially if you include it in the autoexec.bat file, you'll banish clutter from your computer and reap the benefits.

■ ■ ■

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

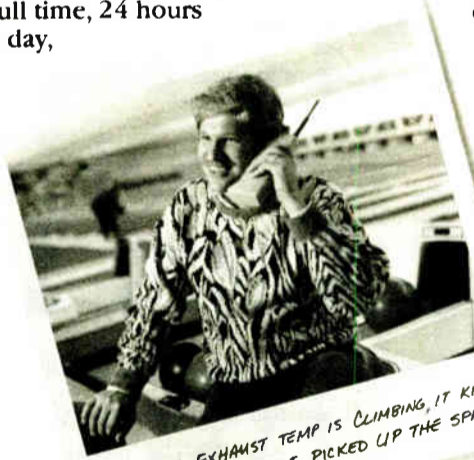
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Babysitting the transmitter is no one's idea of a good time. Somehow, nothing seems to go sour from nine-to-five. You get "beeped" or called at the most inopportune moments. They're in a panic and you've got to jump in the car, race to the site and start problem solving. What a nuisance.

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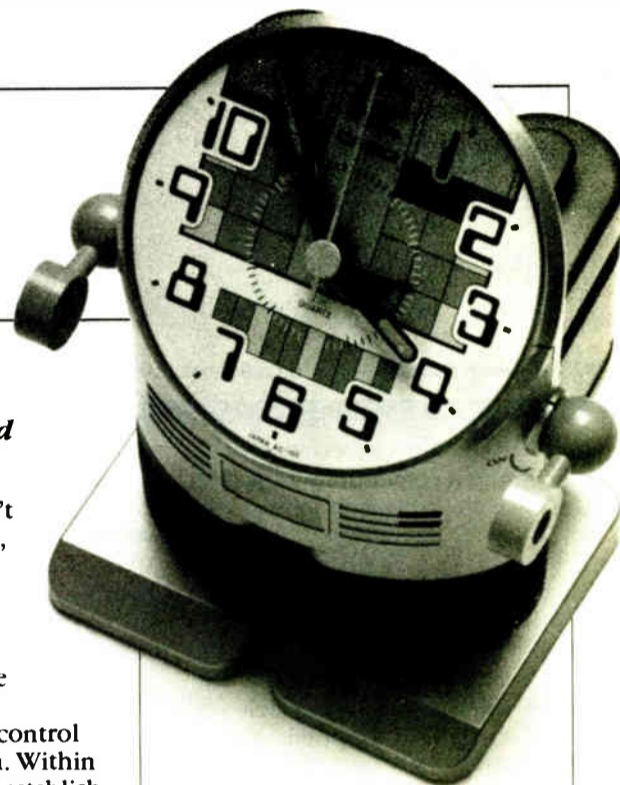
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De-icing Antennas

(continued from previous page)
time meter.

The time meter is useful in scheduling maintenance and predicting de-icer failures. If your de-icers have several hundred hours on them, it might be economical to replace all of them when one fails.

Many stations only have some sort of "on-off" indicator for de-icers via the remote control back at the studio. While this is better than nothing, it's easy to monitor de-icer current, and provide a remote readout in amps.

AC interface

Either purchase or build a remote AC current interface for your remote control system. Route the hot lead of the de-icer wire through the torroid in the interface. You may have to experiment with the number of loops to get the right sampling voltage.

Calibrate your de-icer current reading with the measurements taken earlier. Now you'll be able to tell at a glance if the de-icers for one of the bays has burned out. You may want to include a space in the maintenance log for recording de-icer current during the winter months, and check it at regular intervals.

You may also want to include in your interface box a relay with N.O. contacts paralleling the thermostat control. With this in place and wired to the remote control, you will have a means of manually overriding the thermostat in the event that it should fail.

Unexpected de-icer failure in the dead of winter can have a "chilling" effect on your stations ratings and the engineering budget. A little preventive maintenance and planning in the fall can help reduce trauma in the coming months.

■ ■ ■

Tom Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-367-1151.

WORKBENCH

Maintenance and Measurement

by John Bisset

Fairfax VA Broadcast engineers are usually responsible in some fashion for the entire physical broadcasting plant.

got a great deal!

You must qualify for your copy, but the publisher lists a number of qualification categories that would fit most engineers: engineer, facility manager, purchasing agent, property manager or maintenance manager.

What? You say your job description covers all those categories? Welcome to the club! *The Contractor's Register* can be contacted toll free. Their number is 800-431-2584. In New York State, dial 914-245-0200. The company is headquartered in Jefferson Valley, NY.

Directory assistance

While we're on the subject of reference books, are you familiar with the *Electronic Industry Telephone Directory*? The EITD costs \$50, but is worth every penny.

In its pages are directory listings of nearly every electronics manufacturer or distributor in America. The EITD features both a "yellow pages" and a "white pages" making the engineer's life much simpler when trying to track down a specific component.

I have been told that sometimes manufacturers or suppliers have copies of the EITD to give away. If you deal with one particular supplier for your electronic parts, ask if they have a copy. At the very least, they may be willing to give you last year's copy.

For those of you whose engineering budgets will permit such an expense, you can order your EITD by contacting

Where the exciter permitted the LED display to be changed from "bar" to "dot" display, the instability effects were

Broadcast engineers are usually responsible in some fashion for the entire physical broadcasting plant.

Harris Publishing Company, Twinsburg, OH. Their toll-free number is 800-888-5900. In Ohio, dial 216-425-9000.

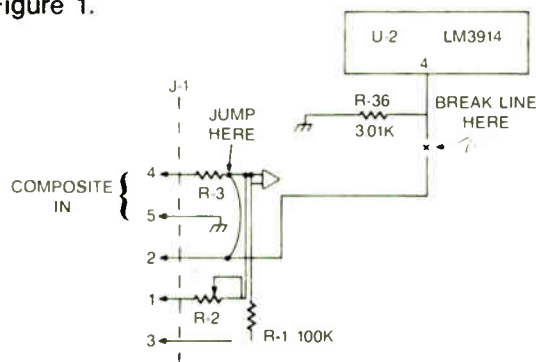
FM Exciter Modification

Ed Burkhardt runs a frequency measuring service for the lower mid-Atlantic states. Several months back, he reported a carrier frequency instability which occurred as modulation that was applied or removed. Rapid carrier frequency changes of a few hundred cycles to over 2,000 cycles were noticed among many of his clients. In each case, the exciter had a built-in LED modulation display.

Both field and bench tests traced the cause to the heavy current draw of the LEDs when the exciter was operating in a solid bar display mode. This causes a change in the modulated oscillator supply voltage.

minimal. The studies that Ed and several of the engineers from client stations conducted found that the problem could not be properly measured during steady tone conditions; it would not show up

Figure 1.



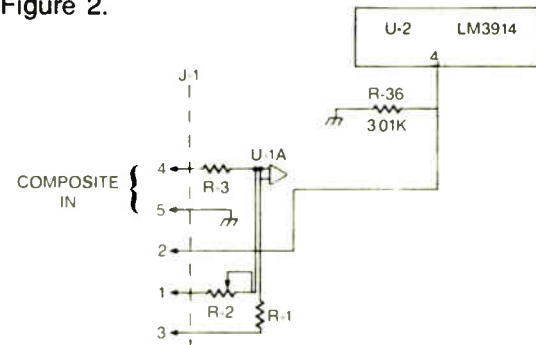
A-6 modulation display board, before modification

And though we aren't expected to be experts in plumbing or air conditioning (or are we?), we are expected to know who to call.

A few years back, I stumbled onto a couple of resource books that I've found to be invaluable. The first is *The Contractor's Register*, better known as *The Blue Book of Building and Construction*. This three-inch thick volume is available free for the asking, and is published for broad regions.

For each region, the Blue Book lists contractors, material and equipment dealers, and suppliers of pretty near everything you could imagine. Add to this vast compilation of construction-oriented data the free cost, and you've

Figure 2.



Modification to Continental 802-A exciter to permit disabling of front panel LED meter. A similar modification can be performed to the bargraphs of other FM exciters.

on a digital frequency counter and was barely noticeable using an analog frequency meter.

The problem was visible on Ed's precision frequency measuring equipment and could also be seen using a good spectrum analyzer.

The study results offered three solutions: first, leave the LED display on your exciter in the dot mode; second, convert your display to dot mode; and third, remove the input signal to the display when not needed.

WETA-FM CE Joe Davis came up with a straightforward modification for the Continental 802A Exciter. Joe has modified his modulation display PC board (A-6) to change the front panel "115%/20%" meter range switch to a "115%/meter off" switch.

Exciters manufactured by other companies can be modified in the same manner. On the A-6 board, the trace from pin #2 of J-1 is cut, however, R-36 is still connected to pin #4 of U-2. A jumper is then soldered from pin #2 of J-1 to the junction of R-1 and R-3.

After performing this modification, the meter operates normally when the front panel switch is out. When the switch is depressed, the meter is disabled. Ed Burkhardt can be contacted at Burkhardt Monitoring Service in Glen Allen, VA. His number is 804-266-9065. Joe Davis can be reached at WETA-FM, 703-998-2765.

John Bisset recently left Delta Electronics to concentrate on Multiphase Consulting, a contract engineering company. He is also RW's Technical Editor. He can be reached at 703-379-1665.



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World Radio History

FAA Flexes Its Muscles Over EMI

by Harry Cole

Washington DC If you are one of the legions of broadcasters who have recently run afoul of the FAA's electromagnetic interference ("EMI") policies in connection with efforts to improve your facilities (or maybe to build a new station), you may have thought things on that front couldn't get much worse.

You've got at least one more think coming: If the FAA adopts certain rule changes it has proposed, broadcasters will have an even tougher row to hoe.

First, some background. As we all know, the FCC is the federal agency generally responsible for regulating use of the radio spectrum. Lately, however, the FAA has muscled in on the

FCC's regulatory turf.

How? Well, aeronautical navigation has become increasingly dependent on various radio devices ("avionics," to the cognoscenti). But like all radio devices, avionics are susceptible to interference from other nearby spectrum users (like, say, FM or TV broadcasters).

Since harmful interference could conceivably screw up a

plane's (or an airport's) systems just long enough to cause a hazard to air traffic, the FAA has asserted its authority to regulate EMI in the vicinity of airport landing systems.

Extending FAA influence

The FAA has long had some say-so in the broadcast licensing process. Where a broadcaster proposes to build a new tower

structure, the FCC looks to the FAA for a determination whether the tower, because of its height and proximity to air traffic, might be a hazardous physical obstruction to such traffic.

Recently, however, the FAA has examined not only physical aspects of broadcast proposals (like tower height) but also EMI factors. Thus, when a broadcast applicant notifies the FAA of some proposed construction, the FAA looks beyond the tower sketch and considers whether the operation of the proposed transmission system might adversely affect air traffic in some way. That's where the problem begins.

COLE'S LAW

By taking that approach, the FAA effectively decides how the spectrum should be utilized, and arguably encroaches on the FCC's primary function. This might not be bad if the FAA and the FCC were coordinating so that their respective standards for determining harmful interference were identical. But that's not the way it is.

Rather, the FAA has adopted its own approach, with only limited regard for the FCC's views. (This has led to an interesting inter-agency turf war which may be grist for a future column.)

The result, in case you've been in a cave for a couple of years, has not been good. Broadcast application after application has been delayed because of the FAA's EMI concerns. And since those concerns tend to be difficult to allay, in many cases the broadcaster ends up having to come up with some alternate proposal, adding expense and delay to the already-long FCC process.

Out of the frying pan

So how could this situation get worse? Easy. In August, the FAA proposed to broaden considerably its control over broadcast applications.

This would be accomplished in several ways. For example, broadcast applicants currently are required to notify the FAA of proposed changes in their operations only when those changes involve structural modifications (such as construction of a new tower over a certain height, increase in height of an existing tower over a certain height, etc.).

Under the FAA's proposed rules, any construction of a new FM or VHF TV station, and any alteration to an existing FM or

(continued on page 28)

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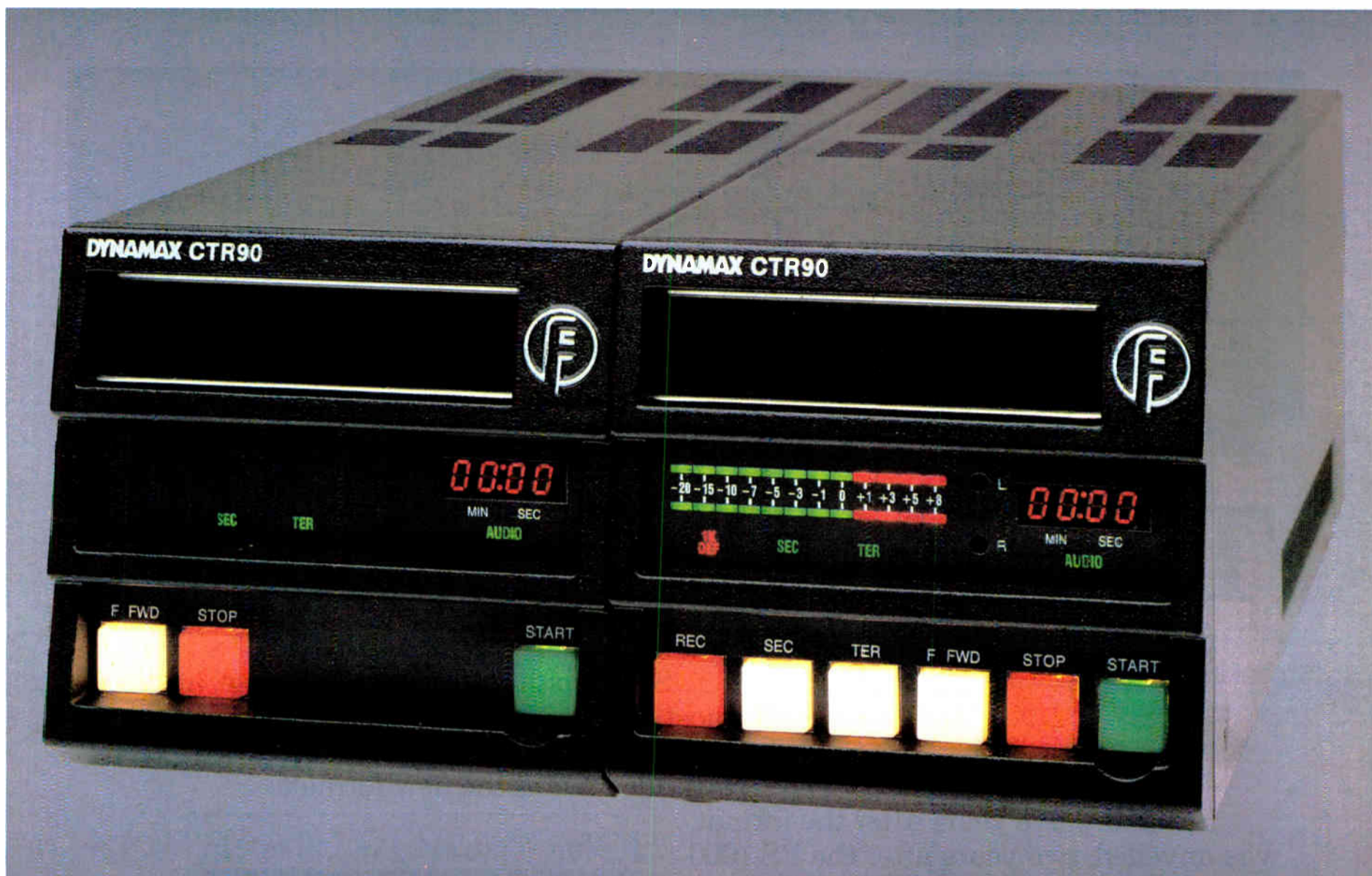
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The Birth of Digital Cable Radio

by Dee Mcvicker

New York NY On 21 May, 1990, a new radio service was launched from Staten Island that delivered its programming from several studios not much larger than oversized coat lockers. Digital Cable Radio, with 17 audio channels automated by computer, became the first digital audio service offered via satellite to cable television subscribers.

FACILITIES SHOWCASE

Digital Cable Radio is the brainchild of Jerrold Communications, a division of General Instrument that manufactures cable equipment. According to Marketing Director Paul Clough, "We got into this from the angle: 'Is there something we can develop for the cable operator?' We developed the digital audio technology and it made sense to go into the cable audio business as well."

Several years prior, Jerrold Communications tested the feasibility of cable radio with an eight-channel service beamed to test markets.

Encouraged by the results, the company began planning almost two years ago for a full-time service that would initially bring into subscribers' homes 17

audio channels featuring a variety of music, as well as 11 TV simulcast channels featuring movie tracks.

Enlisting the help of three key broadcasting companies to develop the new service, Jerrold Communications secured space at the Teleport building, a satellite uplink facility, and began implementing its plan.

Locker-sized studios

Instead of studios with consoles, microphones and special effects equipment, Jerrold Communications packaged its radio service into small computer stations automated by Media Touch OmniPLAY software.

Each of the 17 computer stations consists of a 386 SX personal computer, two Sony CDK-006 jukebox compact disc players, and a Sony DTC-1000ES DAT machine. For audio source of the service's formats, which range from classical to rock, Century 21 Programming CD libraries were brought in, as well as a few commercial CDs.

Using common computer technology—the ARCNET 286-SFT Novell local-area network (LAN) manager—Jerrold Communications was able to network control of all 17 stations from a central computer file server. Analogous to a program director, the file server controls overall operation and serves the stations' respective program

logs.

In this homogeneous environment, commented Paul Guttman, Media Touch senior systems engineer, "you can centralize certain facilities, which can be accessed by all (stations)."

Schedules of the stations' playlists are downloaded via computer modem to the system by Jerrold Communications music programmers. Done weekly through Radio Computing Services' scheduling software, programming is then fed to each computer station where two Sony CD players holding 60 CDs each can rotate music according to the week's playlist.

The human touch

Human access to the network is done primarily through two of three ancillary computers, referred to as the Controller Computer and the Workstation Computer.

The only computer in the facility with a Sony touchscreen monitor, and analogous to a studio console, the Controller Computer is used to intercept control over any station in the network. "It takes all the screen and keyboard control of any particular station. So if you wanted to see what was happening on the classical station, maybe move Beethoven from 2:00 to 3:00, you just touch the classical channel," said Guttman.

The Workstation Computer, in con-

trast, is used for on-line system maintenance, such as downloading playing lists for the file server as well as generating system reports.

To ensure service at all times, redundancy and automatic correction strategies were built into the system. The server, at the heart of the system, is backed up with an identical computer



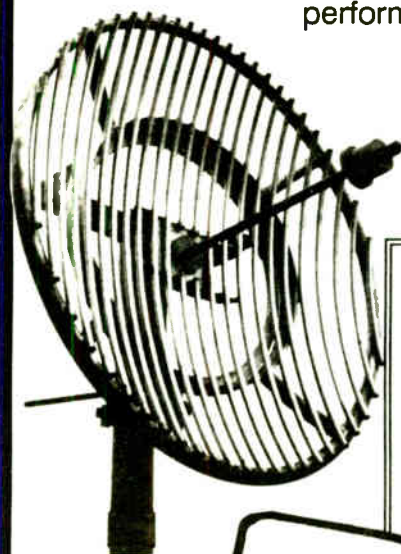
Digital Cable Radio President Dave DelBecaro poses with Media Touch automation, with RDAT and Sony CD players.

file server which mirrors programming playlists and programs on a twin 250 megabyte hard drive. In the event of primary file server failure, all 17 stations are capable of automatically logging onto the backup file server.

(continued on page 29)

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FAA Wants More Say in Radio

(continued from page 24)

VHF TV station, must be run by the FAA first.

The term "alteration" includes, for these purposes, at least "changes in radiated power, antenna height and antenna type"; other changes might also be subject to this requirement.

Note that these proposed rules are unrelated to the notion of "physical obstruction" as that term has been commonly understood. That's because the FAA has decided that EMI should now be considered an "obstruction."

As a result, if you plan, for instance, to increase your antenna height on an exist-

ing tower which already exceeds your proposed height, you would still need FAA clearance under the proposed rules. The same would be true if you just want to upgrade your antenna (even if that upgrade did not require any prior application to, or approval from, the FCC).

Further complications

There are other little surprises in the FAA's proposal. For example, a determination of no hazard would last only as long as any FCC construction permit issued in connection with the changes.

If the construction or modification has not been completed by the expiration

date of the applicable FCC construction permit, the broadcaster will have to obtain both an extension of the permit from the FCC and an extension of the FAA's determination of no hazard.

For another example, the FAA now proposes to reject the notion of "antenna farms" because "the interference and related complications generated from antennae in proximity to each other tend to make antenna farms infeasible." Presumably those sites which might, to the uneducated eye, appear to be existing "antenna farms" will be grandfathered.

The FAA has provided estimates of the costs of compliance with the proposed rules. Assuming that between 3000 and 7500 notices of proposed construction are filed with the FAA per year, the estimated "present value costs" to be generated over the first ten years of the new rules are estimated (by the FAA, mind you) to be between \$237,000 and \$397,000.

If anyone understands how they came up with those figures, please let me know. The estimates surely do not include any consideration of the cost of delay which FAA consideration of EMI claims almost invariably generates, nor do they appear to include the costs of consultants (FCC counsel, aeronautical experts, etc.) usually necessary to resolve FAA problems on that front.

What can be done?

Broadcasters should obviously be extremely concerned about the FAA's

proposals. However, it appears that little, if any, attention is being paid. There is some time to correct that, however. Comments on the proposals may be filed with the FAA on or before 31 December 1990.

A copy of the FAA's notice of proposed rulemaking appeared in the Federal Register on 3 August 1990 (55 Fed.Reg. 31722)—you can probably get a copy from your communications counsel.

If you are an FM or TV licensee and you think that maybe, just maybe, you might be wanting to improve your facilities in the next couple of years, you should be sure to take a close look at the FAA's proposals, and you should be ready to present your views loud and clear to the FAA.

As a final thought, interested broadcasters should also be prepared to launch a strong lobbying effort directed to Congress. Congress, after all, controls both the FAA and the FCC, and the FAA often claims that it has been directed by Congress to get tough on EMI.

The difficulty with lobbying Congress in this area is that the general aviation lobby—you know, the private pilots and airplane owners of the world—is formidable (at least in part probably because a significant number of Congress people are from their ranks). Going one-on-one with them would likely be tough.

In view of the hassles which might flow from the FAA's proposals, however, even a tough one-on-one battle might be worth the effort.

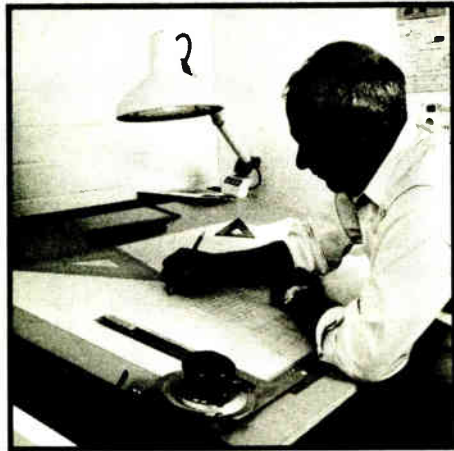
■ ■ ■

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

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Digital Audio Available by Cable

(continued from page 27)

Each station is also equipped with a 40 megabyte hard drive, which contains a week's programming log to continue operation in the unlikely event of a full network failure. In addition, stations are capable of CD error detection and reporting should a compact disc player or its compact discs go awry.

A backup computer with two Sony CDK-006s also resides in the facility to take over for stations during long-term repair. In cases when a station will be out of service for any great length of time, the spare can be logged on manually as a replacement.

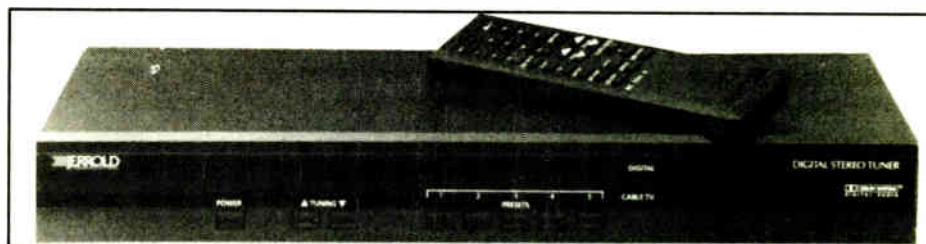
In short-term emergencies, such as a

said, "each computer is talking directly to its audio switcher via the Smart Switch." But, he added, "when a backup implementation or short term spare needs to be substituted for a computer, through a command port, the backup computer breaks that connection from the local computer and attaches its second port to the (defunct computer's) switcher port and then controls that audio switcher."

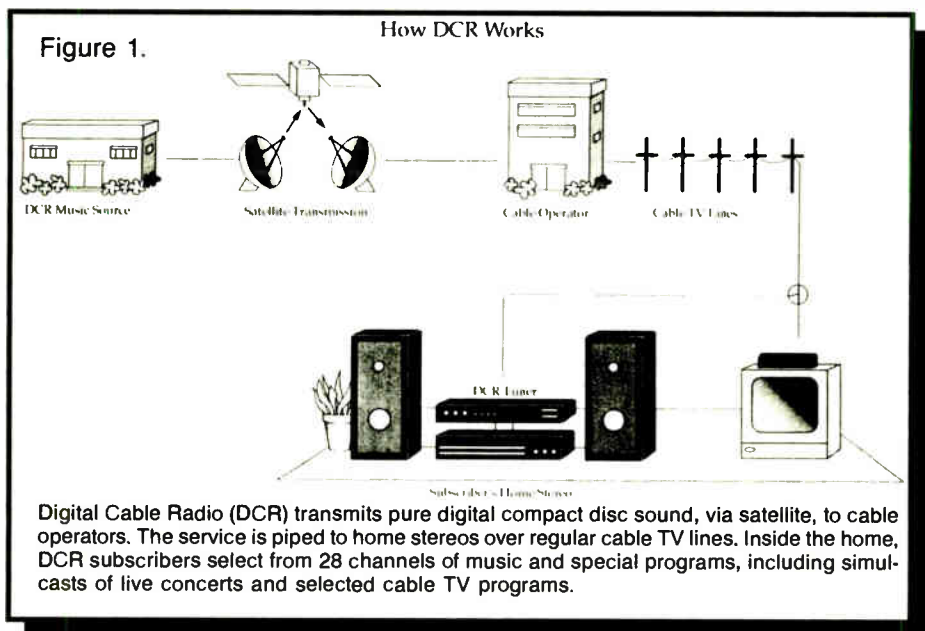
As a stop-gap measure, each computer station also is equipped with an R-DAT machine and R-DAT controller to randomly access 120 minutes of programming. These come into play, informed Guttman, "if the spares were already

we had to develop a way to do it. The choices were between having live operators or developing an automated way

can pull up a human voice, which was previously digitized, and get the song and the artist."



The DCR tuner matches most stereo components and provides remote control and five channel presets.



CD jam, one of two computers can also log on as a temporary replacement for a wayward computer station—all under the automated control of a software module referred to as the Silence Sense.

Levels of silence

Explained Guttman, "We have two levels of silence protection: one at 45 seconds and another one at 45 seconds after that. The first 45 seconds, the silence is detected and the signal goes back to that individual station.

"At that point (the station computer) tries to start the next event in the log—it attempts to get rid of the silence. If it should be silent for another 45 seconds, the second silence (signal) fires and at that point switches in one of the two temporary spares automatically."

The two temporary spares have two Sony CD players each. To facilitate all 17 formats, they contain an abbreviated playlist of only two hours for each channel. Although scheduled playlists are discontinued during these temporary emergencies, the spare computer is able to segue into the abbreviated programming list without interruption of service.

This Silence Sense software module works in concert with the system's Smart Serial Switch. A master RS-232 switching bank, the Smart Switch outputs directly to Ramko audio switchers located at each station. With each computer station interfaced directly to the Smart Switch's input ports, control can be handed off to temporary computer stations at any time by a signal from the Smart Switch command port.

During normal operation, Guttman

being used or if we needed to take the system off the air for quick maintenance."

Voice mail for subscribers

As part of the service, Jerrold Communications elected to provide its subscribers with programming information. Said Clough, "We decided we had to provide this program information and

of doing it."

Jerrold Communications, obviously, elected to automate this function of its service as well. The company accomplished this by marrying the playlists provided by RCS and the automation software provided by Media Touch into what Clough calls the Audio Response Unit (ARU). Similar to voice mail technology, the ARU provides call-in subscribers with listings of recent and current songs on the 17 channels.

Explained Guttman, "Basically every item in the system has a unique identifier, and that code is sent to the ARU. When someone calls up and asks what was playing on a particular channel, the ARU has the last three codes available: one that is currently on the air and the two previous items. From those codes it

To beam Digital Cable Radio's service to cable operators nationwide, an encoding technology similar to PCM was installed. Dolby's Adaptive Delta Modulation, available in its DP-85 analog-to-digital encoder, was used to package the signals in a bandwidth-efficient manner for satellite service and ultimately to cable operators.

According to Clough, cable operators and satellite services will be making even more room for Digital Cable Radio in the future. Currently, he said, Digital Cable Radio is capable of 96 channels and plans to expand are already in the making.

■ ■ ■

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

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Express Yourself with Aphex

by Ty Ford

Baltimore MD There are more than a few stories of embarrassed engineers and studio owners who call Aphex claiming their new Compellor or Studio Dominator must not be working right because they can't hear the usual side-effects of gain reduction, only to find out it's working just fine.

PRODUCER'S FILE

Don Werrbach is VP of engineering at Aphex. It's always fun to watch the twinkle in his eye when those stories are told. I was more than surprised, then, to see his brow wrinkle when I asked him about one of Aphex's latest devices, the Expressor.

The Expressor is a compressor/limiter/clipper with a few interesting twists. The first twist (and the cause for

Aphex also included several nifty design features: the SPR (spectral phase refractor), HFX (high frequency expansion) and a short-sensor at the output. This sensor automatically puts full audio on whichever leg of the output is not grounded, and turns off the grounded amp, a circuit that's in all Aphex designs.

SPR: flexibility in bass sound

The SPR circuit is designed to allow you to vary the time alignment of the lower frequencies (up to 150 Hz) relative to the rest of the bandwidth. Aphex theorizes that, "Through the many steps of recording, duplicating, distributing and reproducing sound, the phase of the low frequency audio spectrum becomes delayed compared to the mid and high frequencies."

According to Werrbach, "The Expressor adds a delay that gets longer as frequency gets lower, which nets out as a phase advance. All audio amps have a low frequency corner frequency below

too thin, my guess is you'll like what the SPR does.

During music passages, the SPR appeared to reduce bass ducking when the comp/limiter section was processing heavily. In general, SPR also added a subtle but perceivable thickness to the bass frequencies.

HFX puts back the edge

The HFX circuit is designed to restore the high frequencies normally lost during compression and limiting. HFX addresses the problems caused by the standard practice of applying EQ after gain

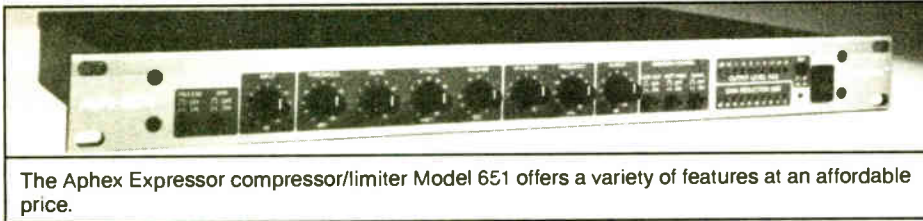
reduction to "put the edge back on."

Since the same EQ is applied to all audio, whether it occurs above or below the threshold of gain reduction, the part of the signal that falls below the threshold does not need the "edge" put back on, because it was never taken off.

The HFX ratio and frequency controls, then, serve to reverse the ravages of gain reduction between 2 kHz and 20 kHz with a 6 dB per octave shelving EQ.

At 0:1 (the minimum setting), there is no HFX effect. At 1.0:1 (the maximum setting) there is 1 dB of high frequency expansion for every 1 dB of gain reduction; however, maximum expansion never exceeds 6 dB regardless of the amount of gain reduction.

Fortunately (or unfortunately, depend-
(continued on page 31)



The Aphex Expressor compressor/limiter Model 651 offers a variety of features at an affordable price.

Werrbach's furrowed brow) is that you can actually adjust (or misadjust) the controls so that the audio sounds really bad. You want pumping, you got it! You want clipping, no problem! You can also take the more moderate route and adjust the controls so that you get a considerable amount of gain reduction before the "grunge threshold."

According to Werrbach, "The Expressor is the equivalent of a feed forward compressor, which accomplishes its control via a separate side chain control VCA circuit. In fact, there are three separate VCAs at work: one for the audio, one for the side-chain and one for the HFX circuit."

which everything is rolled off.

"When this happens, visible phase shifts occur. The Expressor goes through two 180° phase rotations from 20 Hz to 200 Hz in its attempt to correct those phase shifts." The manual cautions that, "In certain situations, there may be an opposite effect, so use your ears."

When recording my voice, my experience was that the SPR circuit added low frequency content, more than I felt I needed. Obviously it's also a matter of taste. Over time I've found I really like a Sennheiser 421 in the music position for my voice. If you like the way you sound on an RE-20 and think the 421 is

The End of LA Jazz

by Frank Beacham

Los Angeles CA For the first time since the mid-1950s, the City of Los Angeles—the nation's largest radio market—is without a commercial jazz broadcast station.

The end of the jazz era came abruptly on Friday afternoon, 14 September when Saul Levine, president of KKJZ-AM, ordered his engineer to pull the plug and begin simulcasting sister station KKGO-FM's classical music programming.

Financial losses due to lack of advertisers were cited by Levine as the reason for killing the jazz format. "The audience for jazz is very small and fragmented and doesn't show up in the ratings," Levine said.

Where's the jazz?

The latest saga in LA's loss of a popular format stems from the sale and format change in September 1989, of LA's commercial classical station, KFAC. That change left the nation's largest radio market with no classical commercial station.

Levine decided to fill the void by bringing classical music to KKGO-FM (105.1), which had been the city's premiere commercial jazz station. KKGO's

jazz programming, effective 1 January, was switched to sister station KKJZ-AM (540).

The jazz format on KKJZ lasted less than a year, and LA jazz fans were unhappy from the start due to the station's often hard-to-receive AM signal.

Irate letters and calls swamped the station over the reception quality, which was often inconsistent in the day hours and nonexistent in the evening in the metropolitan Los Angeles area.

Levine blamed part of the problem on poor quality AM receivers and urged his listeners to upgrade to better radios. He also got his station carried on local cable channels and offered a special "Jazz Box" sub-carrier receiver that picked up the jazz programming off an FM sub-carrier.

He tried to get permission from the FCC to move his transmitter from Apple Valley to Costa Mesa and receive a power increase (from 25,000 W daytime, 3000 W at sunset), but was rejected due to the current freeze on modifications to AM stations.

No support

In the end, Levine's efforts to save the jazz format failed. "We didn't receive support from either listeners or advertisers," Levine said. "We hoped for some kind of audience, any kind of an audience, even a .1 share, but it simply failed to materialize."

Before pulling the plug, Levine contacted KLON, the major non-commercial jazz station in the area, about hiring two of his veteran announcers of more than 20 years. He also donated KKJZ's jazz library to KLON. The announcers, Levine said, are now working at KLON.

In late October, KKJZ was to be relaunched with new call letters. "We haven't given up on AM," Levine said. "We are switching to a beautiful music service and we think it is broad enough and appeals to an older audience used to listening to AM. We think it will work."

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Aphex's Affordable Expressor

(continued from previous page)

ing on your point of view), if the high frequency content has caused pumping or hole punching in the middle and lower frequencies, the HFX won't reduce the pumping. It will, however, significantly increase the brightness of the audio passing above the gain reduction threshold. There was enough range to boost the highs of my voice track so that they were unacceptably sibilant.

Gain reduction controls

The front panel of the Aphex Expressor offers a full complement of gain reduction variables. The hard-wired process on/off bypass switch allows comparison of processed to unprocessed audio.

The previously mentioned SPR on/off switch is followed by a 30 dB continuously variable input control. The servo-balanced input accommodates balanced or unbalanced sources from -15 dB to +15 dB. Maximum line input is +27 dBm.

The variable threshold control allows you to set the point at which gain reduction occurs from -20 to +20 dBm and is independent of the input control. These two knobs provide an impressive amount of control which allow you to accomplish an extremely wide variety of gain reduction.

The continuously variable ratio control (1:1 to 50:1) and the attack and release times (50 μ s to 100 ms and 40 μ s to 4 seconds, respectively) allow the Expressor

to be operated as a simple leveler, compressor, program limiter, peak limiter or clipper.

The output control is referred to as the "make-up gain" control because the compression and limiting usually reduce the output of a device requiring a gain stage to bring the level back up so that it properly feeds the input of the next device.

This control is servo-balanced and can be adjusted from -12 dB to +18 dB.

"The Expressor is the equivalent of a feed forward compressor, which accomplishes its control via a separate side chain control VCA circuit."

There are also side-chain controls, including a low cut filter, soft knee on/off switch and a slave on/off switch.

LED displays

There are two LED displays. The output level display is switchable for -10 or +4 dB levels. The gain reduction display is calibrated in 2 dB steps and reads gain reduction whether the unit is bypassed or processing. Finally, there is a lighted power switch.

Rear panel connections include an XLR 3-pin audio input and output, and standard 1/4" phone jacks for the link,

send and return side-chain connections.

If your experience with gain reduction circuits has been limited (no pun intended) to devices with simpler controls and you're concerned that the full-featured Expressor might be too complicated, don't worry. As is their style, Aphex has written a manual that explains each control very well.

One whole chapter is devoted to different ways to adjust the controls, with explanations for over 20 different

setups. If the fine points of gain reduction have eluded you, the Expressor and manual can teach you a lot.

The link jack on the back panel allows stereo or master/slave operation. You can even replicate the "old ducking trick" with a stereo music bed by using three Expressors.

Set the first one up to process the voice. Using a "Y" connector, take the link output of the unit processing the voice and plug it into the link jacks on the two Expressors used to process the stereo music bed. Put both in slave mode and adjust the levels so that the music

"ducks" for the voice track.

If you've got a music or voice track that lacks punch, try setting a slow attack, a moderate release and a high ratio (over 5:1). The slow attack setting lets the first part of each sound pass unprocessed, making it louder than that portion of the audio effected by the gain reduction which occurs at the designated attack time.

What you're actually doing is reshaping or over-emphasizing the dynamics of the audio, using the slower attack time to produce an intentional overshoot at the beginning of each sound. This, of course, assumes that there was a certain amount of dynamics to begin with. Don't expect this to work on a sustained synth line.

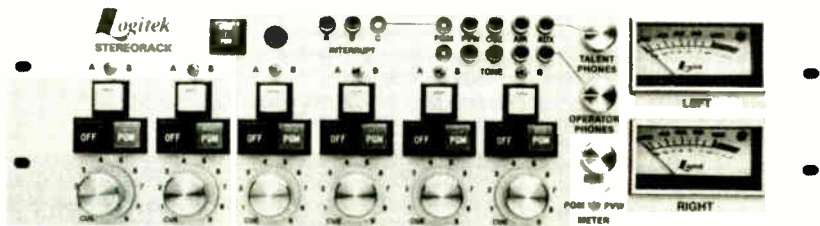
The Expressor can also be useful in controlling play-by-play audio or to process mic chains on the air. The soft-knee, which lowers the gain reduction threshold by 10 dB and uses that space to make the entry into gain reduction more gradual, does a great job of smoothly controlling the voice from a whisper to a scream.

For the amount of control it offers, the Expressor's list price of \$495 makes it a reasonable entry into the increasingly competitive audio processing market. Give me a call if you have any questions, or call Don Werrbach at Aphex: 818-767-2929.

■ ■ ■

Ty Ford is an audio producer/voice talent with enough curiosity for at least three people, especially when it comes to audio production. He is seldom without an opinion. Reach him by phone at 301-889-6201, via MCI mail (#347-6635) or via America Online (Tford).

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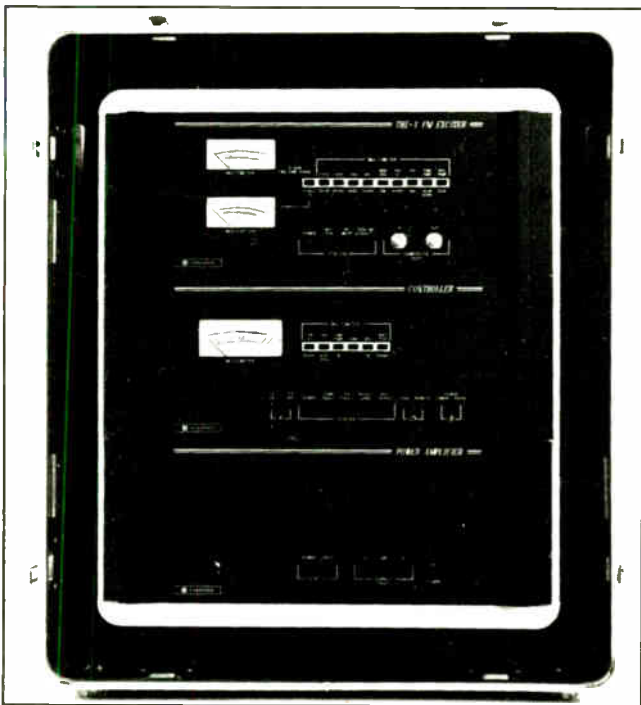
BUYERS GUIDE

Transmitters, Exciters & SCAs

Harris Introduces the HT 500FM

by Richard J. Fry, Sales Eng
Harris/Allied

Quincy IL Harris Broadcast Division has introduced a new, transportable 500 W FM broadcast transmitter package.



The Harris HT 500FM comes fully assembled in a rugged shipping container, for emergency use.

any scheduled airline or surface carrier, and to transport to almost any site by mini-van or utility vehicle. With the front and rear covers snapped off the container, this 500 W transmitter is ready for connection to AC, program and antenna, and to begin broadcasting.

Fully featured

The HT 500FM FM transmitter is totally frequency-agile. It can be set quickly to any licensed frequency in the commercial FM band and returned to full power output with no tuning whatsoever. In fact, there aren't any tuning controls!

Superb technical performance and off-air sound are provided by a Harris THE-1 FM exciter. Other standard features include automatic power control and VSWR foldback plus inputs for composite stereo generator, dual SCAs and monaural audio. The unit

includes all interfaces for standard remote control.

includes all interfaces for standard remote control. The husky, ferro-resonant power supply runs on any single-phase line voltage from 200V-250V and is very tolerant to AC line variations and transients.

Harris is planning to offer a new FM antenna for use with the new transportable FM transmitter. The antenna would be transportable in an air-shippable package and would be easy to assemble and disassemble. The new antenna would be field adjustable for operation anywhere in the FM band.

For this emergency application, the antenna will probably use two horizontally-polarized crossed dipoles, providing omnidirectional coverage with a small amount of gain. The antenna mount will be designed to clamp to typical small OD pipes, flagpoles, etc., or to a small, home TV-type tower section.

Antenna design and testing is underway and this new antenna is expected to be available in January 1991.

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Multitude of applications

The transportable HT 500FM is a natural for many situations. For example, the unit can be used as an emergency transmitter when the main site experiences a long-term outage (tower failure, fire, etc).

It can also be employed as a "beta site" transmitter. Easy to install in the studio or downtown building, the HT 500FM can provide suburban coverage in emergencies. It can also serve as a complete

backup transmitter, for peace of mind in any situation. This is great insurance for the owner who wants to guarantee virtually no off-air time.

As a backup transmitter for group operators, a transportable HT500FM could be stored at a central location for quick dispatch to any station in the group needing an emergency transmitter.

start-ups and renovations, the HT 500FM can get a station on the air before the CP expires or while major moves or facilities changes are underway.

The transmitter also can be employed as an RF exciter/driver upgrade for older transmitters. How would 500 W of ultra-low distortion, broadband drive power improve your present signal?

Finally, the HT 500FM can be transported easily and installed at potential booster sites to evaluate coverage, interference contours, etc.

As a service to broadcasters, Harris plans to maintain an inventory of transportable HT 500FMs and antennas for quick shipment to meet emergency conditions. A variety of purchase, rental or leasing arrangements is planned.

Editor's note: For more information on the HT 500FM transmitter, contact Richard Fry at Harris/Allied Radio RF Sales: 217-222-8200, extension 3401; FAX: 217-222-7041, or circle Reader Service 28.

TECHNOLOGY UPDATE

Several stations in the same market can use the HT 500FM as a regional backup. Its frequency agility allows quick access to any frequency in your market. A small investment shared by several operators will provide a backup transmitter usable by any one of them (great for a centralized beta site).

As a temporary transmitter during

BUYERS GUIDE INDEX

- CCA 5kW Transmitter**
by Mark Schmucker, WQHL **35**
- Continental 816R-5B Transmitter**
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Also, Technology Updates from Harris/Allied, NCA, BE and QEI; Special Reports from Armstrong Transmitters and Econco.

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NCA Debuts Remote Monitor

by Harold Hutchinson, Dir Mktg
NCA Microelectronics, Inc.

Saint John, New Brunswick CANADA NCA has introduced the R-2000, a modular remote monitoring and control system for the remote radio broadcast transmitter site. Its PC compatible design is based on plug-in cards, which permit easy expansion and field servicing. The modularity provides a cost effective means to achieve a custom system.

Each sensor input module features 16 status channels which can accommodate digital, analog or temperature probe in-

puts. The measuring parameters for each channel are configured through the user-friendly, DOS-based software.

The relay control modules are also configured in blocks of 16 outputs. Each channel can be independently configured (through software) to latch or pulse various relay types. A fully configured R-2000 can control up to 256 relays and can monitor 256 analog, digital, or temperature status points.

Hearing voices

The user communicates with the system with either the DataLink package—which provides access via a remote stu-

dio terminal—or through the system's digitized female voice and a standard telephone keypad. The system can be connected to a regular dial-up telephone line or through any of the other standard methods.

TECHNOLOGY UPDATE

The digitized voice is of a much higher quality than the standard speech synthesizers found on various other monitoring systems. The voice product is sold separately by NCA to the transit industry, under the name "Chat-R-Box" or "Transit TALK-R," to identify station stops.

The heart of the system is the DOS-based software which features many easy to follow menus and pop-up win-

configured from the studio end, if the DataLink option is employed.

From start to finish

The system is available in two configurations, the R-2000 and the R-2000A. The R-2000A is an entry level system. Expandable to the regular R-2000 and beyond, the system includes 16 status inputs, 16 relay outputs, one temperature probe, digitized voice module and software. The user must supply a standard PC with a minimum of 512k of RAM and 1 floppy diskette drive. This unit retails for under \$5000.

The standard R-2000 comes complete with 32 status inputs, 16 relay outputs, eight magnetic latching relays on a frame, digitized voice module, three temperature probes, eight-hour battery backup, software and Toshiba T-1000 in a drawer. This unit retails for \$7800, and is a complete turnkey system.

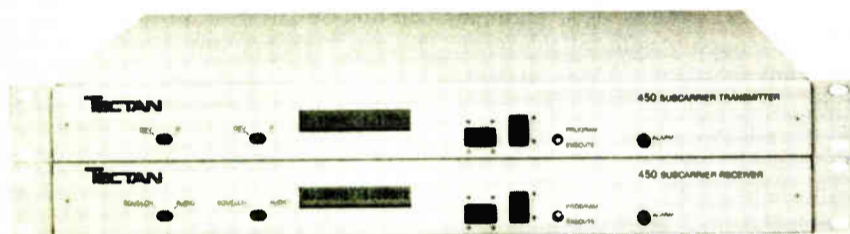
An R-2000 demo phone line has been set up, permitting interested parties to call up, listen to, and control a real R-2000. The number is 1-506-634-5018.

The unit is sold in the US through

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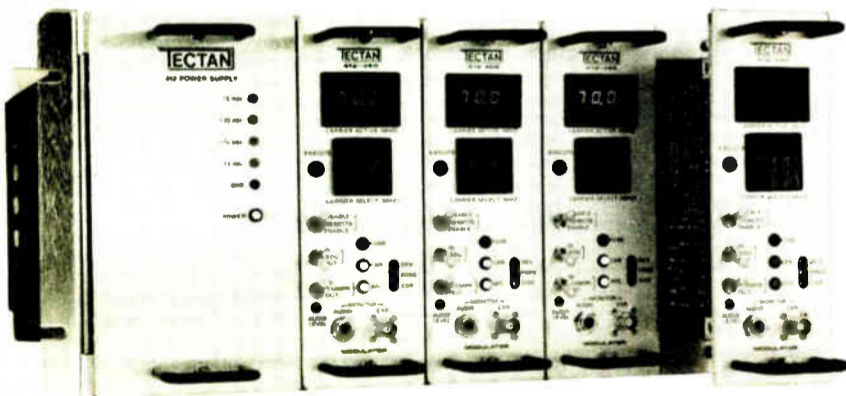


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The 450 is a frequency agile, synthesized FM subcarrier designed specifically for narrow band multi-channel applications and incorporates the latest noise reduction techniques, superior audio quality and unmatched flexibility for any situation where two or more audio circuits are required. Each unit contains two completely independent transmitters or receivers for stereo applications over terrestrial microwave, satellite or analog fiber optic facilities.

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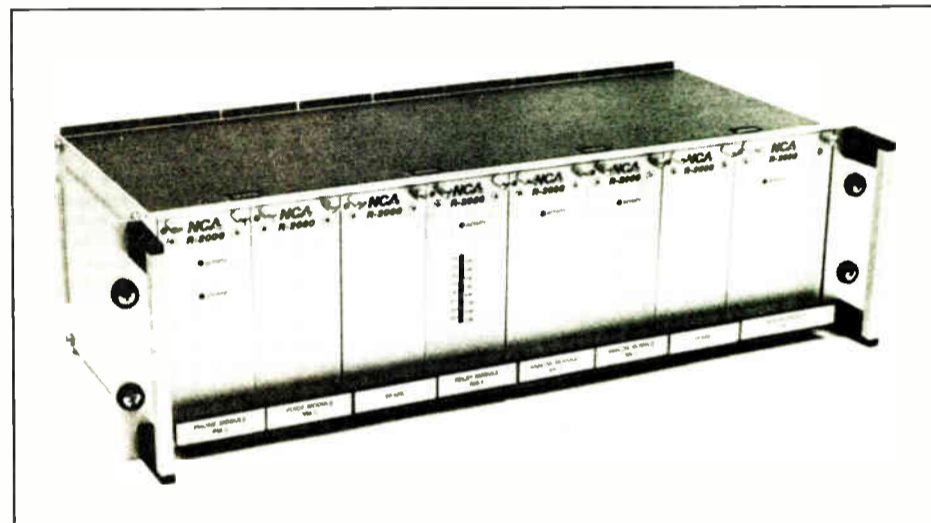
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NCA's R-2000 remote monitoring and control system features modular design.

dows. When configuring the system, all required parameters appear in strategically positioned windows. The desired value is selected by moving the cursor over the item and pressing the ENTER key.

One advantage of the DOS-based approach is that the user can configure the system on any PC (anywhere) and then pop the new diskette in the R-2000 when visiting the site. The system can also be

James Grunder & Associates: 913-831-0188, FAX: 913-831-3427. In Canada the distributor is Maruno Electronics Limited: 416-255-9108, FAX: 416-255-3791.

Editor's note: For more information on the R-2000 monitoring and control system, contact Harold Hutchinson at Microelectronics, Inc.: 506-634-5014, FAX: 506-634-5019, or circle Reader Service 32.

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SOMICH ENGINEERING: The Leaders In Competitive Processing

DAB: No Response Needed Yet

by Alex Zavistovich

Falls Church VA Get any group of radio engineers together and you can be sure that DAB will become a topic of conversation before long. The idea of digital audio broadcasting has captured the collective imagination of the industry.

But has this novel concept cast any shadows over conventional broadcast technology? Are manufacturers planning any improvements to existing equipment in the high-tech world of signal transmission?

In a word, no. Most manufacturers contacted by RW expressed confidence in the quality of conventional transmitters and related gear for the foreseeable future. They seem to feel that the two technologies can co-exist, without DAB posing a significant threat.

Even those who view DAB with greater scrutiny seem only to be "watch-

fully waiting." For these people, it is simply too soon to tell what type of response may be required.

Peaceful co-existence

For James Kaplan, broadcast sales representative with TFT, it's too early to assess the threat from the new technology.

"We're not presently concerned with DAB," said Kaplan. "For right now I don't see it as competition with mass media radio as it is." He added that the company's Reciter, an STL receiver and RF exciter in a single package, is "well suited" to accommodate digital sources.

"Our feeling is this (the Reciter) will stand up against DAB on its own. It is our belief that DAB and conventional broadcasting can co-exist," he said.

Kaplan stressed his belief that "DAB will not replace local broadcasting. DAB programming will probably originate from national centers as opposed to

regional or local. Also, the nature of the transmission will probably be limited to specific formats of music and not news and information."

INDUSTRY ROUNDUP

That question of the application of DAB is at the heart of a number of companies' attitudes toward the technology in general. Until the concept becomes more concrete, manufacturers seem willing to take the long view.

Walt Rice, domestic marketing manager for Continental Electronics, acknowledged that "we will see some new technologies being developed for existing systems. I don't see any transmitter manufacturers involved in digital technology, but I'm sure there are many looking at it as we are, asking how they can prepare for DAB, 15 to 20 years down the road.

"In the meantime," commented Rice, "if you ask the average citizen or politician what DAB means to them, they would probably have little to say."

Harris Corporation feels likewise. Bob Weirather, Harris' marketing manager, said "DAB right now is entirely unclear; its method of distribution isn't clear, many things are uncertain about it.

"What we continually try to do is pro-

vide products that help broadcasters make a living *today*. Naturally, we are interested and we study new technology, and contribute where we can, but our policy is to provide equipment that broadcasters can use today."

Broadcasters, not manufacturers

So, is there a need to worry about the onset DAB? For some manufacturers, the concern should be on the part of broadcasters. Competitive equipment is available now, they say, and broadcasters who are concerned about a threat from DAB should be prepared.

Said TFT's Kaplan, "Broadcasters will have to upgrade their systems to provide for a higher quality analog signal if they are directly competing with the same sort of programming (DAB will provide). But," he added, "I don't think they'll lose much of their market."

The practical aspect of DAB implementation is still the crux of the matter. As Kaplan noted, "It will be a long time before there are receivers on the market for DAB. Also, with HDTV and other services vying for chunks of the spectrum there is still a problem allocating frequencies."

Added Weirather, "I've seen a lot of proposals, and heard DAB described in many ways so it's not clear how it will develop; there are just a lot of trial balloons being floated right now."

CCA 5 kW Tapped For WQLC Start-Up

by Mark Schmucker, CE
WQHL

Lake City FL Broadcast engineers dream about the opportunity I've had: building a station from the ground up, from the control room to the transmitter plant. Included with that thrill, however, are doubts and questions about picking the equipment for the project.

grid design, eliminating the need to maintain screen voltages and currents.

Tuning of the transmitter is both easy and straightforward. The exciter is rack-mounted in your associated equipment rack. The exciter control circuits can be easily connected to the transmitter so that the output is muted when the transmitter plates are turned off—to protect the IPA tube.

Metering of the transmitter consists of not only the required parameters, but also voltage and grid currents of the IPA tube as well as PA grid current. The transmitter also has metering for filaments of the IPA and PA tubes and the AC line voltage. The filaments are adjustable for both tubes.

Located behind the meter panel is the auto power control, plate control and overload circuits. The overload circuit monitors all the important points of the transmitter as well as VSWR. The auto power control monitors the output from the directional coupler and will maintain the output to the set levels.

The transmitter has ample status lights to tell you what is off, as well as when and where an overload has been detected. It will attempt to recycle itself in the event of an overload, but the overload status will remain lit until it is manually reset.

Going right to the top

The evening the transmitter was first turned on we were, unfortunately, faced with a bad plate transformer. After a call from the station manager to the president of CCA (how many other companies let you speak directly to the president?), we had a new transformer delivered within the day and were able to get on the air by the target date.

(continued on page 39)

USER REPORT

The single most expensive equipment purchase will be the transmitter. Of course, the cost involved with the purchase and the operating expense are very important. The bottom line: Get the most and best for the least. We chose the CCA 5000G, 5 kW FM transmitter with the CCA 20G 20 W exciter for WQLC, our start-up FM.

CCA has been in business many years and has many transmitters throughout the country. Within a 60 mile radius, I can find several CCA transmitters either on the air full time or on standby. In fact, WQHL, the station where I am employed full time as the chief engineer, uses a CCA 10 kW FM transmitter; it has been on the air since 1973 and has had very little down time.

The CCA 5000G is packaged in a single nice-looking cabinet. The power supply as well as the PA box are built with enough room for easy maintenance and repair.

Tube technology

CCA still uses tubes in both the IPA and PA. The IPA is a 3CX800A7 tube, which supplies more than enough drive for the PA. The PA uses the reliable 3CX3000A7 tube in a grounded



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“We’ve bought 31 Auditroneics consoles since 1975,”

says Wilbur Brann, Director of Engineering for Capitol Broadcasting Company, Inc. “Our first was an Auditroneics 110, serial 0039 for WRAL-TV5 right here in Raleigh. And it’s still performing as well today as our new 200 at WWMX in Baltimore.”

“Features are important to us and we shop for features before we buy. In fact, when you compare consoles on a feature-for-feature basis, Auditroneics is priced very competitively.”

“But, reliability is the key to why we’ve stayed with Auditroneics consoles all these years. They’re essentially a service-free product. And, if we ever need anything, their factory and dealer support is excellent,” says Brann.

“Capitol has only one console left that isn’t Auditroneics,” says Keith Harrison, Chief Engineer of Capitol’s WRAL-FM. “And it’s almost as old as I am. When the man who runs it retires, we’ll likely retire that board along with him, and replace it with another Auditroneics console.”

To learn about the Auditroneics audio consoles that are the house standard at Capitol Broadcasting Company, Inc. call today 800-638-0977.



Wilbur Brann
Director of Engineering
Capitol Broadcasting Company, Inc.
300 series — WRAL-TV5
Television production
Installed 1985



 **auditroneics, inc.**
3750 Old Getwell Road, Memphis, Tennessee 38118
901-362-1350



200 series — WRAL-FM
Radio on-air
Installed 1983

Circle 89 On Reader Service Card

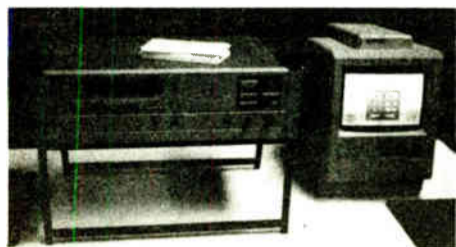
MARKETPLACE

Send us your new product info. Be sure to include a black and white photo. Send all submissions to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041

Recording/editing station

Symetrix, Inc. has introduced the DPR44 random access editing system, equipped with a color controller screen and graphics control tablet. Other features of the station include complete interlock of all record/edit events with timecode, video sync and word clock as well as simultaneous four-track recording and playback.

For more information, contact **Stephen St. Croix at Symetrix: 206-282-2555, FAX: 206-283-5504, or circle Reader Service 6.**



Pro-DAT recorder

The SV-3900 Pro-DAT recorder from Panasonic is compatible with virtually all other editing controllers and automation systems, and comes with a MK390 remote controller.

The system also has selectable ES/Bus or P2 machine control/networking interface, 44.1/48 kHz sampling rates through either analog or digital inputs.

For more information, contact **Ron Tomczyk at Panasonic: 201-348-7183, FAX: 201-392-6485, or circle Reader Service 67.**

Interactive phone system

TeleMedia, an automated phone system by TeleMax Voice Systems Inc., contains such features as an eight slot announcement wheel that will rotate a different recorded message on a per-call basis, and two voice mailboxes which each have the capacity for 100 45-second messages.

For more information, contact **Warren Harris at Telemax: 214-929-1200, FAX: 214-929-1221, or circle Reader Service 88.**



Recording/archiving system

Panasonic Professional Audio in conjunction with Bruel & Kjaer Instruments, Inc., has introduced a portable R-DAT recording/archiving system. The system includes two Bruel & Kjaer type 4006 omnidirectional microphones and a Panasonic SV-255 portable R-DAT recorder in a padded suitcase. Also included are a low noise mic/line pre-amp, MASH A/D converter and 64x oversampling.

For more information, contact **Adrian Weidmann at Bruel & Kjaer: 508-481-7000, FAX: 508-485-0519, or circle Reader Service 23.**

Intercom system

The SMI-5A is a studio monitor in-

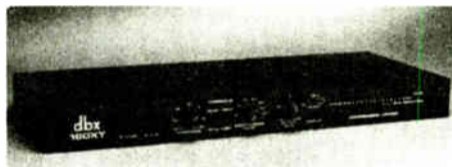
tercom system from Broadcast Tools. The unit features a telco interface input, which allows output from an external telephone hybrid to be inserted into the headphone circuit. Two built-in headphone amps with multiband equalization and a front panel electret condenser mic with limiter are also included.

For more information, contact **Don Winget at Broadcast Tools: 206-938-4089, or circle Reader Service 49.**

Wireless cable catalog

"Wireless/90" is a new catalog from Microwave Filter Co. It describes microwave filters and accessories for MMDS/ITFS/MDS reception. Video aural combiners, channel combiners, channel group combiners, preselectors and interface filters are all included with response test curves and dimension displays.

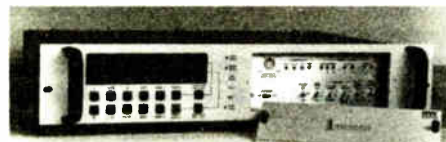
For more information, contact **Elizabeth Buck at Microwave Filter Company, Inc.: 315-437-3953 ext. 252, FAX: 315-463-1467, or circle Reader Service 105.**



Compressor/limiter

dbx Professional Products has introduced the dbx 160XT compressor/limiter, with features such as XL-type connectors, a ground-lift switch at the balanced input and additional matched RMS detectors for true power summing when stereo strapped with another 160 XT.

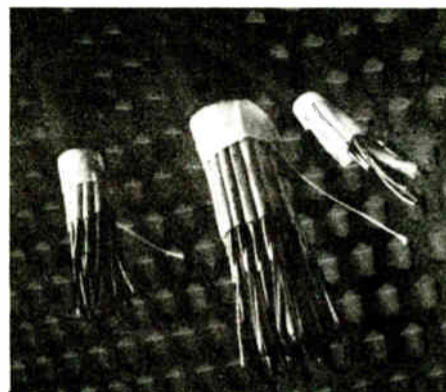
For more information, contact **Scott Heineman at dbx Professional Products Division, AKG Acoustics: 415-351-3500, FAX: 415-351-0500, or circle Reader Service 93.**



Stereo generator

The Model 706 FM stereo generator from Inovonics incorporates the FMXTM coverage-extensive transmission system and is compatible with FM-stereo broadcasting standards. The 706 also includes a variable composite processor, internal combining for up to three SCA or RDS subcarriers, and dual-channel bargraph metering.

For more information, contact **Ann Pelz at Inovonics: 408-458-0552, FAX: 408-458-0554, or circle Reader Service 51.**



Snake cables

Available now from Belden Wire and Cable are nine multi-pair snake cables. Available in pair counts of four to 32, the cables contain 24 AWG conductors for longer runs, are CM rated, and UL listed to meet NEC requirements for installation between walls.

For more information, contact **John Valentine at Belden Wire and Cable: 317-983-5200, FAX: 317-983-5294, or circle Reader Service 40.**

Acoustical analysis service

The Azonic Acoustical Analysis Service (AAAS) is a three-dimensional com-

puterized modeling program designed to maximize noise reduction. Using a special sound analysis kit, information is collected and sent to Azonic for analysis. When returned, the analysis gives information on acoustics, detailed graphs and recommendations to reduce noise levels.

For more information, contact **Brent Johnson at Azonic: 612-894-2230, FAX: 612-894-2748, or circle Reader Service 57.**



Transmitter/receiver

The Pro-Audio Fiber optic link from T-Tech can convert two to four channels of audio or other analog information having DC-65 kHz bandwidth per channel into digital information. The information is then converted to optical format, and transmitted across a fiber optic cable into digital and finally analog format.

Each channel has a 200 kHz sampling rate and the system can be wave division multiplexed on existing fiber optic systems.

For more information, contact **Daniel Talbot at T-Tech: 508-562-5820, FAX: 508-568-1219, or circle Reader Service 104.**

Studio amplifier

Crown International's macro-Reference amplifier has a 20 Bit digital range, multiple plug-in input configuration and is operable in bridged/mono or parallel/mono modes.

The amplifier's bandwidth is between 3 Hz and 100,000 Hz and its damping capabilities are in excess of 20,000 at 8 ohms.

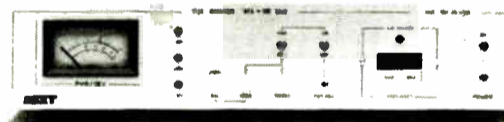
For more information, contact **Gerry Barclay at Crown: 219-294-8314, FAX: 219-294-8FAX, or circle Reader Service 45.**

World proven. And improved.

First, there was the original TEX-20 FM exciter from BEXT. It was bulletproof. It was priced right. It found its way into over two thousand FM stations around the world. Owners raved.

Next, this popular exciter was redesigned.

Front panel frequency selection, a BEXT advantage, is now accomplished in 10 kHz increments. Custom phase locking is provided for compatibility with external references. The TEX-20's internal layout is now completely modular, so testing and service are accomplished easily and quickly. The capacity to run on 24 volt DC is added. Main operating parameters are brought out to the back panel for remote control, including remote raising and lowering of output power. Specifications are enhanced.



Now, stations have found the TEX-20 "flawless" and "perfect in every way" (we're not

making this up). Nearly three thousand are in the field, in most cases with BEXT amplifiers at the output. More and more FM's are finding that they don't need to spend more to get more reliability, features, or performance from their transmitters.

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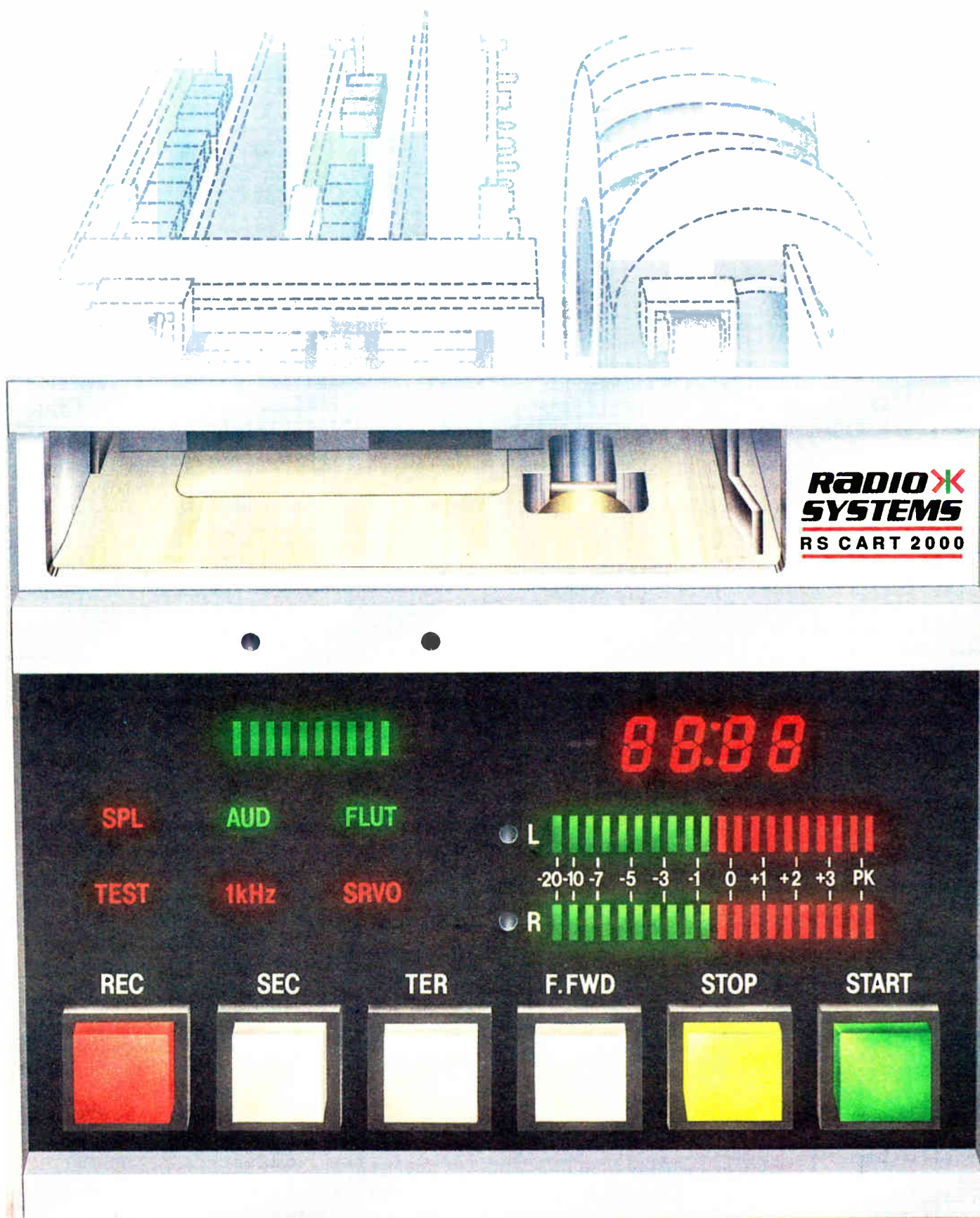
Next, build it to last. That means long life heads, 1/2" thick deck plate, direct drive Nidec motor, massive toroidal power supply, newly designed positive cart hold-down and guidance systems, and precision head-block assembly.

Finally, distinguish it with features no other unit has. The RS-2000 is the first cart machine to offer flutter correction, splice finder, and timer on all models.

But features aren't important if the engineering isn't top-notch. The RS-2000 was created by industry-renowned design engineer Mike Sirkis. So this "new" machine carries more than a decade of cart machine experience.

One last note: since the RS-2000 is built, sold and supported exclusively by Radio Systems, it carries one more trademark—**VALUE**. Every RS-2000 model is very affordable.

Call toll-free today for details.



KIOI Switches to Continental

by John Buckham, President
John Buckham Consulting Svcs

Belmont CA When we were replacing the KIOI transmitters, we went to the NAB spring show in Atlanta to look over the offerings. After three days, we decided to purchase two new 35 kW Continental 816R-5B transmitters. I think it was the right choice.

I'm no stranger to Continental. As a contract engineer, I see quite a few broadcast transmitters; some of the most trouble-free transmitters I maintain come from Continental. When I need to order parts I always find Continental has them in stock or can make them for you quickly. What's more, the field service department is fantastic.

Straightforward installation

Installation was extremely straightforward, with clear instructions to guide us along. Inspection and installation took us only six hours from start to finish, thanks to a built-in harmonic filter and nicely placed terminal strips.

The 816R-5B sports features such as a

solid state IPA and power control modules, VSWR foldback, PA tube filament regulation, automatic power failure restart and a full tally display of 24 indicators. The cabinet is pressurized by a large blower which has a filtered source so the inside of the transmitter will remain clean if the unit sits in a dusty environment.

USER REPORT

Both our transmitters were equipped with Continental's Transtat control and monitoring system. This is a computer that replaces the control panel; it looks just the same, except for an extra indicator and RS-232 connector on the back.

The Transtat not only monitors all the voltages in the transmitter, like the filament and plate voltage and current, but also monitors such items as PA exhaust temperature and line voltage. It will then log these values and store them at a

preselected interval, or you can send them out to a printer.

In addition to its logging duties, Transtat can also control the transmitter much like a conventional remote control. We ordered 9600 baud data line down to the studio so the operator could use the Transtat for both purposes. The Transtat also has a 2400 baud dial-up modem so you can check on the transmitter from home with your PC.

Easy start-up

Start-up was a snap. The transmitters are tested at the factory at your TPO, line voltage and transformer configuration. I also noticed that 25 hours had elapsed on the filament hour meter—they had let both transmitters run for a day before they shipped them to us. A nice touch, to say the least.

We patched the number one transmitter into the load, hit the filament "on" switch and nothing happened. Only one light was glowing on the annunciator panel. It was clear we had to reverse two of the phases. We did and the blowers came on.

The rig is equipped with a phase loss/reversal lockout relay. After 30 seconds the "ready" tally came on and we were ready to switch on the plates. A quick press of the button, and the power smoothly ramped up to 34 kW—our licensed TPO—without a hitch.

It worked perfectly out of the box! A quick check of all the factory test data showed that everything was as it had been at the factory in Dallas. I couldn't ask for a smoother start-up.

When I need to order parts I always find Continental has them in stock . . .

With the Continental 802A exciter, the transmitter met the published specs with room to spare. The synchronous AM noise was an incredibly low -55 dB.

The number two transmitter went in as easily as the first, with no surprises. Both transmitters have been running main/alternate main now since June with no serious problems to report.

With all the refinements Continental has made in these transmitters, they are every bit as high performance as the competition's units, while retaining the time tested standards of the 816 family of transmitters.

♦ ♦ ♦

Editor's note: For more information on the 816 series, contact Steve Claterbaugh at Continental: 214-381-7161, FAX: 214-381-4949, or circle Reader Service 151.

CCA Key to Start-Up

(continued from page 35)

The transmitter is operated by remote and is controlled by a Gentner VRC 2000. Interconnection between the transmitter and the remote control was easily accessible from behind the meter panel.

The only things I do not like about this transmitter are that the upside-down IPA tube is difficult to install and CCA no longer provides a tube puller for the PA tube.

I have had good luck in the past with CCA transmitters and expect it to continue with this one. I will

have no problem in leaving CCA on my transmitter consideration list when I am faced with recommending a transmitter for future purchases.

♦ ♦ ♦

Editor's note: Mark Schmucker is CE for WQHL-AM/FM, Live Oak, FL. He is the contract engineer for WQLC-FM, Lake City. Contact him at 904-362-5810.

For more information on CCA transmitters, contact Ron Baker at CCA: 404-964-3530, FAX: 404-964-2222, or circle Reader Service 137.

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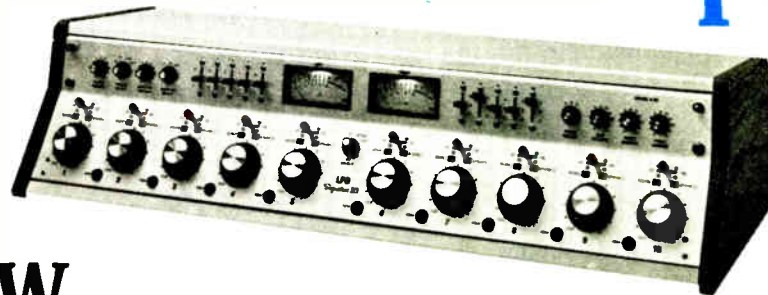
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Chances are, it's all of the above. But whatever the reasons, leading stations and engineers across the country demand Signature III's "unstoppable" performance. In fact, they've made it one of the most popular consoles ever built. If you've been spending too much time inside your console lately, contact your broadcast equipment dealer or call LPB for full information and specifications at (215) 644-1123.

LPB Signature III audio consoles are available in 6,8,10 and 12 channel stereo and 6,8 and 10 channel mono configurations.

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Altronic Load Used in Testing

by Richard Garrett, Spvsr Bcast Test
Continental Electronics

Dallas TX Dummy loads are used daily in the test facility at Continental Electronics Corp. in the testing of AM, FM and SW transmitters. Our requirements for loads depend on the output power of the transmitters being tested. We were excited, therefore, to try the 35 kW air-cooled load from Altronic Research.

The air-cooled load, Model 6735, is designed to operate from DC to 240 MHz with a VSWR of 1.15:1 maximum; it is perfect for the application of testing broadcast transmitters in the 10 to 35 kW

power level.

The load, available in 115 V or 230 V models, is designed using 24 non-

USER REPORT

reactive resistors (300 ohms each) and is cooled by a centrifugal blower. The blower pulls air from floor level up through a plenum that encloses the resistor assembly. Air is then channeled down through the resistor assembly and out a discharge vent.

This arrangement results in extremely quiet operation. In fact, some transmitters may create more blower noise than does this load.

The output vent has a removable grill so that a duct may be installed to allow moving the hot air outside. This allows efficient mixing of load and transmitter air exhaust.

External characteristics

The outside of the load has a main power switch, an overheat light, a blower "on" light, AC input connector, a ground terminal, and an interlock terminal strip. As the instruction book indicates, these can be grouped into two categories or control circuits. Both circuits are supplied power via a 15 A circuit breaker.

In the blower control circuit, power is supplied to a blower relay through the front panel power "on" switch or through one of three thermal switches in parallel with the power on switch. The thermal switches activate at approximately 120° F. Upon activation, the blower relay supplies power to the motor and blower on lamp.

The second circuit provides interlock contacts for the user. This circuit consist of two thermal switches in series with the interlock relay. These thermal switches open at approximately 260° F. Because the blower on thermal switches will cycle the blower on when required, the interlock provides a closed pair of contacts whenever power is applied to the load.

... some transmitters may create more blower noise than does this load.

During the more than twelve months we have had the load, service requirements have been zero. Maintenance of the load as recommended by Altronic Re-

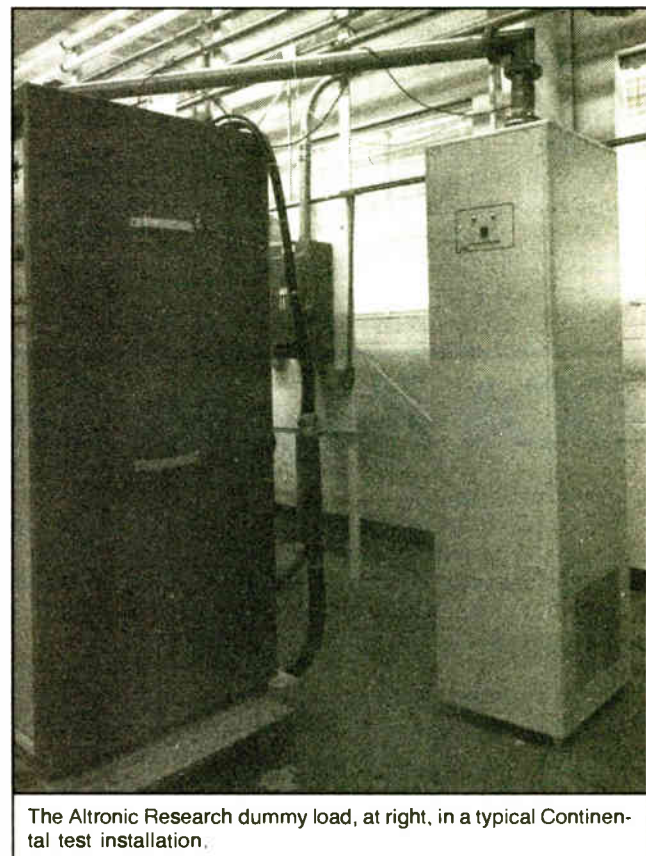
search consists of periodic cleaning of the blower and motor assembly with a vacuum cleaner. Also, periodic lubrication of the motor is recommended depending on the amount of service it provides.

Replacement of the resistors in the RF circuit is an easy task. All panels are removable via Torx head screws. Once the outside panel is removed, the inside panel must be removed to expose the resistor bank.

Flawless operation

In conclusion, we have used the Altronic load for over a year, and during that time have experienced no failures. Indeed, the load operated flawlessly even when temperatures were over 100° F in our test facility.

The most enjoyable parts of using this load are its extremely quiet operation and its stable VSWR under power. In ad-



The Altronic Research dummy load, at right, in a typical Continental test installation.

dition, the load is completely enclosed with solid panels that provide important safety protection from RF.

If it ever becomes necessary to replace any resistors, the easy access to the resistor bank will be a big plus. The instruction book is well written and provides ample information needed in the operation and maintenance of this load. We have found the Altronic Model 6735 RF load to be a positive addition to our test facility.

■ ■ ■

Editor's note: For more information on the Model 6735, or other Altronic dummy loads, contact Doug Starkey at Altronic Research: 501-449-4093, FAX: 501-449-4091, or circle Reader Service 73.

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BE's M/A Minimizes Downtime

by Bill Harland, Mgr Dom Sls, and Russ Erickson, Mgr RF Products Broadcast Electronics

Quincy IL As FM radio stations become more profitable, lost revenue from any time off the air has become unacceptable. The solution of building new FM transmitter installations featuring completely redundant transmitters with automatic standby activation is becoming more common. The problem is that the time needed to design and build such a system is generally more than a typical station engineering staff has available.

To provide a solution to this problem, Broadcast Electronics designed Main/Alternate Main (M/A) FM transmitter systems as "standard" products.

Complete dual-combined FM transmitter systems have been common for many years in situations where 10 kW or more transmitter output power was required, but a factory delivered system that provides 100% full power standby capability has not been available except as an expensive custom alteration.

Wide range of levels

Broadcast Electronics has standard M/A FM transmitters available at all power levels from 100 W to 38.5 kW. These systems include two transmitters of the same model, a motorized coax switch, a center

control cabinet housing the transmitter/switch controller, and all required RF plumbing and control wiring.

TECHNOLOGY UPDATE

BE can also add to the standard system options such as: manual RF bypass patching, switching for two antennas, in-line RF wattmeters, system RF loads, probes, couplers, etc.

If failure of the transmitter on the air occurs, automatic change-over is controlled by a Broadcast Electronics FA-2 transmitter/output switch controller. This unit is designed for direct connection to (and control of) Broadcast Electronics FM transmitters and all popular motorized coax switches.

The FA-2 provides automatic activation of the standby transmitter if the on-air transmitter's power output falls below a user adjustable threshold for a designated period of time. It includes an alarm closure to inform the operator that the transmitter change-over has occurred.

The FA-2 is equipped with latching relays to provide "memory" of which of the transmitters was on the air, in the event of an AC power failure. If the transmitter site loses AC power, the

transmitter that was on the air at the time the power failed automatically returns to air when AC power is restored.

Installation made simple

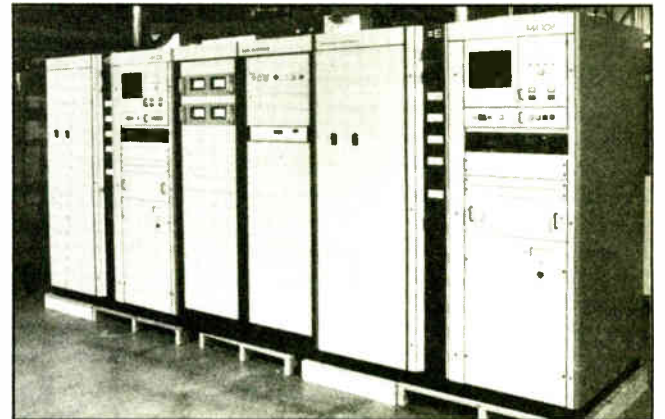
The most significant advantage of Broadcast Electronics' M/A transmitter system is installation time once the system has been delivered to the customer's location. This is because the entire system RF plumbing and control wiring is laid out and pre-cut as a part of the final assembly, prior to final test.

When the system is received at the customer's transmitter site, there is no measuring or cutting of transmission line or installation of connectors or spade lugs on control wires required. The user simply puts the transmitters and control racks in place, installs the pre-cut rigid line and connects the pre-cut control wiring.

Since the M/A was tested as a system, not only have the transmitters had a complete final test, but so have all the control wiring, motorized coax switches

and the automatic change-over controller.

Because the system has been assembled at our factory, it includes all the needed rigid transmission line. The customer receives not only the benefit of saving installation time, but also the time spent planning, specifying and purchas-



A BE FM-10B M/A, recently delivered to WYNY, includes an optional second center cabinet, Bird RF Wattmeters and a Burk Technology ARC-16 remote control.

ing the smaller components required for the new transmitter system.

■ ■ ■

Editor's note: For more information on Main/Alternate Main FM transmitters, contact Russ Erickson or Bill Harland at Broadcast Electronics: 217-224-9600, FAX: 217-224-9607, or circle Reader Service 12.

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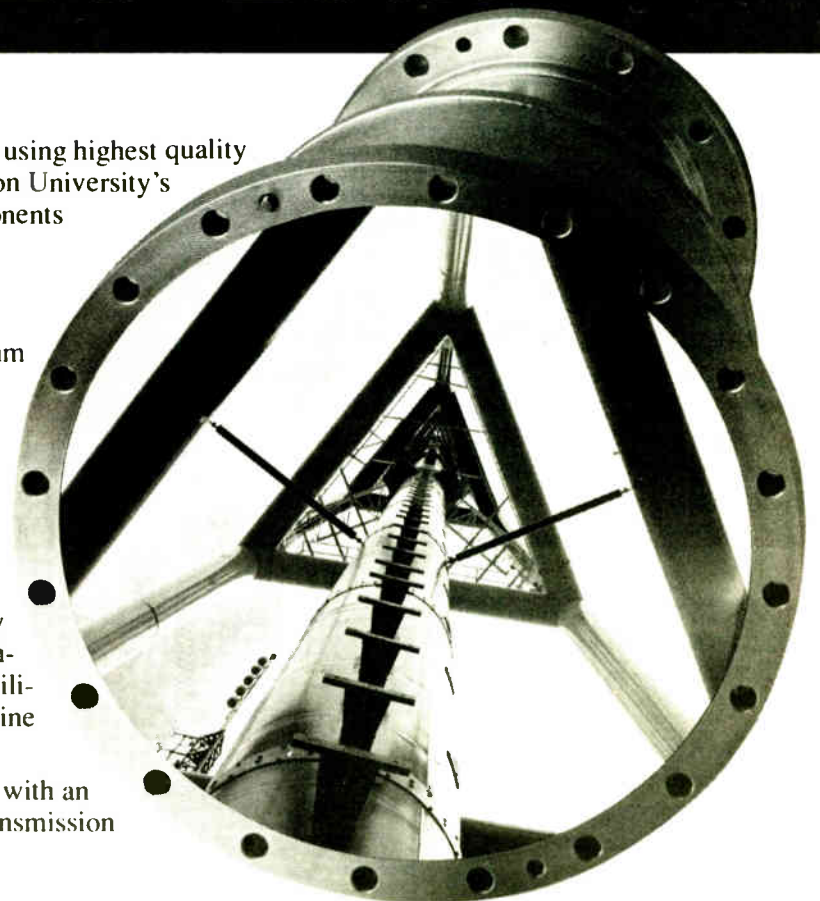
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QEI Offers Power Supply Option

With FMQ-20000B/30000B, Broadcasters Can Choose Between Single and Three Phase Supply Design

by Jeff Detweiler, Dom Sls Mgr
QEI Corp.

Williamstown NJ "If we don't have it . . . you don't need it!" That's how most transmitter manufacturers used to treat the idea of a high power single phase transmitter. They overlooked the possibility that Class "A" facilities might someday upgrade their plant and be confronted with the cost or inability of the power utility to provide three phase power.

Such stations often installed rotary phase converters to generate three phase for the new transmitter. But this rotary converter approach added complexity and another piece of equipment to maintain. There had to be a better solution to the problem.

Many transmitter companies had single phase designs. But because the tetrode designs of many manufacturers were prone to having the plate voltage soar when exciter drive was lost, many a rectifier stack was sacrificed in a plume of smoke and fire.

It was this inherent problem of mixing tetrodes and single phase that led QEI to design its high power transmitters

around a triode in a grounded grid configuration.

If you measure power in and RF power output, the overall efficiency between a tetrode and a triode transmitter are within 1% to 2% of each other. Triodes typically are less expensive, and rarely foul up catastrophically like their tetrode counterparts. Add in the inherent stability, elimination of tube neutralization, and greater internal component spacing, and you have a rugged tube with a predictable characteristic.

TECHNOLOGY UPDATE

For those concerned with synchronous AM noise, the grounded grid triode is the only design to get numbers approaching -60 dB!

Triode advantage

What makes the triode so conducive to single phase operation? Obviously, the tube doesn't care how it gets the DC voltage. The problem is filtering the DC to the degree required for

transmitter operation. It requires the use of a two-section choke input filter.

However, to keep the inductance of the input choke to a realistic value, a relatively large minimum current must be maintained. Should the current drop below the critical value, the filter will act as a capacitor input filter and the DC voltage will rise to the peak value of the applied AC (approximately 150% of normal). With a tetrode design this happens when RF drive is removed, as could happen with a momentary power glitch or an exciter or IPA fault.

The use of a bleeder resistor to maintain this current would waste large amounts of power. Switching the bleeder in and out with RF drive would save power, but is complex and expensive to accomplish.

Fortunately, the zero bias triode accomplishes the switched bleeder trick automatically. With no RF drive, the idling current is sufficient to allow an input choke of practical size, and as RF drive is applied, the plate current makes RF power instead of heat.

A breed apart

This design concept resulted in the QEI FMQ-20000B/30000B, the first high power FM transmitters to offer a single phase and a three phase design. Beside having a power supply that sets the FMQ-20000B/30000B above the others, QEI has incorporated our proven "lump constant" PA circuit around the grounded grid triode. It has no trouble-prone sliding contacts, and no conventional plate blocker.

Driving the PA are QEI's own 600 W solid state IPA modules. In addition to

modular IPAs, the FMQ-20000B/30000B have redundant modular power supplies. This design gives each module its own supply, adding to the ease of maintenance.

The entire package including power supply is housed in two 24"x76"x34" cabinets. Through the use of hinged front panels and full rear doors, every component is easily and safely accessible.

With a free spares kit, free on-site



QEI's FMQ-20000B/30000B transmitters employ modular solid state IPA design.

check out, a 15,000 hour tube warranty, and the option of having the single or three phase supply you want at no extra cost, FMQ-20000B/30000B really make QEI stand for Quality, Engineering and Innovation.

Editor's note: For more information contact Jeff Detweiler, at QEI Corp.: 609-728-2020, FAX: 609-629-1751, or circle Reader Service 101.

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Sidekick WYNY's SCA Solution

by Jim Huste, CE
WYNY

New York NY Is your station going to try to pick up some extra money by selling its unused SCA space? More and more services are looking for an SCA to

USER REPORT

carry their programming—foreign language broadcasting, digital paging and background/foreground music—to name but a few.

It's easy money, really. It's invisible to your main audience and can add thousands of dollars a week to the station's bottom line. If you haven't been asked to install SCA equipment yet, you will be, eventually.

There are many SCA generators currently on the market and they all work

well at generating the subcarrier to be mixed with your main program. However, not all SCA generators incorporate critical features that will make your life easier. Most of the time the company wanting the SCA will supply the programming to you on a telephone wire or a satellite dish and will also supply the SCA generator.

Not all gravy

So there you are, out at the transmitter hooking this stuff together. Nothing could be easier: You get it on the air and, well . . . the main channel program is chattering in the background, especially during those modulation peaks with cymbals and drums. The customer's not happy and you've got to fix it.

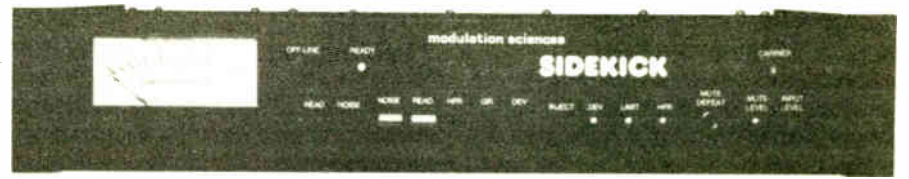
You try hooking up an old CBS Labs Volumax to up the levels; no help. To get it louder would mean to overmodulate or overdeviate the SCA. Nope, can't do that.

The SCA instruction book says try retuning the transmitter. So you've twisted the knobs all over the place, it still sounds bad and your transmitter efficiency is down to 47%. There must be a better way.

pass exactly in the middle of your operating frequency.

That in itself is a book's worth of discussion. But with the Sidekick you've got everything you need to perform this tuning procedure simply. Eric Small and his buddies have included a wideband noise source and an AM noise meter in the Sidekick to facilitate this type of tuning.

Inject the wideband noise into the ex-



Modulation Sciences' Sidekick simplifies SCA operation at WYNY.

There is! Get a Modulation Sciences Sidekick SCA generator and throw out everything else. The Sidekick's got a preemphasized limiter so you can crank up the volume without over deviating the preemphasized high end. You'll be able to pick up several dBs of loudness this way, helping you to get further away from that dreaded crosstalk noise floor.

Tuning made simple

Speaking of crosstalk, that's why you were trying to retune the transmitter: to reduce the crosstalk by reducing the AM synchronous noise. Which is another way of saying that you are trying to center the transmitter's band-

citer in place of the composite audio and hook the Sidekick's AM noise meter into a convenient RF sample port, then tune the transmitter for a null on the Sidekick's meter.

You've just tuned the transmitter for minimum AM synchronous noise and crosstalk. Now you've got the best SCA performance in town and a pat on the back from the SCA people and the GM . . . not a bad day's work.

♦ ♦ ♦

Editor's note: Jim Huste can be reached at WYNY: 212-237-2561. For more information on the Sidekick SCA generator, contact Eric Small at Modulation Sciences: 718-625-7333, FAX: 718-260-8286, or circle Reader Service 117.

WMXR Selects Bext

by Rob Wolf, GM
WMXR

Woodstock VT Our station was pieced together in the spring of 1989 with a mix of both new and used equipment. We anticipated replacing much of

its remote access. The half-mile hike to a ridge overlooking the Connecticut River required as maintenance-free a facility as possible while remaining fiscally conservative.

The transmitter, an old ITA model refitted with solid state power supplies, uses composite STLs, a new remote control and 2-bay Jampro antenna coupled with an over-built tower to withstand additional services. The exciter is a Bext PTX 20.

Impressive performance

The performance of the Bext exciter has been impressive. In a technical and financial environment that promotes new and expensive, the quality and

(continued on page 44)

USER REPORT

the original equipment in phases after the first three years, so we felt we had an ability to compromise with used equipment.

The transmitter facility required greater attention than the studios due to

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-- Ron Frillman, Manager, Radio RF Sales, Harris Broadcast Div.



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Bring your station into the 90's with CAT-LINK—the digital STL/TSL.

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Jeff Andrew, WGCI-FM, Chicago

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

Paul Christensen, WIVY-FM, Jacksonville, FL

"CAT-LINK makes money for us, and it improves the sound of the station."

Mike Callaghan, KHS-FM, Los Angeles CA

"CAT-LINK has held up through extreme heat, a hostile RF environment and nasty summer lightning storms."

Dick Byrd, WZGC-FM, Atlanta GA

Two-way multi-channel communications

CAT-LINK digitizes the entire composite signal with no data compression, so you can run the stereo generator and processing at the studio, where they really belong. At the same time, CAT-LINK sends and receives up to four customized auxiliary channels with no crosstalk—SCAs, control channels, voice communications, RS232 data, AM audio, transmitter readings and satellite or remote program feeds. What's more, CAT-LINK gives you extra capabilities like transmitter building surveillance via closed circuit TV and an analog telemetry channel.

Transparent digital transmission

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

No audible delays

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

Flexible signal path options

• 23 GHz

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

• DS1 (T1) Data Line

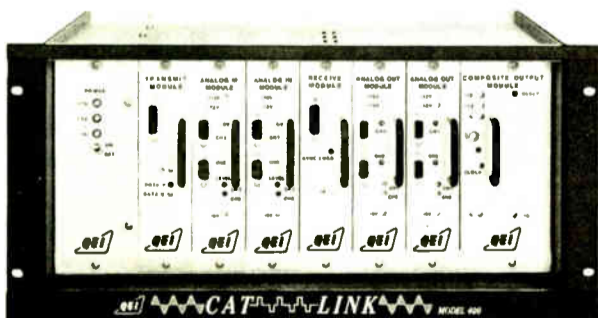
CAT-LINK is cutting phone bills for stations that don't have a clear microwave path. With CAT-LINK, a single bidirectional DS1 line replaces multiple Class A telco lines, providing multi-channel STL and TSL over the same link. Already available virtually anywhere, DS1 service is getting cheaper every day.

• Fiber Optic

CAT-LINK and its optional fiber optic modem provide direct connection to discrete fiber.

• Twisted Pair

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Circle 31 On Reader Service Card

Bext Offers Quality Audio on a Budget

(continued from page 43)
cost-effectiveness of Bext deserves attention.

With the anticipated replacement of the entire system with "new" sometime in the future, the Bext will likely be replaced—with another Bext unit. Not just because it is significantly less expensive than other units on the market, but mainly due to its proven reliability and the way it sounds.

Everything should operate right out of the box, right? Wrong. We had a series of malfunctioning new equipment and the Bext was the exception. However, perhaps more than any other factor, the Bext exciter sounds good—better, in my judgment, than other "famous brand" exciters used by the other stations in the market.

The model we currently have on the air is an older unit no longer in production and we understand the current models offer better specifications. Check with Bext for the subtle details. Even intermod specs are very good.

Our PTX 20 accepts one composite, two mono and three SCA inputs easily, with internally adjustable gains for each as well as an overall deviation adjustment on the front panel. Setup was a breeze.

Front panel metering

Perhaps the most helpful detail of the PTX 20 is the front panel metering with three frequently used functions: output power, VSWR and modulation. There's even an accurate peak indicator lamp that helps verify our entire system. Both the meter and peak indicator were proven accurate during our initial setup and proof.

The PTX model uses front panel thumbwheel switches to set up the frequency. Just set it and go. A harmonic filter on the output has helped our ancient transmitter operate cleanly and in a pinch the exciter works well as a 30 W backup transmitter. Our unit feeds a grid excited 250B IPA and the front panel

metering makes it easy to tune the tank circuit for minimum VSWR.

The internal base frequency in the frequency synthesizer can be tapped and fed to another Bext exciter for synchronous operation. Our model was not initially designed with this feature in mind and will require more extensive modification

The unit has never failed, and worked right out of the box.

than I would care to make in the field. However, the newer models have been developed with this feature and make it easier for synchronous booster operation. At least the frequency will match, if not the overall deviation.

Simple and reliable

The internal workings of the Bext exciter are simple. Since our unit has required no servicing and has been the most reliable piece of equipment we bought, our only internal exploration was for curiosity. The unit has never failed, and worked right out of the box. Even the physical construction lends credibility: It's solid, rugged, looks good, fits into the rack well, etc.

My only criticism is about the front panel meter. Ours "sticks" somewhat in colder weather; and if only it were slightly larger...

Why do I recommend Bext? With so much pressure on a broadcaster today, I won't waste time and money. I'd buy a Bext again without hesitation.

Editor's note: Since this writing, the PTX-20 has been renamed the PTX-30. For more information, contact Anne De Fazio at Bext: 619-239-8462, FAX: 619-239-8474, or circle Reader Service 3.

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KKIQ Updates with TFT Reciter

by John Buckham, President
John Buckham Consulting Svcs

Belmont CA KKIQ in Livermore, CA was looking for a replacement for our aging STL system. A number of options existed. After examining all the conventional STL systems available, I discovered a new product by the Santa Clara firm, TFT.

TFT's new Reciter combines a high performance STL (950 MHz band) receiver and an exciter (88-108 MHz) in one compact package. The receiver demodulates the RF signal down to an IF frequency, rather than baseband audio. Because there are fewer electronic circuits for the signal to pass through, distortion figures are improved.

The unit's exciter boasts a powerful 50

W, with full harmonic filtering, so the Reciter could be employed as a stand-alone transmitter. Because it has only one FMO—in the STL transmitter, not the exciter—the system's performance is limited only by the quality of the STL transmitter and RF path of the system.

The system

The front panel of the Reciter has a multi-function meter for modulation level, output power, receive signal level, supply voltages and internal RF levels. In addition to the analog meter there is a peak responding LED bargraph modulation display and an output power adjustment. An array of push-button switches for the meter functions, IF band width and RF sensitivity finishes off the control lineup on the front panel.

The STL transmitter we used was TFT's model 8300. This unit is a tried and true high power (14 W) unit with a number of noteworthy technical features, such as a directly generated RF carrier.

USER REPORT

The Reciter will work with any STL transmitter. The device uses a spectrum efficient modulation of 37.5 kHz rather than the older standard of 50 kHz, so the deviation of older STL transmitters will need to be turned down a bit to produce the proper modulation on your main channel.

Another feature of the Reciter is the

availability of options that synchronize both modulation and frequency for booster use. As far as I know this is the only system to offer these options. I have experience with the Reciter in a booster application, and the system works well.

Easy installation

Installation was a snap. The Reciter was installed in the rack at the transmitter, the antenna from the STL antenna was connected to the type "N" RF input connector and the RF output BNC jack of the Reciter was connected to the input of the transmitter. The RF output level was adjusted to provide proper drive for our transmitter.

The first improvement we noticed was dramatically improved stereo separation and better definition in the program

(continued on page 46)

Buying Used Gear

by G.W. "Toby" Tobias, President
Armstrong Southwest

San Antonio TX Radio broadcasters are hearing the name Armstrong Transmitter Corporation more and more lately. Who are these people? Are they just another "used equipment" (junk) dealer? Not at all.

marketplace to provide the smaller market station access to the highest quality engineered transmitters available at a price they too could afford.

Everyone in broadcasting can probably share a used transmitter horror story. For many, though, that is the only practical source of equipment.

"What do we do? Do we gamble and buy used? With my luck, I'll end up spending as much to fix up the old one as it would cost for a new one." Well, you can choose a used equipment dealer "scientifically" and flip a coin, or you can rest easy and go to Armstrong Transmitter for a refurbished "pre-owned" unit.

Armstrong buys trade-ins from major transmitter manufacturers and from stations that may be upgrading. They are shipped to one of Armstrong's plants in Syracuse, San Antonio or Miami. Once sold, engineers examine the transmitter thoroughly, repairing or replacing parts or components as required.

The transmitter is then re-tuned to the

client's frequency, which includes replacing any frequency-determining components as required. Once the engineers determine that the transmitter is ready, the customer is contacted and strongly urged to come to the plant to witness and/or participate in the final testing.

The FM antennas are sub-contracted to a company that specializes in FM antennas and exotic antenna systems. Each bay is individually re-built and re-tuned to the client frequency. Once completed, the antennas are returned to our plant, completely reassembled and tuned and tested as a complete unit.

Every transmitter or FM antenna that leaves the plant is guaranteed to meet original manufacturer specifications as to power, modulation and frequency.

Editor's note: Toby Tobias is also president of Tobias & Co., Ltd. For more information on Armstrong's services, contact Bob White at Armstrong Transmitters: 315-488-1269, Toby Tobias at Armstrong Southwest: 512-599-0789, or Amalio Rodrigues at AR Import/Export Inc.: 305-471-1180. Or, circle Reader Service 98.

SPECIAL REPORT

Armstrong Transmitter Corporation is owned and operated by a young electronics engineer by the name of Sinan Mimarouglo. Quite a mouthful, huh? You may have spoken on the phone to him as "Bob White." He calls himself Bob White, not for some sinister reason but rather because people can't remember his name or even pronounce it.

They saw the need in the broadcast

HARRIS ALLIED
Radio World Bulletin Board

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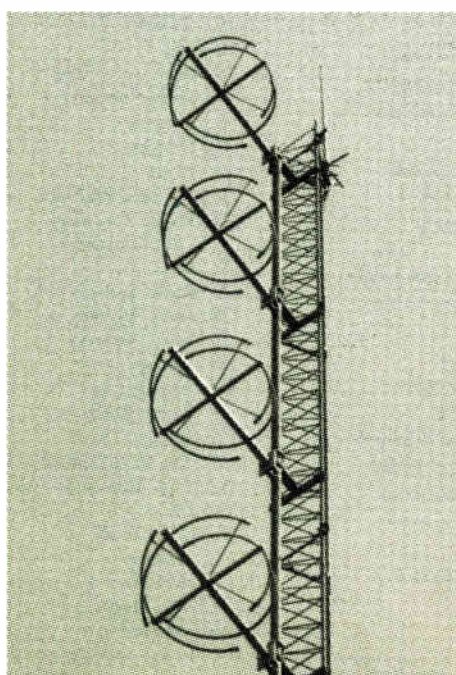
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Having Tubes Rebuilt

by John Sullivan, Co-owner Econco

Woodland CA Often Econco engineers are asked by customers, "What do you do to rebuild a tube?"

At Econco, all tubes sent for rebuilding are first routed to Incoming Test,

SPECIAL REPORT

where an analysis is made of the condition of the tube. Over the years, testing of all incoming tubes has allowed Econco to develop a detailed picture of what constitutes normal modes of failure for each tube type.

Incoming tubes that do not fit the normal pattern may result in a call from Econco's engineers to the customer to inquire about any abnormal circumstances associated with the sending of the tube to Econco. This often allows us to help a user solve an application problem which they were unaware existed.

After incoming testing, the tubes are routed to the Internals Department, where they are opened and broken down into their basic elements. Filaments are replaced, grid assemblies are repaired or replaced as required and cleaning of internal surfaces is completed.

Filaments are carburized, a process which causes the filament to emit sufficient electrons at the proper operating temperature. During normal operation, the carbon burns out of the filament, resulting in reduction of the electron emission to the point where normal output can no longer be achieved. Grids, on certain types, require surface processing to reduce "grid emission."

After reassembly, alignment and seal-

ing of the vacuum envelope, the tubes are vacuum processed. The vacuum pumping process can require from six to 30 or more hours, depending on tube size and the degree of gas evolution from interior elements.

Cleanup, plating and testing to new tube or greater specifications then leave the tube ready for return to a customer.

Econco has produced a booklet, *Tube Topics*, describing in more detail power tubes and their operation. We will be happy to send *Tube Topics* at no charge to any interested tube user.

Editor's note: For more information on Econco's services, contact John Sullivan at Econco: 916-662-7553, FAX: 916-666-7760, or circle Reader Service 144.

TFT Reciter

(continued from page 45)
material. Later that night I ran an audio proof.

With the old system total harmonic distortion was 1.1% at 400 Hz; with the new Reciter/8300 system the distortion dropped dramatically to 0.3%. The measurements were made directly from the transmitter with a TFT 883 modulation monitor. Stereo separation appeared to be a function of residual noise. Signal to noise ratio was better than 65 dB down from 100% modulation.

KKIQ has been quite pleased with the system and so far it has proven to be rock solid reliable. I would not hesitate to recommend the Reciter to any station who would like to update its STL and exciter system to this new technology.

Editor's note: For more information on the Reciter, contact Herb Didier at TFT: 408-727-7272, FAX: 408-727-5942, or circle Reader Service 65.

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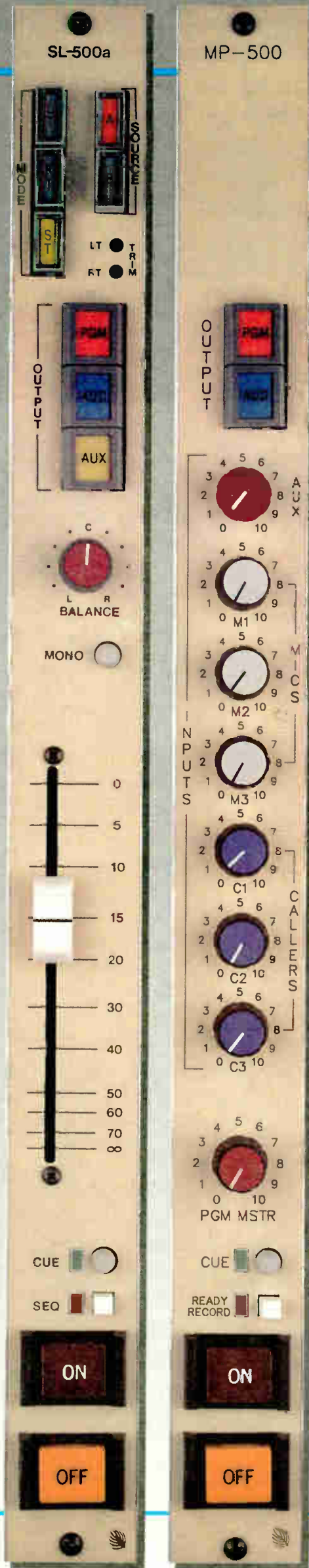
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Customize your A-500 Console with Wheatstone's powerful accessory modules! We've handled auto-sequencing, telephone call-ins, and intercom requirements. Our auto-sequencing line input will take the rush out of back-to-back carts. Our multiphone module can handle 3 callers, 3 mics and reel-to-reel machine control all at once. Our new 8-station intercom module will link up all your studios and talent positions...

AUTO-SEQUENCING: The SL-500as input module allows the DJ to automatically sequence through a pre-loaded bank of cart or CD machines. All audio and machine control functions are handled by the module's logic circuitry. When the first ON switch is pressed, that module's associated machine automatically starts to play; when it has finished the channel is turned OFF, the next programmed module is turned ON, and its machine starts to play. Dead air and missed spots can be a thing of the past with this sequence function.

TELEPHONE/TALK SHOW: The MP-500 multiphone module offers a totally new way of handling telephone talkshow functions. Operation is simple: when the announcer wishes to do a phone segment he simply activates the MP-500 module and all mute, level, combining, and machine control functions are handled automatically. The MP-500 permits conferencing between 3 callers and 3 microphones, and provides separate multitrack tape feeds for various mic/caller signal combinations, permitting simple track punch-ins to replace razor and tape edits. This module eliminates complicated announcer set-ups, miscalls, and feedback problems.

COMMUNICATIONS: The ICM-500 module is part of a completely integrated intercom system; a family of modules available for all Wheatstone broadcast and production consoles. It even includes a rackmount version for your equipment room or remote hook-ups. It allows direct communication between 8 locations in your facility. Your intercom needs are handled by simply plugging in this module set.

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Our new A-32EX is even better, with ample expansion room for additional inputs and a powerful family of accessory modules, including our new MP-32 talkshow module (that neatly interfaces multiple hybrids, tape recorders, announcer mics and studio-to-caller feeds), our ICM-32 six station intercom module (letting you communicate with other console locations and announce studios), and our SC-20 studio module (to provide comprehensive studio monitor, automatic muting, and talkback functions), plus multiple line selector and machine control modules, and a complete family of studio turret components.

The A-32EX console features modular construction, a fully regulated rackmount power supply, logic follow, full machine control and of course, an all-gold contact interface system. It has two mic channels and fourteen stereo line modules, each with A/B source select and Program/Audition bus assign, plus Cue switches on the line modules. Standard features include Program and Audition VU meters, digital timer, and a monitor module for control room and headphone functions. The console is also available in a smaller version (the A-20) with two mic channels and eight stereo line input modules.

The A-32EX is a perfect choice for stations planning an upgrade in signal quality and control room image. It's also a natural choice for the newsroom. So profit from Wheatstone's experience and reputation—call us today for immediate action!

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