

NTIA, Texar Alter AM Stereo

by David Hughes

Washington DC ... The National Telecommunications and Information Administration (NTIA), the arm of the Commerce Department that forms telecommunications policy for the Executive Branch, announced in late September that it had started its three-month study of the AM stereo situation in the US and around the world.

The NTIA's action comes just after Texar Inc. announced 26 September that it had formally filed its request for rulemaking asking that the FCC abandon its "marketplace" approach to AM stereo and select a standard. The Texar petition, which was announced in July, does not specify which system—C-QUAM or Kahn—should be selected.

The 75 page document said that a "quagmire" exists—"station owners and management are frozen in place for fear

of picking the wrong system."

Texar President Glen Clark said he has been personally presenting his petition to the Washington D.C. broadcasting community, including the NAB and the SBE.

NTIA Assistant Secretary for Communication and Information Alfred Sikes told RW that his organization has finished designing the study and has begun collecting data. He unveiled the study at the Radio '86 show, held 10-14 September in New Orleans.

"On a fundamental level there is so much confusion about AM stereo, so many claims," said Sikes. "By the end of 1986 our completed report will draw some conclusions about the situation."

However, Sikes would not say if the NTIA will come out in favor of a single AM stereo standard; he did maintain that it was probably too late for an FCC mandate.

He said a "strong marketing effort by

the industry" is needed to promote AM stereo. Sikes would not comment on which organizations, such as the NAB (broadcasters) or the EIA (receiver manufacturers), should be involved.

Tom Keller, head of the NAB Science and Technology Department, said that his organization is mounting a major campaign to push stations to switch to AM stereo, but it is not advocating which system they should select.

The NTIA study would determine, among other items, whether a "de facto standard" already exists in the US. It will also examine AM stereo use in other nations—such as Brazil, Canada, Japan and Australia; the latter has standardized using C-QUAM, and reports that 40% of its stations have converted, as opposed to only about 10% in the US. More than 300 US stations have selected the C-QUAM system, while the Kahn system is reportedly in use at about 80.

Sikes formerly headed a broadcast group that owned four radio properties in Missouri and Colorado, including AM stereo operations.

In other AM stereo news, General Motors, which manufactures Delco car receivers, said it has agreed to pay the New York State Attorney General's Office \$10,000 in costs in connection with alleged violations of the state's business laws.

The attorney general had been investigating whether the corporation adequately notified consumers that its Delco receivers received only C-QUAM broadcasts in stereo.

In a 16 July letter to Assistant Attorney General Robert Roth, GM Comptroller John Rhame said the corporation would also place a notice in future receiver advertising.

The notice reads: "Receives C-QUAM AM stereo broadcasts. Most AM stereo stations across the country broadcast in C-QUAM but some do not. Check with your local stations for compatibility in your area."

Rhame said GM's actions are "voluntary and do not constitute an admission or proof of a violation" of the law. He added that GM has not engaged in deceptive advertising practices and that Delco has, in the past, described its AM stereo units as being C-QUAM only.

Delco officials could not be reached for comment on the issue.

Delco can be reached at 317-451-7275. For more information on the NTIA study, contact Sikes at 202-377-1840. For more information on the Texar petition, see the 1 November issue of RW, or contact the firm at 412-856-4276.

FMX Fate Uncertain in CBS Move

Stamford CT ... Serious questions remain to be answered about the future of the FMX stereo transmission system after it was learned in mid-September that CBS, in a cost-cutting move, planned to shut down its 28-year-old Stamford, CT-based technology center.

The corporate bombshell came just as Orban Associates said it has received "mixed" results on recent on-air tests on FMX, creating industry jitters about the viability of the CBS Technology Center/NAB developed system.

CBS officials indicated the technology center's approximately 100 employees would either be laid off or transferred to other CBS divisions. The facility reportedly had an annual budget of \$8 million.

Emil Torick, CBS's audio technology VP at the center and co-developer of the FMX system, could not be reached to comment on his future within CBS or the fate of FMX in the light of the network's action.

Jim Wood, president of Inovonics Inc., which plans to have its "X-tra" FMX generator on the market in late October or early November, said he is "hoping (the system) will stay alive."

He said the CBS officials he has talked with were "very disappointed" with the decision to close the technology center, which is also working on a wide range of recording and television improvements.

NAB could step in

Some industry officials, Wood added, are hoping that the NAB can continue FMX development.

NAB Science and Technology VP Tom Keller, who with Torick designed the FMX system, said that there is a legal contract with CBS that "would cover a situation such as this." He added that if CBS discontinues its FMX work, NAB could pick it up.

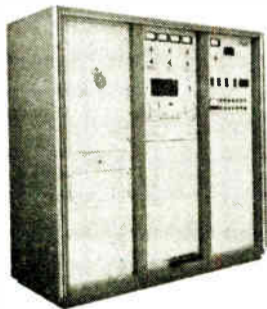
"We're still not 100% sure about the

details, but if they (CBS) don't pursue it, we will," Keller said. "That is part of the agreement. I just spent an hour with our legal department."

There was some indication that the CBS decision may delay FMX research, he maintained. "They were just about to

(continued on page 8)

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Regulatory News

KOB Gets Synchronous Xmtr CP

by David Hughes

Washington DC ... The FCC has approved its second recent construction permit for an experimental AM synchronous transmitter.

In late August, KOB, Albuquerque, NM, got approval from the Commission to construct a 230 W synchronous transmitter at Santa Fe, 65 miles northeast of its main transmitter.

Because KOB, a 50 kW operation on 770 kHz, must protect co-channel Class I-A WABC, New York, it was having difficulty serving Santa Fe at night, according to GM Arthur Schreiber.

At RW's press time, KOB CE Gary Diamond reported that he was in the process of setting up the link to Santa Fe. He said the synchronous transmitter could be on line by mid-October.

The Commission issued its first recent permit for a synchronous transmitter in January to KROL, a new station licensed

to Laughlin, NV. Synchronous transmitters relay a station's signal on the same frequency as its main transmitter in order to fill gaps in coverage area.

According to Gary Thayer, a staff engineer with the FCC's AM Branch, six additional synchronous applications are pending Commission approval. They are: KGNW, Seattle, WA; KIPA, Hilo, HI; WJNO, W. Palm Beach, FL; KNEW, Oakland, CA; KNUZ, Houston, TX, and WORC, Worcester, MA.

KROL fired up its main transmitter and its synchronous operation in late August, according to Tom Letizia, station president. "It's going pretty good," he said.

The station is still busy fine tuning the system, Letizia added.

KROL's main transmitter, which operates with 10 kW during the daytime (it had been operating temporarily with 2 kW) and 1 kW nights on 870 kHz, is located 90 miles south of the synchronous

facility, in Henderson, which is near Las Vegas. The synchronous transmitter puts out 300 W days and 250 W nights.

Letizia said the night power for the slave transmitter will soon be upgraded to its authorized maximum of 500 W at night. He added that, because of poor soil conductivity, he would like to increase the synchronous transmitter's daytime power to 700 W to improve coverage in the Las Vegas market.

The two signals do interfere with each other and create "an unusual sound," but that area is confined to a largely unpopulated desert area between Laughlin and Las Vegas, he said. "It has not been a problem."

The station is in the process of filing "extensive reports" to the FCC on its experiment. "We're the guinea pig," Letizia said. "We're helping to create the rules."

(continued on page 9)

FCC Clips

Mexican Agreement Text

The text of the recently signed US/Mexico broadcasting agreement has been made available to the public, the FCC said.

Among other things, the bilateral treaty allows daytimers on Mexican clear channels to add nighttime operations.

Copies of the agreement, which was signed 28 August, can be viewed in the FCC's Mass Media Bureau Public Reference Room (Room 239, 1919 M Street, NW, Washington DC) or they can be purchased from International Transcription Services, which can be contacted at 202-857-3800.

The document consists of the agreement itself and two annexes.

It also features a US/Mexico-developed procedure to be used in the verification of the stations included in the plan.

According to the Commission, the verification process will proceed frequency-by-frequency during a two-year period.

As the various frequencies are completed, the FCC will issue a Notice of Proposed Rule Making and a list of stations on the affected frequencies.

The agreement replaces the previous 1968 agreement with Mexico. For more details, see the 1 October issue of RW or contact Jonathan David at the FCC: 202-632-6955.

Policy Upheld

The FCC reports that a federal appellate court in September upheld the Commission's 18 January 1985 action adopting a policy statement and order eliminating six broadcast policies it found to be no longer warranted or necessary.

The Telecommunications Research and Action Center (TRAC) sought review of the action from the US Court of Appeals claiming that it was not in the public interest.

The policies in question pertained to licensee distortion of audience ratings, conflicts of interest and sports announcer selections, promotions of nonbroadcast business of a station and use of a station for personal advantage in other business activities.

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

Annual Report

The FCC's 51st Annual Report, for fiscal year 1985, is now available from the US Government Printing Office (GPO).

The price is \$4.25 per copy. Stock number is 004-000-00449-3.

To order the document call 202-783-3238 or write: Superintendent of Documents, GPO, Washington DC 20402.

FCC Amends FM Rule

Washington DC ... The FCC will no longer require a showing of compelling need from FM stations requesting channel substitution, providing the filing windows are closed and the channel to be substituted "meets the applicable spacing requirements for all applied-for sites at the time the petition is filed."

In late August, the Commission said it addressed 23 "petitions for reconsideration and/or applications for review" of its statement that FM requests for substitution of allotments would require

a showing of either compelling need or FCC error.

The FCC maintained that its policy of having a compelling-need showing for channel substitutions "was necessary to prevent disruption and confusion."

The Commission also found, however, that the requirement no longer applied to omnibus allotments for which the filing windows were closed.

FCC Docket number is MM 84-231. For more information, contact Robert Hayne at the FCC: 202-634-6530.

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Group W AMs to Go C-QUAM

by David Hughes

Philadelphia PA . . . Group W/Westinghouse Broadcasting, which owns seven AM stations, including major 50 kW operations in New York, Philadelphia, Boston and Pittsburgh, recently confirmed that it plans to install C-QUAM AM stereo generators at all its stations by the end of 1986.

"We plan to make the switch by December 31," said E. Glynn Walden, engineering manager for Group W's AM stations and a member of the National Radio Systems Committee (NRSC), the joint NAB/Electronic Industries Association group that is spearheading the AM improvement movement.

Walden, who is based at KYW, Philadelphia, said he hoped the Group W action will be "a shot in the arm" for AM stereo.

Many in the industry have expressed concern at the lack of stations that have

switched to AM stereo during the past year. Broadcasters have said that the lack of a single US standard has resulted in low consumer awareness and interest in AM stereo.

Motorola's C-QUAM system, with 315 US stations, and the Kahn-Hazeltine ISB system, with about 80 stations, have been vying to be the industry standard. In the meantime, the percentage of US stations that have made the switch has leveled off at about the 10% level.

Walden said that, while Group W had "an understanding" that it would convert its stations to stereo for "quite some time," the decision to go ahead with the C-QUAM purchase was made this year.

Group W vowed in its comments on the FCC's much heralded AM improvement report, which was released in April, to upgrade its AM stations to stereo, he said.

The affected stations include four 50

kW operations—WINS, New York; KYW, Philadelphia; WBZ, Boston; and KDKA, Pittsburgh. The firm will also switch its lower-powered stations to C-QUAM stereo—5 kW KFNB, Los Angeles; 5 kW KEZW, Denver; and 1 kW KMEO, Phoenix.

The stations plan to heavily promote their switch to stereo, Walden added. "Broadcasters have to get the word out."

Unlike some CE's at clear channel stations that swear by the Kahn system, Walden said he is firmly behind the C-QUAM system.

One major complaint regarding the C-QUAM system involves the problem of platform motion, particularly on skywave signals reflected off the ionosphere. However, Walden said most skywave listeners, faced with signal fading, not to mention co-channel and adjacent channel degradations, listen in the narrowband mode anyway.

"What is stereo on a narrowband receiver, with a degraded signal?" he said.

"There is no real sincere stereo listening (with) skywave." Stations, he added, use skywave for "prestige, not Arbitrons."

Walden said the marketplace has already decided to select the C-QUAM system.

Even though the Group W AM stations are switching to stereo, few of them play music. WINS, KYW and KFNB are all-news stations, while KDKA and WBZ devote a substantial portion of their programming to both news and talk.

Walden said he is excited to see how AM stereo works with the news and talk formats. "We plan to immediately start airing stereo commercials and jingles," he said.

"We would like to air stereo actualities. However, there are no provisions yet for that. The cassette machines do not guarantee phase compatibility between the play and the record mode," Walden added.

He said that the development of portable digital audio tape recorders will solve that problem.

All of the Group W AM stations will also implement the recently developed NRSC pre- and deemphasis curves, he said. "Our CEs will be pretty busy. They won't be getting any sleep for quite a while."

For more information on Group W's plans, contact E. Glynn Walden at 215-238-4894.

Studer/Philips Sign

by Alex Zavistovich

Nashville TN . . . Studer of Switzerland and Philips of the Netherlands recently signed an agreement for joint CD systems research and development, formally establishing a venture which was initially announced at the NAB convention this spring.

Under the terms of the 8 July agreement, the new venture between Studer and Philips CD Systems AG will be an equal partnership and will be headquartered in Regensdorf, Switzerland.

According to Bruce Borgerson, spokesperson for Studer Revox America,

Inc., management of the new firm will be on an "equal-share basis." Willi Studer will serve as chairman of the board; Pieter Berkhout of Philips will be managing director.

Borgerson said that because the venture has only recently been legally established, no plans for new products have been made.

New systems developed as a result of the joint agreement would be manufactured abroad and marketed in the US through Studer Revox America, Inc., Borgerson said.

For more information, contact Studer Revox at 615-254-5651.

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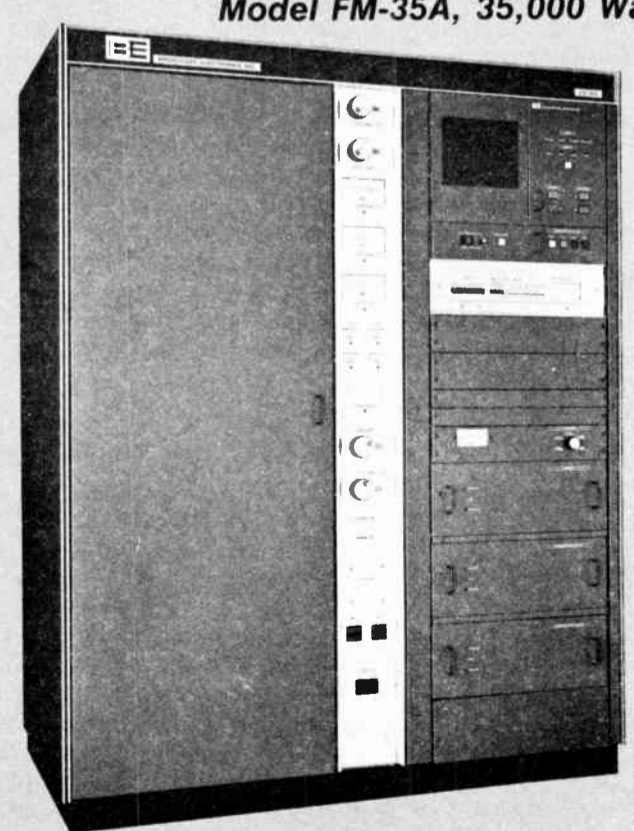


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AM Antennas Studied at IEEE

by Alex Zavistovich

Washington DC . . . This year's Institute of Electrical and Electronics Engineers (IEEE) Broadcast Symposium, held 18-19 September at the Hotel Washington, covered many radio broadcast engineering issues, including the control of noise in radio transmitters and a computer modeling of new reduced skywave AM antennas.

Other topics at the well-attended event included the presence of toxic substances in the broadcast environment and developments in broadcast standards.

In the opening session of the symposium, Jeffrey Steinkamp of Broadcast Electronics detailed problems arising from noise and vibration in broadcast transmitters.

Steinkamp pinpointed the transmitter blower motor as one of the chief sources of noise and vibration in transmitters. He said blower noise may result from mechanical failings or from the aerodynamic properties of the blower fan.

Blower vortex shedding, Steinkamp said, is related to the impeller tip velocity and accounts for 90% of blower noise.

Biby antenna study

In a subsequent presentation, R. W. Adler, of the Naval Postgraduate School, used the numerical electromagnetic code (NEC) to investigate the performance characteristics of a new design for an anti-skywave antenna (ASWA) by Richard Biby of Communications Engineering Services, Arlington, VA.

Biby's antenna is part of an NAB-sponsored project on AM antennas designed to increase/enhance groundwave and reduce skywave propagation.

The NEC, Adler explained, solves cur-

rent distribution on an antenna for a specified set of incident fields or drive voltages.

The ASWA, Adler said, was devised by Biby to reduce skywave radiation without a degradation of the groundwave signal. The antenna consists of a central monopole of 90-135°, encircled by a ring of 10° antennas located 5° from the monopole.

Ostensibly, Adler said, selection of amplitude and phase of current on the two antenna parts would allow a null to be placed in a given direction of the skywave.

To block radiation and prevent lessening of the groundwave signal, Biby's design suggests locating a fence or screen $\frac{1}{4}$ wavelength from the small antenna, Adler added.

According to Adler, calculations using numerical modeling indicated some discrepancies in Biby's reported results.

Modeling of the 90° antenna indicated lower signal, different impedance and lower current (therefore lower signal strength) than Biby had calculated, Adler said, although he added that he had not finally resolved whether the modeling results were correct or not.

Adler also concluded that the screen surrounding the antenna "doesn't seem to do any good," and that the next step in evaluating the antenna would be to calculate its performance over "real ground."

He agreed with Biby's conclusion that the antenna would not work over "perfect ground."

Prestholdt antenna study

Jim Breakall, with Lawrence Livermore Labs, used NEC modeling to test the performance over perfect ground of

the vertical-horizontal antenna designed by Ogden Prestholdt, with the engineering consulting firm A. D. Ring & Associates, Washington, DC.

Prestholdt's antenna is also part of the NAB's AM antenna project.

The Prestholdt antenna, Breakall said, was designed to place a null in the skywave elevation angle, providing interference protection while not affecting the groundwave, thereby preserving the coverage area.

Breakall concluded that sinusoidal test results showed the antenna to have a field reduction of "65% of the field of a single tower." He added that, using the NEC code, the actual reduction may be 51%.

Prestholdt's vertical-horizontal array, Breakall said, shows large field strengths at high angles, which might cause nighttime skywave interference in one's own coverage area.

He suggested that a reduction in skywave radiation might be achieved either by raising the horizontal element or by adding a second horizontal and phasing all three elements.

Broadcasting improvements

Michael Rau, staff engineer with the NAB, spoke to the group via a remote from Alaska, where he was attending an Alaskan Broadcasters Association meeting.

Rau said that the NAB's "Status of AM-FM Improvement Development Work," stressed his organization's commitment to maintaining the technological competition among land-based communications.

Rau said a number of measures have been taken in AM improvement, among them the electrical interference standards

set via the Electronic Industries Association and IEEE.

Other areas of improvement included research into broadcast interference stemming from overmodulation, transmitter antenna developments and receiver improvements, Rau said.

Rau discussed the draft interim voluntary national standard recently proposed and approved by the National Radio Systems Committee (NRSC), which suggested a 75 μ s transmitter preemphasis and corresponding receiver deemphasis.

During demonstrations of the NRSC system at the recent Radio '86 exhibit in New Orleans, Rau said, engineers were enthusiastic, while management adopted a "wait and see attitude."

The NRSC proposal also included a bandwidth limit to reduce the effect of second adjacent channel interference, Rau said.

Another move toward AM improvement, Rau said, was the study of modulation, overmodulation, and occupied bandwidth conducted by the consulting engineering firm of Hammett & Edison, Inc., on behalf of the NAB AM Improvement Committee.

The modulation study addressed the problem of splatter from high-frequency boosting, Rau said. An FCC bandwidth limit does not guarantee a noninterfering signal, he said, suggesting that splatter control may be aided by low-pass filters or final clippers.

Rau expected implementation of the standard for transmitter and processor manufacturers to be immediate, and that the draft could become a voluntary national standard by January 1988, "if all goes well."

Chemical hazards

Jack Pfrimmer, of GE, presented a paper called "PCBs in the Broadcast Environment." Pfrimmer explained that PCBs (polychlorinated biphenyls) were used as fire resistant liquid insulation in electronics because of their dielectric insulating and heat transmitting properties.

Pfrimmer said askarel, the generic form of PCB, often was mixed with the solvent trichlorobenzene, to modify the flow characteristics of the liquid.

PCB has now been discovered to have the same clinical toxic rating as kerosene or turpentine. Skin eruptions called chloracne have been known to emerge on exposed individuals, Pfrimmer said.

According to Pfrimmer, the Toxic Substance and Control Act charged the EPA with creating rules on the use and servicing of PCB transformers. Penalties for noncompliance with the EPA rules were based on the gravity of the violation.


The EPA rules pertain to both PCB
(continued on page 19)

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Lend some support

Dear RW:

I just read Mr. Montgomery's article (1 July) and have a great deal of empathy for his plight.

I developed a two-year technical video program around our \$170,000 TV studio in conjunction with a technical telecommunications program which is offered at Mercer County Community College in Trenton, NJ. My students receive 5 college credits for the course, and then go on to Mercer to complete their training.

During the initial phase of the program start-up, I contacted all of the major networks and several major manufacturers of equipment for the industry. All were very supportive and encouraging to us. But when it really came down to getting involved, they vanished like the wind. If it were not for good personal friends in the industry the amount of real support would be measured in negative figures.

It is as if the industry runs on a hand-to-mouth basis with little regard for future planning. Yet they are all moaning and groaning about the lack of good technical support people.

When you look at the bottom line, the amount of support funds and materials which are needed to maintain a few good technical programs such as ours would probably be less than what these big companies shell out for toilet paper per year.

I would like to see them save the lip service for their publicity departments

and either lend some support to the solution to their problem or stop bitching.

Charles Burke
Instructor & Studio Consultant
Matawan-Aberdeen Reg'l H.S.

Making technical transitions

Dear RW:

I read with interest John Shepler's column, "Engineer's Role in Transition," in the 1 June RW. It was an unusually accurate article. However, it didn't really get into the greatest transition of all—the technical complexities.

I have a technical school education, no college. I began in June, 1949, assisting in construction of a 250 W station in my hometown, a town of less than 10,000 souls. I just happen to like small towns. Less than five years of my experience is in towns with greater than about 15,000 people. I was amused at Mr. Shepler's suggestion of doubling into another job to make more money. In these sized towns, you double over if you want to keep your job! I have doubled into every job there is except "owner." My favorite is "news."

Such doubling often takes time you need to keep up with the technical changes. Extra schooling is virtually impossible, since these size towns rarely have any facilities beyond high school.

(continued on page 6)

The closing of the CBS Technology Center (CTC) is another casualty in a long list of retrenchments in technical innovation and investment in the US.

Rather than second guess CBS' decision, the sad fact is that the business climate in the US no longer supports investment in technology in a number of industries, broadcasting included.

Despite a long list of noted accomplishments at CTC, its closing would have engendered less alarm or comment 15 years ago. A number of factors in the US economy have greatly influenced decisions like CBS', and served to close the doors on other giants of the industry—RCA being the most obvious case within the last year.

The economic environment in the US currently operates in a way that discourages investment in some small industries without something akin to a near monopoly to help offset such investment. And radio is a small industry; there are only 10,000 or so possible customers, of which perhaps 5%-10% are buying the latest gear during any given year.

Then there's competition. The upshot is that a manufacturer of radio broadcasting equipment in this country has to look overseas or to related industries in order both survive and fund investment in new technology.

To complicate matters, there has been an incredible inroad by consumer, or "pro," gear into radio stations in the last decade. Such use of pro gear often undercuts existing radio industry manufacturers (take a look at turntables and CD gear).

With the closing of CBS Technical Center, the time has come for the industry to wonder where future innovation will be coming from. One answer is the existing trade organizations such as NAB's Science and Technology Department, EIA, SMPTE and others. There is some precedent involved that could be built upon if the interest developed.

The industry should look ahead to future investment in itself with the closing of CTC. Rather than let such a valuable technical resource die, the industry should ensure, via its associations and organizations, that research and innovation continue to enhance the health and development of the industry within the US.

—RW

Investing In Future Of Radio

New 73.44 Changed Obligations

by Ron Balonis

Wilkes-Barre PA ... Has the pendulum of deregulation started to swing back to the left? Based on some fallout from the AM stereo battle, it could be happening.

The AM stereo battle over the marketplace between Kahn and Motorola continues unabated and unresolved, and, it's beginning to look like it's more trouble than it's worth.

In the FCC's response to Kahn's recent complaint against Motorola's C-QUAM, there is an ominous warning about the use of transmitting equipment at all AM radio stations.

The warning is in Thomas P. Stanley's (CE of FCC's Office of Engineering Technology) letter to Kahn telling Kahn his complaint was without merit. The bottom half of the next-to-the-last paragraph of the letter states: "... it is the responsibility of the station operator to ensure that equipment used in his or her station

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

complies with the Commission's rules. Should out of band operation occur, we would expect the operator to respond accordingly. ... "

Kahn's complaint was about operating C-QUAM systems (operating in the real world, not in a laboratory) violating Section 73.44—the spectrum occupancy

Guest Editorial

rules. By now everyone knows 73.44 is the section of the rules that details the bandwidth and spurious emission limitations for a station's signal and how to measure them. But perhaps not everyone knows that Section 73.44 is a product of reregulation. Prior to 1 March 1982, 73.44 was not in the rules, and the rules specifying spectrum occupancy were not as precise in fixing responsibility on the operator.

Prior to reregulation, the spectrum occupancy rules were part of the section 73.40—Transmission system requirements. In old rule books, the essence of 73.44 can be found under subsection (a)

Design, subsections 12, 13, and 14 of this section. The wording seemed to delegate the major share of occupancy compliance to the transmitter maker, with a (my) presumption that type acceptance extended to the real world of radio operation.

Today's section 73.44 combines the spectrum occupancy rules both for type acceptance (equipment makers) and, with very specific wording, for operation (equipment operators). For both, it specifies the same spectral limitations. However the methods and conditions of measurement each is to use are quite different.

The maker gets to use an artificial antenna of "substantially zero reactance" as his transmitter's load. The operator gets to use his real-world antenna, one that has non-constant resistance and non-zero reactance, as his transmitter's load.

The maker measures his transmitter in a controlled environment with well-regulated AC and without benefit of high RF fields at the output of the transmitter. The operator measures his transmitter in a harsh environment with un-

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RW Readers' Forum: Education

(continued from page 5)

My own library was often more complete and modern than the public library.

I did complete a correspondence course while serving as a transmitter engineer of a directional station. (I took that job in Lubbock, TX with the understanding that I *wouldn't* enroll in Texas Tech... the Chief wanted an engineer he could call without disrupting a class schedule!)

Now to the technical perspective. The total equipment list of that 1949 station was, as I recall, about \$11,500! It consisted of a 250 W transmitter, frequency monitor, modulation monitor, limiter, console, two turntables and three mics... plus the stuff that goes with them to stick them together.

Five years later I installed a station in NM with virtually the same equipment list—all tubed, of course.

Now, sitting in front of me, and behind me, and all around me and, for that matter, over me, are three satellite receivers (one video for weather, one digital for national network and one SCPC for state network, baseball, et al), AGC amps, limiting amps, two stereo consoles, a mono console, a mono console, seven reel-to-reel tape recorders,

a triple-deck cart playback, two double-play carts, two single-play carts, three record-play carts not counting a half dozen carousels, the automation brains with a video terminal, weather radar, two RPU's with receivers, two STLs with receivers, a TSL with receiver, five playback cassettes and eight more portable cassettes and the great audio cosmetologist, otherwise known as a processor, two teletypes and a company-owned phone system.

All of these are solid-state, all of which I'm expected to keep running even though some companies guard their service manuals like they were the crown jewels. (At \$50 a phone call, maybe they're trying to buy the crown jewels!)

I haven't even mentioned the transmitters. Some of the stuff is digital, some analog, some use microprocessor control, some combine several of these approaches. We expect to be trying compact discs and maybe later some

digital carts, as well. Did I mention that I also change lightbulbs? Not the tower bulbs, the company doesn't like for me to leave my fingerprints in the solid steel legs!

Shucks! Once I was a pretty good service technician. Now I can't even understand the table of contents! But its been an exciting ride and the end isn't in sight yet. I wonder if there has been any other profession that has come close to the technical transition that has taken place in electronics?

Larry Chisholm, Sr. Eng.
KJEL-KIRK
Lebanon, MO

Rule 73.44 Changed Obligations

(continued from page 5)

regulated AC and with the benefits(?) of high RF fields at the output of the antenna, in the far field.

The maker gets to use artificial programming of some sort to modulate his transmitter. The operator gets to use his own real-world programming.

In the age of "AM Improvement," it is odd that, for type acceptance, a transmitter maker need not use a load that has even the moderate characteristics of the "normal transmitter load" specified by the EIA in 1949: "A load resistance that can depart by 5% from its carrier frequency value at ± 5 kHz or 10% at ± 10

kHz, and a reactance, which is zero at carrier frequency, that can be as high as 18% of the load resistance at carrier frequency at ± 5 kHz or as high as 35% at ± 10 kHz." That's a real-world transmitter load, not one of "essentially zero" reactance with constant resistance.

One of the intents of *reregulation* was to clarify the wording of the rules. Perhaps that has been done too well, and the new rule wording merely reflects how the old rules were *interpreted*, but not so worded.

But, whatever the intent, the new wording makes me wonder and gives me a cause for concern. If FCC type accep-

tance (approval) is made with the transmitter looking into an artificial world, and responsibility is declared looking into the real world, what is the purpose of type acceptance?

If "AM Improvement" really is the common goal that everyone professes, removing a level of responsibility—the level that a manufacturer's designs and product must work in the real world—is not going to improve AM radio at all. In fact, to me, it looks like a step backwards. But I don't manufacture equipment; my responsibility, because it is my profession, is to try to maintain and operate it.



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Congress Allots 'Cuba' Funds

by David Hughes

Washington DC ... Congress has appropriated funds that the US Information Agency (USIA) can use to compensate Florida AM stations in their battle with interference from high-powered Cuban stations.

However, there is no indication when that money will reach broadcasters. Some interference-plagued stations have been waiting for funds since 1984, when the FCC began its program to compensate stations that made technical improvements to offset increasing Cuban interference.

The legislative body has "authorized to appropriate up to \$500,000" that can be spent on FCC issued monetary recommendations, according to USIA Counsel John Lindberg.

While the FCC has recommended that six stations, so far, receive compensation, only one has confirmed that it has received any funds. Five of the six recommendations were made in early 1986.

USIA request

While the FCC examines the individual interference cases, it does not handle disbursement of the funds. The recommendations are forwarded to the USIA, which then requests the money from Congress.

USIA officials have previously said that, rather than making a number of small requests to Congress for the funds, it would rather wait and make large requests.

Even though the funds have been earmarked, Lindberg said no time frame has been established as to when the stations would actually receive the funds. "There are still many details to be worked out,"

he maintained.

The funds are for the USIA's "radio construction account," Lindberg said, and will be targeted for "payment of claims for damages."

However, Lindberg said the \$500,000 will not cover future claims, which could come to a \$1.5 million total.

While the FCC recommended claims in the six cases so far total \$501,172, Lilo Cunningham, of the FCC's Audio Services Division, said more stations are waiting compensation recommendations.

The six Florida stations that have had their claims approved include: WINZ, Miami, \$31,461; WVCG, Coral Gables, \$245,751; WNWS, South Miami, \$113,271; WIOD, Miami, \$84,027; WSUN, St. Petersburg, \$12,265; and WEAT, West Palm Beach, \$14,397.

Still waiting

Rick Edwards, head of engineering for Guy Gannett Broadcasting, which owns WINZ, said his station has not seen any compensation yet, even though the station was one of the first to file for it.

However, Edwards criticized the larger claims made by some stations. He said his station tried to hold the cost as low as possible, doing much of the technical work in-house.

WINZ's costs were also kept relatively low, he added, because the station relied primarily on a power increase, and did not need to change its tower array or purchase new land for a new antenna site.

WEAT GM Jim Connor said his station is also waiting for compensation. However, he said that the amount the \$14,397 the FCC recommended in compensation for WEAT's problems is a

mere "one-tenth of the \$150,000 or better that we actually spent."

Even with extensive improvements—a new ground system, a fourth tower and a new phaser—WEAT's 1 kW nighttime signal is only "slightly better" than before, Connor said.

He criticized the Commission's compensation program, saying it lacked "real guidelines. The rules were vague. We'd apply for something and then the FCC would want more documentation."

"We haven't seen a penny, yet," he said. Connor added that most of the other Miami-area stations are in the same boat.

Officials from WVCG, WIOD and WNWS could not be reached by RW to comment on the compensation plan. Only one official (from WSUN) indicated his station had seen any compensation funds, but that was "long ago," he said.

Interference continues

South Florida stations still report a significant, steady level of interference from Cuba, although, for the most part, there are no reports of it increasing or decreasing.

"It's about the same," said Bob McKinney, the engineer-in-charge at the Commission's Ft. Lauderdale monitoring station. "We routinely see (Cuban) sta-

tions up and down (in power)."

He said complaints of increased interference are often related to atmospheric conditions. "It's seasonal. When a cool front passes, interference seems to pick up."

McKinney said Cuba occasionally "performs tests" on certain frequencies, causes interference, and then stops them as mysteriously as they started. In August, such a test was noticed on 943 kHz.

Edwards said the 943 kHz jammer seriously affected WINZ, on 940 kHz. The Cuban station, a poor audio relay of Cuba's "Radio Reloj," cut WINZ's coverage area by 25-30 %, he said.

However, Edwards said he followed through with the complaint to the FCC and to the US State Department. After two weeks, the jammer disappeared, he added.

McKinney reported that the US did send a telex to Cuba regarding the station on 943 kHz.

Despite the resolution of that immediate problem, Edwards said, "Cuban interference is still there."

WSUN's problems

Despite a major power increase at St. Petersburg's WSUN, the station still reports a severe Cuban interference problem at night.

(continued on page 10)



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FMX Fate Uncertain with CBS

(continued from page 1)

set up a real scientific study of FMX in Stamford."

Keller added that, as of RW's press time, the NAB was still waiting for more details from CBS.

Orban tests

Despite the grim news from CBS, Orban has continued tests of the FMX system.

Orban reported that it discovered the presence of multipath-type distortion in standard, non-FMX receivers, according to the firm's Marketing and Sales Manager, Howard Mullinack. Orban's tests results are similar to those reported by WFMT, Chicago, in June.

Mullinack said Orban's engineers and some listeners could hear the difference on non-FMX receivers when the FMX signal was being transmitted.

While Mullinack was reluctant to say more about the tests, including which station they were performed at, he said they involved one "lightly processed" station in the San Francisco area. Receiver monitoring was performed various

locations.

The FMX system allows listeners with FMX-equipped receivers to receive a clean stereo signal in fringe areas, or poor coverage areas, without the accompanying hiss, sometimes referred to as the 'stereo penalty.'

Wait and see

Despite rumors at the September Radio '86 show, Mullinack said Orban has not abandoned plans to be involved in FMX generator production. He added that the firm's test results are being forwarded to the CBS Technology Center.

"We are just going to wait and see what CBS does (to correct the problem)," he indicated before the CBS announcement to close the technology center. "We haven't made any decision yet."

"If FMX can create benefits without hurting existing receivers, then we'll go ahead with it," Mullinack added. "But if it hurts (non-FMX receiver) reception, we won't go ahead."

While there have been reports of the similar multipath-type interference in previous FMX tests, the results are not

conclusive and uniform.

While Chicago classical music station WFMT said it pulled the plug on its June FMX tests because of listener complaints, officials at New York City adult contemporary WLTW reported no listener com-

plaints and no problems.

plains and no problems.

Torick said at Radio '86 that the FMX transmission at WFMT was demonstration of the system in conjunction with the CES show there, and not a test.

Torick previously indicated that tests conducted for more than a year at NPR-affiliate WPKT, Middlefield, CT, have resulted in virtually no listener complaints.

CBS has claimed that the past multipath problems were caused by FMX equipment alignment. However, some

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

Torick has acknowledged that there is a quadrature rejection problem in some receivers, but he indicated that it was not a severe concern.

Despite the CBS upheaval, FMX research continues. Inovonics President Wood said recent on-air tests of his gear caused no significant compatibility problems with non-FMX receivers.

"The FMX system may not be for everyone, but it has shown benefits in some situations. I'm very optimistic."

Products planned

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

Aphex Systems said it plans to have a working prototype on display at the October SBE show in St. Louis. It would not reveal details about on-air tests of the unit.

Meanwhile, receiver manufacturer NAD Electronics said it plans to have a new FMX receiver on store shelves this fall, with four other FMX receivers in "the development stage."

For more information on FMX, contact Emil Torick at the CBS Technology Center, 203-327-2000, or Tom Keller at the NAB, 202-429-5346.

“Mullinack said Orban has not abandoned plans to be involved in FMX generator production.”

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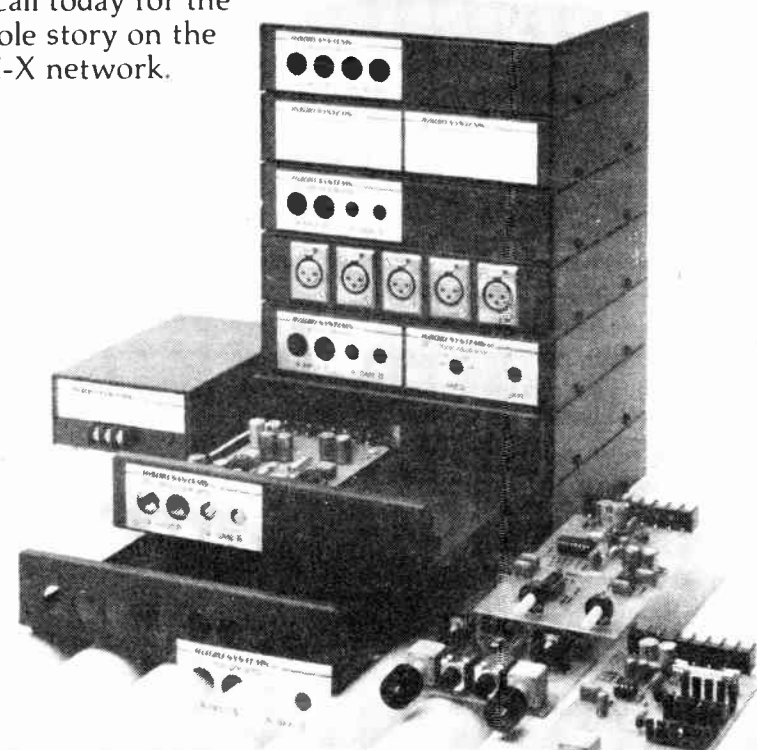
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AES to Cover Variety of Topics

by David Hughes

New York NY . . . The Audio Engineering Society (AES) will hold its 81st Technical Meeting and Exhibits show at the Los Angeles Convention Center and nearby Los Angeles Hilton Hotel 12-16 November.

More than 185 firms occupying a total of 400 equipment booths will be located in 150,000 square feet of exhibit space at the downtown convention center, according to AES Executive Director Donald Plunkett.

In addition, more than 70 papers will be presented in the context of 24 workshops and 36 sessions.

Many of the workshops and papers scheduled will deal directly with the show theme, "The Digital/Analog Fusion: A Rainbow of Technology."

Workshops start Wednesday, 12 November, with a discussion of the all-digital recording studio. Other topics to be addressed the first day include wireless microphones, CD preparation, and the

economics of operating a recording studio.

Thursday's workshop sessions will involve loudspeaker design, measurement, and instrumentation, and a session on microphones titled "Out of the Studio and into the Real World."

Friday's schedule includes discussions on tape machine maintenance, "Audio for Video," computers in audio, and a talk on "Transformers in Audio."

The workshop sessions continue Sat-

urday and Sunday, covering audio preservation and restoration, recording studio design and "the Art and Science of Equalization."

Other papers scheduled to be presented at the show will cover a wide range of audio recording, acoustics and reproduction issues.

In addition to the workshops, papers and exhibits, there will be a series of technical tours in the Los Angeles area. For example, a video facilities tour will spot-

light the CBS Television Center, Compact Video and the Post Group facilities.

There will also be tours dealing with sound reinforcement, film post-production, music recording, and "media centers," which will visit KTTV—Fox Television.

The AES is also planning an awards banquet Saturday evening, featuring the Firesign Theatre.

The exhibit floor will be open Thursday noon to 9 PM, Friday 10 AM to 6 PM, Saturday 10 AM to 5 PM, and Sunday 10 AM to 3 PM.

For more information on AES activities, call 212-661-2355.

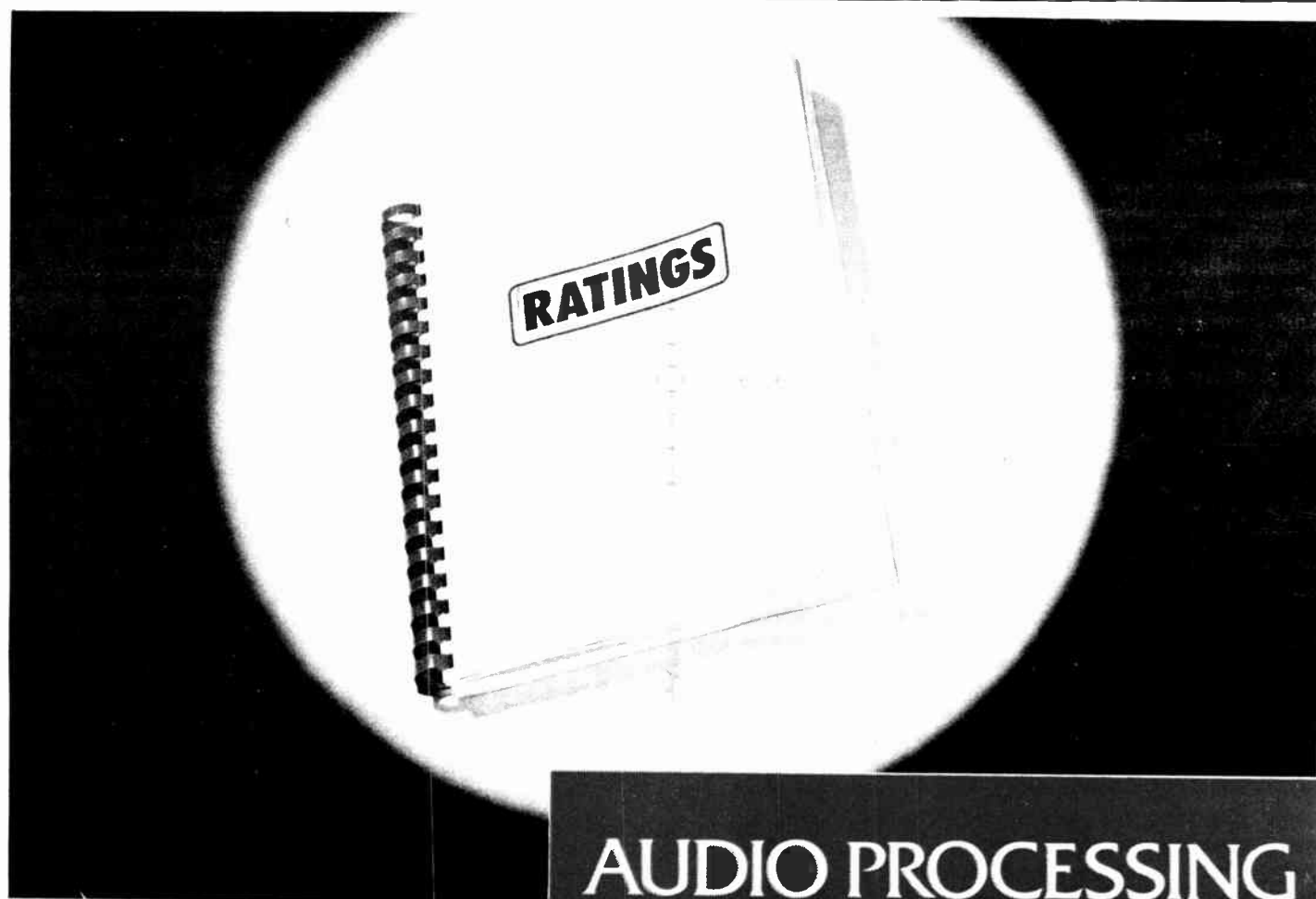
KOB Plans

(continued from page 2)

The Commission said it plans to issue a Notice of Proposed Rule Making (NPRM), in connection with the April AM improvement report, dealing with the more widespread use of synchronous transmitters. However, Thayer said that no time frame for the rule making proposal has been set.

Other FCC officials indicated that the Commission needs time to study the results of the KROL and the other synchronous experiments.

For more information contact Gary Thayer at the FCC: 202-632-7010.



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Madison True Exchange of Ideas

by Bill Sacks

Arlington VA . . . I just came back from The Madison Broadcaster's Clinic, and it continues to be one of the best regional conferences I have had the privilege to attend.

This is a fun conference, with lots of good engineering fellowship and a real exchange of ideas. It is also the oldest continuously running broadcast conference in the US. Many thanks to Don Borchert, WHA, the University of Wisconsin, and Radio World/TV Technology. If you can get to this conference next year, go.

Guest speakers covered a variety of subjects, from acoustics to digital television standards.

FM modulation measurement

Eric Small gave an impromptu presentation dealing with the conflicting US FM modulation rules. We all realize the stupidity and futility of an absolute peak deviation FM modulation measurement. He is going to try to get the NAB to file a petition for rulemaking that would permit modulation measurements to be made via the occupied bandwidth method. They should do this willingly as our designated lobbyists.

Bill Sacks, a senior RW columnist, is president of Straight Wire Audio. You can call him at 800-368-2081 or 703-522-7780.

Small's formal paper was also very good, exposing some phony SCA techniques and get-rich-quick schemes (I've heard some of these vaporware techniques require regular injections of snake oil into the stereo generator).

Mock-FCC inspection

Garrett Lysiak of the FCC (known as the Minneapolis Radio Sheriff, or Deputy RF Dawg) and George Wearl presented a mock-FCC inspection.

Straight Talk

Two things made this presentation really funny. The first is that they presented excuses and stories that the FCC had been given on real inspections. The second is that Garrett is leaving the FCC next week, and I've never seen him so loose in public (during the day). It was a riot.

Great idea contest

This year's conference included the first annual Great Idea Contest (where have I heard that before?). Manufacturers donated prizes for the best ideas. Prizes ranged from a pen and pencil set to a CD player and a grand prize video monitor/VCR.

Ideas included two multiphase power line monitoring systems, one of which would off-hook the transmitter telephone

for a quick and dirty indication of phase loss.

Another idea was to put three single-phase mechanical clocks in service at the transmitter, so you could prove to the power company that they really did have a problem.

Tim Valley of WCAL was among the select few contestants who won multiple prizes. One of his ideas was a station clock synchronization system using Radio Shack components. RW will be publishing some of these ideas in the near future.

The best thing about the Madison Conference is its informality and the fact that it fails to attract high-powered salesmen (or at least the ones there seem to be well-behaved).

Entrepreneurial spirit

It is somewhat ironic that at such a fun conference we received unfortunate news. On 17 September, Harry Priestler announced the passing of Mr. Parker Gates.

We are all familiar with the Gates Radio Company. It was the first independent to seriously challenge The Big Red Meatball. His entrepreneurial spirit was the face that launched a thousand ships in the form of small broadcast equipment companies. We will all miss him very much.

Institutions eventually pass away also. Bell Labs was our National Communica-

tions Laboratory. It did not have to produce a profit, or even products. They did much pioneering work in audio and stereophony, and of course their basic research gave birth to the transistor.

The transistor, although patented by Bell Labs, was given to the world. Imagine if the transistor had been invented by a private company and maintained as a proprietary device for 17 years.

Bell Labs still exists, but it ain't the same. Now that ATT has lost the monopoly, they can not be as laissez faire with Bell Labs. I'm glad to see the monopoly broken, but this is a fly in the ointment.

CBS Tech Center

Last week I heard of the passing of another good friend—CBS Technology Center. That is the modern name for what we all knew as CBS Labs. CTC was not as apt to share their inventions with the world as Bell Labs, but they did some true basic research. They have made valuable contributions to broadcast and audio technologies.

I spent many fascinating hours there and will miss them.

As you probably know, CTC fell victim to the sharks of Wall Street, who manipulate paper and do absolutely nothing for our real industrial/manufacturing base. We have lost another valuable national asset in the quest for short-term profits and paper gains.

Maybe they'll sell the lab equipment to the Japanese.

See you in St. Louis, Louie.

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Congress Allots Funds For Cuban Interference

(continued from page 7)

Even with his station's power increase from 5 kW to 10 kW, WSUN CE Frank Berry said Cuban interference during the past year at his station has been getting worse.

"I noticed a big increase last spring," Berry said. He added that listeners in parts of WSUN's city of license report a Cuban station underneath.

Berry said he believes the Cuban station on WSUN's 620 kHz frequency upgraded from 30 kW to 50 kW.

"There is very little (more) we can do," he said, "except to change our frequency, but that would be a very remote possibility, because the spectrum is so crowded."

WEAT's Connor added: "In all practi-

city, there is no (US) nighttime AM in South Florida. Most stations hardly have any nighttime coverage."

In related news, Cuba has maintained that it wants to start an English-language, high-powered AM station to serve the US, in retaliation for the Voice Of America's Spanish-language Radio Marti service to Cuba on 1180 kHz, which started last year.

Sources indicate the threatened new service, dubbed "Radio Lincoln," may be more likely now, in the wake of collapsed talks on emigration and broadcasting issues between the two nations during the summer.

For more information on the FCC's compensation program, contact Lilo Cunningham at 202-632-6485.

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Good Mic Technique Essential

by Tyree S. Ford

Baltimore MD . . . I wish that we were far enough into the communication age so that I could quickly link up with you and do a quick and thorough equipment inventory, including which pieces work best and which you could stand to lose. Until we all get wired, the next best thing is the phone.

So here's what I'd like you to do. Call the home office number at 301-889-6201 and answer the following questions for a poll. The odds are good that I won't be there, but my answer box needs the exercise. (If you have a tight budget remember, Sunday night rates are low.)

Producer's File

The first topic will be microphones. If you get the box, first identify yourself (spelling your name would be helpful). Also give your call letters or company name and address, and a return phone number. Then, in order, please answer the following questions.

1. What mic or mics are you now using in your main or air studio?
2. What mic or mics are you now using in your secondary or production studio?
3. What mics would you like to be using in these studios, and why?
4. What mics have you tried recently and not liked, and why?

If you keep this article in front of you

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

for reference when you call, you can probably get through the whole thing in about a minute. Take more time if you wish. I will print the results in an upcoming issue.

Equally important as which mic you use is the human voice which speaks into it. The joining of mic and mouth is referred to as "mic technique." Mic technique is something that usually goes undiscovered and unexplored by the novice

broadcaster. Unfortunately, without good direction, their "instincts" will often lead them astray.

At my second station, over 15 years ago, I distinctly remember tweaking the RCA 77DX to get as much "bottom" in my voice as I could. At that point I was too green to realize that, because I was new and more than a little nervous, I was restricting my diaphragm and reducing my resonance. That extra "bottom"

masked the projected punch normally associated with the 3-6 kHz range. My attempts to sound "ballsy" only made me sound muffled.

True resonance can not be EQ'd or processed. True resonance occurs when the body is relaxed and breathing properly.

The most important aspect of resonance is diaphragmatic breathing. When

(continued on page 13)



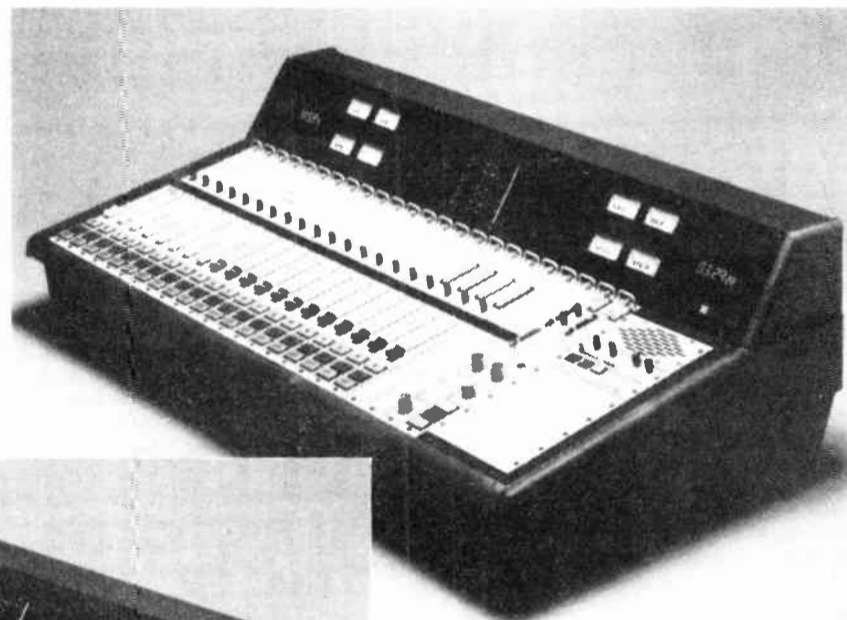
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Good Managers Have Qualities in Common

by John M. Cummuta

Chicago IL ... Typically, those promoted to management positions in broadcasting get there because they were the best at whatever skill position they played. Also typically, workers think that managers have "cushy" jobs that are basically luxurious rewards for either accomplishing the right goals or, more often, for pandering to the right people.

Both of these prevalent situations cause serious problems in the successful operation of our businesses, but the first is more serious than the second.

Probably the most subtle but insidious problem with promoting the "best" engineer or jock up to the management of his or her department is that they enter the position with the misconception that, "because I was/am the hot player on my team, I can effectively run it." They assume the position, mistakenly believing that mere knowledge of the tasks performed within that department will enable them to effectively lead it. Wrong.

"Manager," is a skill-intensive job just like "morning-drive announcer." You wouldn't agree that just anyone could hold down the morning slot on a radio station; neither should you assert that just anyone can move up to being an effective manager—at least not without putting in some effort on building up the new set of required skills.

However, there are also some innate qualities that are key to success as a manager. Most of these can be devel-

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

oped, but some are either there or they're not. Let's examine the list.

The desire to succeed is, by far, the most important quality necessary to effectively lead any organization. No one can give you this desire. You must find it within yourself, and you must shun anything that interferes with it.

A strong desire to succeed can overcome a multitude of other character or professional shortcomings. In fact, a person with sufficient desire for reaching a goal is nearly unstoppable.

Desire is also the only thing that can sustain the necessary drive to keep going when things aren't going your way. Most people are not exceptional successes because they usually give up when they run into obstacles. Without exception, superachievers are those who *persist* against all odds and through all setbacks.

Lastly, you cannot commit yourself to anything you don't truly desire to accomplish. Without that commitment, you're doomed to failure or, at best, mediocrity.

Agressiveness: Good bosses take the lead. They are leaders, not pushers. They want to lead the charge. They want to say, "Look what I've done." Admiral Chester Nimitz, Pacific Fleet Commander during World War II, said it best: "When you're in command . . . *command!*" That doesn't mean lording it over your employees; it means showing them the way, clearly and decisively.

Self-confidence: Here is an area you can build up, but if you already have it, you're ahead of the crowd. You must know that you can handle the challenges of the position you are accepting. This gets easier as you climb the ladder, because you can look back at the obstacles

you've tackled in the past and believe that you'll successfully surmount the new ones. Success is most easily built on past successes.

The root of self-confidence is self-belief. When you're alone before the bathroom mirror, you know that person inside and out. You know what you're capable of. Chances are you've never come close to your full potential, so the odds are in your favor that you can accomplish the things you dream of.

In fact, to paraphrase many great philosophers of history, "There is nothing capricious in nature. No being is given the desire for something, unless there is

Engineering-Manager

within that being the innate ability to accomplish it." The mere fact that you truly want a given success or position implies that you have within you the ability to achieve it.

One important note about self-confidence is simply that it must be controlled to be of any value. Unbridled self-confidence is usually interpreted as arrogance, and denies you the cooperation of other people, without which success is pragmatically impossible.

Articulateness: This one skill, absent of nearly every other, can make you a success. I'm not talking about mere glibness or the "gift of gab." I mean the ability to clearly communicate solid ideas, issues and solutions. To be articulate is also to have the ability to be persuasive, motivational and inspirational. These are all "people" skills, and are tremendously effective tools in making people desire to assist you.

Articulateness is more valuable than intelligence. All the knowledge in the world is of little value unless it can be communicated.

Sense of urgency: Here is the hidden

key to super-success. The willingness to "accept responsibility" is not enough to propel you to the top. You must seek out and conquer responsibilities. You must seize them from those who are not using or assuming them. You will generally end up with as much authority and responsibility as you take.

The people who see "everything involving their company" as their responsibility are the ones who move ahead dramatically. They are quickly recognized as boss material.

Good judgment: You must have intellectual honesty. That means that wishful thinking has no quarter with you. You can only base sound management judgments on "real facts." But this also means that, after you've digested all the data, you trust your instincts, your gut.

Decisiveness: One of Henry Ford's most celebrated attributes was his decisiveness. All great managers find that their strong ally is the ability to make a decision without extended vacillating.

Even in close decisions, there must be a decision. Trust your instincts and *make* a decision as soon as you understand the elements of the situation. Stand by your decision and be slow to change your mind. Extensive research shows that over 80% of business decisions should be made immediately, the first time an issue comes up.

Dependability: The people who get the nod for the top jobs are those who consistently "come through." If you make a commitment, you've assumed responsibility for a resolution in that situation. You can delegate tasks associated with the job, but never the responsibility. Do it *now*. This reputation for "always getting the job done" can propel you to the top. When looking for promotable people, management wants a person who "always" achieves or exceeds the expected results.

Consistency: This is a similar quality to dependability, but consistency is what you show toward your subordinates, while dependability is shown towards superiors.

Treat everyone even-handedly. Never be arbitrary or capricious. Never play favorites. That doesn't mean that you can't depend more on the more dependable people. Just don't give them breaks where the others don't get them.

Consistency also means that if you applaud a subordinate's work, and it comes under fire upstairs, you still stand by the work and the worker.

A decent reward: No one really climbs up the ladder by stepping on other people. Subordinates will only put out their full effort for a leader who they know truly cares about them. Both those who produce and those who consume your product or service are people. So your future is dependent on the loyalty and good will of people. Treat them with respect.

Integrity—the absolute essential: You will *never* really make it unless you are totally and irreversibly honest in your dealings, both personally and professionally. Both your superiors and subordinates, as well as clients, must have complete confidence in your integrity, or you are doomed. Remember that a good reputation is easy to lose, but oh, so hard to regain!

(continued on page 15)

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Circle Reader Service 41 on Page 51

How to Improve Mic Technique

(continued from page 11)

you inhale, your abdomen should expand. When you exhale, it should contract. Shallow breathers, with poor breath control, poor projection and poor resonance, usually don't breathe this way.

If you are a shallow breather, don't give up. You *can* change the way you breathe. Practice in the production studio and roll tape on yourself. You may find it difficult at first to concentrate on breathing and talking simultaneously. Your voice will probably sound a little harsh to you, but that's OK. You are releasing a lot more air through your voice box than it's used to. As you continue to breathe and speak this way, your muscles will learn to control your newly found power. You will be more resonant. You will be able to read up to double the copy before needing to take in air.

Once you have gained control over your resonance, you will be able to work well with a variety of mics that may have been less than flattering to your "old" voice.

This kind of listening is an art within itself, and requires a good monitoring system. Unfortunately, in many studios the "good" headphones are often the only ones which still work on both sides. If you intend to do much voice work, I strongly suggest that you invest in your own set of phones.

My favorites are the AKG 240s. I bought two pair 10 years ago and the only problems I had were headband breakage and wire fatigue. AKG has since changed the headbands and the wire to withstand more abuse. These phones are light, cover the ears very well and are resistant (but not impervious) to feedback.

My maintenance engineer solved the wire fatigue failure by adding a piece of heat-shrink tubing for additional strain-relief, right where the cable enters the left earpiece.

You might want to shorten the length of the cable anyway. The standard length can quickly become entangled in the casters of your chair, causing undue surprises when you stand up quickly or roll your chair across the room to the cart rack.

If you're working with mono *and* stereo equipment with stereo headphones, get a stereo-to-mono adapter. Ask your friendly engineer for a strain relief strap so you can strap the adapter right on to the headphone cable, about 6" away from the plug.

A good air monitor and headphone amp are vital to good performance. Over the years, I have noticed that distorted headphone feeds can distract a good talent to the degree that their performance is compromised.

If the feed is too low, the talent may lose articulation because they can't hear what their mouth is doing. This will also tend to make them "crowd" the mic or increase their projection level in an attempt to compensate for a low feed level. "Crowding" the mic can cause unwanted mouth sounds to be recorded, while over-projection can result in an out-of-character delivery.

If you're using an average or better consumer AM/FM tuner-amp for a monitor, set the tone controls flat and leave the loudness and other filters out.

I know there are a few people who feel more comfortable with the loudness switched in or the bass jacked up because it seems to make them more resonant to themselves. This kind of crutch will actually keep them from becoming more resonant later.

The quicker you get rid of this crutch,

the quicker you will develop your own resonance, which everyone will hear.

It's good to remember that each mic has its own hot spot. As you speak into it, try moving around a little and listening for the subtle changes. Get too far to the side and the highs disappear. Get too close on some mics and you sound very "boomy" or bass heavy. In general, your projection level and the distance between your mouth and the mic are proportional.

Simply stated, back off when you get loud. The object is to keep the meters as close to 0 VU as much as possible, regardless of tone or projection. You can't be expected to keep an eye on the meters all of the time, but you can develop your hearing so that your mic technique allows you to be more consistent. Controlled resonance, projection, intonation, and consistency all combine together to form what the pro's refer to as "smooth delivery."

As usual, keep those calls and letters coming, and don't forget to call me with your mic poll. Remember, a clean head is a happy head.

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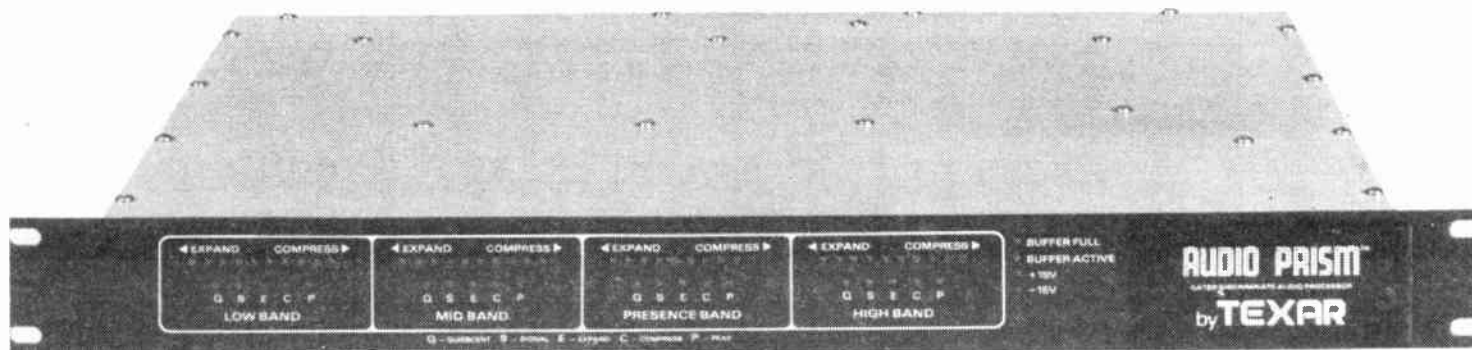


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Heat is Xmtr's Worst Enemy

by Floyd Hall

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

Heat is the worst enemy of electronic gear—tube or solid state—even more so than moisture and corrosion?

This was brought to me forcibly this hot summer in Southern California, in two separate condition and installation situations.

The first time I really got into a heating problem was in the summer of 1952. I had just built and put into operation LA's last AM station, then KPOL, now KSKQ. We had installed one of the first Gates 10 kW transmitters.

The transmitter room had a high peaked ceiling, and a fairly large exhaust fan was installed in the downwind side in the peak. It was immediately apparent that this thing wasn't moving any hot air out of the room—there was no intake! So, we opened the back door!

Now, this huge old transmitter had four 2500 F3s lined up in a row behind two Plexiglass windows on top of a Plenum chamber. The blower in this transmitter was huge, but quiet. Everything was individually metered, with big 4" Westinghouse meters, lined up from left to right, at the very top of the 7' cabinets! (By the time you got the thing tuned up, your neck was so stiff you couldn't see your feet for 20 minutes!)

The first thing that happened was that two or three of these meters began to stick. You had to bang on them to get them to read. Since it was still in warranty, I called Gates and had them send out a couple of new ones, and sent the bad ones back.

About the time I got those two installed, a couple more got to sticking. I reached up one day and tapped one, then laid my hand flat against it, and wow, it was so hot I couldn't touch it!

So, I got my a ladder, and climbed up for my first look at the top of this transmitter. There were two small grills on the top—neither of which were directly over the tubes below. That night I took a power hacksaw and cut some openings in the top to let the hot air out!

Well, this helped, but about that time I suddenly discovered by audio measure-

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

ment that the PA tubes were flat—with only about 500 or 600 hours on them! This was ridiculous, so I packed those tubes up and shipped them back to Eimac with a nasty letter.

Two days later I got a phone call from an engineer at Eimac, who said they had examined those tubes and determined that they had been run at excessive filament voltage! Boy, I exploded at this, and told this guy off in no uncertain terms.

"Alright then," he said, "the tubes have been operated at excessive anode temperature, which will increase the filament temperature, and dissipate the carbon deposit from the filament."

Old Timer

Oh! Now, I backed off, and said I would check the anode temperature and get back to him.

I got a couple of mercury thermometers, with a range to 200°C, and pasted the bulbs to the plates of the PA and modulator tubes in such a way that I could read them through the windows. These things were running 175-180° Centigrade!

To shorten the story a little, I contacted the blower manufacturer, who sent a man out to look at my transmitter.

Right away he said, "That slow-speed blower won't work; you have got to have more pressure." So they furnished a new blower, which got the Plenum chamber pressure up to about 5-6 " hydrostatic, and then finally, the heat problem was solved.

Now, the above is a brief summary of a book-length treatise on how to reduce the operating temperature of transmitter tubes, and to achieve an equitable, usable life.

OK, let me generalize a little. To keep transmitter and tube temperatures down, and thus to maintain a reasonably long life, you have got to move air through those tubes, and out of the transmitter cabinet and out of the room! (Unless you've got some water-cooled bottles!)

What I did this summer ...

Now, let me tell you what I did this summer. I moved a 10 kW FM transmitter to a new location in the CA/AZ desert. The temperatures in July were running 112-116°F.

We built a little frame house, covered with plywood, about 10' square on a concrete slab, and installed the transmitter and associated gear. We installed a 3500 CFM exhaust blower directly over the transmitter, and down at ground level on the north side, a 4,000 CFM intake blower.

This pressurized the little shack to keep out dirt and dust, and moved the hot air off the transmitter as fast as it came out. On a day which registered 116°F, I placed my hand flat on the front panel of the transmitter near the top, and it was warm—about the same as the walls of the building. Oh, it was extremely uncomfortable to work in that shack, but the transmitter wasn't bothered.

If we had not been moving that air through there so fast, the plate temperature of the tubes might well have risen close to 200°C, instead of running around 140-150°F, and sure wouldn't lasted very long.

Now my friendly client said, "Well, I think I'll put some air conditioning in there."

"You know how much it would take to bring the temperature in there down to about 75°F?"

"No, how much?"

"Well," I said, "offhand, I would guess about 18 tons!" Needless to say, it is still running nicely with two ¼ horse blowers!

Now, that's a success story, but about two thirds of the stations I see have a very carefully installed duct from the top of the transmitter out through the ceiling, and in many cases I have seen, they do not have a source of air intake in the transmitter room.

That duct is a restriction—a resistor in series with the current—and so the transmitter blower is just churning up air which is going nowhere—and getting hotter by the minute.

I was called in to one exactly like that—a 20 kW FM transmitter, and the solid state exciter had quit entirely. The transmitter room was large, with wall-to-wall carpet(!), and the room was spotless. The ambient air outside the building was only about 95°F, but the transmitter was hot to the touch. There was no air intake, and they had a small exhaust fan in the ceiling off to one side of the duct on top of the transmitter.

I opened the doors for a little air circulation, then got a heating/air conditioning contractor to come up and install a

4,000 CFM squirrel-cage blower on the east wall of the room to bring air in, force it through the transmitter and out the duct through the ceiling.

Solutions

My advice: Never put duct on the top of a transmitter. Put a good squirrel-cage blower up there to exhaust the hot air, before it has a chance to heat up the entire transmitter—and tubes. Never try to use a "fan" for either intake or exhaust. They just do not work with the slightest back pressure. And don't put restriction in front of a slow-speed blower either—if you do, they just churn up the air like a fan.

In an inadequately cooled transmitter, heat accumulates, and everything in that cabinet will get hot—too hot. Tubes, condensers, transformers, relays, etc., and a few weeks of this will deteriorate every one of these items.

Most everything in a transmitter runs a little warm in normal operation. A plate transformer may warm up to 90-95°F with ambient air temperature at only 70°F. Now, bring that cabinet temperature up to 175°F, and that transformer is just short of smoking.

A few weeks of this, and the varnish in the coils has hardened and become brittle, and it's insulating properties reduced; so, the first good line spike that comes along arcs between layers, and now the thing does smoke!

Now, I hope I have given you the message. It isn't 100-120°F ambient temperature that hurts a transmitter.

No way! It's accumulated heat beginning there, and winding up around 200-300°F.

Just one last gasp. I was called one time to a station that was losing tubes and relays, etc., and the transmitter room was absolutely beautiful—a big old Collins 5 kW, on top of which was a great mass of the tinsmith's artistry! I reached up and laid my hand on this mass of duct, and it was almost too hot to hold.

"Oh," said the CE, "that's taking the hot air out."


But that hot duct was fastened directly to the top of the transmitter, and by conduction a lot of heat was being fed right back into the transmitter cabinet. In addition, they just had a little old fan on the roof, presumably to exhaust the hot air! I finally persuaded them to get rid of that bunch of iron and put a good exhaust blower on the roof, and their troubles ended about then.

Managing

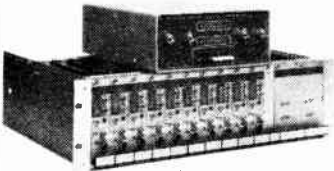
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After having run through the roster of necessary elements in a successful manager, we come full circle to desire. You will not likely have the listed virtues, or at least you won't incorporate them, unless you truly have the desire for the job, with all its shortcomings and challenges. If you don't have that desire, get into a line of work where you do—or live a very unsatisfying life.

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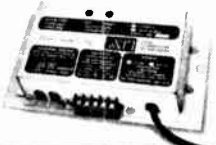
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Let Documentation Be Habit

by Steve Conover

LaVista NE . . . As a former field service engineer for Harris Broadcast Products, I had the opportunity to visit quite a number of radio stations around the

United States and Canada. As such, I was also able to meet with an even larger number of engineers, and to experience more problems than most engineers will experience in a 20-year tenure with any one station.

Among the many habits I picked up over this time was to document all of the work I did.

Documentation is one of the last steps in the evolution of any product. It typically receives the least attention from en-

gineers because they are more concerned about making the product work. Paperwork has always been a necessary evil with the majority of engineers in any line of work.

"Documentation" is the process by which one keeps a detailed log or journal of some sequence of events or work performed throughout the field of one's responsibilities. This journal should include the time of day any one particular event actually occurred.

Keep the entries as short as possible, yet include the detail necessary to convey all of the facts necessary. This is a very hard procedure for many of us, and is something that time and experience will teach. Many articles and self-teaching kits are on the market to help learn the process of keeping accurate information in a personal ledger.

The amount of detail, or the lack of it, is strictly up to the individual keeping the journal. From experience, I have learned to keep a somewhat extensive journal of information. Below is a sample list to get you started, followed by more detailed information you may want to document, and rationales for doing so.

- The start and ending time of day, using the military or 24-hour format, a particular event took place.
- Person or persons involved, including job responsibilities, if you feel that information is important.
- A brief description of the events that occurred or the work performed.
- Telephone numbers called in connection with the particular journal entry in question.
- Transmitter operating parameters and subjective opinions regarding its operation or performance.

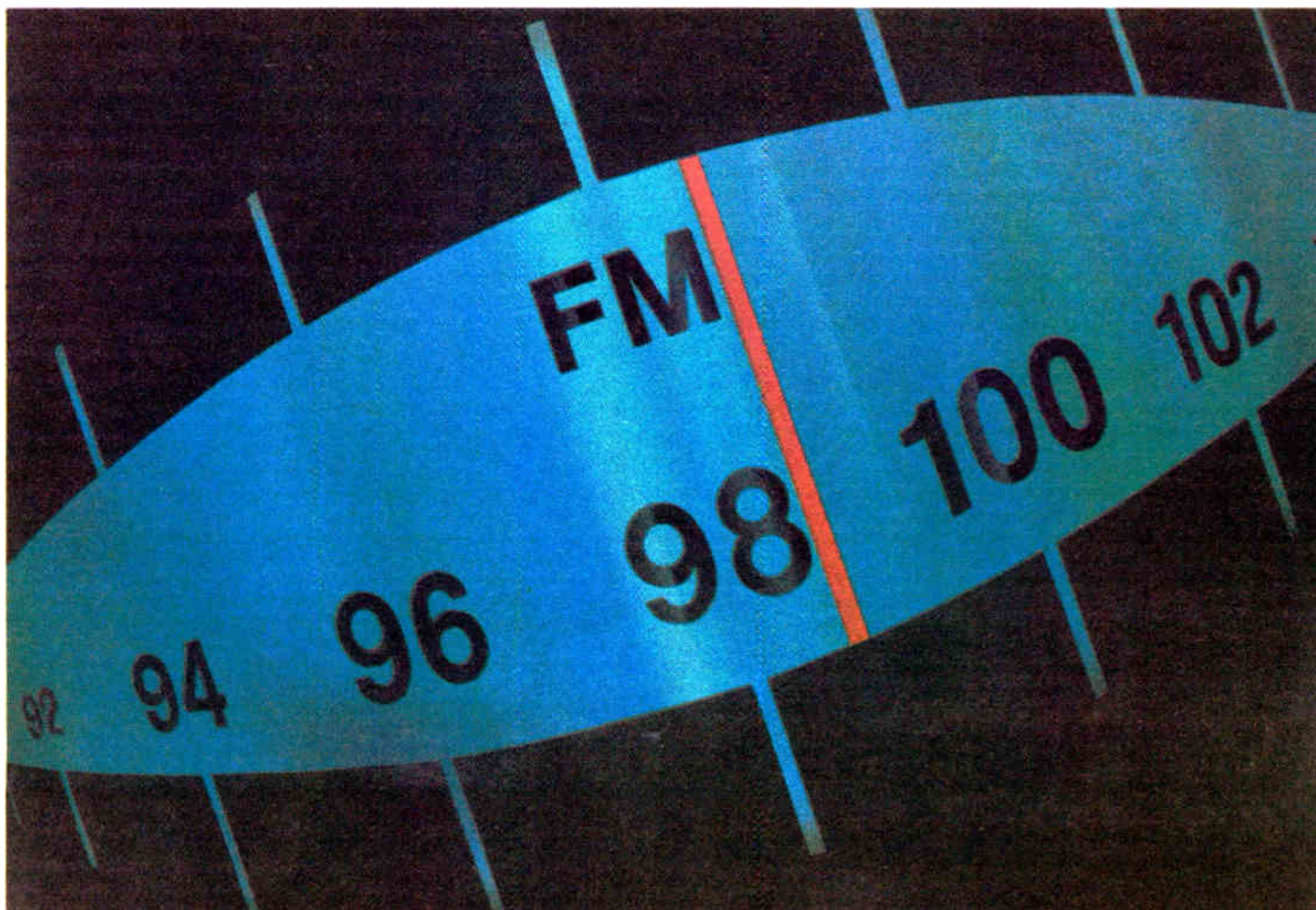
When a major piece of equipment is worked on, make it a point to take down the serial number of the unit. In the future, if there is any question as to which item is worked upon, the serial number of the unit distinguishes each individual item.

Any time parts or materials are purchased for the station, keep track of the amounts and for what purpose the purchases were made. In the future, this information will help you to protect anticipated expenses or highlight which piece of equipment is consuming the most expense for repair or maintenance.

With deregulation an ever-present factor, the station engineer *must* keep track of the entire facility and the operation of the station not only for his own protection, but for the protection of the licensee of the station. This is probably one of the most important jobs the station engineer has to perform.

The other side of the coin, so to speak, is establishing and maintaining an accurate, prioritized list of actions or work to be performed. The best help kit I have found is the Dr. Charles Hobbs time-management package, "Your Time and Your Life." This package is available from the Day Timers Company in PA. I have included their address and phone number at the end of this article for your convenience.

Another area where documenting the
(continued on page 19)



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Circle Reader Service 5 on Page 31

Contract Engineering

Hints for Small-Market Work

by Ed L. McDade

Fuquay-Varina NC . . . Like all things, contract engineering has its pros and cons. However, whether it is a challenge in life, stimulation or a change from the daily grind, contract engineering is "where it's at." Nowhere else can a person get the excitement of constant change that exists when you do contract work.

To answer some of the questions posed by author/contract engineer Barry Mishkind in the 15 August issue of RW, we must establish the basic facts. Who can a successful radio station do without?

Well, you definitely need to have a top-notch air staff that can keep the audience up to date and informed, keep them happy and play the songs they want to hear . . . unless you have an automation system or a satellite service, which in some cases can do the same.

It is also necessary to have a sales staff to bring in revenue so you can pay the bills . . . unless you're an educational station, in which case it is not necessary. But very few educational stations are huge money-making successes.

A traffic director is a must, under any circumstances. Whether it's a full-time position or a member of the in-house staff, someone must take care of the program logs, the books, contracts and the rest of the thankless duties of an office.

Of course, in larger stations you have different people to handle each of the above-mentioned duties, but in this article we are going to discuss small market stations.

The next area of a radio station that cannot be ignored (even though many times it is) is engineering. In most of the larger stations, there is a complete engineering staff, with all the equipment know-how and reference material needed, to take care of everyday problems. Larger stations also have stock parts, such as finals, IPAs, modules and other necessary replacement parts. Most

Ed L. McDade is owner of Blue Ridge Consultants, Fuquay-Varina, NC. He can be reached at 919-552-9557.

have a budget to work with to plan the fiscal year, but as I said, we are going to discuss small market stations.

Small-market considerations

It has been the experience of other contract engineers I have talked with who work with smaller stations that trying to get stock items which are needed is the same as pulling teeth. Granted, these stations cannot afford to have a complete stock, but there are necessities. It's usually no problem to get tubes in a "must have" emergency situation and the transmitter is off the air, but if these owners and managers could see how much more money they would have in the long run, they would keep these items in stock and on hand. Because, like the old saying goes, "you can't see dead air."

Salaries for CEs in a small station have to be considered. I remember from personal experience that chiefs are required to do a permanent board shift, plus take care of their regular duties. This setup works, but only at the expense of 50-80 hours a week (which would be wonderful, if it was paid by the hour). The station I gained this experience at was an AM-FM combo and my scheduled air shift was 6 PM-1 AM Monday through Saturday. That shift is a job by itself, not to mention the 5-6 AM calls because a fuse is blown or a breaker is tripped or something more complex has gone awry.

A lot of you engineers know exactly what I'm talking about. To do this takes dedication and an iron constitution.

But, we must look at the owner's point of view. He or she needs an engineer. Now comes the decision . . . can they justify the expense of a full-time salaried engineer who can do them a good job? In most cases the answer is no, and therefore you have a double-shift individual. Most engineers have cut their teeth by working in a small station, getting paid minimum wage or a little better, and that's fine, because you have to start somewhere.

A veteran broadcaster once told me "work in a small station for a year and get the feel of the operation; work, learn and grow, then move on." This is sound

advice.

Dedication to a goal and quality work are a large part of contract work. Know-how, honesty and the ability to get along with people, not to mention business sense, all fall into the same category. Dedication, in this case, is defined as giving your all to each station you work for.

Contract-work profile

The goal for every engineer should be to have the best "sound" the station can deliver, enough to meet the old standards set down by the Commission, and to be able to pass the toughest technical inspection by the Commission. This is what I think it should be, but it's hard to do at a station where you get little or no cooperation from the rest of the staff, especially the ones who sign your checks. However, as long as you've done the best with what you have to work with, you are dedicated.

Quality of work is very important.

When an owner/manager signs your contract, they expect quality work. If they don't, then you should expect it of yourself. Take the time to make quality repairs. I know that in some emergency cases that all there is to work with is a pair of jumper wires; if so, fine—use them. But when the emergency does not exist anymore and time is available, go back and make the job permanent.

We recently rebuilt two executive consoles that, when delivered to us, were a joke. Out of one console came 60' of wire. I don't mean wire that was hooked up and in use, I mean 60' of wire that should have been back on the spool. The master level pots were hanging loose on the inside of the console, because two pushbutton switches for a make-shift automation system were installed in their place. The sign-on operator had pulled the front down to make an adjustment (here it comes!) and when the front panel

(continued on page 18)

Q. Do you know what's missing?



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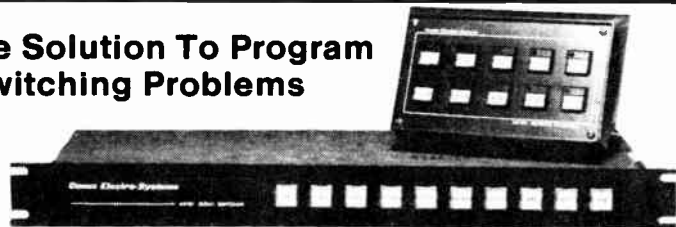


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Hints for Small-Market Work

(continued from page 17)

was put back in place, the metal-cased master controls touched the chassis ground and the +30 of the power supply (they said the smoke was pretty).

By now you are asking yourself why the fuse didn't blow. Each fuse was supposed to be 1½ amps—one was, but it had tinfoil wrapped around it and the other was a 30 amp car fuse. Work like that is inexcusable, sloppy and dangerous. If the correct fuses were not avail-

able at the time, then fine, use the console like that, but, the correct fuses should have been installed immediately, not by someone else several months later.

Know-how, honesty, discretion

Know-how and honesty fit like a glove. If you know what you're doing and can be honest with the people you work with, you have a good chance of making a 'go' on your own.

The engineering firms that do applications have to be the most discreet. For example, on a recent trip to western North Carolina, I met an engineer who had just gone into contract work. We talked about changes in the broadcast industry, both new and old, then he proceeded to tell me about what other stations were doing as far as applications go.

It was none of my business what changes other stations were making, in-

sofar as finding new frequencies and powers. For all he knew I might have been the contract engineer for the competition. The moral of the story: what an owner/manager discusses with his engineer should be kept between them. It is not meant to be put on the six o'clock news.

Having qualified contract engineers is an easy enough task. Ask around, talk to other station owners. Word gets around about whether someone is doing good work or not. In many areas there are TV repairmen, cable installers, bakers or high school kids taking care of the needs of a radio station. If these people have broadcast engineering experience and can do a good, quality, dependable job, then use them. But if they don't have these qualifications, be prepared to pay the price for inexperience and negligence.

Recently while on a call to a non-contract station to make repairs, the in-house technician was looking over my shoulder, which was no problem, because everyone needs to learn something new. The problem came when we were making the final adjustments on the transmitter and he started pushing buttons and turning knobs like there was no tomorrow... all the time saying "I wonder what makes this needle move?" (It was the AC line voltage meter).

After that was straightened out, I asked him if he had much experience with this particular transmitter. He said no. His fulltime job was as a TV repairman. I told him to read the technical manual for the transmitter, to ask a lot of questions and to go to school.

Fees

A good argument for the owners is that they can't afford a good contract engineer. It's true that many stations can't pay the bills some engineers charge.

In some cases you have to pay a higher price for specialized services, such as applications or antenna work for the FM or AM (especially directional systems). The areas are specialized and cost the person doing it a great deal of money. You have to consider higher education, tools necessary to perform the job in an orderly fashion and subscriptions to services needed for applications and getting material from the US Printing Office or from the Commission's contractor, for these printed materials are not cheap.

However, field work on cart machines, turntables, transmitters and other engineering needs of a station can be done for a reasonable price. Small stations cannot afford to pay a tremendous amount for work, so they sacrifice quality and dependability in order to exist.

My advice to them is to look around. Odds are someone in your area is doing the fine work you need, and is doing it at a fair price. If you're satisfied with your present situation, you are in good shape. If not, find someone else. Ask for references, letters of recommendation, talk to the contractor, and try to determine if they are trustworthy.

Those of us who do quality, dependable work can and will supply you with all this information. Remember, engineers are the backbone of a station, we are your friends, not your foes. To have a successful station takes teamwork—without it nobody profits.

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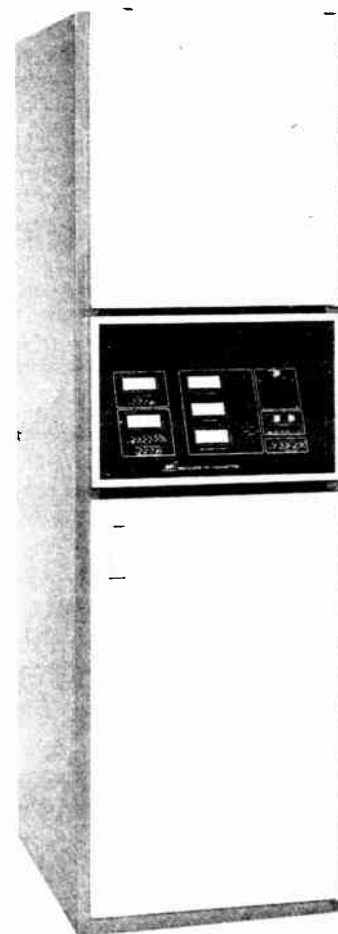
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Perhaps low price is most important? Look at the deal you can make with companies assembling those 25 years old look alikes.

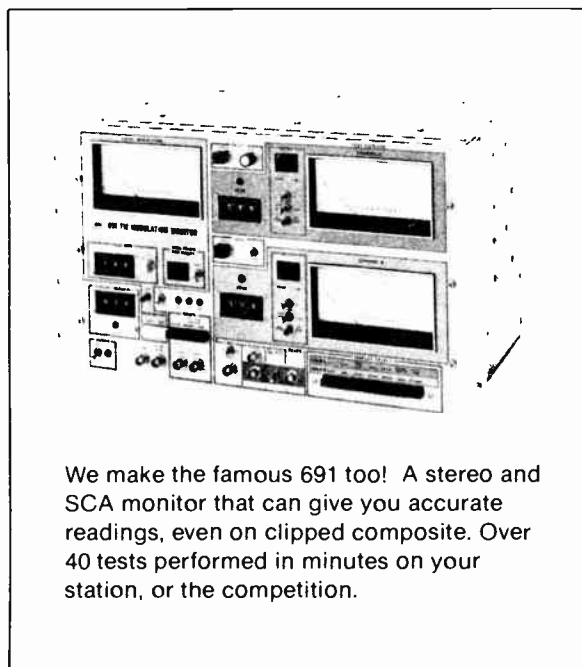
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Circle Reader Service 11 on Page 51

World Radio History

New Products

BE FM-10A Transmitter

Broadcast Electronics' FM-10A is a 4,500-11,000 W FCC-approved FM transmitter employing an advanced single-tube design.

The power amplifier section of the FM-10A utilizes a patented folded half-wave cavity which eliminates the troublesome plate blocking capacitor and sliding contacts found in other transmitters.

The output tube itself is an Eimac 4CX7500A tetrode. PA efficiency in the FM-10A is rated at 80% to 84%.

The FM-10A's intermediate power

amplifier system is completely solid state and is mounted in a handy slide-out drawer for easy maintenance.

The IPA output transistors are fully protected against any possible mismatch condition.

Operational aids for the IPA include three front panel status indicators and buffered rear panel metering outputs.

Other features of the FM-10A include a broadband input matching network, an advanced digital control system, an automatic power control with proportional VSWR foldback protection,

extensive metering (10 meters total), and a provision to add the optional Microprocessor Video Diagnostic System (MVDS).

For more information, contact Bill Harland at Broadcast Electronics: 217-224-9600.

Aphex Type C Exciter

Aphex has made several engineering changes to its Type C Aural Exciter. The basic circuitry has been changed to provide a more open and natural effect with greater enhancement of details. The company has applied for patents for these

improvements.

Aphex will upgrade older professional Type II Aural Exciters for \$200.

Through additional circuit refinements, the noise level was dropped an additional 14 dB. The company will not upgrade Type C Aural Exciters sold prior to July 1, 1986, when this change became effective. But, it will provide schematics of the changes for dealers or customers who would like to make the changes themselves.

For more information, contact Marvin Caesar at Aphex Systems Ltd.: 818-765-2212.



BE's FM-10A 10 kW FM Transmitter

Documentation Is Good Practice

(continued from page 16)

work one does concerns special projects, modifications to station equipment or construction of existing or new facilities.

Keep these projects documented separately. I have found that it is best to segregate the studio systems from the transmission systems. Each of these will then have separate dividers for such things as air control rooms, production facilities, news facilities and/or interconnecting wiring.

What can be said is whatever system you feel most comfortable with, use it. As long as you can demonstrate to the next individual the logic of the system you have employed so that they can use

your information to maintain or modify the system as necessary, then you have done the job well.

When you create the documentation for a project in advance of the actual construction, you then have the data necessary to speed your construction of the project through to completion with a degree of success than if one were to simply start the project and build-as-you-go, creating the documentation on the fly.

As an example, would you consider building your home or apartment building without the benefit of construction blueprints? I don't know of any contractor that would even consider such a situation. Why should you?

So many times I have heard the comment, "I just don't have the time!" or "I can remember everything."

You must make the time available to keep your journal entries up to date and accurate. The longer one waits before making entries, the greater the probability for inaccuracies to enter into your records.

On several occasions, it has become necessary to recall, with accuracy, certain facts and figures obtained while working on a client's equipment either for the client or the FCC. Referring to my journal provides all of the data necessary, including the time of day each particular event actually took place.

Whenever there is a doubt or a question, my first response is, "Let me consult my Day Timer for the details." Over the past couple of years this simple statement has seemed almost intimidating to individuals or clients who question the facts, though it was never intended as such.

Protect yourself, the facts of the work that you have performed, and your good reputation. Keep records of what you have done and create the documentation necessary to ensure a successful project.

Steve Conover is a radio consultant and contract engineer with Calhoun Engineering Services, LaVista, NE. Contact him at 402-339-8743.

IEEE Offers Wide Variety

(continued from page 4)

and askarel transformers, Pfrimmer said. PCB transformers are those with 500 or more parts per million of the substance.

PCB transformers must be inspected quarterly for leaks, Pfrimmer warned. If a leak is discovered, repairs must be initiated within 48 hours of discovery of the leak.

PCB equipment must carry EPA-specified "large mark" warnings. Large, high-voltage PCB capacitors (those with 3 or more pounds of dielectric fluid) may be used until October 1988, providing there is no risk of exposure of food to the substance, Pfrimmer said. After that time, access to the equipment must be restricted by a containment area surrounding it.

The large, high-voltage capacitors must carry a "large mark" warning, Pfrimmer said.

Pfrimmer said the disposition of PCB

equipment is carefully regulated and would best be handled by licensed hazardous waste disposal companies.

For more information, contact the IEEE at 212-705-7900.

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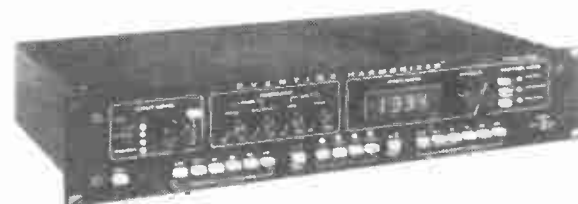
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Buyers Guide

STL, Remote & Telco Equipment

QEI's Arc 27 Simplifies Life

by Walt S. Gradzki, Pres.
Marionics, Inc.

Toms River NJ . . . When I was asked to write an unbiased equipment evaluation, I didn't hesitate for a moment. The piece of equipment I'm writing about is the ARC 27 automatic transmitter remote control, manufactured by the QEI Corporation in Williamstown, NJ.

As a consulting engineer, the ringing of a telephone in the middle of the night or morning (it doesn't really make very much difference), can mean only one thing: someone is off the air.

I've always wondered whether, if I knew the problem before traveling, could I save a trip? The answer is yes. That is, for one of my clients, anyway.

A few months ago I installed a new QEI 3.5 kW transmitter for WSLT in Ocean City, NJ.

At the time I had the option of either using their old remote control or purchasing a new one. I chose the new one and ordered the companion QEI ARC 27 option 01.

There were many reasons for this decision. Some were purely technical; others were based on personal feelings.

First, the companion remote would work without any modifications or special interface boxes.

If there's one thing I dislike, it's trying

to interface two different manufacturers' equipment; one wants to see a switch closure to ground, another wants that same closure to go high. But in any case, it never fails—a relay or two will have to be added to change some sort of operation.

User Report

Second, all the functions located on the transmitter were duplicated on the remote. There are warning alarms, warning lights and an LCD.

The LCD normally displays current time, plate voltage, plate current and power output. A key switch is provided to allow authorized personnel the ability to access the diagnostic functions.

In the diagnostic mode, the operator can view up to 64 different analog and digital transmitter parameters, including stack temperature, ambient temperature, line voltage, efficiency and even tower lights.

Third, I needed a remote that would work with the present telco lines and a future STL link.

The WSLT studio is located about six or seven miles from the transmitter. Telephone lines are used for the audio as well

as the control functions.

The QEI can be ordered with both modes installed. By changing a few jumper plugs, the remote will work either way.

The remote transmits and receives data at a 0 dB level. This level is more than sufficient for a good voice-grade telco line.

The fourth, and perhaps the most important feature for me, is the ability to access the remote via a dial-up telco line through my home computer. This is a dream come true.

When the phone rings, I simply have my computer dial up a modem at the studio and call up the working or history tables.

The history table tells me when and why the transmitter failed. The modem also can be installed at the transmitter end where a fault table can be accessed.

By the way, there are no control functions available through the RS-232 connector, so you won't have to worry about computer hackers turning off your transmitter.

Many times I'm able to talk a nontechnical person through a system checkout. Being at the Jersey Shore, we get quite a few lightning storms, high winds and power failures. It's nice to know when the power company or telco is down before making a long trip.

Since installing the new transmitter, it has gone off the air at least a dozen times. Most were due to loss of primary AC power. Cause? Atlantic Electric Company.

On two occasions the transmitter was hit by lightning. Just recently the remote was damaged by lightning through the phone line and two ICs were blown.

It didn't take long to correct the problem, since the parts were on hand. (I always order a spare-parts kit with the purchase of any major piece of equipment.)

Other reasons for choosing the QEI remote control were size, cost and quality.

The size of the remote is small, requiring only 3.5" of rack space. But don't let the size fool you—there's plenty inside.

(continued on page 26)

TC-8 Price is Right

by Hal Buttermore, CE
WHYT-FM

Detroit MI . . . The Advanced Micro-Dynamics TC-8 Remote Control System has proven itself an excellent choice for WHYT's new transmitter installation.

In early 1986, WHYT moved its main transmitter and antenna from the studio location in midtown Detroit to a suburban location. For the first time, we had to consider remote control equipment.

Our requirements were rather simple. With one BE 30 FM transmitter at the new site, and the auxiliary transmitter wire directed at the studio location, we didn't need a full-blown computer controller system.

Something basic but reliable with capacity for future expansion was what we were looking for. I should mention that a second transmitter is planned for the new site in 1987.

In with the new

I started the evaluation process and something caught my attention. A new company, Advanced Micro-Dynamics, offered eight channels of telemetry and control, plus status and microprocessor control—all in 1 3/4" rack space.

These features, along with a \$2,195 price tag, made me take a closer look. The quality of design, reliability and low cost are what convinced me to go with the TC-8.

First off, I like the 1 3/4" size of this box. This is definitely not one circuit board lost in a sea of sheet metal. Operation is simple, with just three buttons for operators and three more for the engineer. The TC-8 is designed by an engineer with radio experience, a real plus in my book.

Installation

Installation of the TC-8 was quite simple and went smoothly. Connections are made to the transmitter using "D" ribbon or telephone-type connectors. Although slightly tedious, these are commonly used and, if care is exercised, should cause no problems.

User Report

Interfacing was direct since BE provides an interface panel for this purpose. The BE diagnostics status indicator can be remoted with the TC-8 by consulting Advanced Micro-Dynamics for advice.

Due to the two-phase installation, we have not utilized this feature at this time. Status inputs accept TTL, 28 VDC or closure to ground.

The analog inputs are limited to 4.5 VDC, which required a voltage divider to reduce to the proper range or plate voltage. This is inconvenient at most, but

(continued on page 30)

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Buyers Guide

Symetrix Works Out of the Box

by Don Winget, CE
KISW

Seattle WA . . . When we decided to upgrade our on-air phone system, we detailed our needs and then made a careful survey of the available multiline controllers.

We soon discovered there are very few real choices in this product category. At first we thought we had set our sights too high, but it turned out there just aren't that many manufacturers that bother to integrate a phone system for broadcast purposes.

More for the money

After comparing features and price, and talking with other stations that were using these systems, we decided on the Symetrix Model 108 Broadcast Telephone System.

Even though some of the other systems seem, at first glance, to be well-designed for broadcast, we were surprised to find that only Symetrix includes a stand alone electronic phone system. Along with two-wire to four-wire telephone interfacing circuitry, it provides complete line handling facilities.

The other products we checked out re-

quired the addition of a separate key system, making their actual cost excessive. Once we discovered the Symetrix 108 met our needs and required nothing more to go on the air, the purchase decision was easy.

Our primary requirements for a phone system were really quite straightforward.

User Report

It had to handle at least six lines, be easy to install, easy to operate and be well documented. The manufacturer had to have a demonstrated ability and willingness to back up the product. (Of course, the unit also had to be FCC certified.)

Extra Features

The Symetrix 108 met all of our primary requirements, and provided many more features we hadn't even thought of.

It handles eight incoming phone lines just like a normal business telephone system. Because it uses a microprocessor to execute complicated signal routing and line handling operations from single key-stroke commands, we didn't have to spend weeks teaching the talent.

All eight lines may be seized, transferred to hold, to cue, to air and released from the command console in the studio. All the incoming telephone lines and connections to the mixing console go to the rack-mounted electronics package, so we didn't give up any more table space than necessary.

In addition, the system comes with three hybrids, allowing six callers on the air at once. At KISW we do a lot of bits via telephone, so the ability to have multiple lines on the air at once is very appealing.

We have two air studios at KISW, so the optional second command console allows us to keep a complete system ready to go in each studio.

We also have the ability to use one of the rooms to answer incoming calls off-air, then pass them to the talent. Or, by changing the unit's operating mode with the front panel "Mode" switch, we can lock out the unused console so no call gets put on the air, or disconnected, inadvertently.

The 108 works quite well for contests, because it always remembers the order in which calls are received. The LED associated with "oldest" call on hold flashes faster than the others. When calls come

in, and are subsequently answered or released, the order is preserved and indicated by the flashing LEDs.

Installation

Every CE gets a little nervous each time a new piece of gear goes on the air, and I have to admit this was no exception.

Telephone hybrids can be finicky enough by themselves, but in multiples they can be downright painful to adjust. Even though I knew this system would make life a lot easier for the talent, I wasn't looking forward to the installation.

Installation Rule #1: Read the manual. Installation Rule #2: See Rule #1. There's little else one can do to facilitate the installation of a device as potentially complicated as a multiline phone controller.

As a rule, I always get a look at the manufacturer's documentation before taking on any new gear that requires more than simple input/output hookup.

Most manufacturers will sell you a copy of their manual for a nominal fee, then take that cost off the purchase price if you decide to buy. I consider this time well spent because, without good documentation the actual cost of a product can almost double (if one or more engineers have to spend several days working on it).

(continued on page 27)

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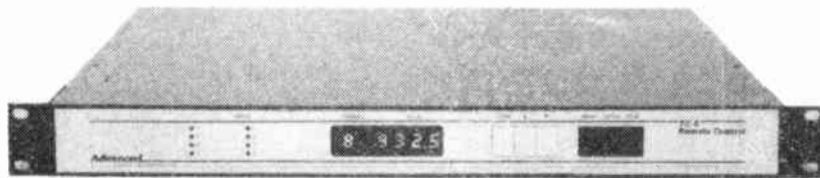


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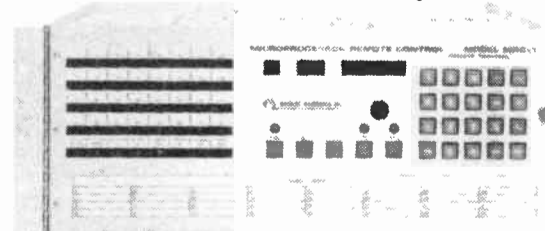
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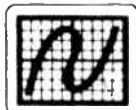


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Buyers Guide

EFT-1000s Can Go The Distance

Bill Lemmon, Tech Dir
WMEE-FM/WQHK-AM

Fort Wayne IN . . . A problem that we all have doing remotes is when we're trying to reach one of those hard-to-reach places.

What do you do? Use an equalized phone loop? Only if you return to the same location often enough. Besides, since deregulation, most phone companies have forgotten what an equalized loop is. And, if they do know, you have to order it at least 27 working days in advance.

So, how do you handle a last-minute remote in that "hole?" Russ Gentner has one possible answer.

Microprocessor control

The EFT-1000 Extended Frequency Transceiver is a telco-based remote unit. Stick one unit in line with a standard telephone at the remote site. Put another unit at the studio and, *voilà!*, instant "remotes."

Well, it's not quite that easy, but it does work, with some limitations. I will explain the limits that we have run into, and some things that have helped our operations.

The EFT-1000 is a microprocessor controlled, dial-up phone coupler, with lots of extra features, like full-duplex capability, a choice of one or two lines, auto-

answer/disconnect, auto-encode/decode, Aphex® processing, mic/line input, and headphone monitor jacks (two).

How does it work? A sharp low-pass filter cuts off the audio above 3 kHz, and the audio is shifted up by 250 Hz to retain the 2½ octaves of lower frequencies. The audio then fits into the nominal 300-3500 Hz bandpass used by the phone company.

At the receive end, the audio is downshifted by 250 Hz, and the Aphex processing recreates the higher frequencies above 3 kHz.

Revision B units include full time 2:1 companding for an extra 30 dB of quieting. The EFT-1000 is also compatible with a Comrex receiver.

The single-line setup is duplex (send/receive is one line); the two-line operation uses separate lines for send and receive audio.

For single-line operation, the unit is hooked up to receive audio at the studio, and sends program/cues to the remote site. You can set the unit for duplex operation by pushing the Duplex button in. (You can have a phone set plugged in as well.)

At the remote, the phone line is plugged into the EFT Transmit line jack, and the phone into the set jack. All you have to do now is plug in a mic or mic mixer to the input XLR connector (select line or mic level), and plug your head-

phones into the monitor jack. Push the Transmit-Duplex button on the back, turn the power on and you're ready to go.

To establish contact with the studio unit, push the Transmit-Set button in and dial the studio number. Then im-

User Report

mediately push the Transmit-Line and then the Encode/Decode Auto button to allow the unit to auto-answer and enter the encode/decode mode automatically.

Adjust the send and monitor levels on the front panel, and that's it.

Two-line operation

The two-line operation is similar, but includes an extra line to call up for receive audio.

The studio unit is set up with two phone lines, with the Duplex buttons out. This is very important.

At the remote, use the same setup, with the extra phone line plugged into the receive jack, and the Duplex buttons out.

Dial up the studio with the Transmit Set button in (you'll be sending audio on this line). Push the Transmit Line button. Shift over to the Receive Set button and push it in (you'll be listening to the studio on this line).

Again, push the Receive Line button and then the Encode/Decode button. The units will then Handshake and automatically set themselves up. Set the audio levels in and out, and you are ready for operation.

Obviously, there are several variations to these procedures, i.e., you can manually operate the various functions, use duplex mode on the receive line for sidetone, and so on.

As I mentioned earlier, if you have a

Comrex receiver, you can use it as a second unit for the studios.

We have been using our units for nearly six months. It has been a learning experience—most of it about our in-house telephone system, rather than about the EFTs.

However, there are some things to watch out for. In particular, *do not unplug the units with the power switch on.* To our embarrassment, we learned that doing so will blow one of the encoder chips.

We have found that in duplex operation, we can hear crosstalk noise generated by the microprocessor clock. Gentner has made a modification to reduce this problem, but it is still noticeable under poor phone transmissions. Switching the unit out of duplex mode, while on the air, cleans up the problem.

Also, low ring voltage will prevent the units from recognizing each other and shifting into automatic mode.

Our existing phone system (PBX/Key hybrid) has caused us much grief due to mismatched impedances, low ring voltages and the like. As a result, we have dedicated lines for use with the EFT-1000s.

If you want studio quality, get a satellite uplink, but be prepared to spend the big bucks. The EFT-1000s are designed to give us an alternative. They are definitely better than a normal phone line, and the addition of the fulltime companding in the B models gives the extra edge over S/N.

The Aphex processor regenerates the higher frequencies (3+ kHz) and restores some of the presence to the signal. Even lines are improved.

We are beginning to use the EFTs more and more. We can now do remotes in some of the surrounding towns and areas that we could not reach any other way

(continued on page 25)

RC 16 + Rugged Unit

by Terry Jordan, CE
Cape Fear Brdcstg Co.

Fayetteville NC . . . The summer of '86 will be remembered for years to come as the summer the lightning came. Mother Nature finally invaded the inner sanctum of our Potomac Instruments RC 16+ system's transmitter unit.

User Report

I assessed the damage and called the factory . . . asking to speak to (no joke) "the Maytag repairman." I used that expression because, since we installed the RC 16 well over two years ago, it has worked and worked, and worked!

After informing the factory of the damage, they wanted to see the unit, so a loaner was immediately sent.

This is a strange way to begin a user report, but I don't know of anything electrical in nature that lightning *can't* get!

The RC 16 is state-of-the-art, featuring an internal FSK modem at 300 baud full duplex, and all the intelligence in the studio unit *away* from RF. More importantly, it is designed for the busy air personality to use without having to have a degree in computer science.

Installation is straightforward, with spacious barrier strips for easy connec-

tion of control and metering circuits. In our application, at WAAV (AM), Wilmington NC, the RC 16 handles many tasks.

We operate on 980 kHz with 5 kW fulltime, DA-N, using SX-5 main and BC5-P auxiliary transmitters. The Potomac phase monitor is connected to the remote control, allowing the operators simple and accurate monitoring of directional parameters.

Switching modes is accomplished on one channel using raise (day) and lower (night). Either transmitter may be switched to the antenna via the system as the off-air transmitter is automatically dumped into a 5 kW dummy load.

The RC 16 is connected via a dry loop from the telephone company. In the near future, we'll upgrade the unit to allow use over STL sub and TSL (transmitter-to-studio link).

Provision is made for a CRT display and a printer connection, as well as automatic operation with AUTO-LOG.

In my opinion, the Potomac RC-16+ (the + means it is expandable) is a very reliable remote control system . . . and, after all, isn't reliability a condition that brightens our faces?

Editor's note: For more information, contact Dave Harry at Potomac Instruments: 301-589-2662. The author may be reached at 919-864-5222.

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Buyers Guide

Studer Hybrid Clean

by James F. McGivern III
Asst CE, WTIC AM/FM

Hartford CT . . . The best way to get good, clean telephone audio is to install a telephone hybrid and null it for each

caller, or install a Studer telephone hybrid and let it optimize for the best null automatically. When rewiring our telephone conferencing system at WTIC, we chose the latter method.

Anyone with a speaker phone or fixed

hybrid is already aware of the problems with providing consistently good telephone audio.

Speaker phones pop, click and chop in and out if there is any noise in the studio.

Hybrids get around these problems by allowing both sides to speak simultaneously. However, to do this, the hybrid has to separate local audio from caller

audio. The measure of a good hybrid is how well it can do this.

Most hybrids can be adjusted to provide adequate separation on any given line, usually somewhere between 12-15 dB.

The problem is that phone lines are like snowflakes—no two are alike. Every time a new line is switched in, the hybrid needs readjustment. Most stations can't afford to pay someone to constantly re-null the equipment, so it is set up for an "average" line.

Automatic nulling

Studer addressed the problem by incorporating an automatic nulling circuit in its hybrid to custom adjust for each line.

The circuitry at the heart of the Studer hybrid is a bridge circuit not unlike the one in your impedance bridge. The bridge provides error signals to two phase comparators which control an "electronic resistor" and an "electronic capacitor" to match the real and imaginary components of the phone line in use.

User Report

This results in good cancellation of local audio. All that is left is the caller audio at the output terminals.

The installation is quite simple, but does require some time to set up the circuit to operate properly.

Once the unit is installed, the autonull sequence is slightly audible during the first second after a new line is selected.

Twice a year we find it is necessary to re-do the setup because of drift and changes in the lines themselves.

Functional design

The Studer telephone hybrid is designed to be rack mounted. It measures 1 $\frac{3}{4}$ " high, 19" wide and 11" deep.

All of the adjustments are on the front of the circuit boards, which sit in sliders behind a quick disconnect cover. All the connections are made on the rear skirt, where audio goes in and out on XLR connectors. The telephone line and handset use speaker-type clips.

The overall construction is straightforward and well thought out. The unit even includes a free slot to support two independent hybrid circuits.

We make good use of the second hybrid in our two-line conferencing system, but it can be used in two separate studios if that's what you need.

The Studer telephone hybrid has provided a consistently clean telephone system for WTIC since 1979. There have been no failures.

In fact, the unit works so well that I sometimes take it for granted. For my money, that's the kind of equipment I want—and the kind I recommend to others.

Editor's note: For more information, contact Bruce Borgerson at Studer Revox: 615-254-5651. The author may be reached at 203-522-1080.



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Buyers Guide

KMGC Pleased with TFT 8300

John Adcock, Tech Mgr
KMGC-FM

Dallas TX ... The selection of a new composite STL for KMGC was part of our plan to continue updating and improving the station's transmission equipment. We determined that the new system should be compatible with the system that the station had purchased some time before.

We also wanted the new system to incorporate a highly selective receiver so that interference and noise would not be a problem. STL frequencies in the Dallas-Fort Worth market have become increasingly congested as more and more FM stations move their transmitter sites to the Cedar Hill towers.

By late 1984, we had pretty much narrowed our choices to either another of the same product or the TFT 8300 STL.

The TFT 8300 STL equipment began receiving positive reviews shortly after its introduction. Two other FM stations at KMGC's Cedar Hill transmitter site were utilizing TFT 8300 systems, and the engineering departments for both stations seemed pleased with their performance.

In August 1985, the local TFT representative, Darryl Parker of Parcom, arranged for KMGC to demo the TFT 8300 STL for a couple of weeks. When the packages arrived containing the TFT equipment, each package was opened immediately for inspection.

All of the equipment arrived in good shape and with the correct accessories.

Spare moments during the next few days were spent becoming familiar with the TFT 8300 system and operating manual. The printed TFT 8300 specs were almost identical to our system's specifications (although the TFT transmitter is capable of a slightly higher power output).

Interestingly, the pinouts for each of the transmitter's remote connectors also were almost identical. We were pleased to discover that, by resoldering one wire in the transfer panel remote cable, the TFT transmitter would operate with our transmitter transfer panel.

After some discussion with TFT fac-

EFT-1000

(continued from page 23)
(even Indiana has hills).

Our farm director can now go out and do his reports anywhere there is phone service. The morning shows are planning to go "on the road" for a week or more a couple of times a year. And we have the capability to go anywhere to reach our listeners and/or clients.

The Gentner EFT-1000 is becoming a valuable addition to our ability to reach the public. And that's what it's all about.

Editor's note: For more information, contact Elaine Jones at Gentner: 801-268-1117. The author may be reached at 219-447-5511.

tory personnel, it also became evident that the TFT receiver would probably work with our receiver transfer panel, thereby eliminating entirely the need to purchase any new STL transfer panels.

Finally, about one week after we received the TFT equipment (during which time we tested the transfer panel connections and audio/Rf circuits on the bench), we placed the 8300 system on the air, after midnight.

Immediately, we noted a crosstalk problem between the station's 110 kHz remote control MUX signal and the program channel. Measurements indicated it was about 45 dB below the main program—and (of course) it drove the air-staff crazy.

Next-day consultation with TFT factory personnel and Parker indicated that a MUX frequency change to 152 kHz (from 110 kHz) was in order. Because the station's transmitter remote control was a TFT model 7610, it was easy to obtain a couple of MUX generator and receiver cards from the factory overnight.

It was not easy to install them—both cards drifted off frequency when the remote control unit covers were replaced and the equipment was reinstalled in the station equipment racks.

It took a lot of patience and a new LM565 chip on the MUX receiver card for the remote control system to operate with any degree of reliability.

With the remote control crosstalk problem eliminated, it was time for more system tests and, unfortunately, more problems. Further tests after midnight revealed a ground loop between the TFT 8300 STL transmitter and the station's

TFT 7610 transmitter remote control in the control room (approximately 175' away from the engineering equipment racks).

Regrounding both equipment racks to the station's copper ground strap system dropped the level of the ground loop to -64 dB.

The off-air, de-emphasized noise level of the left, right and main channel with

User Report

the remote control disconnected (and the 8300 receiver IF switch set to the "wide" position) was around -69 dB, according to the station's QEI 691 modulation monitor—not bad for a composite STL system utilizing an 18 mile path into a congested RF environment.

The TFT system passed square waves relatively well; we noted very little overshoot. Distortion measurements made using a Sound Technology 1710A fed by the QEI 691 modulation monitor revealed that the system was performing well within specifications. Frequency response was essentially flat across the entire baseband.

On a less objective level, I've noticed that STL systems have "different" sounds—as do amplifiers, transmitters and other things that must pass complicated audio waveforms. Our observation is that the TFT 8300 STL can sound open and pleasing, without the midrange screech of some systems.

Since KMGC placed the TFT STL on the air, only one failure has occurred; a

defective transistor in the receiver front end failed, thus lowering the receiver sensitivity.

This was indicated by noise on the remote control MUX channel and by a low RF level indication on the receiver's front panel LED display. The problem was noticed in time and did not result in any unplanned loss of air time.

The TFT 8300 STL receiver uses a series of LEDs to indicate the received RF signal strength.

During day-to-day use, we have determined that our other receiver provides a more accurate indication of the received RF level. On the other hand, the LED modulation bargraph on the TFT transmitter is easy to use and provides an accurate indication of the STL transmitter's deviation.

Sooner or later, everything stops working. If that didn't happen, a lot of broadcast engineers would be unemployed. At many stations, with their shrinking engineering staffs and little or no maintenance time, one of the challenges engineers face today is finding equipment that performs reliably and exceptionally in the day-to-day environment of commercial broadcasting.

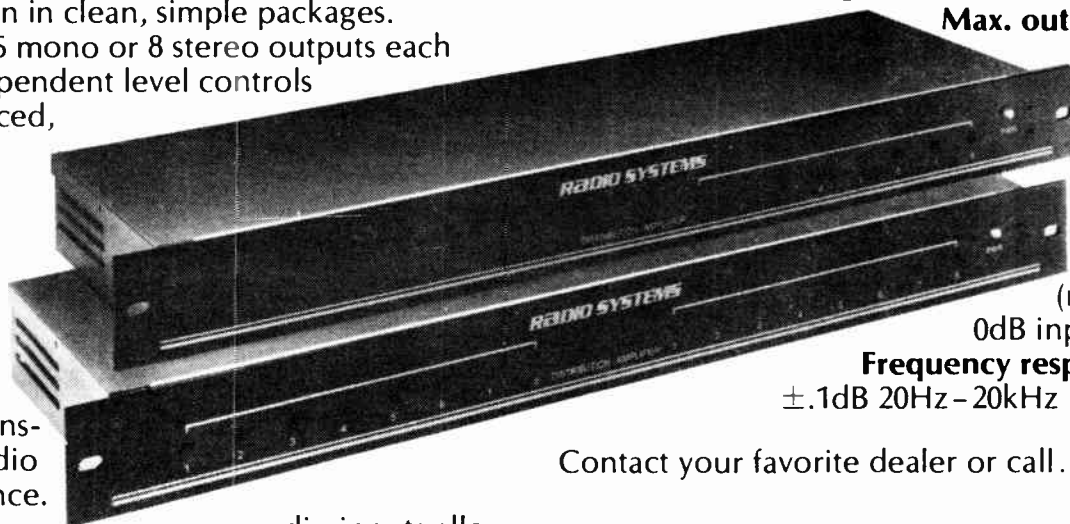
For KMGC, the TFT 8300 composite STL has proven that it has "the stuff" to provide the station with an STL that delivers quality and performs reliably. It is truly the closest thing we've found to a "piece of wire."

Editor's note: For more information, contact Jesse Maxenchs at TFT: 408-727-7272. The author may be reached at 214-688-0641.

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Buyers Guide

Comrex Will Run the Extra Mile

by Richard Dearborn
Radio Eng. Mgr.
The Christian Science Monitor

Boston MA . . . The Christian Science Monitor, an international daily newspaper, is undergoing an expansion program that now includes radio and television programming, as well as a short-wave world service scheduled to go on the air in January 1987.

As with any major news organization faced with the deadlines of daily radio production, we had to deal quickly with the need to obtain story feeds from remote locations. An additional challenge was the fact that our feeds had to meet the quality standards of public radio broadcasting on FM.

The decision was made early on to rely heavily on the Comrex dual-line frequency extension system for production feeds from remote locations.

The system allows us to feed reasonable quality 50 Hz to 5 kHz audio signals down two conventional telco dial-up lines, which normally have a response of only 300 Hz to 3 kHz.

The system works on the principle that an audio signal can be split into two components: one containing low frequencies, the other high. The entire low frequency signal is then upshifted 250 Hz, and the high downshifted 2,000 Hz.

Each signal is then fed through the two telco lines. At the receive end, the opposite process takes place, resulting in a recombined signal with a transmitted response of 50 Hz to 5 kHz.

In addition, telco-related hum has been shifted beyond the resultant passband,

and line noise has been reduced by means of 2:1 companding.

A further improvement in quality can be obtained by sending the material down the phone lines at half its originally recorded speed. After a feed has been recorded at half-speed on the receive end, the tape is then sped up to its normal speed, resulting in a 10 kHz signal.

We actively use both methods of transmission.

User Report

Within the last year, we have equipped Monitor bureau offices in Los Angeles, Washington, DC and London with dual-line Comrex PTLX extenders.

We also own a fourth unit in our pool of field equipment.

On the receiving end in Boston, we have a system which allows only one dual-line Comrex receiver to serve our entire facility of 12 studios.

The two incoming phone lines are connected to two Comrex TCB-2A auto-answer couplers. These devices will pick up a line when it rings, and hang up when the caller hangs up. They also couple the telco signal to a standard, balanced XLR audio output.

The two couplers feed a Comrex LX-L Auto Leveler, which matches the gains of the two telephone lines when the Comrex alignment tone is fed from the PTLX transmitting extender.

This automatic level adjusting step compensates for any level differences on phone lines and makes it unnecessary for

an engineer to physically adjust the receiver every time a feed is taken.

The output of the LX-L is then fed directly to the input of the Comrex RTLX two-line receiver. The receiver decodes the processed phone line signal, which we then feed to our house routing-switcher system.

Each studio in our facility has access to the routing switcher, allowing immediate access to Comrex feeds. In fact, use of the Comrex becomes so intense at certain times of the day that we have had to schedule it in 15-minute intervals.

The only regular problem we have encountered is in receiving feeds from our London bureau.

Frequently the call made on line one will take a different path to Boston than the connection on line two. This happens when one signal travels via satellite, the other via submarine cable.

The result in Boston is a time delay between the two lines, making the program material unusable. A solution to the problem—which has worked well for us—is to dial the two lines with all but the last digit, then punch in the last digit at the same time on both phones.

Comrex has informed us that they are already experimenting with an optional variable digital delay the receive engineer can use to compensate for travel phase delays.

We find the dual-line Comrex system to be a high quality, reliable means of getting news material to our studios with a minimum amount of pre-scheduling.

The quality does vary somewhat every time it is used, but the variations are due to the difference in quality of phone lines,

and not the Comrex equipment itself.

One other problem we have experienced is a slight high-end edge distortion when using dual-line at half-speed. Comrex informs us that this is because the processing rate was designed for full-speed rather than half-speed audio. This tends to slightly chop the HF signals at half-speed.

A new device is being researched which has different rates for full- and half-speed transmission.

One of the biggest advantages of using Comrex equipment is the staff at Comrex. In general, we have found them to be among the nicest and most responsive of any of the equipment vendors we deal with.

Comrex representatives are very responsive to new product ideas and improvements. They also have the ability
(continued on next page)

QEI Arc 27

(continued from page 21)

The QEI contains a demodulator so you can receive right and left channel audio, RS-232 modem connection, key switch to prevent unauthorized fingers from resetting alarms or changing parameters, and a full diagnostic readout.

The quality of all QEI products speak for themselves. These guys have been around for awhile. They use over-the-counter multiple-source parts. This means you can go down to the local Radio Shack and pick up many of the parts. The rest could probably be picked up from Jameco or Digi-Key.

I told you I would be unbiased. This piece of equipment is far from being perfect. There are some annoyances.

An LCD alphanumeric display is used to read all of the information. To read the display, you have to view it from just the right angle, otherwise you see only a blank screen.

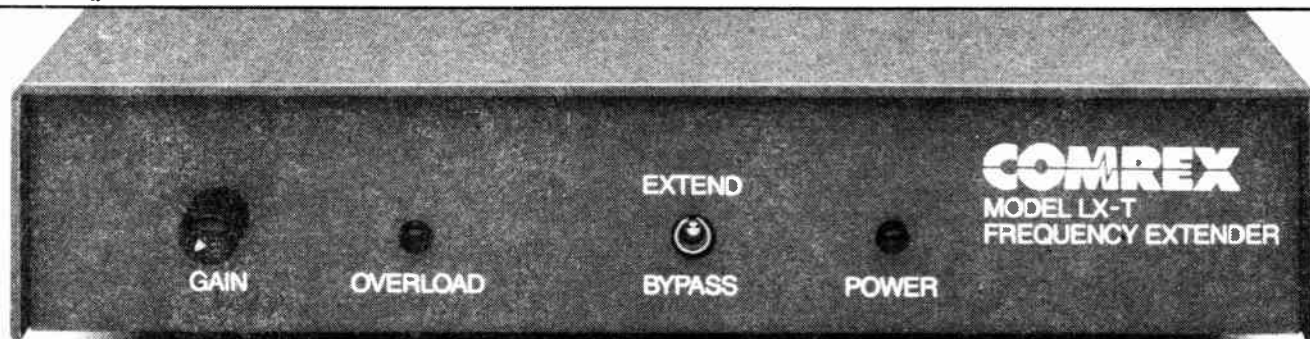
This is typical of all LCD displays, however, and I believe with the addition of a backlight the display could be read without any problems.

Another thing that annoys me (and it's not only QEI), is the lack of a good circuit description and flow diagram. The service manual is excellent, but things are hard to find in it. I would like to see some waveforms and voltage readings throughout the circuit, and maybe some test points.

As far as the installation, it was simple and straightforward, with only four connections. I hooked up the phone, antenna, audio outputs and a Radio Shack modem. It worked the first time, right out of the box.

There is one thing I would like to see QEI install—a digital readout of the actual defective component, showing location, value, part number and problem (shorted/open). Only kidding, folks. If QEI comes up with this one, I'll be out of work!

Editor's note: For more information, contact Bill Hoelzel at QEI: 609-728-2020. The author may be reached at 201-240-3119.



COMREX EXTENDER—\$495!

Finally there's a frequency extender that's really affordable. And, it's a Comrex. Frequency extension is a way to send broadcast-quality program over a standard telephone line. It's an encode/decode system that restores the lower frequencies that the phone can't handle.

We've been building these systems for years, but a lot of people who should have been using them simply couldn't afford them. That's why we developed the Basic extender. Each component (encoder and decoder) sells for \$495, so your complete system is less than \$1,000.

The Comrex Basic may not offer some of the "extras" available on our other models. What it does offer is a distinct improvement in program quality sent over telephone lines.

Call Comrex for a demo tape, at 1-800-237-1776. Or write Comrex Corporation, 65 Nonset Path, Acton, MA 01720. Tel. (617) 263-1800. TWX 710-347-1049.

COMREX
BUILT FOR BROADCAST

Buyers Guide

DRC-190 is Willing and Able

by Johnny Bridges
WYAY-FM

Atlanta GA . . . When we acquired Y106 FM in 1984, expansion plans for the transmitting plant showed that our analog 15-channel remote control would have to be replaced.

While quite reliable, it was not expandable, and did not support a CRT display or printer.

An evaluation of available units showed only the Hallikainen & Friends DRC-190 met our needs of flexibility and price, so a two-unit system was acquired with 20 channels of control and metering.

Building-block system

The DRC-190 system uses a building block approach; each site starts with a common unit, to which features can be added.

The common unit contains a microcomputer with some nonvolatile memory, a display and control panel, communications speaker, an RS-232 com-

munications port, operating software, a calendar/clock and Microsoft's 8K BASIC resident in the unit.

Sites communicate on a common two- or four-wire line, which may be telco, subcarrier, TRL or a combination. Keying is provided for TRL systems, so that a single frequency can be used. A maximum of 99 sites may share a system.

To each site may be added up to 100 channels of metering and raise/lower control in blocks of 10, status in blocks of 32, memory in banks of up to 64K, an auto-answer modem and a disk drive.

There isn't much limit to what a system can do or where. Add either a microcomputer or a dumb terminal and printer to the RS-232 port of any site (or all of them), and each parameter at each site is available.

We started with two sites in an interim studio, and operated the unit for several months from the front panel as a basic remote control.

The units performed quite well, both on telco lines and on an STL subcarrier/TRL system. When our new studios were

complete, we added a Commodore 64 microcomputer and color display, and a printer.

Although we're constantly adding features to the display as time permits, it

User Report

currently shows RF plant parameters with updates each minute or so, and prints hard-copy parameters each half hour.

We set limits in the software, and change screen colors to attract the operator if a limit is exceeded. Should we lose the main transmitter, the backup comes on-line automatically, and the display changes to show its parameters, with a note and color change to attract the operator to the change.

Each time a limit is exceeded, we print all parameters. This makes it easier for us to determine what happened, even in the middle of the night.

Although battery backup is offered for

the DRC-190, we haven't needed it because of its "wake-up" feature.

The EEPROM in the units can be loaded with a short BASIC program, and the unit will load and execute this program on power-up or reset. We use it to run a simple scroll program to keep the display going until the Commodore can be reset.

It should be noted that the front-panel controls of the 190 and the display on the unit are unaffected by the BASIC program. Thus the system can be used as a remote control at any time, whether the display is connected or not.

Service, maintenance

Firmware updates for the unit are provided by Hallikainen & Friends each time new features are added. These are sent at no charge on an exchange basis.

Although a 24-hour service number is provided, we haven't needed it. Calls during business hours have gotten us prompt answers to our questions, and helpful hints for using the 190.

We've only had two minor failures, both due to lightning strikes on our telephone lines. The addition of suppressors on the lines at the telco block has resulted in uninterrupted operation of the unit.

All in all, the DRC-190 represents a very flexible remote control system at a reasonable price. For the computer buff, it's a dream which can be made to do anything you care to command it.

Symetrix 108 Works Out of the Box

(continued from page 22)

Fortunately, the Symetrix 108 comes with as complete an installation and operating manual as one could desire. It's as good as any I've seen, and really helped me get comfortable with this product. Spend 20 or 30 minutes reading, and you'll have the system up and running in an hour and a half.

The installation section of the 108 manual begins with a checklist, so nothing gets overlooked. Each item in the checklist is referenced to the section of the manual that provides complete details. By simply running through that list one item at a time, we had the unit working the first time we fired it up.

Also included in the manual is a group of short, narrative style "Typical Applications," that will clear up any misunderstandings the talent might have about how the unit is used. Talk shows,

contests, telephone polls, and off-air conference calls are a few of the topics covered.

Line matching

The 108 comes from the factory ready to go, except for local phone line matching. The matching procedure requires nothing more than a small screwdriver, a meter, and enough patience to run through it with each of the three hybrids.

Of course, if you don't take the time to match the hybrids to your local phone line impedance, the system will never sound as good as it should.

At KISW we tuned the hybrids by ear, then checked the results by putting the announce mic signal up on the board's left channel, and the caller signal on the right.

The board levels were set for 0 VU peaks, first with just the announcer speaking (on the left), then with just the caller speaking (on the right).

By observing the left/right level difference while speaking into the announce mic, we could see how well the hybrids were working, because the right meter indicated how much of the studio signal was coming back through the phone line. The right meter hardly moved, so we knew we were achieving a consistent trans-hybrid loss of 15 to 20 dB.

Product suggestion

There is really only one suggestion I had for Symetrix on this product. To enable the use of the same phone lines on air and for business, they should make some kind of little relay box to transfer lines to the air system so somebody in the office doesn't accidentally end up talking receivables with the whole world.

It turns out there already is such an ac-

cessory but Symetrix doesn't push it. It's called the 108RB. It has eight relays that follow the 108's activity, and it's priced so low I can understand why they don't try too hard to sell one with every unit.

Editor's note: For more information contact Dane Butcher at Symetrix: 206-282-2555. The author may be reached at 206-285-7625.

Editor's note: For more information, contact Hallikainen & Friends: 805-541-0200. The author may be contacted at 404-955-0106.

Comrex

(continued from previous page)

and a willingness to test both transmit and receive units over phone lines from their headquarters in Massachusetts.

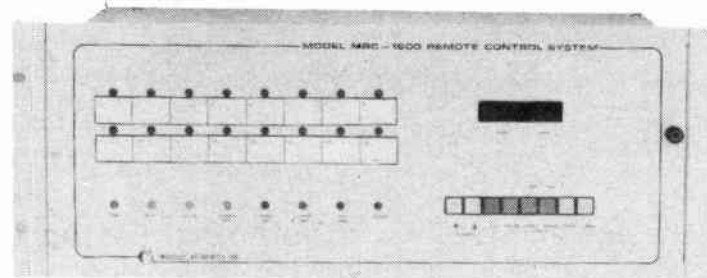
The Comrex dual-line frequency extension system has become an integral part of our news gathering activities for radio. Not only does our air product sound significantly better, but the convenience and reliability of Comrex equipment have saved the day for us on many occasions.

Editor's note: For more information, contact Lynn Distler at Comrex: 617-263-1800. The author may be reached at 617-262-2300.



Moseley

Microprocessor Remote Control



The MRC-1600 Microprocessor Remote Control offers microprocessor flexibility and sophistication in an economical and dependable package for general AM-FM remote control applications. It comes equipped with 16 status inputs, 16 telemetry inputs, 16 raise command outputs and 16 lower command outputs. Each command output is relay-isolated. Adapting the MRC-1600 to current system interconnections is easy.

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In NC-800/221-7267

Buyers Guide

Master Remote with Marti RPU

by Clifford W. Koch, Corp Eng
Great Empire Brdcstg, Inc.

Wichita KS . . . Remote pickup units for remote broadcasts: are they necessary?

I would ask, is revenue necessary to maintain operation of your station? If revenue is important, is your station prepared to carry a remote broadcast on short notice, or does it still take 7-18 days for a telephone broadcast loop to be installed?

Evaluating options

Let us review the possible and impossible uses of remote pickup broadcast equipment. We use equipment manufactured by Marti Electronics: an RPT-2 hand-carried portable transmitter, a CR 10 base receiver, and RPT-25 UHF and RPT-40 VHF transmitters.

The decision to buy equipment manufactured by Marti was based on my normal evaluation, as follows:

- Is it a company that has been in business and intends to stay in business, thus assuring easy procurement of parts and repairs in the future?
- Does the company and its employees have a good attitude? (If all employees feel they are an important part of that

company, you will find the entire company staff working on your problems with you, should problems arise.)

- Will equipment meet your needs and perform satisfactorily?
- Is the equipment competitively priced and reliable?
- Are transportation routes that are established satisfactory for emergency parts shipment if any are needed?

User Report

Finding positive answers to all of the above, we made a decision to go with the Marti equipment.

The location of your studios will determine some of the system design criteria.

At KFDI in Wichita, we use a CR 10 UHF base receiver and 10 dB gain omnidirectional antenna mounted atop a tall building downtown. The output of the receiver is connected to a permanent, equalized telephone company remote line, which carries the receiver audio output to the KFDI studios on the north side of Wichita for broadcast.

The telephone company permanent remote line eliminates the installation costs

that would apply if a line was ordered for each remote. At KTTS, in Springfield MO, the receive antenna is mounted on the KTTS-AM tower next to the KTTS studio.

It is important to establish the receive point in a location that will allow coverage of the area you desire. After the receiver is installed, it will take some trial runs to establish a reliable coverage area. Tall obstructions such as buildings and hills can alter the coverage in some directions.

Transmissions

Transmitting to the receiver is accomplished with an RPT-25 UHF transmitter. It can be mounted in a car or van, or can operate unmounted inside a client's place of business.

It will operate on AC voltage or 12 VDC. For mobile operation, we use a roof-mounted omnidirectional antenna. For remotes, the antenna used is a yagi directional antenna. The RPT-25 has mixing facilities for three low-impedance microphones and one high-level 600 ohm input.

Many times the yagi antenna is mounted on a microphone stand in a store window, pointed in the direction of the receiver location.

The Marti RPT-25, connected to the

antenna, serves as the transmitter and microphone mixer. Other remotes may require the RPT-25 transmitter to be operating in the van with an extended slip-together mast to raise the height of the yagi transmitting antenna.

In this setup, we use a Shure M67 or similar mixer in the client's place of business, and connect one shielded pair of audio wires from the mixer output to the #4 high-level input on the RPT-25 transmitter. The shield is not connected at the Shure M67 mixer to minimize ground loops.

This will suffice for a start of a remote pickup broadcast system. For more flexibility and convenience, add a RPT-2 transmitter and another receiver in the VHF band. The receiver audio output can be connected to the RPT-25 UHF transmitter #4 input or can be connected to a Shure M67 mixer that is feeding audio to the RPT-25 UHF transmitter.

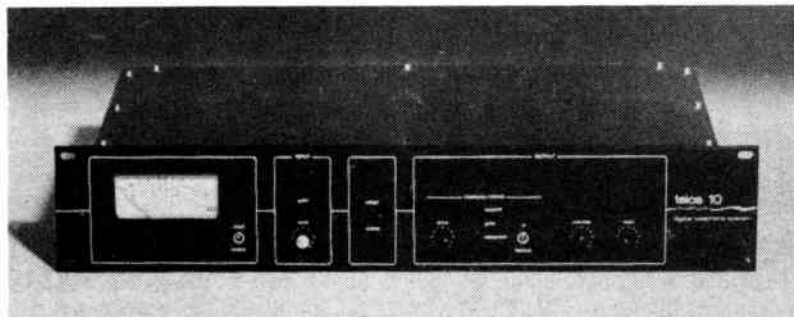
The RPT-2 transmitter, which is hand carried, can be used in many locations if the remote involves a large shopping center. As a wireless microphone, it will cover an entire car lot, rodeo grounds or fair grounds.

Just let your imagination and creativity go to work. Since either unit, the RPT-25 transmitter or the RPT-2 transmitter, are operable from AC voltage to DC, they can be used in either mobile or fixed locations.

Great Empire has used this equipment
(continued on page 31)

TELOS 10

The Major Market Telephone Hybrid



Networks and stations in New York, Los Angeles, Chicago, Detroit, Washington DC, Philadelphia, Atlanta, Denver, and other Major Markets now have the state-of-the-art in telephone interconnection. They chose the Telos 10 for its superior hybrid performance, full duplex capability, and simplicity of operation. Above all, they know—ITS THE BEST!

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Talk to Your RCS-1V

by Gary L. Diamond, CE
KOB AM/FM

Albuquerque NM . . . Your telephone rings in the middle of the night, and you struggle to gain enough composure to answer it. The telephone call, it turns out, is from your transmitter remote control.

An over-power condition has gone unnoticed by the overnight board-op for almost 10 minutes, and the remote control thought you should know about it.

You punch in a few commands on your Touchtone™ telephone and correct the problem. Another phone call to the board-op expresses concern and clarifies operating procedures, and then it's back to bed.

If it had been anything more complicated, a sequence of commands and interrogations could have determined the problem without having to talk the board-op through a complicated sequence of controls. An engineer's dream, right?

Talking remote

Well, the Delta RCS-1V remote control system allows you to do exactly that by utilizing its telephone control port—one of its handiest features.

You may enable a call-on-alarm feature, or interrogate the system from any touchtone telephone. I have even taken a set of meter readings on KOB-AM from O'Hare Airport in Chicago while

on a business trip!

Dialing "90" gives you a summary report. If all is well, the voice synthesizer will tell you "In Limits." If all is not well, the voice will tell you which channel is out of limits.

If you have set the system up to allow telephone control of some of the channels, you may turn things on and off to your heart's content!

The Delta RCS-1V remote control system is a microcomputer-based, very flexible system, and because of that, some-

User Report

what difficult to set up the first time through. Channels may be set up to be one of two types, either data channels or status channels.

Data channels may be set up with or without alarm limits, and they may also be active under only a certain set of circumstances. For example, a channel which indicates nighttime antenna parameters may be muted during the daytime.

Separate limits may be set for daytime and nighttime operation. More than one transmitter may be monitored by the system. If you should be controlling a daytimer AM and a fulltime FM, the system can be set to mute the AM readings during the time it is not on the air.

(continued on next page)

Buyers Guide

Your RCS-1V is Calling You!

(continued from previous page)

Status channels are the second type of information channel handled by the RCS-1V. Active channels are designated by an asterisk next to the channel on the CRT.

Controls may be made either momentary-contact or latching type, and all outputs are isolated by relays.

The RCS-1V also features a real-time bar display of modulation, and modulation peaks are shown by a reverse-video indicator on the CRT.

There are two modulation bar displays, and they can be used for left and right channels or positive and negative modulation. If the telephone access port is used, codes allow you to listen to either of these two inputs.

Logs may be hard-copy printed and the system completely updated at any preset time interval desired. KOB-AM uses an update interval of one hour between log printouts. If desired, a code allows a forced printout at any time, such as when an alarm condition is detected.

Interruptions in power

All of the channel definitions reside in RAM in the RCS-1V transmitter control unit. Because of the length of the program, the loss of it could cause a major headache.

The RCS-1V provides a method for backing up the RAM information using a data-grade cassette machine. Reloading the program only takes a few moments.

Since it is easy to make changes to the system to accommodate new devices, frequent backups should be made on tape (this detail is easy to overlook).

Only one severe problem has occurred with the RCS-1V system which bears mentioning. Ours is one of the very first, and the problem may have been corrected in later editions.

Occasionally, brief glitches in electric power have caused the system to crash or the memory to be lost. We added a small uninterruptible power supply to each end of the system, and have had no problems since.

The system has an internal battery backup for the memory, which seems to work fine for longer outages, but small glitches tend to do it in.

The KOB-AM system utilizes Recal-Vadic modems at both ends of the control communications link. We have used both telco data lines and subcarrier/telemetry return links successfully with our RCS-1V.

The modems do not appear to be very level sensitive, and they, too, are backed up utilizing the same UPS the remote control uses. Communications problems are indicated on the CRT using messages such as "Data Error" or "Data Fail."

I have been very impressed with the Delta RCS-1V. We have acquired a second system to use with KOB-FM. Video outputs on the studio end controls allow extension monitors to be added, and our plan is to put a pair of monitors in our engineering shop.

The people at Delta seem anxious to help with problems, and have provided ROM updates at little or no charge as operating systems are upgraded.

If one takes time and spends a little effort with a pencil and paper determining the initial setup, most problems can be avoided. There is a small amount of

computer-related nomenclature to deal with, but once you get used to the way the RCS-1V works, it will cause no problems.

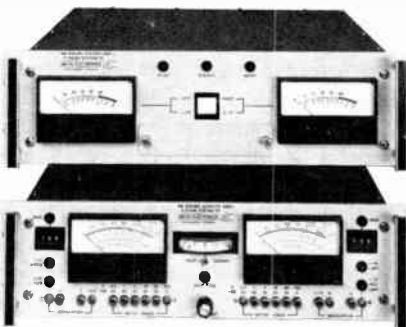
The RCS-1V manual we have is one of the first produced for the system, and dwells at length on microcomputer number systems. Later manuals were quite a

bit easier to understand, and include a section on the Motorola CRT monitor used in the remote control system.

Considering all the system can do, and its price, the RCS-1V is a good value and should be looked at by anyone thinking of upgrading remote control systems.

Editor's note: For more information, contact Bob Bousman at Delta: 703-354-3350. The author may be reached at 505-243-4411.

DELTA BROADCAST PRODUCTS



ASE-1/ASM-1

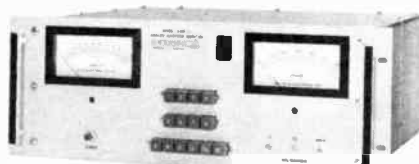
AM Stereo without compromise. The AM Stereo Exciter and Modulation Monitor provides a C-QUAM™ quadrature modulated stereo signal featuring low distortion and channel separation greater than 35 dB throughout the audio spectrum. The ASE-1 generates a signal to produce a phase modulated transmitter carrier. An L+R audio signal AM's this carrier to produce the C-QUAM signal, the only signal completely compatible with all C-QUAM, multimode and envelope detector receivers.

C-QUAM is a registered trademark of Motorola, Inc.



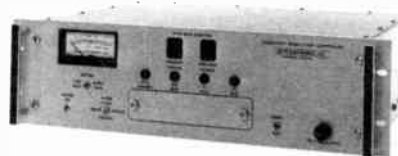
RCS-1V

This Remote Control System calls you when it needs help! The RCS-1 combines microprocessor technology with easy operation. Features include direct interface boards for antenna monitors, patented remote modulation bargraphs, automatic logging, and synthesized speech telephone interface. Additional input and control boards to expand remote control capabilities can be added at any time.



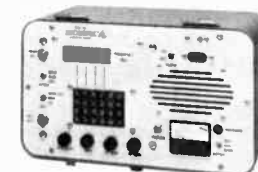
DAM-1/AAM-1

The Digital and Analog Antenna Monitors measure the parameters of directional antenna systems. Readings are: relative current; and current ratio and current phase to a reference antenna. The DAM-1 accepts samples from 12 towers with a ±1° phase and ±2% current accuracies displayed on digital readouts. The AAM-1 can monitor up to 8 antennas with ratio and phase measurements displayed on front panel meters.



AMC-1/FMC-1

The only modulation control systems which provide a completely closed loop around the transmitter. The Amplitude and Digital Modulation Controllers sample actual modulation levels after the PA output network assures precise adjustment for optimum modulation levels. Both the AMC-1 and FMC-1 keep count of over-modulation bursts for signal control through a linear attenuator.



RG-4

High output Receiver/Generator. The Receiver/Generator combines a two-watt RF output and a correlation detector circuit that virtually eliminates interference problems. The RG-4 operates in the 100 kHz to 30 MHz range. It is designed as the ideal companion instrument for Delta's OIB-1, OIB-2, and OIB-3 impedance bridges.



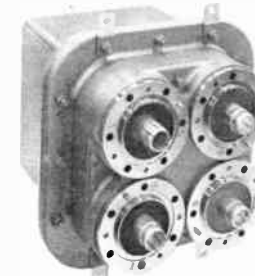
APC-1

Your insurance against over- and under-power operation. The Automatic Power Controller continuously monitors the transmitter output power, making automatic power adjustments via the transmitter loading control. The APC assures proper power levels at all times.



OIB-1/OIB-3/CPB-1

Full power impedance measuring. The Operating Impedance Bridges measure the impedance of radiators, networks and the like while operating under normal power. The OIB-1 measures VSWR and impedance up to 400 ± j300 ohms. The OIB-3 extends the range to 1000 ± j900 ohms, and has an RF amplifier for improved nulling. The Common Point Impedance Bridge is permanently installed for continuous monitoring of the common point during network adjustment. An optional TCA ammeter can be installed in its front panel.



6730E/6740B

Fast, efficient coaxial transfer switches. The coaxial transfer switches are designed to switch transmitters, transmission lines, antennas, dummy loads and auxiliary equipment quickly and easily. Either manually or remotely controlled, the switches are fully interlocked to prevent switching with RF power applied. The 6730E switch uses 1-5/8 inch connectors, the 6740B switch uses 3-1/8 inch connectors.

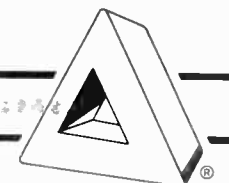


TCA/TCT

Simplifies antenna current and phase sampling. TCA Ammeter Systems provide accurate, modulation-free current readings on a variety of meter types. Toroidal Current Transformers provide current and phase samples, and are available with three output voltage ranges, as well as high voltage models.

DELTA ELECTRONICS

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Buyers Guide

WBZZ's Telos Sets the Standards

by Chris Hudak
and Tim Tress
WBZZ/B-94 Engineering Dept

Pittsburgh PA . . . Our pet phrase in the WBZZ/B-94 Engineering Department is "setting the standards." What was once part of a cartoon and good for a chuckle is now a way of life at the "Bee."

No matter how good something is, there's always a better way to do it. That's why we've added the Telos to our phone system. It "sets the standards."

The telephone is crucial to B-94's success. We use it on the air for requests, contests and phone bits, making it an essential on-air tool.

The quality from our speaker-phone hybrid setup was good; the Telos made it much better. As a matter of fact, our local callers sound like they're in the studio with the jock.

The Telos is a remarkable device, combining a wide variety of functions. An active hybrid which is digitally processed and controlled by a Z-80 microprocessor is the heart of the unit.

Upon line seizure, the Telos auto null circuit sends a burst of noise along with a tone and adjusts itself to the individual telephone line's characteristics, enabling nulls in the 40 dB range.

During this process, audio is muted, eliminating any clicks or pops on-air when the line is answered. Audio filters, companding, and wide-range AGC circuitry provide superior caller audio.

Front panel controls on the mainframe provide adjustable gating, gain, compress/expand crossover threshold and an override control.

This control provides ducking on the caller audio ranging from the "speaker-phone sound" to full duplex hybrid operation. Once the null has been coarse-adjusted by the internal null adjustment, the digital circuitry provides feedback-free hybrid operation.

The Telos consists of two units—a 3½" rack mount mainframe and a system control box for answering incoming lines. In its present configuration, the Telos does not provide a touchtone pad, making a telephone for dialing out still

necessary. (This simple addition would eliminate the telephone completely from the studio.)

The control panel is provided with two 6' ribbon cables to remotely locate it at the operating position. Caution is advised when installing these, as the plugs are identical but not interchangeable.

User Report

Interfacing the Telos to the existing telephone system is quite easy. Up to 10 lines may be controlled by the Telos standard control box, four of which may be used for conferencing calls. This is expandable on special order.

A standard 50-pin telephone plug and pigtail are furnished for connection to the telephone system. The plug mates with a receptacle on the mainframe, and the free end may be connected to a 66-style punch block, which is what we did at WBZZ.

Care must be used during this wiring as the Telos pinout is not directly pin-for-pin compatible with the key service unit. The Telos is designed to directly in-

terface with a standard 1A2 keyset, which has become "the standard" at many stations.

The installation manual provides a very thorough explanation of hybrid problems and interfacing techniques, along with many connection schemes for various phone systems and studio designs.

The Telos features dual inputs and outputs which may be user-programmed to provide internal mix-minus capacity. At WBZZ, all mics are mixed externally, along with a switchable mono feed from the console for special contest capability.

The mic mix is then fed, preset, directly into the Telos. Since the mic feeds are sampled at the mic processors, audio is available to the Telos at all times, providing a speaker phone approach to studio telephone answering.

The Telos main output feeds tape decks and headphones for recording and editing calls before they are aired. The auxiliary output of the unit directly feeds the console cue bus and program input, providing "caller only" audio for the cue speaker and airing "live" caller situations.

Advanced Micro's TC-8 Price is Right

(continued from page 21)

most other remote control systems examined had the same spec.

It will accept as little as 0.25 VDC, and a fail-safe circuit is provided for FCC requirements. Alarm outputs are provided to indicate line loss in either direction.

Another nice feature is the link choice. While waiting for approval on our 450 license, I ordered the TC-8 for telephone line operation.

While I used a data-grade line, the manufacturer had built the wire modems so that a standard voice-grade circuit will work fine, therefore providing savings on line changes. This is a nice plus for stations on a tight budget.

Several months after installation, the 450 license was granted and the wire modems were swapped for radio

modems. At this writing, I haven't yet completed the changeover but, based on my experience with the original TC-8 installation, it should go quite smoothly.

Setup

Setup of the TC-8 couldn't be easier. Six front-panel buttons do it all. The channel and up and down buttons handle the display in each of three function modes: maintenance, setup and calibrate.

The maintenance mode is essentially the old local/remote switch. The setup mode is entered for setting the decimal point and polarity, and changes are stored in memory upon leaving the mode. Calibrate is self explanatory.

But one nice extra is the speed of the TC-8. You can go from 0 to 9999 in close to 20 seconds, which is most appreciated when it's late and you're still at the transmitter.

Other remote systems can take more than five times as long for this, which can be aggravating. The system has smart power-up recovery after a failure at either end. It will return the system to whatever mode it was in, and updates as soon as data is received.

Calibration is one person at the transmitter, with no need to call the studio (only to be put on hold or told that you are not a winner!).

Operation is nearly "jock proof," since the channel up and down buttons are all that are used. The larger-than-normal dot matrix display is a nice extra, and has good daylight visibility.

The factory changed the remote con-

As wired in the WBZZ studios, the Telos is very simple to use. The jock simply answers incoming calls on the Telos control panel, speaking into his or her microphone. Caller audio is heard from the cue speaker, while preset mixed jock and caller audio appears at all studio recorders, making telephone recording a simple two-step process.

As with any microcomputer device, the Telos may require resetting in case of AC powerline disturbance. This is easily accomplished by simultaneously pressing both off buttons on the control box.

Response from air personnel and management has been very enthusiastic, both in ease of operation and audio quality. However, the first Telos unit we installed suffered from an annoying intermittent lock-up of its internal microprocessor, which could not be reset.

After replacing the Z-80 CPU chip and some unsuccessful troubleshooting, our original unit was exchanged by the manufacturer. Both the exchanged air studio Telos and the production studio unit have been performing flawlessly for many months.

Editor's note: For more information, contact Art Reed at Bradley Broadcast: 301-948-0650. The authors may be reached at 412-381-8100.

trol interface to use form C contacts and use sockets for the relays. The other improvement I suggest is that they provide an internal buzzer or alarm. There is an alarm output that allows you to drive whatever you want, but it would be nice to have something in the box itself.

Other factors you may find useful are an optional computer interface for connection to a PC, which allows full-page display and printer logging. Also available is a remote interface panel. This provides barrier-strip connections for all inputs and outputs, with plug-in form C 10 A relays for outputs.

I have this option, and phase two of our installation will see this used to control an older-style transmitter requiring external relays. Also, AM stations can control up to eight towers with the TC-8.

I appreciate good manuals, and in this day of skimpy photocopy booklets or equipment being sent with no manuals at all, the TC-8 manual shines. This book has a binder and is written clearly and concisely, with schematics, a parts list and a troubleshooting section to help those with all levels of experience.

Advanced Micro-Dynamics offers 24-hour telephone technical assistance with an engineer at the other end, a plus for any company.

I would recommend the TC-8 to anyone looking for a highly reliable, compact, quality-built remote control system. The price is icing on the cake.

Editor's note: For more information, contact Peter Burk at Advanced Micro-Dynamics: 617-456-3570. The author may be reached at 313-873-9821.

WEATHER RADIO

Model CRW



Price \$475.00

Sensitivity .28 microvolts for 12 dB quieting. All 3 frequencies. Alert tone demutes receiver, closes relay and gates audio to 600 ohm rear terminals. Another set of rear terminals has continuous 600 ohm audio output. Double conversion crystal controlled, crystal filter in first I.F., ceramic filter in second I.F. Dual gate MOS FET front end. 50 ohm coaxial input. Adjacent channel (j25 kHz) down 70 dB. 19" rack mount, 3½" H, all metal enclosure. In stock—available for immediate delivery.

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Buyers Guide

Moseley PCL-606 is High Tech

by D. L. Barnett, DE
Moseley Associates, Inc.

Goleta CA . . . Audio studio-transmitter link (STL) systems have traditionally offered broadcasters an alternative to leased telephone lines for conveying program information from the studios to a remote transmitter location.

STLs offer complete control over program carriage and will also convey a program subcarrier, such as an SCA feed, as well as remote control information over the same economical link.

Moseley's PCL-606 line, designed for quality monaural audio service, may be used in a dual configuration for stereo service where composite stereo is not desired. The PCL-606/C conveys the composite stereo waveform with virtually no degradation.

Enclosed module construction is used to reduce the possibility of RFI, as well as allow easy service access to each printed circuit board. Extensive internal metering capabilities are standard both in the transmitter and receiver.

The transmitters employ a direct FM modulation concept not used before in STL equipment. A synthesized reference oscillator is used for frequency and phase control of the direct FM oscillator. Transmitter FM modulated oscillator frequency conversion is done via a double-balanced mixer, instead of employing the

usual frequency multiplication of the modulated RF signal.

The transmitter includes a front panel meter with step-switch input selection to allow the metering of important parameters. The metering system even includes built-in, absolute value, peak responding voltmeter capability with an internal LED to indicate DC polarity.

The receiver designs incorporate several unique performance and user-controlled features. A PIN diode attenuator circuit provides for user adjustment of overall SNR, and reduces adjacent signal intermodulation products caused by input signal overloads.

The receiver demodulator incorporates a new design, offering extremely low distortion and noise characteristics. The demodulator is broadband and adjustment free, using digital pulse counting techniques for maximum fidelity.

The receiver has a front panel meter with step-switch input selection to allow the metering of several parameters, and includes a built-in, absolute value, peak responding voltmeter capability with polarity indication. The metering circuit output appears on a back panel connector for remote metering. Built-in transfer circuitry is standard to allow automatic changeover to a standby receiver in case of malfunction.

Moseley composite STLs have wide-band inputs that transmit the complete

stereo waveform over a single STL. This allows the stereo generator and all audio processing equipment to be located at the studio, accessible and far from intense RF radiation.

Both the Moseley mono and composite STLs can transmit two subcarrier frequencies for SCA and/or remote control as well as the program. The mono versions have a 16 kHz lowpass filter so that two PCLs, used in the split channel method, transmit right and left programs with no measurable crosstalk.

After muddling through the above, you may be wondering what Moseley is doing about the "new" spectrum efficient FCC requirements. In RF dense market areas, the 950 MHz aural STL band is saturated with users. In 1985, the FCC adopted a plan to divide the 950 MHz band into 25 kHz stackable segments, allowing for narrower channel bandwidths and other forms of modulation.

For example, in an RF dense market area, the bandwidth of a composite STL for stereo FM service would be reduced

from 500 kHz to 300 kHz. However, in light RF traffic areas, users could continue to use 500 kHz of bandwidth.

Moseley has developed a flexible aural STL. Future PCL-606/C STLs will use internal switching to optimize the system for both 500 kHz and 300 kHz channel spacings.

Dual-switched signal processing paths eliminate the need to realign the system in the field when switching from wide to narrow bandwidth operation. The FMO, IF filters, and the baseband processing all have dual adjustments which are aligned at the factory for both modes of operation.

In physics, as in business, there is no free lunch. Some performance is lost in the narrow bandwidth mode, no matter which company's STL is used.

First, the use of a 185 kHz subcarrier is lost. Also, THD, SNR and adjacent channel rejection suffer somewhat. However, Moseley feels these losses are outweighed by the increased spectrum utilization in the narrowband mode.

Editor's note: For more information, contact the author at Moseley Associates: 805-968-9621.

MAX-Z Provides Quality

Merrifield MN . . . Zercom's MAX-Z remote broadcast console provides flexibility, utility and audio quality. Standard with the MAX-Z are a custom-made carrying case, built-in rechargeable batteries and charger, a clock, a stopwatch/timer, a VU meter, wide-range audio inputs, cue channel, phone line alarms and memory dialing.

The unit's rear panel controls include a notch filter which, when switched on, activates the 2600 Hz filter to help prevent accidental disconnect.

The four audio inputs each have a unique preamp circuit with an input level knob that smoothly adjusts the optimum gain and noise characteristics for any level from 150 ohm mic (-50 dBV) to line level (+24 dBm). This has the ad-

vantage of permitting a setup so that each front panel knob can be set at "12:00" during normal usage.

The phone line out plugs into a standard dial-up telephone line, and is optimized to work best with the limited dynamic range and frequency response of a dial-up line. Nominal output level is -9 dBm.

The dedicated line is a high-quality output for use in the studio, or with a direct pair. The direct-coupled active-balanced output is 600 ohms. Frequency response is 20 to 20,000 Hz ±0.5 dB.

The SNR is 86 dB for the line level input, and 70 dB for the mic level input. Distortion is 0.15% typical.

For more information, call Jeff Zernov at Zercom Corporation: 218-765-3151.

Master Your Marti RPU

(continued from page 28)
for remotes of all sorts. Many of these activities produce revenue. Some, however, are civic duties to our communities that we are a part of and serve.

Remember, all is not perfect. We still use some telephone remote lines.

If you have more than one RPU transmitter on—at the same time and on the same frequency—the closest transmitter to the receiving point will block the other out.

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rections with no problem. This allows remote facilities on short notice.

The most distant point of transmission has been 20 miles. This required the transmitting antenna at the remote site to be raised to 30' above ground. Trial runs and familiarity will soon give you the areas you can cover in your community.

So create, serve and enjoy using your remote pickup units.

Editor's note: For more information, contact Mac McClanahan at Marti: 817-645-9163. The author may be reached at 316-838-9141.

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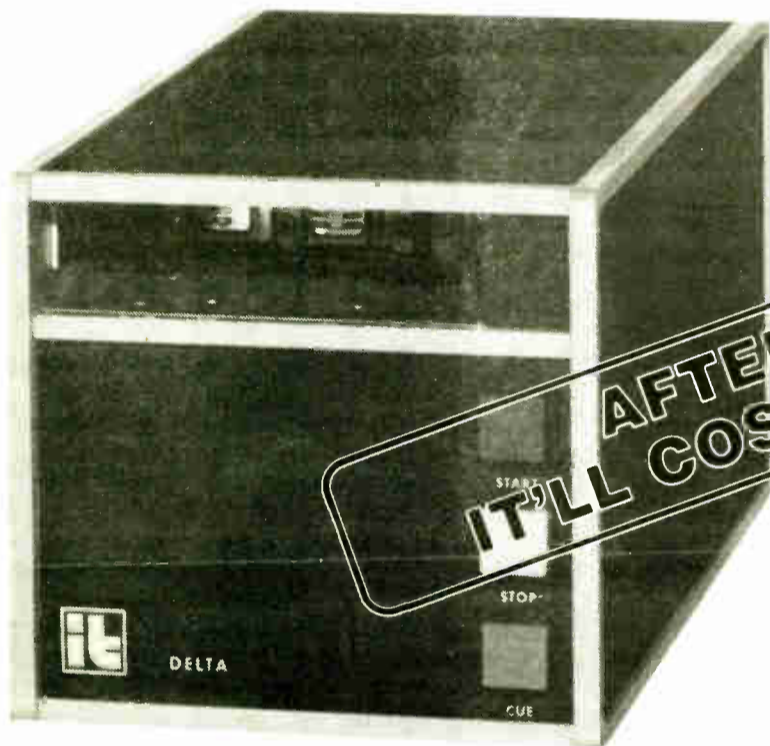
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