

BROADCAST engineering

November 1983/\$3

Reel-to-reel roundup

Aural/video STLs

Automation systems update

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BROADCAST engineering

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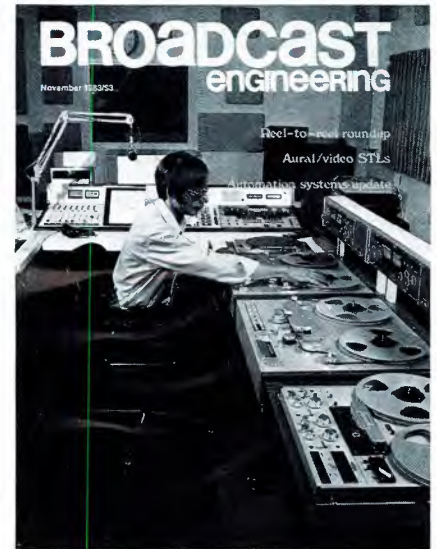
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THE COVER shows the on-air studio of WFMT in Chicago. WFMT is a classical music *superstation* with cable distribution of programming throughout the United States. The reel-to-reel tape recorders in the foreground are Revox PR99s; those in the background are Studer A80RCs. Steve Reeder, WFMT announcer, is at the controls. A roundup on reel-to-reel tape recorders begins on page 78. Photo by James S. Addie.

NEXT MONTH leading authorities from the major networks, the FCC and consulting firms will speak out on how key issues and new technologies are reshaping the future of broadcasting. Some of these factors are imminent; others are years away. Thus, industry experts will share their thoughts on how legislation, regulation and new techniques will affect broadcasting in 1984 and the years beyond.

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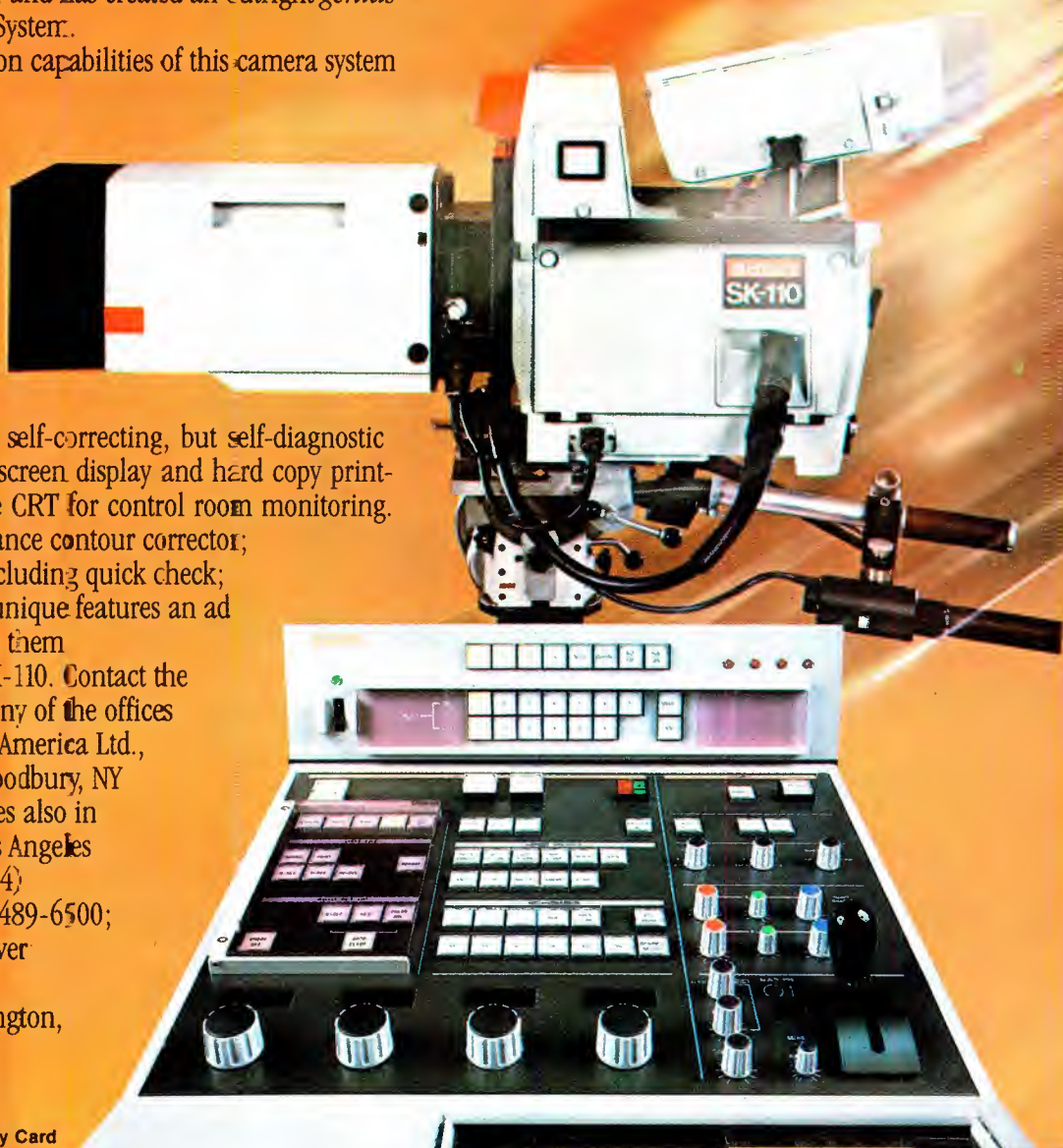
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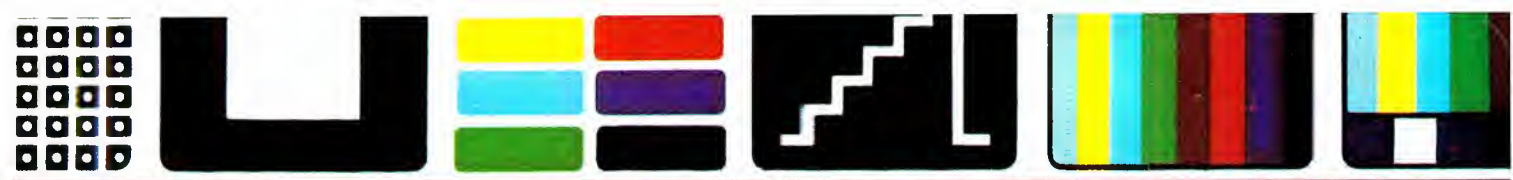
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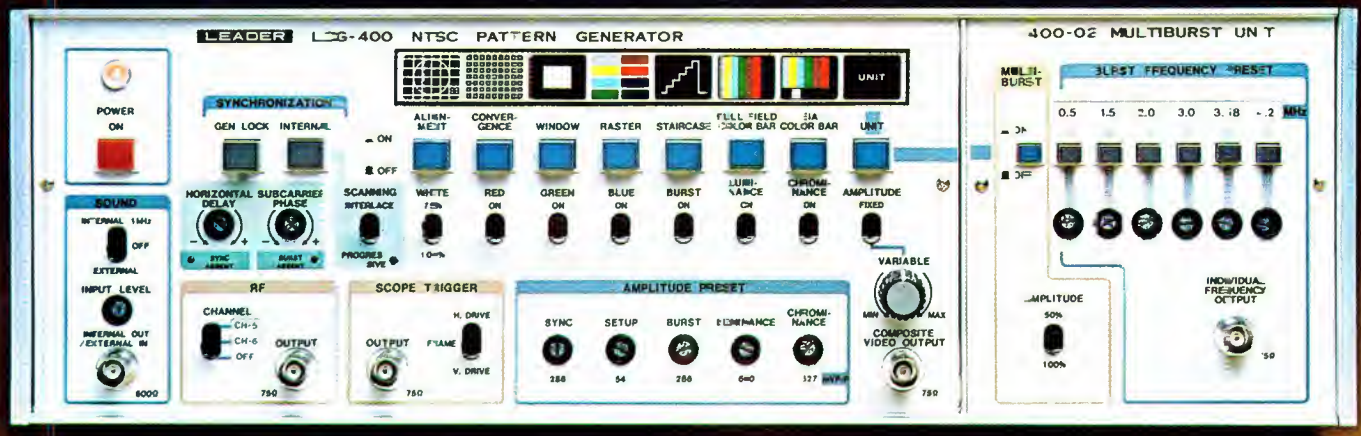


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FCC update

Harry C. Martin, partner, Reddy, Begley & Martin, Washington, DC

November 1983



7-station rule modification proposed

The commission has instituted a rulemaking proceeding looking toward eliminating, to the extent possible, current restrictions that limit to seven the number of broadcast stations one entity may own in the same service. As an interim measure, the commission may raise the allowable ownership limits to 36 for AM and FM stations and 14 for TV stations.

In initiating the rulemaking, the commission expressed concern that the existing 7-station rule may limit programming diversity contrary to the initial purpose of the rule (in other words, to maximize diversification of program and service viewpoints). The cost of producing and distributing programs can be prohibitive, the FCC said, and relaxing current restrictions may allow access to additional resources, promoting program diversity. In this connection, the position of the agency's Office of Plans and Policy is that the FCC should focus only on local ownership rules to carry out its program diversity policy, because "the range of choices available to viewers depends on the number of outlets available at the local level."

Some specific issues the FCC would like to see addressed are:

- whether the growth of the broadcasting industry in the past 30 years is a reasonable justification for the FCC's proposed modification;
- what significance the commission should accord to broadcast-like alternatives (particularly cable TV) in its consideration of whether the current rules are outmoded;
- whether the commission should defer review of matters related to economic concentration (in other words, anti-trust considerations) to other federal agencies such as the Federal Trade Commission or the Department of Justice;
- what the relevant markets should be in considering economic concentration matters;
- how the FCC should assess the market characteristics for information diversity purposes;
- whether the current policy of diversity of ownership is effective in

promoting diversity of program and viewpoint;

- whether separate treatment should be given to radio and TV stations; and
- whether special restrictions should be imposed on expansion of network ownership of stations.

No action is expected in this proceeding until at least mid-1984.

LPTV processing update

The new computer designed to handle the estimated backlog of 12,000 LPTV applications has been operational since June 1983 and the first LPTV/TV translator lottery was conducted in late September. Approximately 100 applications were involved in the first lottery.

The commission is developing new computer programs designed to more efficiently purge the database of technically defective applications. These programs were expected to be operational in late September and the purge process to be completed by the end of the year. Thereafter, commission staff efforts will focus exclusively on the technically feasible proposals. Problems that may arise due to filing applications under two sets of rules (the old "judgmental" standards and the new technical standards) will be dealt with as they occur, and any modifications to the current programs that may be necessary will be made as required.

Finally, the commission (effective Sept. 15, 1983) froze filings on all low power and TV translator applications so that processing of applications currently on file may be expedited. The one exception to this filing freeze is for applications that are mutually exclusive with those on cutoff lists.

2GHz and 7GHz bands retained as private preserve

To preclude interference from future DBS operations in the 12.2-12.7GHz band, the commission has taken action to accommodate existing 12GHz users on other frequencies. A plan to permit the displaced 12GHz users to share the 2GHz and 7GHz bands with TV auxiliary stations was rejected.

The new rules provide existing 12GHz users non-exclusive use of the 18GHz band and access to the 6GHz and 13GHz bands. Should these replacement frequencies prove inadequate, the commission will consider waiver requests for reaccommodation on other frequencies, including the 2GHz private band.

Obscene materials

The commission is soliciting comments on what steps, if any, it should take to prohibit use of common carrier facilities to transmit obscene materials.

Specifically, the commission has requested comments on whether the agency has authority to determine if material is obscene and, if so, whether it is advisable for it to get involved in regulating the content of messages transmitted by telephone. Also, the commission is seeking comments on whether a common carrier has authority to determine what materials are obscene and to exclude those materials from carriage or terminate service.

Restrictions on AM broadcast operations

Depending on final agreement with Canada and Mexico, the FCC has relaxed its rules to permit expanded operation hours for many daytime-only standard broadcast stations. The agreement with Mexico is expected to be completed early in 1984.

Specifically, the new rules will:

- permit pre-sunrise operation of Class I daytimers located east of co-channel Class I-A stations;
- allow Class II daytimers operating west of co-channel 1-As and outside their primary skywave contours to begin pre-sunrise broadcasts at 6 a.m.—regardless of local sunrise time at the 1-A;
- allow Class II-D daytimers outside a co-channel Class I-A's primary contour to broadcast until 6 p.m. at a maximum of 500kW. Daytimers within the primary contour of a 1-A to the west will have to sign off at the 1-A local sunset time (if earlier than 6 p.m.); and
- permit Class III daytimers to operate until two hours past local sunset at 500W, reduced as necessary to provide protection for other Class III stations on the channel.

The commission has adopted a formula for identifying stations that will be affected by the new rules and is now applying that formula to existing stations. Stations affected by the new rules will be notified as the commission determines that they qualify under the new formula. At press time, the commission expected to complete this process and to compile a master list of stations affected by late October or early November.

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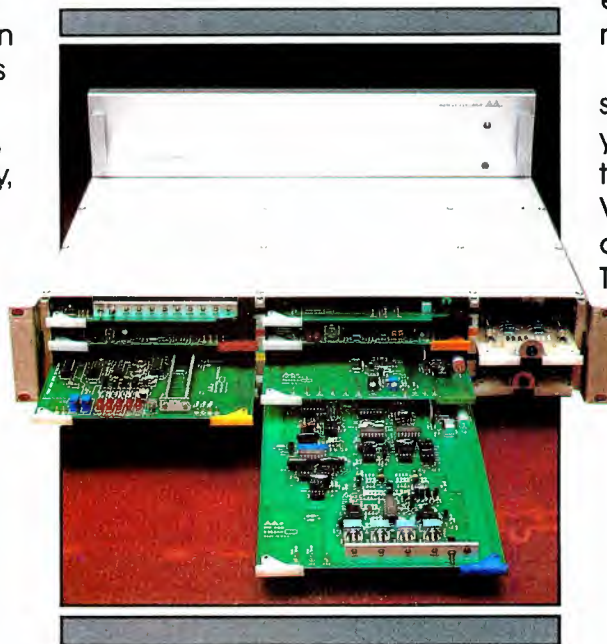
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November 1983 *Broadcast Engineering* 7

Deregulation and the public



A guest editorial by Daniel L. Ritchie, chairman and CEO, Group W, Westinghouse Broadcasting and Cable, New York, NY

For several years, deregulation has been one of the more unavoidable topics inside or outside of Washington. And fashionable ideas, however intrinsically valid they may be, can be dangerous.

Certainly the idea of totally deregulating broadcast television has produced some unlikely alliances. It's just as Fred Friendly pointed out some years ago in his book on the First Amendment: It's hard to tell the "good guys" from the "bad guys."

You can mark me down among those opposing the *total* deregulation of broadcasting. In particular, I would strongly argue for retaining broadcasting's fairness doctrine, which requires broadcasters to present a diversity of views on important issues. I also support retaining requirements for affirmative action to remove discrimination against women and racial minorities. Let me tell you why I think this way.

There are four key arguments generally used by those who call for deregulating broadcast television:

1) The FCC in general and the fairness doctrine in particular are failures. They haven't worked. Indeed, they usually have worked *against* their intended aims.

2) FCC regulations have been unreasonably expensive to broadcasters.

3) The new technologies have eliminated scarcity, which was the original and sole reason for regulating broadcast television.

4) Any regulation of television is an unconstitutional infringement of the First Amendment.

Let's take these arguments one at a time.

Critics who say that the fairness doctrine has been a failure should answer two brief arguments—one general and one specific. First, more generally, is imperfection the same thing as uselessness? Because a medicine proves not to be a universal remedy, is that sufficient reason for doctors to abandon its use altogether? More specifically, to all those who say the fairness doctrine has been a failure, I would merely say, look at the record. From the moment that Mississippi TV station WLBT lost its license under a fairness doctrine challenge, our entire industry was put on notice as to the consequences facing any station that worked to disfranchise a portion of its community.

Second, is it true that regulation has been unreasonably expensive to broadcasters? Let me speak from my own personal experience. Group W is now and always has been a business. We are not an eleemosynary institution. We have always believed that it's possible to make a profit and to do the right thing. It's more difficult that way, to be sure, but it can be done.

And frankly, our policies and practices have been changed little, if at all, by the introduction of regulation or its recent removal from radio. (Before the fairness doctrine, we had one of our own. Should the government repeal its doctrine, we still will keep ours.)

The deregulation of radio has not caused us to discontinue our program logging or our efforts at ascertainment. We regard both of those activities as essential business requirements.

I also have considerable problems with the third argument for deregulation; that channel scarcity has been made obsolete by such new technologies as multichannel CATV and direct broadcast by satellite. To paraphrase Lincoln Steffens, I have seen the future, and it's still in the future.

Cable is here, it's real, it's exciting, and we in Group W are involved in it. We believe cable is a medium that deserves full First Amendment rights. But the simple fact is that cable exists for only 40% of the people in this country. And many of the other much-talked-about new technologies are still just that: much talked about. That means that millions of Americans still will be relying throughout the '80s on the same broadcast signals they watched in the '50s.

Even in cable households, broadcast television remains the mass medium, and scarcity for the would-be broadcaster still, and always, will exist. Not everyone can broadcast; the government must somehow choose among those who

Continued on page 139



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Satellite update

By John Kinik, satellite correspondent

The Region 2 Administrative Radio Conference (RARC-'83), which was held in July in Geneva, Switzerland (with the participation of 24 countries), has determined a specific technical plan for implementing direct broadcast satellites (DBS) in the Western Hemisphere. This plan, known as the Final Acts of The Region 2 ITU Broadcasting Satellite Conference, allocates satellite orbital positions and frequency spectrum/channelization and establishes the maximum signal power to be received at the earth.

Also, other key technical performance parameters have been established to provide the basis for satellite and receive earth station designs. Considering the number and variety of plans tabled by the Region 2 countries, it is remarkable that a single cohesive plan was drafted and agreed upon in the time frame involved. The conference results are pleasing to the United States, because the main requirements put forward by the US delegation were met. The basic elements of the plan, as it relates to the major North American countries—the United States, Canada and Mexico—are described as follows.

DBS channel plan

One of the major disagreements at the conference focused on the division of the 500MHz bandwidth (12.2-12.7GHz) into a channel plan. The United States proposed a 24MHz channel bandwidth, with 13MHz channel separation, giving 36 channels per orbital slot. A competing plan argued for a total of only 16 channels per orbital slot. The latter plan would not have met the requirement for a

total of some 2000 channels originally requested by all countries, when all orbital slots were considered. A compromise was reached, with a modified high capacity plan adopted, resulting from a joint effort between the United States, Canada, Mexico and Brazil. The plan is based on a 24MHz bandwidth, with 14.58MHz spacing, giving 32 channels per orbital position.

Orbital positions

The assignment of orbital positions involved compromises for all three of the major North American countries. The positions assigned were as follows (in degrees west longitude):

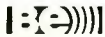
- United States—175°, 166°, 157°, 148°, 119°, 110°, 101°, 61.5°;
- Canada—138°, 129°, 91°, 82°, 72°, 70.5°; and
- Mexico—136°, 127°, 78°, 69°.

The eight orbital positions give the United States a theoretical total of 256 channels for all current and anticipated future DBS applicants. Practically speaking, however, the easternmost position (61.5°) has severe limitations caused by satellite eclipse occurring during prime evening hours, and the two westernmost positions (175°, 166°) are accessible from the Pacific Time Zone only. This places a limitation on their usefulness with respect to the basic US concept of four time zones, with each satellite covering one or two time zones. The US position going into the conference was for 10° spacing, whereas the resulting assignments are based on non-uniform spacing, with a typical minimum spacing of 9° for any country.

Signal power

The maximum signal power flux density at the earth has been set at -107dBW per square meter. The United States had proposed a higher power (-105dBW per square meter) and has taken exception to the lower power level, implying that it might not comply with that requirement. The lower level was adopted because of the concern of some countries (such as Brazil) with high rainfall rates, which produce signal fading at the frequencies involved, making it difficult to reach the higher power level proposed by the United States. Also, other North American countries were concerned that the higher level might lead to much lower priced receive earth stations that would be purchased by their citizens to receive US signals, rather than their own signals.

Space WARC-'85

A World Administrative Radio Conference will be held in 1985 to approve usage of satellite orbital and spectrum resources for the world, including the Final Acts of The Region 2 Conference. Thus, the *Final Acts* are not necessarily final, and some controversial issues are bound to arise, including the possibility that the United States will ignore the lower power flux density level set by the conference and carry on regardless with its originally proposed design. The basic framework for DBS satellites has been established by the Final Acts of the Region 2 Conference, but there is room for a great deal of flexibility, and there will be a need for unprecedented cooperation between countries on issues that will arise. Otherwise, Space WARC-'85 could be a stormy conference. 

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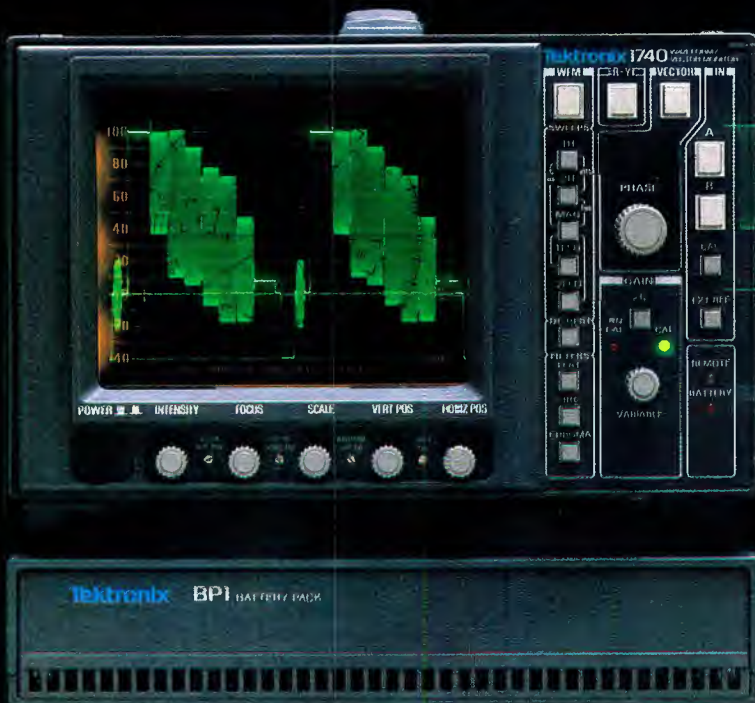
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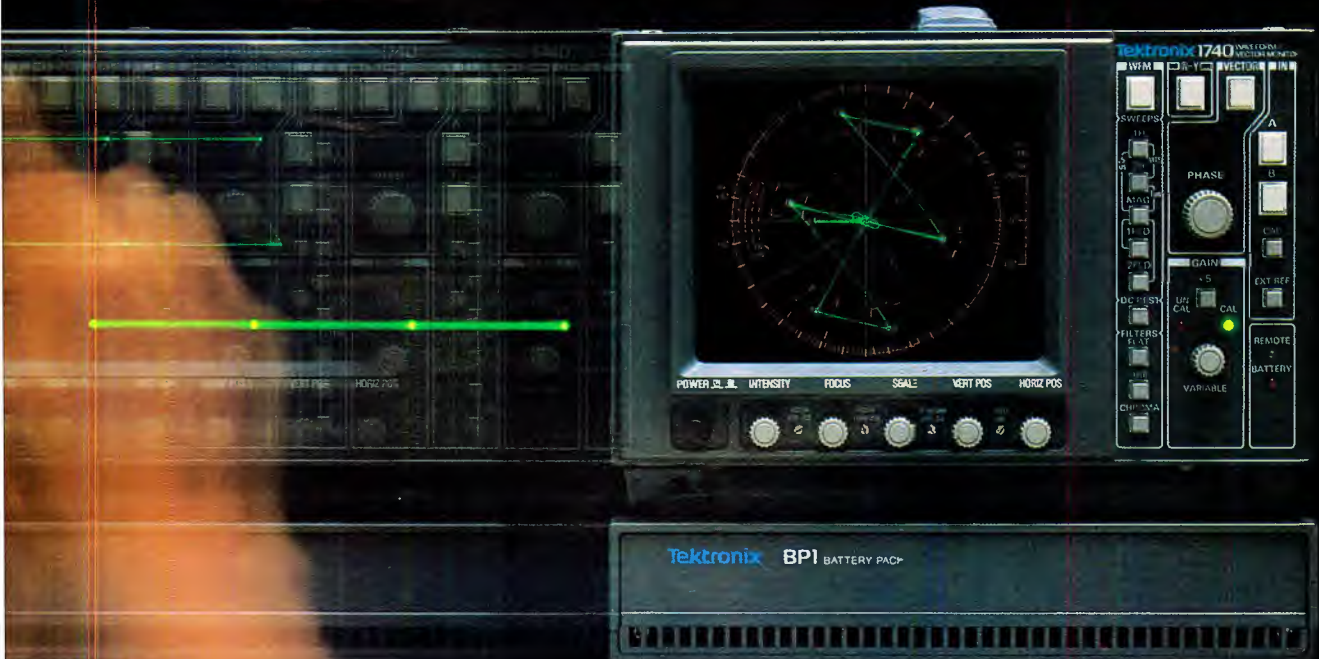
At 8 1/2 inches wide and 18 inches long, the 1740 series uses only half the normal rack width. That means you gain more usable space and more flexibility than ever.

To change from waveform mode to vector mode and back, just press a button. Couldn't be simpler.

There's a brighter CRT display on the 1740 series, too. Viewing is easy even in high ambient light.

And, because it operates on either AC or DC, the 1740 can go wherever you go.

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Using one monitor where two were needed before lowers your equipment costs. And because the 1740 series is completely portable, it makes a sensible purchase for either studio or field use.

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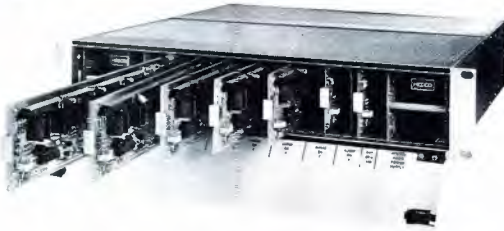
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2 R.U. Distribution Frame

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EQUIPMENT SALES

California Microwave, Sunnyvale, CA, has announced that its subsidiary, **Satellite Transmission Systems**, received contract awards totaling \$2.7 million from Communications Satellite Corporation (COMSAT), Universal Antennas and R.R. Donnelley and Sons Company.

The COMSAT award of \$1.7 million is for the 11/14GHz synthesized ground communications equipment to be installed for COMSAT at Roaring Creek Station, PA, for international satellite message service.

The Universal Antennas award, valued at \$322,000, is to provide a turnkey telemetry tracking and command (TT&C) antenna subsystem for the Hughes Aircraft Corporation's TT&C station for the new satellite system in Mexico.

STS also received an order valued at \$750,000 from R.R. Donnelley & Sons Company for expansion of its 1.544Mbit/s data service to include receive-only earth stations at Spartanburg, SC, and Gallatin, TN.

A TA 110 NE UHF transmitter from **Townsend Associates**, Westfield, MA, has been installed in a new station, KBSA-TV, Channel 46. The \$1.4 million contract includes a microwave system, broadcast monitoring and test equipment, remote control equipment, installation by Townsend Associates personnel and an Andrew circularly polarized transmitting antenna and waveguide transmission system.

Townsend has also been awarded a contract for a 55kW UHF transmitter and ancillary equipment for WNDS/Channel 50, a new TV station in Derry, NH.

Broadcast Equipment Rental Company, Burbank, CA, has announced the first delivery on the West Coast of the Ampex Nagra VPR-5 VTR. Jointly developed by Ampex and Nagra's sound recorder manufacturer, Kudelski SA, the VPR-5 features include studio-type editing control in the field, quality audio technology and separate audio and video confidence tracks.

A new UHF TV station in Fort Walton Beach, FL, is scheduled to begin broadcasting later this year following installation of an **RCA** transmitter, antenna and studio equipment. Valued at approximately \$1.75 million, the equipment purchased from RCA's Commercial Communications Systems Division includes a TFU-36 JDA antenna, a TTU-55C 55kW transmitter and a 7m satellite receiving station, four TK-710 portable cameras and two TR-800 1-inch VTRs, as well as state-of-the-art switching and special effects systems.

Three more post-production facilities have recently taken delivery of Paint Box digital art/graphics/animation systems from **MCI/Quantel**, Palo Alto, CA. They are Producers Color, Detroit; Positive Video, Orinda, CA; and By Video, Sunnyvale, CA.

AFA Systems, New York, NY, has delivered a mobile TV system dubbed the MU12, to CBS. The MU12 consists of two trucks. One is a 46-foot production unit; the other is a 40-foot utility truck.

Sony Broadcast, through its Geneva branch office, has received a major order from the Swiss PTT for the purchase of more than \$2 million of ENG equipment for

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Delta PPV, Time, Freq: Measure any part of a waveform for PPV, time or frequency using Delta measurements. Just dial in the waveform section you want to measure and push.

Simplify Freq ratio tests: Automatically compare input/output ratio of multiply/divide stages from 1:1 to 1:999,999 with the push of a button.



Autotracking DCV, PPV, Freq: Measure DCV to .5%; PPV to 2%; freq. to .001%. Just push a button for either Channel A or B.

One probe input: One probe input per channel for all measurements - digital and scope - with 5 mV to 2000 V measuring range. (2 lo-cap probes provided.)

Super sync: ECL provides rock-solid sync trigger circuits with only 4 controls; includes TV sync separators for video work.

U.S. Patent Pending
Financing Available

The first scope with push button digital readout. If you use general purpose oscilloscopes for troubleshooting or testing, we can double your present productivity with the SC61 Waveform Analyzer, the first instrument to turn every conventional scope measurement into an automatic digital readout.

No more graticule counting. Connect only one probe to view any waveform to 100 MHz. Then, just push a button to read DCV, PPV, frequency and time — automatically!

There are no graticules to count or calculations to make, which speeds every measurement.

The digital readout is from 10 to 10,000 times more accurate as well.

Plus you have everything you want to know about a test point, at the push of a button, which speeds troubleshooting tremendously.

A special Delta function even lets you intensify parts of a waveform and digitally measure the PPV, time or frequency for just that waveform section.

And it's neat. No more tangled leads, piles of probes or dangling cords. The SC61 is an entire test station in one unit.

The one and only. There are other scopes with digital readout, but none of them completely automate every conventional scope measurement so you can automatically analyze any waveform without counting one single graticule. Totally automatic waveform analyzing at the push of a button. It will make all the difference in your productivity.

Double your productivity. When we say the SC61 will double your productivity, we're being conservative. We've seen cases of

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1183



Circle (16) on Reply Card

Swiss Television. The order includes 25 BVP-330P series cameras, 19 BVU portable highband U-matic recorders, 27 BVU-800P/BVU-820P highband U-matic editing recorders, 11 BVT-800P time base correctors and associated equipment and accessories.

A.F. Associates Systems Division has been awarded a contract to design and build a film-to-tape/tape-to-film facility for Manhattan Transfer. The facility will house two color correction suites for film-to-tape transfers. These will be centered around the Rank Cintel Mark IIC digital telecine and the Rank Ferrit magnetic sound system. The third suite will house a Teledyne Kinescope recording system for the transfer of tape in all formats to 35mm and 16mm film. Manhattan Transfer will have the capability to transfer videotape directly to 35mm negative. The facility also will be equipped with the new Ampex VPR-3 VTRs.

ABC Television Network has signed an agreement with **M/A-COM MVS**, Burlington, MA, to purchase a large assortment of microwave equipment and to lease an equivalent amount. This equipment will be used during ABC's coverage of the 1984 Winter and Summer Olympics. The products purchased and/or leased include more than a dozen M/A-COM portable 13GHz transmitters and receivers (MA-13FA) and various numbers of 7GHz antenna systems (MiniScan); 2GHz auto-tracking antenna systems (SuperScan); 2GHz central receivers (MA-2GUX); and 12GHz fixed transmitter and receiver systems (MA-12G).

Eureka Teleproduction Center has announced that it has added 3/4- to 1-inch editing to its production services. Two **Sony** BVU-820 VTRs with slo-mo and freeze frame, and two **Sony** BVT-800 TBCs add to the state-of-the-art equipment at its center in San Carlos, CA.

Digital Entertainment Corporation, Brookfield, CT, has announced the first major North American studio complex to purchase a complete digital audio recording and editing system. Lion Share Recording Studios of Hollywood has just signed an agreement with DEC to purchase a Mitsubishi Electric model X-800 32-channel digital audio recorder, two X-80 2-channel master recorders and the XE-1 digital audio electronic editing system.

Shook Electronic Enterprises, San Antonio, TX, is currently manufacturing a 45-foot production trailer for John Crowe Productions, Houston. The unit is expected to be completed by the end of the year.

TeleProductions, New Orleans, has purchased four **Sony** BVH-2000 1-inch VTRs with two digital time base correctors and two BVU-800/820 series U-matic VTRs. The Sony system's versatility is facilitating TeleProduction's on-line and off-line operation. Recent work at TeleProductions has included three 30-second commercials for Ford, a video segment for MTV by Stray Cats and two hour-long PBS specials for Audrey Barnes Productions focusing on the NAACP and Urban League Conventions.

Venevision, an independent TV and radio operator in Venezuela, has placed an order for four complete LDK 6 systems, including Vinten pedestals and Angenieux lenses. The order, valued at more than \$500,000, was the result of the combined activities of **Industrias Venezolanas Philips** and **Pye TVT Limited**, the Broadcast Company of Philips, who will deliver the equipment in the early part of December.



Small Surprise.



Now a color monitor with every feature you'd expect from BARCO joins our CM Production Series.

The respected BARCO CM Series is coming down in size. And our new small surprise, the CM 22, has the same features as the established 13" and 19" CM monitors, and more.

Put them in your remote vans. Use them in those tight spaces where the distance between viewer and monitor is limited, but the need is for the ultimate in color.

The CM 22 can operate on 110V or 220V mains and 12V local supplies and comes equipped with a fine pitch dot, black matrix in-line gun tube. The rack mount version makes it possible to install two 9" monitors in a single 19" rack. The switch mode power

supply allows stable performance in areas where the main supply may vary under certain conditions.

Features found in the 9", 13", and 19" CM models include: pulse cross; pre-set contrast, hue, saturation, brightness; automatic degaussing; scan format switch; set up switch; front accessible RGB cut off and gain controls. Modular construction allows for quick and easy maintenance.

For more information on our small surprise, the CM 22, and the rest of the BARCO video monitor line, call Chris Golson at 201/882-3584.

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New Harris Wavestar™...

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Additional advantages of waveguide over coax antennas include higher power handling capabilities and greatly increased safety margins to prevent arcing.

The Wavestar pattern performance is excellent by any standard. A highly circular omnidirectional pattern is available, as are cardioid and peanut directional patterns. All of these Wavestar configurations provide the smooth elevation patterns necessary for high signal strength and minimum ghosting over the entire coverage area.

The Wavestar is a low windload design for tower top or side mounting. High mechanical strength and rigidity minimize picture variations caused by wind sway.

Every Harris antenna is completely assembled and tested at the Harris antenna test range...the largest, most comprehensive facility of its kind.

The range is located in an area far from the pattern-distorting clutter of urban development. Situated atop a 230-foot bluff, with test transmitters located up to 3 miles away on flat, unobstructed bottom lands, the range offers ideal conditions for testing, approaching the "free space" situation of an installed antenna.

Here, theoretical azimuth and elevation patterns are verified with the most accurate and sophisticated test instruments available—translating the theory of a calculated pattern into the reality of actual antenna performance.

You can depend on Wavestar for top reliability. And you can be confident that your Wavestar antenna will be thoroughly tested by Harris to meet your exact pattern requirements.

Contact Harris Corporation, Broadcast Transmission Division, P.O. Box 4290, Quincy, Illinois 62305-4290. 217/222-8200.



Circle (18) on Reply Card

The propagation path

By Joe McCleary, chief engineer, KHTZ Radio, Los Angeles, CA

If you contemplate the construction of a microwave STL system, planning at the outset may prevent many unexpected complications. For a short path from 8-10 miles, erecting a dish at each end, connecting the transmitter and receiver electronics and firing them up may prove effective. But if your path is relatively long—20 or more miles—much more thought must be put into the project.

Because STLs have become a popular means of signal transportation between studios and transmitter sites, finding a usable frequency may be a problem in a major market city. Working with the local frequency coordinating committee, if one exists, is necessary.

Two steps toward developing an STL path are obtaining topographical maps from the US Geological Survey and buying path profiling paper, based upon a 4:3 K factor. The K fac-

tor in propagation work is the ratio of the effective earth radius to the actual earth radius.

The K factor

A microwave radio wave does not follow a geometrically straight line, but rather displays a trajectory best described as bending toward the earth. The radius of curvature for the trajectory is somewhat greater than the real earth radius of curvature. The variation from a straight line is caused by the tropospheric dielectric constant, which decreases with an increase in altitude.

Under normal meteorological conditions, the microwave beam may be drawn as a straight line on a fictitious earth representation using a radius of 4:3 that of the actual earth radius. Water vapor pressure and temperature usually decrease with altitude, causing a decrease in the index of re-

fraction. The tropospheric index of refraction is responsible for the speed of the microwave energy moving through the atmosphere. In a standard atmosphere, the upper part of the wavefront travels slightly faster than the lower wavefront portion, causing the radio wave to curve downward in varying degrees.

An infinite K factor indicates that the radio wave follows the actual curvature of the earth, and is referred to as the flat earth condition. Factors less than or greater than one (true earth) result in the beam curving away from or toward the earth, respectively, giving rise to the terms *earth bulging* and *earth flattening*. Under some conditions, the microwave beam may be forced to strike the earth, be reflected upward, refracted to earth again, etc., in a phenomenon known as a surface duct, giving rise to a propagation well beyond the radio horizon.

Continued on page 22

Why Panasonic Recam™ “The Making



When Dino De Laurentiis and producer Raffaella De Laurentiis got together with director David Lynch to film Frank Herbert's classic science fiction novel, "Dune," they knew it wouldn't be easy. But it wasn't just the eight sound stages, desert locations, a cast of up to

20,000 people and a crew of 900. Perhaps Raffaella De Laurentiis said it best: "Dune is the most technical picture ever made!"

That's why it was no surprise that Panasonic Recam was selected to record "The Making of Dune." The reasons: Recam's picture quality

and technology. After all, Recam had already made headlines by recording ABC Sports' momentous ascent of Mt. Everest which was broadcast on "The American Sportsman." And "Benji," the new CBS television series, is also being recorded by Recam.

was selected to shoot of Dune."



David Lynch
Director of "Dune"

Panasonic helped capture all the action from "Dune" on Recam's 1/2-inch format which will later be transferred to 1-inch for television broadcast. All made possible by Recam's incredible YIQ M-format picture quality.

You can see "The Making of Dune"

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Circle (19) on Reply Card



Panasonic
AUDIO-VIDEO SYSTEMS DIVISION

In temperate climate zones, a K factor of 4:3 and a Fresnel zone clearance of 0.6 is generally sufficient for a reliable path. Figure 1 shows ray paths for several values of K factor. The scales are greatly exaggerated to make the difference in curvature more apparent.

Fresnel zones

The Fresnel-Kirchoff theory originally was developed to account for diffraction of light when

obstructed by a diaphragm (in a lens system) and/or transmission through apertures of various shapes and sizes. The theory may be applied to radio and sound waves and is based on the concept that any small element of space in the path may be considered a source of a secondary wavelet. Also, the radiated field can be built up by superposing all these wavelets (known as Huygen's Principle).

Fresnel zones pertain to a required path clearance and the required

height of transmitting and receiving antennas. The zones are made of concentric circles, pierced at their centers by the direct ray path. However, the infinite number of points, from which geometry shows that reflected rays might reach the receiving antenna one-half wavelength later than the direct ray, produces an ellipsoid of revolution. The transmit and receive antennas are located at the focuses of the ellipsoid, which would appear as an elongated football suspended between two poles. The ellipsoid describes the first Fresnel zone and should not be violated (entered) by obstructions.

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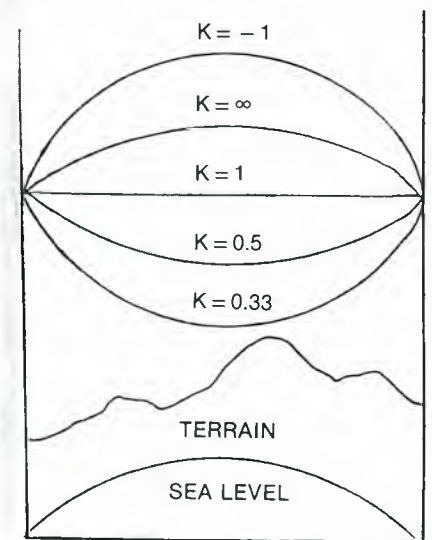


Figure 1. Ray paths for several values of K factor.

The first Fresnel zone is defined as the perpendicular distance from the direct microwave ray line to the ellipsoidal surface at a given point along the path. Mathematically it is calculated by:

$$FR = 17.3(d_1 d_2)^{1/2} f (d_1 d_2)^{-1/2} \text{ meters.}$$

As illustrated in Figure 2, d is the total distance between the transmitter and receiver ends of the path, with d₁ and d₂ indicating the distances between a specified point and the end points of the path. The frequency f is given in gigahertz.

The first zone is bounded by points for which the transmission path from the transmitter to the receiver is greater by one-half wavelength than the direct path. Also, second, third, fourth, etc., Fresnel zones exist and may be computed by multiplying the

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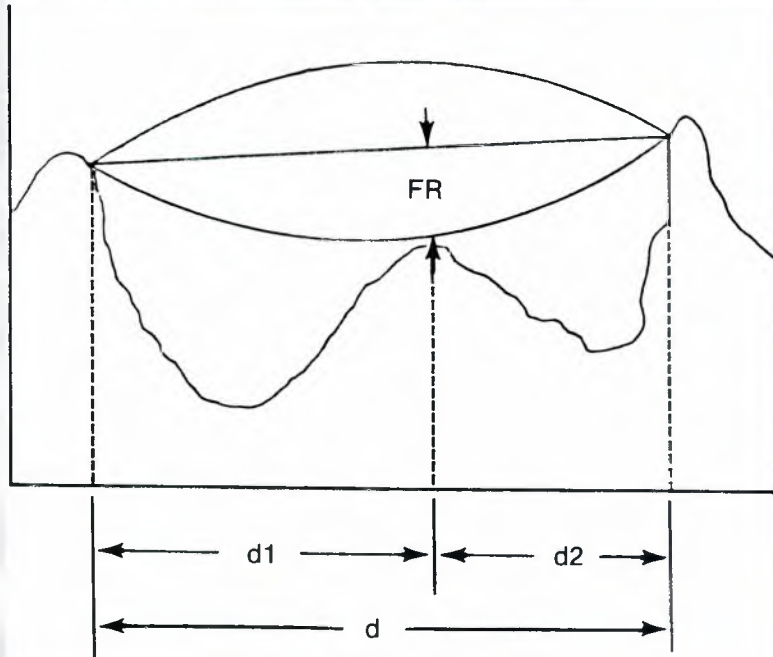


Figure 2. First Fresnel zone radius.

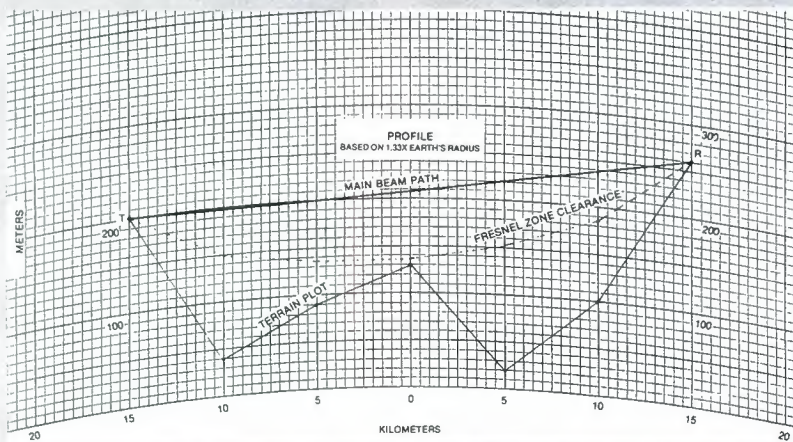


Figure 3. Terrain vs. first Fresnel zone clearance.

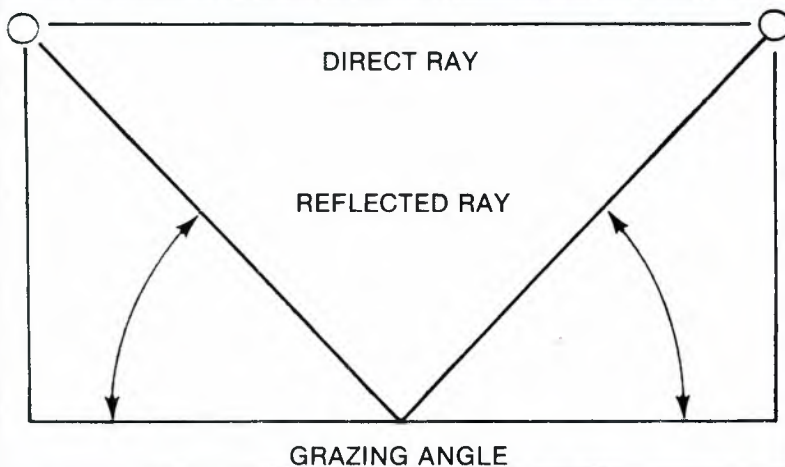


Figure 5. Illustration of grazing angle.

first Fresnel radius by the square root of the desired Fresnel zone number. For path calculations, the 0.6 Fresnel zone clearance generally is stipulated because terrain reflections will not add or subtract from the free-space path loss with that clearance value.

Reflections from the first zone and all odd zones are considered to add to the direct ray, while reflections from even zones subtract from the direct ray. When we say 0.6 first Fresnel zone clearance, we mean that any obstruction, such as a mountain ridge or building, should not protrude more than 0.4 into the first zone clearance.

In Figure 3, we have constructed a terrain plot with the first Fresnel zone clearance on 4:3 profile paper. Points are computed at 5km, 10km, 15km, 20km and 25km for the first zone curve using the formula for FR. It can be seen that we have first Fresnel zone clearance at midpath or 15km. Reflections will be blocked, and free-space attenuation loss can be obtained. We use the nomograph of Figure 4 to find the basic transmission loss in free space. Using a nearly realistic frequency of 0.4GHz for the 30km path, the free-space loss is approximately 114dB.

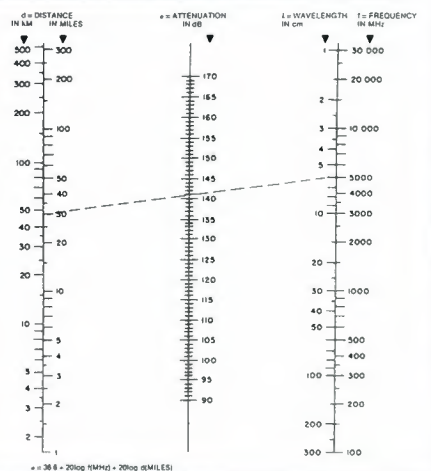
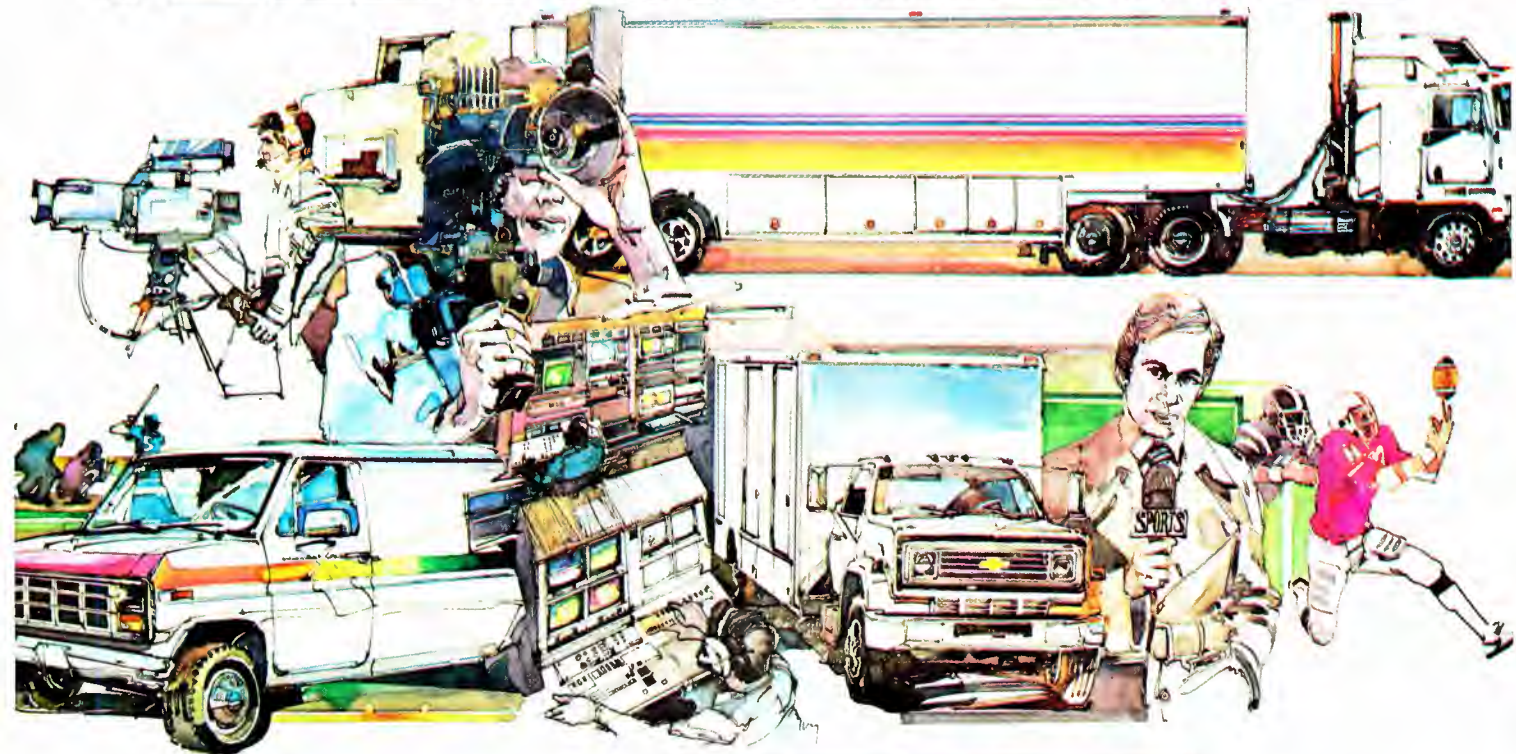


Figure 4. Nomograph to determine transmission loss in free space.

Reflections

Terrestrial reflections probably cause more problems in radio propagation than any other single item. The reflection point (or area) occurs where the incident and reflected rays of a reflected wave area are equal in angle for given antenna heights and past distance. This angle is called the grazing angle, shown in Figure 5. These reflection areas can move with a changing K factor. Grazing angles

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 3 Hitachi SK91 SD3 with 14:1 lens and all the equipment required for studio and ENG use.

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- 1 Yamaha 12 Input Audio Board
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for most of the paths of concern, usually in terms of less than a degree, result in a 180° phase reversal for horizontal and vertical polarization.

Previously we stated that the first Fresnel zone is bounded by points for which the transmission path from transmitter to receiver is greater by one-half wavelength and that reflections from this zone and all odd zones would add to the direct ray at the receive point. They add because the phase reversal occurs at the reflection point. The second Fresnel zone is bounded by points making a path length one wavelength longer, and therefore, after phase reversal at the point of reflection, the waves arrive out of phase at the receive antenna and subtract from the received signals.

If the first Fresnel zone clearance occurs at the reflection point, it is theoretically possible to realize a 6dB gain over the free-space path loss. If the second Fresnel zone clearance occurs at the reflection point, it is possible to have zero signal voltage at the receive antenna. Things are never that neat, however, and problems involv-

Figure 6(a).

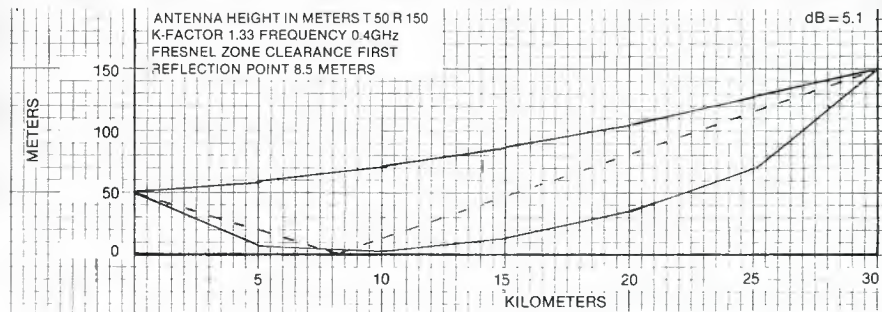
ing reflections are complex. The nature of the terrain at the reflection point plays a major role in the form of the reflection.

Figures 6(a) and 6(b) show the effects of changing some of the parameters of path calculations. Both cases use a 4:3 K factor, 400MHz signals and a 30km path distance. In Figure 6(a), the second Fresnel zone clearance is allowed. Computations for the direct path and Fresnel zone points for 5km, 10km, 15km, 20km and 25km are plotted, along with a grazing angle of 0.413°. (Be aware that the relative scales are invalid for com-

Figures 6(a) and 6(b). Effect of reflections on received signal level in two hypothetical STL systems.

parison purposes.) After summing the losses caused by reflections (15.5dB) and adding the free-space loss of the path found earlier (114dB), we discover a total path loss of 129.5dB, which is less received signal than expected.

In contrast, Figure 6(b) changes the height of the transmit antenna from 95m to 50m. Because of the resulting change in reflection point and a restriction to the first Fresnel zone, a gain of 5.1dB over free-space loss caused by reflections is added to the



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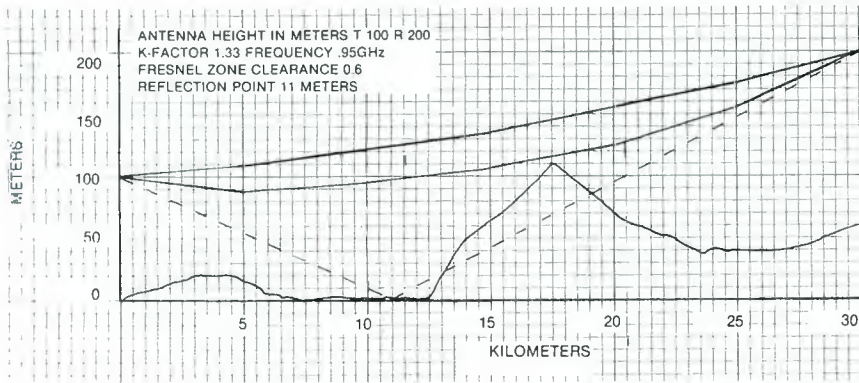


Figure 6(b).

occurs at 11km, but reflections are blocked by the peak. The grazing angle is 0.54°, and after vector summation provides a 1.4dB loss over free space.

Diffraction

If the beam of microwave energy strikes the edge of an object, diffraction comes into play. Diffraction means the breaking up of an electromagnetic wave into an interference pattern. The effect occurs whenever

114dB path loss for a total path loss of 108.9dB. We have gained signal by reducing the height of the transmit antenna.

Figure 7 illustrates another typical STL installation. With a transmit antenna at 100m and receive antenna at 200m, we set up a link for a 30km distance. The frequency will be 950MHz; K factor is 4:3. From the drawing you can see that a 0.6 Fresnel zone clearance is obtained at 17km from the transmitter at the site of an interfering peak. The reflection point

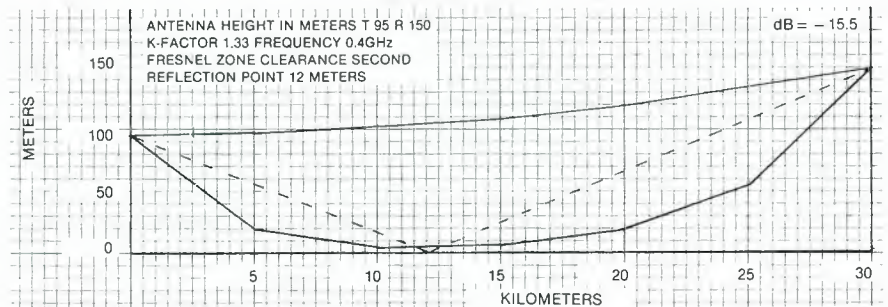


Figure 7. Plot of typical STL system showing blockage of possible reflections.

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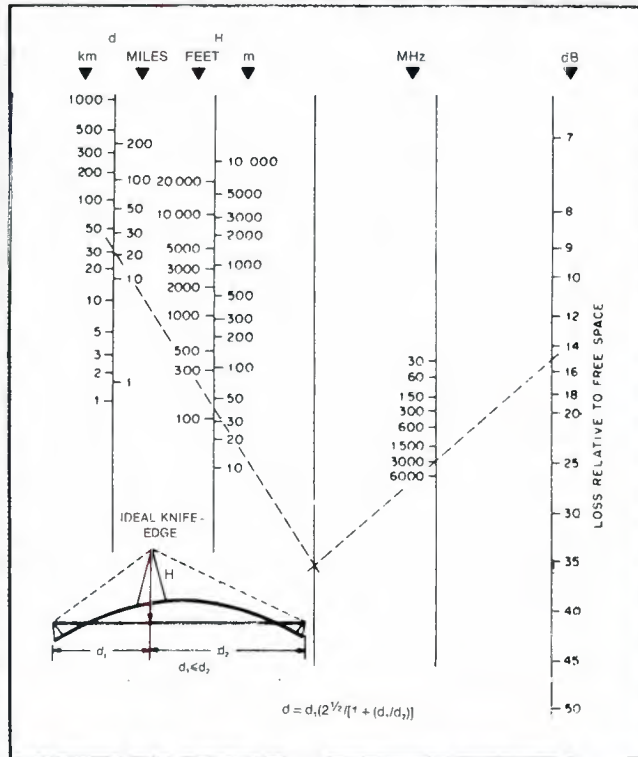


Figure 8. Knife-edge diffraction loss relative to free space.

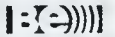
the wave is deflected at the edge of an electromagnetically opaque object, which could vary from a knife-edge-type obstruction to a sweeping edge, such as earth curvature. Diffraction propagation is frequently employed when the direct ray path is blocked.

An ideal knife edge is sharp and has a zero reflection coefficient. Loss caused by the edge depends critically on the shape of the diffracting edge. Because a natural obstacle, such as a mountain ridge, may depart considerably from the ideal knife edge, the diffraction loss in practice is usually 10-20dB greater than that estimated from nomographs such as the one shown in Figure 8, taken from the *Bell Systems Technical Journal*.

Editor's note:

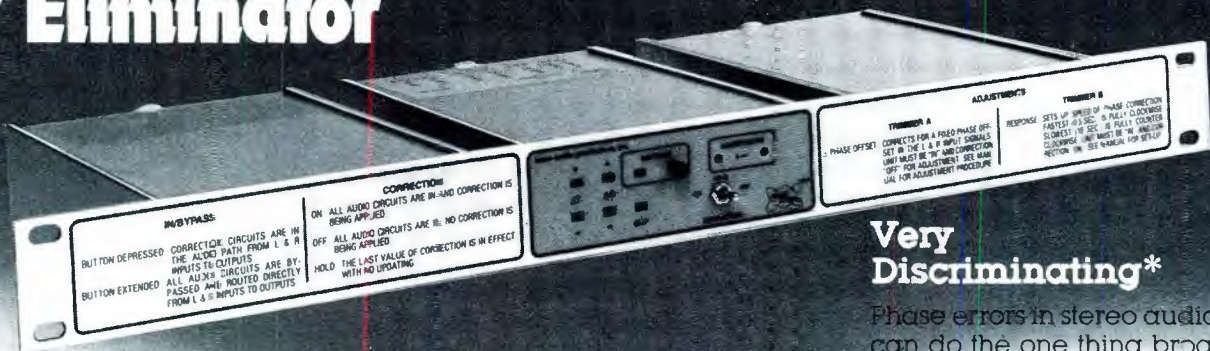
If this thumbnail sketch of propagation theory interests you, the following texts and handbooks are suggested for more in-depth study. Most STL equipment manufacturers also will be helpful in understanding the problems of planning your STL propagation path.

- *Radio Propagation Handbook*, Peter N. Saveskie, Tab Books.
- *Reference Data for Radio Engineers*, Howard W. Sams.
- *Electronic Engineers Handbook*, Donald G. Fink, McGraw Hill.



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Aural STL systems

By Jerry Whitaker, radio editor

Competition, new technologies and a more discriminating audience continue to push the radio broadcast industry to seek improved methods of signal delivery from the studio to the transmitter site. The author looks at some technical aspects of aural STLs and surveys systems shown at NAB '83.

When the studio and transmitter are not co-located, the STL provides the radio broadcaster an alternative to deliver program audio to the transmitter. Using microwave radio instead of Telco lines, the broadcaster has almost complete control over the transmission system. Not only is high quality audio performance possible, but also the capability for transmitting a composite stereo signal or the separate right/left channels, either with additional subcarrier signals, may be achieved, at a much lower cost than through the telephone line.

STLs in general

FCC regulations provide for 10 500kHz channels in the 950MHz spectrum for aural broadcast STL and intercity relays. Table I shows technical considerations of different equipment and operational arrangements. Regardless of the configuration, however, no more than one channel width is allowed. The transmitter's power output is limited to no more than necessary for reliable operation, and highly directional antennas must be used.

With the limited number of channel assignments available, stations must coordinate STL systems to ensure interference-free operation in urban areas. Many cities have frequency coordination committees, often set up by the SBE. Coordination takes into account the frequency, radiated power, direction of radiation, antenna polarization and potential of harmonic or subharmonic interference to or from the STL system.

STL systems require licensing using Form 313 application forms, which are available from any FCC field office

Table I.
950MHz STL technical characteristics

	SYSTEM CONFIGURATION Covered by Application	Frequency with Respect to channel center	Emission	Bandwidth
1	SINGLE STL - Monaural Use	On Center	110F3	120 kHz
2	SINGLE STL - Monaural Use with Type II Control	On Center	110F9	120 kHz
3	SINGLE STL - Monaural with 67 kHz SCA	On Center	230F9	240 kHz
4	DUAL STL - Stereo L or R channel I. or R channel	+125 kHz -125 kHz	110F3 110F3	120 kHz 120 kHz
5	DUAL STL - Stereo with Type II Remote Control System L or R channel & control L or R channel	+125 kHz -125 kHz	110F9 110F3	120 kHz 120 kHz
6	DUAL STL - Stereo & SCA L or R channel L or R channel & 67 kHz SCA	+125 kHz -125 kHz	110F9 230F9	120 kHz 240 kHz
7	DUAL STL - Stereo, Type II Control & SCA L or R channel & control L or R channel & 67 kHz SCA	+125 kHz -125 kHz	110F3 230F9	120 kHz 240 kHz
8	COMPOSITE STEREO STL - FM Stereo	On Center	226F9	236 kHz
9	COMPOSITE STEREO STL - FM Stereo & SCA (67 kHz)	On Center	270F9	280 kHz
10	COMPOSITE STEREO STL with Type II/C Radio Remote Control System	On Center	340F9	350 kHz
11	COMPOSITE STEREO STL with Type II/C Radio Remote Control System and program subcarrier channel	On Center	490F9	500 kHz

Courtesy of Moseley Associates

and most STL equipment manufacturers. Also, much more effort is required than simply pointing the transmitting and receiving antennas at each other and turning the equipment on. Much planning should precede applying for a license.

Path engineering*

The STL's purpose is to direct a signal from a fixed studio location to a fixed transmitter location. Because the studio and transmitter cannot be easily moved, the link must be engineered around these two fixed points. In many cases, the required STL path also will be the ideal line-of-sight path. In other cases, however, the required path will not provide acceptable performance, and special arrangements will have to be used, which may include a remotely located STL transmitter, fed via Telco loop from the studio, or a multihop relay system.

Using Telco lines to feed a remotely located STL transmitter introduces a host of familiar problems, such as differential phase error, noise, cross-talk, distortions, limited frequency

response and ever-present service delays. In some systems, using Telco loops to the STL is the only economical way to complete the link. Although a hybrid system is not the ideal, it is an improvement over an all-Telco link.

Multiple-hop STL systems present several problems, not the least of which is equipment cost. At least two transmitters and two receivers are required for a 2-hop composite or mono link. If dual-program channel or hot standby operation is desired, at least four transmitters and four receivers are needed. In addition to the extra equipment for a two-or-more-hop STL link, the cost and availability of space to locate the repeater link must be considered.

The performance of a multihop system generally is degraded by a predictable amount over a single-link arrangement. S/N, frequency response and differential phase/gain values usually will degrade by $10X \log N$ decibels, where N is the number of hops in the system. For this reason, it is necessary to measure the performance of the system as a whole on a regular basis, as well as to measure the performance of individual seg-

*See "The Propagation Path," which begins on page 19.

ments of the link. However, the same is true for a single-transmitter system fed by Telco lines.

Plans for any STL system begin with accurate, detailed US Geological Survey maps covering the proposed path. Note any natural obstructions (mountains, hills or vegetation) or man-made obstructions (buildings, water tanks, transmitting towers, etc.) in the proposed path.

With some idea of the terrain involved, a plot of the system is made with transmitting and receiving antennas located to provide a minimum of 0.6 Fresnel zone clearance on 4:3 earth profiling paper. The 0.6 Fresnel clearance value is valid for frequencies up to about 2GHz, but at higher frequencies a greater clearance is required.

If it is impossible to allow for the 0.6 Fresnel clearance zone, a minimum of 30 feet of clearance for the path should be provided above any obstruction. Paths between 0.6 Fresnel clearance and 30 feet, sometimes called grazing paths, require a greater free-space attenuation in the path design. An additional 2% of attenuation is

Photo: Merle Shuster



Shown is the Scala PR-450U transmitting antenna used in KPJ-FM's (Eureka, CA) studio-to-transmitter link. The hop is a 10-mile, line-of-sight path to the transmitter at Kneeland Mountain. A Moseley PCL-505C is used in the system.

found in paths up to 25 miles, 4% for 50 miles and 8% for 100 miles.

After the proposed path is drawn, visually check the area for any problems not shown on the maps that might degrade performance, such as newly constructed buildings or undocumented terrain features. Possible reflective surfaces should be examined as well. A large body of water, great for the AM transmission system, can cause severe problems for microwave links. Water is highly reflective to UHF frequencies, and if the surface of a lake is an even number of Fresnel zones from the true path, signal attenuation will occur at the receiver. Thick vegetation also provides substantial reflections, particularly when wet. Changing antenna height at the transmission or reception site is a solution to such conditions.

A margin of safety

Because variable weather factors are encountered, a margin of protection must be provided for the STL path. Figure 1 illustrates the recommended fade margin for a 950MHz

Continued on page 36



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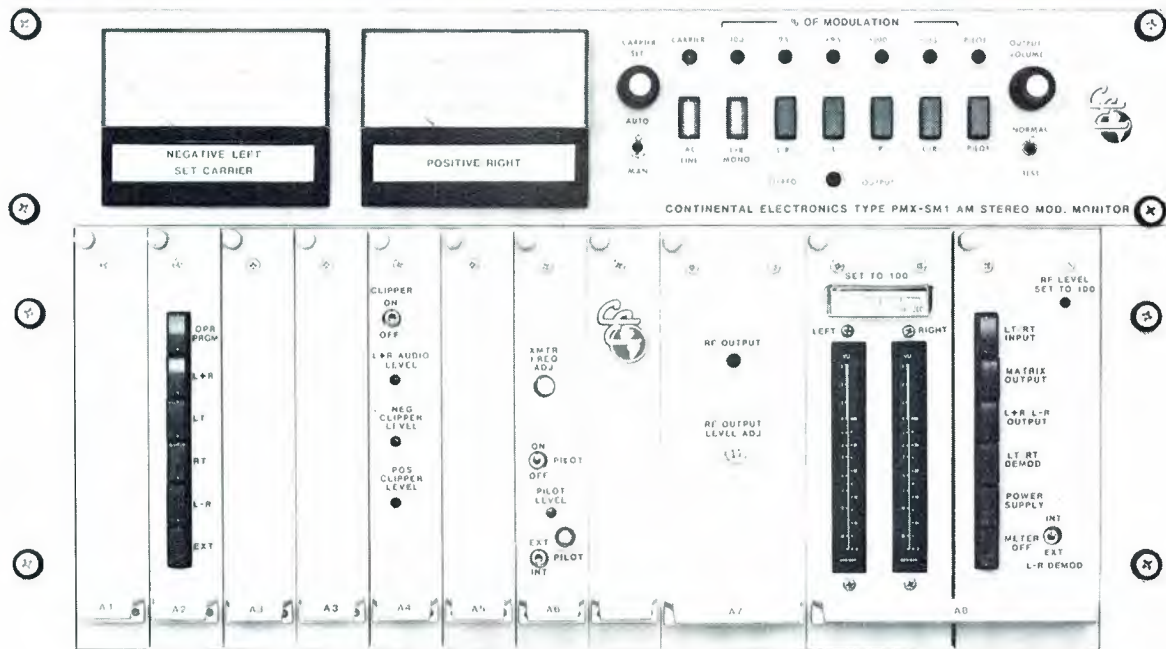


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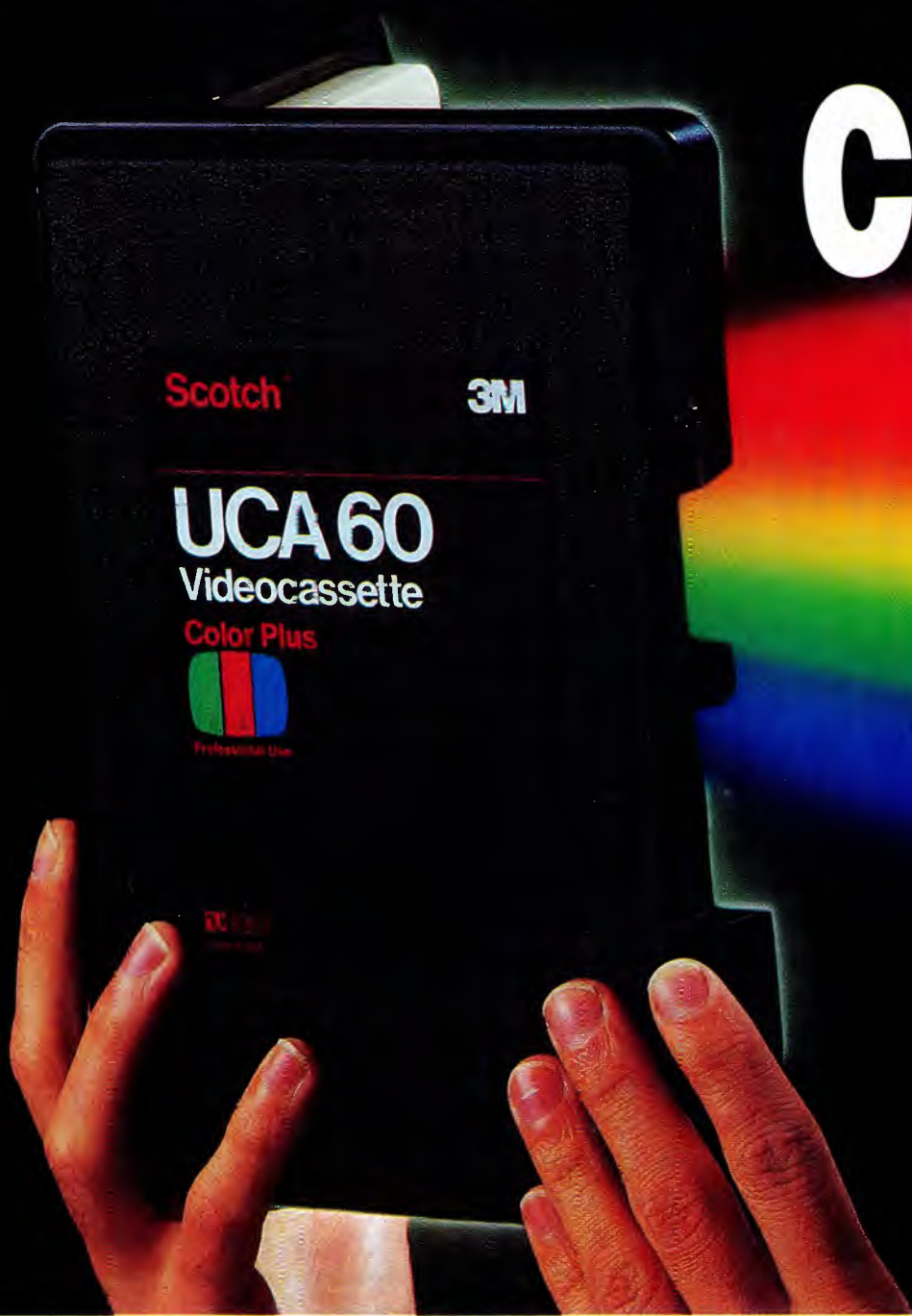


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November 1983 *Broadcast Engineering* 33

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system. If a multiple-hop arrangement is used, the fade margin from the chart applies to each segment of the overall link.

The greatest energy loss from the transmitter to the receiver is caused by free-space attenuation. For a distance N in statute miles separating the transmit and receive sites and a frequency of operation of F GHz, the free-space attenuation A is given by:

$$A = 96.6 + 20\log F + 20\log N.$$

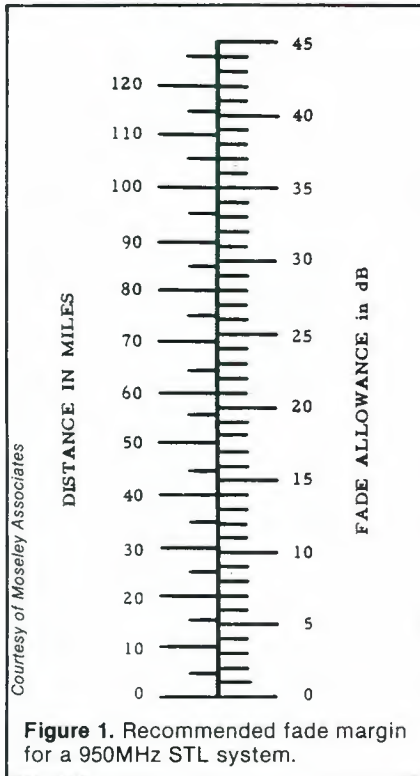


Figure 1. Recommended fade margin for a 950MHz STL system.

MOSLEY ASSOCIATES, INC. (santa barbara research park)

SYSTEM CALCULATIONS

Reference Number _____ Prepared By _____ Date _____

CUSTOMER _____

SYSTEM GAINS

1. Transmitter Power Output (Model # _____) _____ dBm

2. Transmitter Antenna Gain (Antenna Type _____) _____ dBi

3. Receiver Antenna Gain (Antenna Type _____) _____ dBi

4. Total Gain _____ dB

SYSTEM LOSSES

5. Path Loss (_____ miles/_____ NM) _____ dB

6. Transmission Line Loss (Total Ft. _____ / _____ m) _____ dB

7. Connector Loss (Total) _____ dB

8. Other Losses _____ dB

9. Total Loss _____ dB

SYSTEM CALCULATIONS

10. Total Loss (Line 9) _____ dB

11. Total Gain (Line 4) _____ dB

12. Effective Received Signal _____ dBm

13. Minimum Signal Required for _____ dB SNR (Model _____) _____ dBm

14. Fade Margin _____ dB

Courtesy of Moseley Associates

Figure 3. Path engineering worksheet.

High gain transmitting and receiving antennas used in STL systems provide additional passive gain needed for the system to operate reliably. A high gain antenna provides a high effective radiated power (ERP) in the direction of the radiation and helps prevent interference to other stations using STLs on adjacent frequencies. Given enough physical separation, two stations in a particular market can use the same STL frequency. Such sharing of frequencies has become necessary in some highly congested urban areas. For the arrangement to

horizontal polarization.

While planning the STL path, you must account for all gains and losses, starting with the transmitter. For easiest calculation, the transmitter's output power must be known in decibels. With transmitter power P_0 in watts, the output power in decibels dBm is given by:

$$\text{dBm} = 30 + 10\log P_0.$$

For signal accounting, any loss in receive and transmit feeder line connectors also must be considered. A

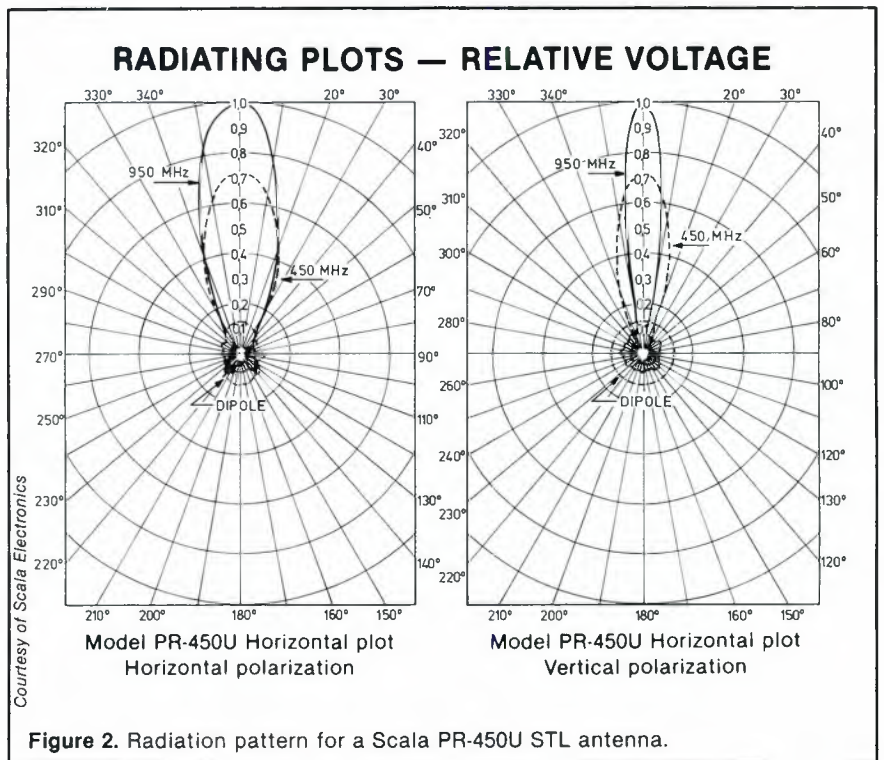


Figure 2. Radiation pattern for a Scala PR-450U STL antenna.

work, however, the antennas used must have very high gain, directivity and front-to-back ratios.

Typical radiation patterns for STL antennas are shown in Figure 2. The Scala PR-450U antennas, to which these drawings apply, may operate to 1GHz. A gain greater than 18dB is specified at 950MHz with a maximum VSWR of 1.2:1 at the specified operating frequency. A front-to-back ratio of 20dB is standard, with higher ratios available. For horizontal or vertical polarization, the antenna handles 100W of input power.

Another method of isolation to avoid interference is cross-polarization. As much as 25dB isolation is possible if one station uses vertical polarization, while the second uses

reasonable value for the usual components for 1/2-inch foam dielectric line is 0.5dB.

An engineering path form, as shown in Figure 3, simplifies the calculation of the STL system's fade margin. Once all gains and losses are listed and totaled, the engineer easily can determine whether the proposed system will be a firm link or a marginal one. A link that operates on the edge of the allowable fade margin eventually will encounter problems. Normal component aging in the receiver or transmitter can increase the S/N ratio to an unacceptable level. New construction could degrade the path. Unusual weather in the area or antenna icing may cause increased system noise and even complete loss of signal for a time.



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The HL-83 is extremely compact and well balanced. It's about the size and weight of competitive one-tube cameras—yet, it's a high performance three-tube, prism optics design. And it uses proven, readily available components. Inside are 2/3" Plumbicon* or Saticon** pickup tubes coupled to

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And with the HL-83's low-power requirement (16W), you can keep on shooting for up to 3 hours with an on-board Nicad battery.

The HM-100 VCR captures the image intact with a very respectable luminance/chrominance S/N ratio of better than 47/48 dB. Audio is better than 50 dB. This flexible, lightweight recorder (9.0 lbs) can be carried on a shoulder strap or mounted on-board

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Courtesy of Andrew Corporation

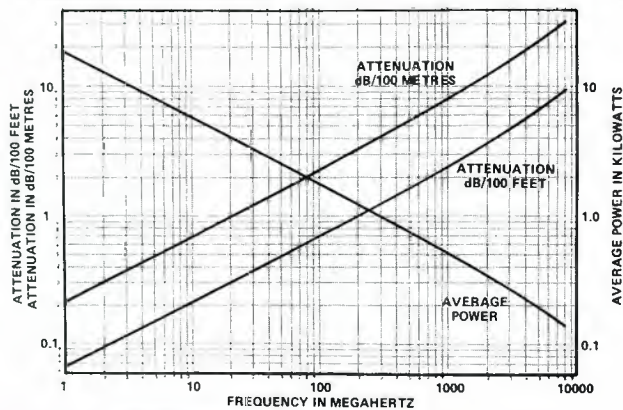


Figure 4. Power handling and attenuation ratings for Andrew 1/2-inch foam dielectric coax.

Thus, an adequate margin of safety should be allowed. If the transmitter allows an adjustment of the output level, acceptable performance should be achieved with approximately 85% of full power. Unforeseen changes can be compensated without the need for system modifications by allowing the 15% overhead capability.

Different types of transmission line can be used from the transmitter or the receiver electronics to the respective antenna. One type often used is 1/2-inch foam dielectric coaxial cable, such as Andrew Corporation LDF4-50 heliax. The power handling and attenuation characteristics of this cable are shown in Figure 4. Although 1/2-inch foam coax is the smallest size cable that should be considered for the main runs from transmitter or receiver equipment to the antenna, larger sizes of coaxial cable and even waveguide materials may be used, particularly for higher frequencies. Coax, such as RG-8/U, is not acceptable, however.

Installation hints

The transmission line is perhaps the easiest part of the STL system into which losses can be introduced during installation. The line should not be bent more than recommended by the manufacturer, because excessive bending will result in a kink in the outer conductor/shield of the coax. A kink will cause a change in the characteristic impedance of the line at the point of the kink. As the characteristic impedance changes, the VSWR of the cable presented to the transmitter increases. An increased VSWR will create a greater signal loss in the link.

The transmission line and connectors must be watertight, where exposure to the elements is possible. Connectors sealed with a silicon dielectric compound and wrapped with a good-quality tape or heat-shrink material should provide reliable operation. If moisture works its way into the connector, signal loss and VSWR problems are likely.

Grounding of transmission lines for the STL is suggested at the point the lines enter equipment buildings and where the lines start up the tower if the height of the antenna is greater than 10 feet. The grounding will help prevent high voltage transients, caused by lightning, from entering the equipment buildings. Inside the building, pigtailed of flexible coax may be used to connect the line to equipment,

Continued on page 42

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November 1983 *Broadcast Engineering* 41

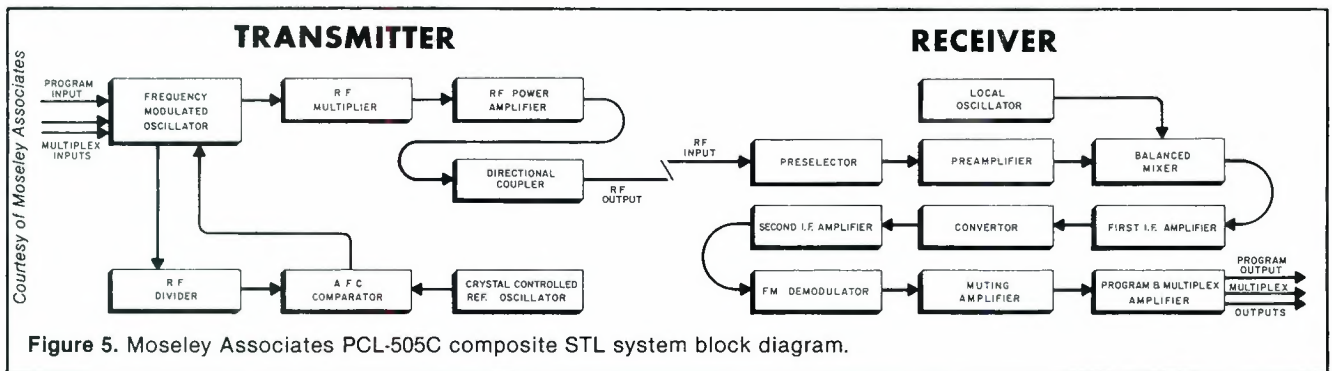


Figure 5. Moseley Associates PCL-505C composite STL system block diagram.

but the lengths should be no more than 18 inches.

If the STL transmitting antenna is mounted on an insulated-base AM radiator, an isocoupler is suggested. The isocoupler passes the STL frequency signal with greater than 90% efficiency, while presenting a high impedance to the AM band. Isocouplers are available in various frequency and power ranges. Installing the isocoupler may change the base impedance of the AM tower slightly, requiring the antenna tuning unit to be retuned, if necessary. Unless the engineering staff is well-versed in such activities, a consultant should handle the adjustment task.

When an FM or TV transmitting antenna is nearby, the STL receiver antenna should be as far away from the radiating elements as possible to prevent desensitizing the microwave receiver.

Dual or composite systems

Aural STL equipment on the market offers various features, controls, prices and specifications. One major difference in equipment design involves the dual-channel or composite system concept. In a dual system, one transmitter handles a monaural program channel bandwidth of 30Hz-15kHz and a multiplex bandwidth of 24-85kHz. The composite system program channel extends from 30Hz-75kHz with the multiplex channel from 106-220kHz.

In the dual system, two transmitters and two receivers are required for stereo program transmission. One antenna usually can be shared by the dual system, if an added loss of a signal combiner and separator can be tolerated. By using a composite link, however, a single transmitter and receiver deliver the entire baseband signal (stereo plus SCAs, if used).

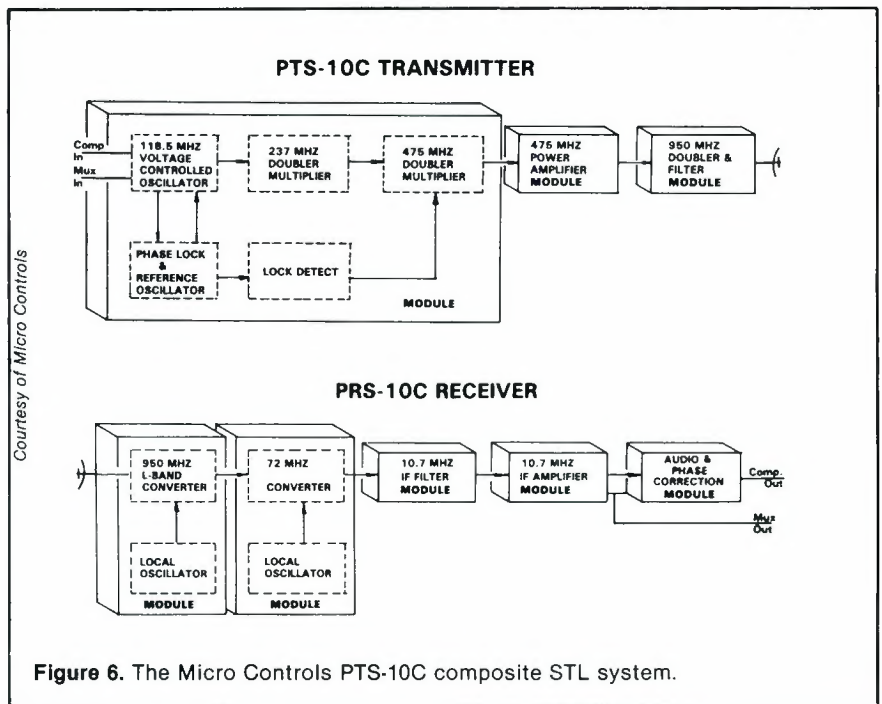


Figure 6. The Micro Controls PTS-10C composite STL system.

Phase shifts and differential frequency response problems that may occur with dual systems are eliminated. The dual system has an added benefit, a continuously operating backup in case one of the two link systems fails. The cost of a composite system with a hot standby unit for redundancy will be approximately the same as the dual system, however.

Product survey

Designs of STL transmitters and receivers vary widely from one manufacturer to another, but some generalizations apply in composite systems, such as the Moseley PCL-505C (Figure 5) and the Micro Controls PTS-10C (Figure 6). Audio is applied to a frequency-modulated oscillator (FMO), which is locked on frequency by an AFC circuit. A master crystal oscillator serves as a frequency reference,

with a specified frequency stability of greater than 0.0005%, as required by FCC rules. The direct FM output of the oscillator is multiplied two or more times and applied to the final power amplifier. Low-pass filtering and directional couplers follow the output of the PA, with protection and power control circuits monitoring the system's output and operating drive and overload circuits.

The receiver typically is a double-conversion system, using crystals in both conversion local oscillators. A preselector at the receiver input removes out-of-band energy. Following the IF amplifier chain, a demodulator recovers the transmitted signal and bandpass filters pick off the program and multiplex outputs.

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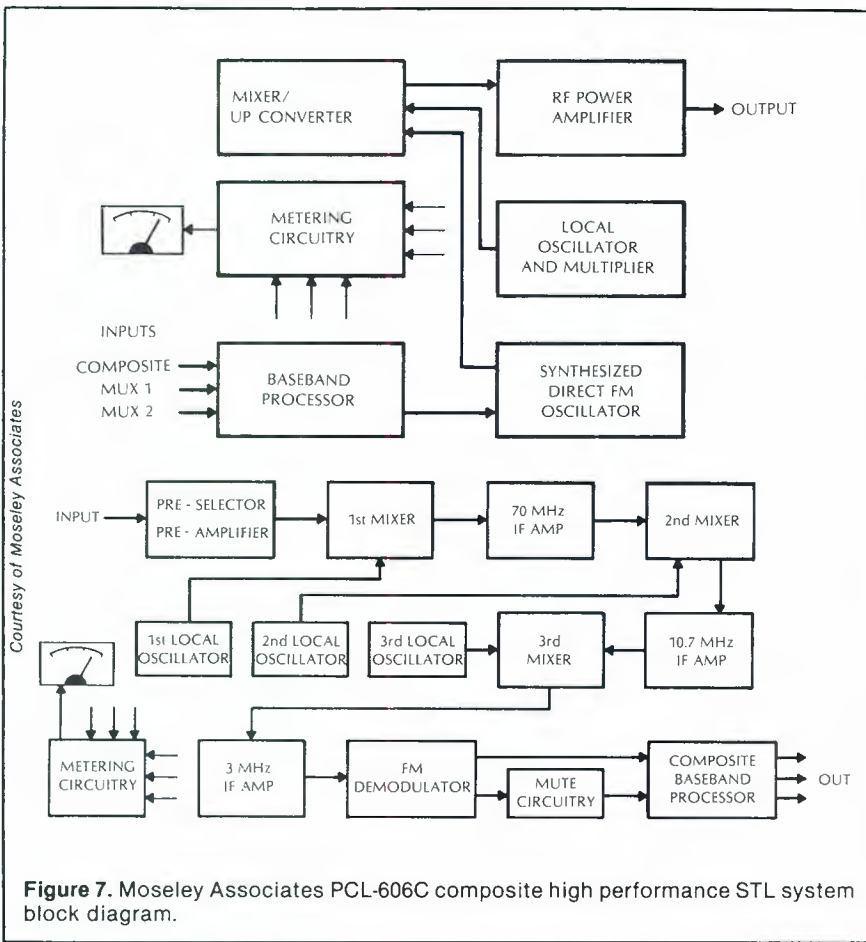
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found in most urban areas. One of them, the Moseley PCL-606, departs from traditional circuitry with digital techniques. (See Figure 7.) Audio is applied to a baseband processor that feeds the FMO, consisting of a synthesized reference oscillator. Frequency and phase of the direct FM oscillator are controlled by the reference. Frequency conversion to the STL band is accomplished by a double-balanced mixer, instead of the usual multiplier. A front-panel multimeter and LEDs indicate system status.

The PCL-606 receiver uses a PIN-diode attenuator circuit to reduce adjacent signal intermodulation products caused by input signal overloads. The bandwidth of the receiver IF can be changed to optimize the trade-off between selectivity and distortion. Triple-conversion with a digital pulse-counting demodulator allows the configuration to give good out-of-band rejection and S/N ratio figures, both vital to high performance in a crowded band.

TFT offers the high performance market STL, the model 8300, shown in Figure 8. Similar in design to the TFT

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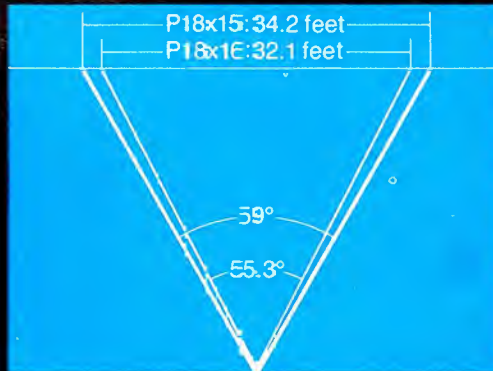
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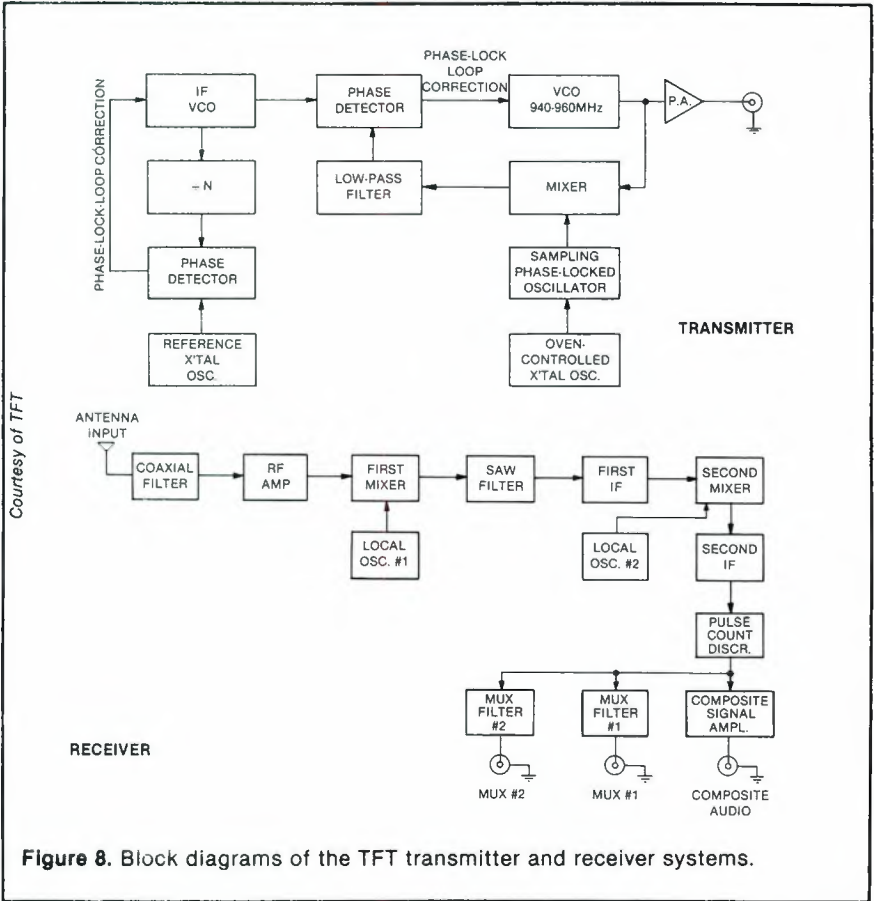


Figure 8. Block diagrams of the TFT transmitter and receiver systems.

7700 series STL, the 8300 is intended for dense RF environments. The 7700 is recommended for less-congested applications.

Baseband audio is fed into an intermediate frequency voltage-controlled oscillator (VCO), which is phase-locked to a 10MHz temperature-compensated reference crystal oscillator (TXO). The IF-modulated signal is mixed up to half the 950MHz operating frequency, using a crystal VCO also locked to the 10MHz reference. An advantage of the 10MHz oscillator is the capability for checking it against WWV for accuracy.

The final transmitter stages consist of a filter, frequency doubler and power amplifier. Mixing in the transmitter by Moseley and TFT achieves signal conversion to the operating frequency with an improved S/N performance of the system.

In the 8300 receiver, a selectable bandwidth design is based on a surface acoustic wave (SAW) filter, allowing the unit to operate in a crowded or quiet RF environment. The SAW filter exhibits precise passband control with good attenuation of adjacent channels and linear phase response across the selected channel. The receiver preamplifier reduces the system's sensitivity to protect the first stage against overloading. Triple-conversion with crystal oscillators for each stage prepares the signal for a pulse-counting discriminator to demodulate the baseband signal. Filters separate the program and multiplex channels.

During the past year, Micro Controls introduced a new system of interest to the FCC and broadcasters. The ULX-2001 Uniphase link/exciter uses a standard MCI PTS-10C wide-band composite STL transmitter at the studio and a unique receiver and FM multiplex exciter at the broadcast transmitter site. The system directly drives the main transmitter IPA stage, without using a separate exciter. Figure 9 shows the receive system in block form.

Audio input to the Uniphase system at the STL transmitter location is never reconverted to audio or stereo baseband until it reaches the listener's receiver, to reduce degradation of program quality caused by demodulation by the STL receiver and subsequent remodulation in the exciter. An emergency modulation input at the STL receiver allows direct audio input to the exciter section, if required.

The signal, modulated to a 75kHz deviation with stereo and SCA sources, is heterodyned down from

STL equipment manufacturers

For more information about STL products and accessories, use the following list of manufacturers, with Reader Service Numbers for your convenience.

American Laser Systems	330	Leasametric	350
Andrew	331	Loral Microwave Communications	
Anixter Communications	332	Terracom	351
Antennas for		M/A-COM Video Systems	352
Communications	333	Marti Electronics	353
Artel Communications	334	McMartin Industries	354
Avantek	335	Micro Controls	355
Bayly Engineering Ltd.	336	Modulation Associates	356
Broadcast Microwave		Moseley Associates	357
Services	337	NEC America, Broadcast	
Cablewave Systems	338	Equip. Div.	358
Coastcom	339	Nurad	359
Comad Communications	340	Omni Spectra	360
Comark Industries	372	Power Pak Systems	361
Continental Electronics Mfg.	341	R.F. Technology	362
DYMA Engineering	342	RHG Electronics Laboratory	363
GTE Lenkurt	371	Rockwell Int'l. Commercial	
HN Engineering	343	Elec. Operations	364
H2A Communications	344	C.N. Rood B.V.	365
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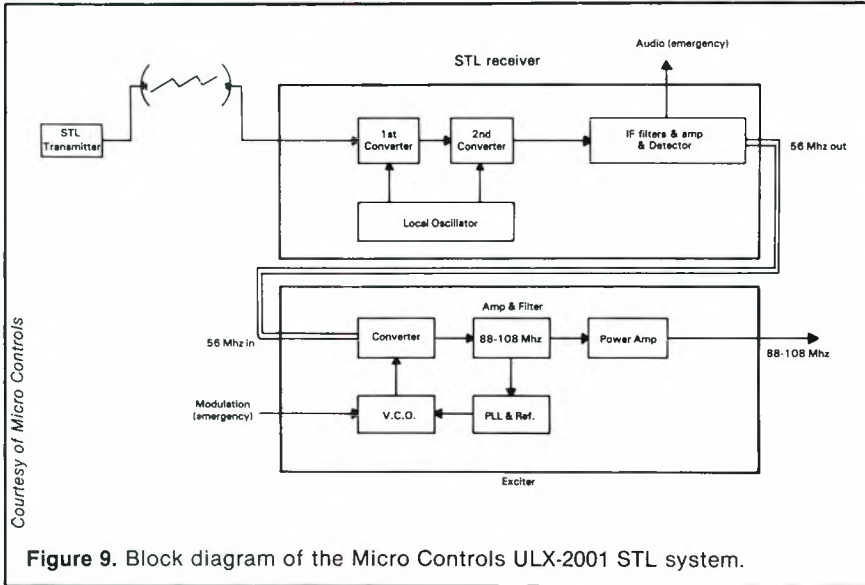


Figure 9. Block diagram of the Micro Controls ULX-2001 STL system.

the 950MHz carrier to an IF frequency of 10.7MHz, where adequate adjacent channel rejection can be attained. The IF signal is then sampled and upconverted twice to the station's operating frequency. Filtering follows each upconversion state with local oscillators for the first and second mixer stages being crystal-controlled.

Because FCC rules require that the FM transmitter's carrier frequency be dependent on only one frequency source, the Uniphase link/exciter includes a PLL circuit tied to a TXO to drive the last conversion stage. Following conversion to the FM band, the signal is filtered and amplified to approximately 20W output into a 50Ω load. The commission presently is licensing the Uniphase equipment on a one-by-one basis while studying the system's gain performance. Stations receive a 60-day temporary authorization to install the ULX-2001, during which time an audio proof and other measurements are made. Following final FCC approval, the system is licensed, just as any other STL and exciter. Systems have been operated with a received signal of 300μV to

date, but the Uniphase is not being recommended for STL links with a marginal path.

Micro Controls also offers the PTS-10CD STL system, a 3-channel unit designed for AM stereo or receive-only satellite installations. The unit features left, right and remote control channels. PLL and VCO designs are based on a crystal reference.

Marti Electronics' STL-8 provides monaural plus subcarrier transmission in the 950MHz band. Because the STL-8 is available only in monaural configuration, two STL-8s are required for stereo operation. Dual-system advantages over the composite type include near immunity to stereo separation degradation in the STL link, automatic backup protection and the availability of an additional subcarrier channel for remote control functions.

The STL-8 transmitter uses a direct FM modulator, varactor final stage, solid-state oven with high accuracy crystal and fault protection circuits. The receiver is crystal-controlled with double conversion.

Marti's STL-10 is a monaural link

with two available multiplex channels for voice or data relay. A stereo STL still would require two units. The STL-10, however, features user-selectable audio pre-emphasis with special low-pass filters to eliminate overshoot on complex waveforms. Metering monitors forward/reflected power, main-channel peak modulation, subcarrier modulation, V+ power and three RF stages. An accessory plug is provided for external dc power from a battery, solar cell panel or any single-polarity source.

The STL-10 receiver incorporates a helical resonator preselector stage and computer-designed bandpass filters for high selectivity with optimum phase and group delay. A sensitivity switch adds an optional 10dB of attenuation for RF interference rejection. Three IF bandwidths are accommodated to meet domestic or international requirements. Similar to the transmitter, the receiver includes test metering and external dc powering, making it ideal for remote sites.

Looking ahead in STLs

All STLs discussed previously have been 7-15W units intended for transmission on medium- or long-distance paths. Power Pak Systems, formerly Micro Control Associates, introduced a system at NAB'83 that used a 1.5W transmitter, designed for hops of approximately five miles. Although the system is not yet available, it will be based on plug-in cards that allow a variety of configurations. A 15W power amplifier will be an option for those wishing to transmit on longer paths.

Other future innovations presumably will involve digital systems, provided that bandwidths can be overcome. The digital system should be more immune to interference problems of the high density areas with little or no degradation of program signals when multiple-hop systems are required.

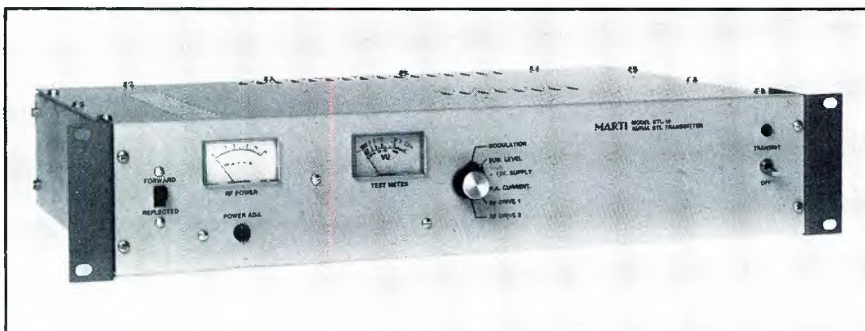
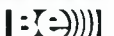
Editor's note:

More information may be found in these publications. Also, additional information may be obtained from manufacturers.

- *NAB Engineering Handbook*, Sixth Edition, "Microwave Engineering for the Broadcaster."
- "Studio-Transmitter Link Applications Guide," Terry Lloyd, TFT.
- "Radio Telemetry Return Link System Considerations," Moseley Associates Tech Note #228.
- "Microwave Path Evaluation," Moseley Associates Engineering Report.

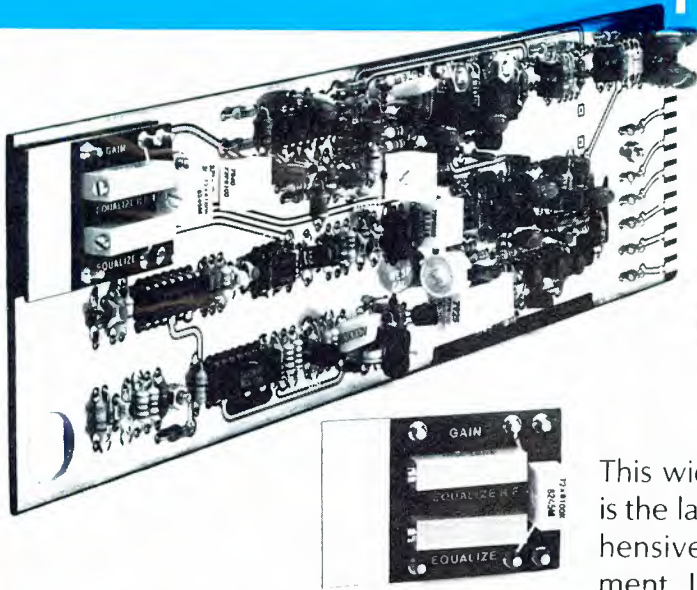
Acknowledgement

The author thanks Moseley Associates, TFT, Scala Electronics and Andrew Corporation for assistance in preparing this report, which was prepared while he was chief engineer of KRED/KPDJ in Eureka, CA.



Marti Electronics STL-10 transmitter

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This wideband, six-output amplifier is the latest addition to our comprehensive line of distribution equipment. It features differential input,

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Here are some prominent SPECIFICATIONS

Input

Return loss > 54 dB to 5 MHz
 > 46 dB to 10 MHz
 Common mode rejection . . . > 60 dB to 1 kHz

Outputs

Return loss > 40 dB to 5 MHz
 > 36 dB to 10 MHz
 Output isolation
 Signal (3.58 MHz) > 48 dB
 Load < 0.05 dB/load at 10 MHz
 < 0.15°/load at 3.58 MHz
 Output DC < ±25 mV at back porch

Timing

Delay 25.4 ns (32.7° at 3.58 MHz)
 Adjustment range typically 6° at 3.58 MHz

Power Requirements

Total power
 dissipation < 2 W

Performance

Frequency response < ±0.02 dB to 5 MHz
 < ±0.1 dB to 10 MHz
 +0 -0.2 dB at 15 MHz
 typically -0.6 dB at 20 MHz
 Differential phase < 0.1° 10% to 90% APL
 Differential gain < 0.2% 10% to 90% APL
 H tilt < 0.25%
 V tilt < 0.25%
 S/N ratio > 70 dB to 20 MHz
 (rms noise/0.714 V)
 unweighted

Equalization

Range 0 - 300 m (0 - 1000 ft)
 Belden 8281, Northern
 Electric 728, or equivalent
 Response < ±0.05 dB to 5 MHz
 < ±0.15 dB to 10 MHz
 typically -0.2 dB at 15 MHz
 typically -1.0 dB at 20 MHz

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Of course, we left in all the good things that made the

Premium Line so popular. The $\frac{1}{2}$ -inch tool plate aluminum deck. Durable, high quality switches. And a solenoid-actuated, chain-and-sprocket pressure roller assembly. All backed by our famous two-year warranty on parts and factory labor, plus a 30-day guarantee of satisfaction. If, for any reason, you're not completely satisfied, you can return the unit within 30 days of purchase and we'll refund your money in full.

The good things are still there. But what you'll notice are the improvements. We think they were worth the wait.

For more information, or to place an order, call us collect from Alaska, Hawaii or Illinois, at 1-309-828-1381. From the rest of the U.S., call the following. Toll-free number:

1-800-447-0414.

1983

1973



INTERNATIONAL TAPETRONICS CORPORATION

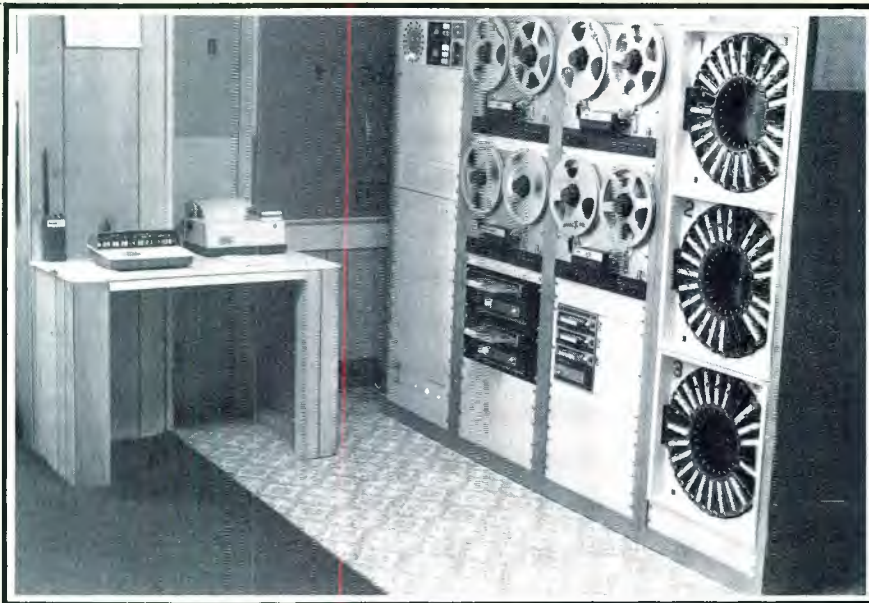
3M hears you...

3M

Case study:

Automation at WWJM—efficiency on a budget

By Mark Bohach, chief engineer,
WWJM, New Lexington, OH



Shown is the WWJM automation system. On the table at left is the controller keyboard and log printer for the system.



The Radio Shack model 1 computer and less expensive printer are shown. Disc drives for the system are on a lower shelf of the table.

In these days of high technology, total station automation is an easy task. However, small to medium market radio stations cannot always afford \$20,000 traffic-billing systems or \$70,000 program automation systems. Low cost automation alternatives are needed. WWJM has found one such alternative.

Before becoming automated, WWJM was a typical small to medium market radio station. Annual programming staff turnover was more than 50%. Payroll costs were excessively high. The air staff was inexperienced, which gave the station a poor air sound. To correct for inefficiency and poor air content, WWJM's owners decided to use automation. In 1981, WWJM purchased a Radio Shack TRS-80 model I 16K Level II for payroll and billing, easing the office staff's paperwork load and making billing more efficient. Later that year, the station purchased a used Cetec-Schafer 902.5 program automation system from a radio station in Indiana. Using this system stabilized the air sound and gave WWJM a consistency it previously never had.

The 902.5 was eight years old when WWJM put it into service early in 1982. Unfortunately, the system's memory was not flexible enough to handle complicated format changes well, and it also had reliability problems. Intermittent failure caused the system to be off the air for several hours at a time. Although the air sound improved greatly with the automation, continuing problems forced the station to look for a more reliable system.

After checking the cost of a new program automation system and finding it unaffordable, and wanting to avoid potential problems with another used system, the station looked for a midpriced alternative. After looking into available equipment and programming sources, the station selected Broadcast Automation Sales and Service, a subsidiary of Century 21 Programming of Dallas. Broadcast Automation purchases and rebuilds used automation equipment and Century 21 provides complete automation formats. After discussing the specifics of automation with Century 21's staff, WWJM chose a rebuilt automation system, accompanied by Century 21's Top 40 music format (Z Format).

The system WWJM purchased, a rebuilt Cetec-Schafer 903, provided the memory capacity and functions needed. With the memory, the station

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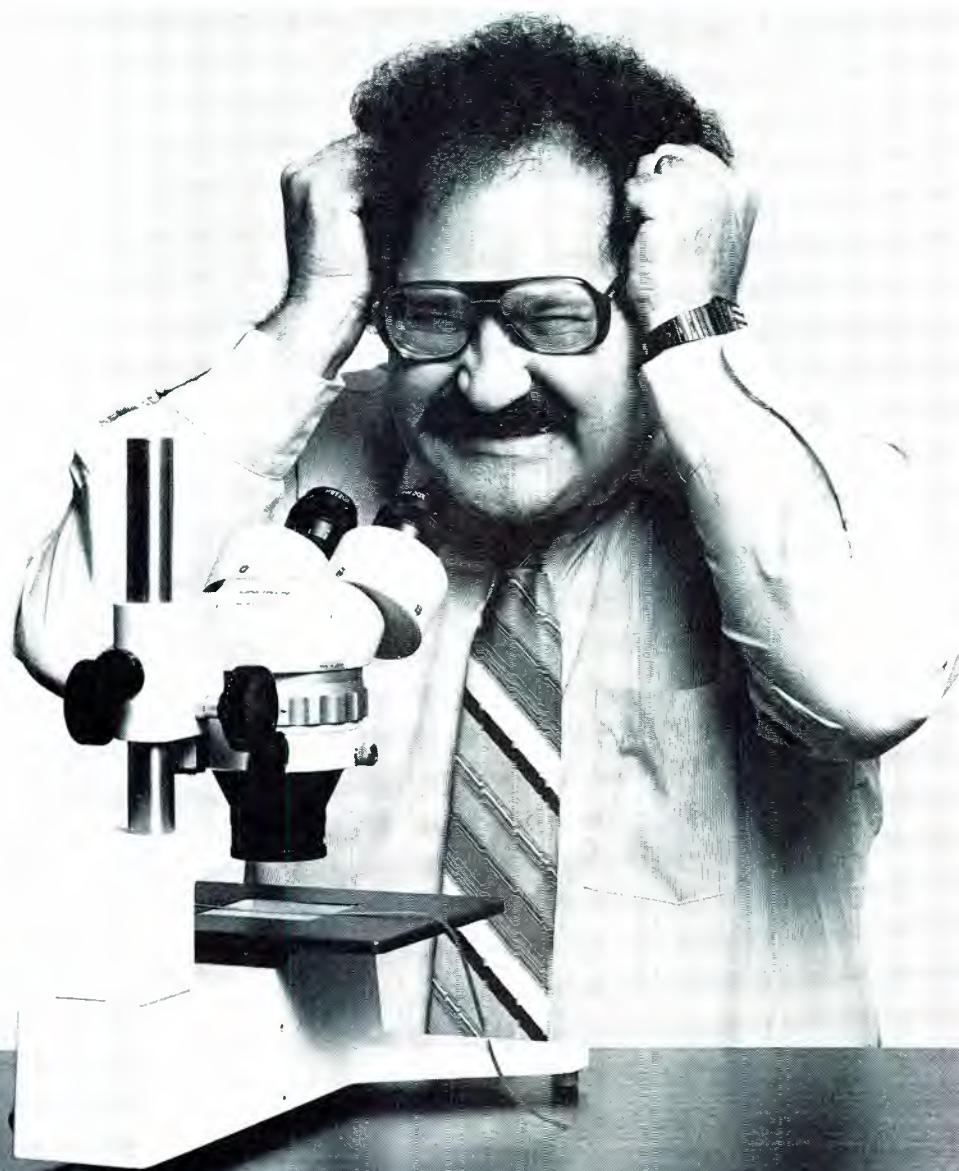
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NEC America, Inc., Broadcast Equipment Division
130 Martin Lane, Elk Grove Village, Illinois 60007



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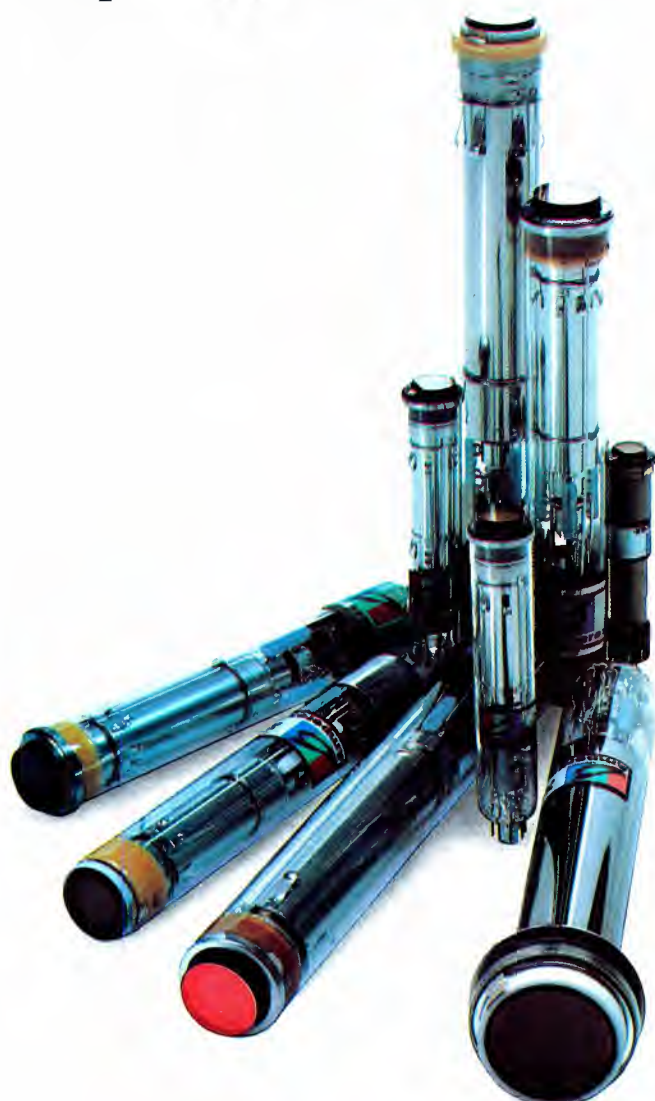
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Circle (42) on Reply Card

Case study: Using the Commodore Automate-64 at KSDB-FM

By David T. MacFarland, associate professor, radio and television, Manhattan, KS

KSDB-FM, Manhattan, KS, used to have a severe problem. The station, a non-commercial educational FM licensed to Kansas State University, and operated by students in the department of journalism and mass communications, used to have to sign off when student operators went home for vacations, such as Thanksgiving, Christmas, Easter, before and after the summer session, and whenever their football team won more than two in a row. Concerned that it was not in the public interest to be off the air so much, Lee Buller, a department professor, George Scheets, the department's electronics engineer, and I began designing an automation

system for KSDB last spring. Initially, we designed it around a Commodore VIC-20 home computer, but then we upgraded it to a Commodore 64. We chose Commodore's line because it was inexpensive, and both models we selected offered a "user" port that made it easy to listen and talk to the outside world.

It did not take long for Scheets to design a unique circuit for the VIC-20/64 that allowed the computer to talk both directions at the same time, controlling up to 15 external devices with reliability. Automate-64 interface boards include a 25Hz tone decoder for reel-to-reel sources, an EOM tone decoder for cart sources, and sets of

flip-flops, relays, power supplies and protection circuits. They include FET switching equipment to join and leave a network or remote, an adjustable silence sensor and a dc-controlled attenuator for smooth fade-outs.

The hardware of automation systems is the glamour part of the business. That is, perhaps, truer today with the capability of running a radio station with an inexpensive home computer. But the professional representatives of computer hardware lines and radio station automation equipment invariably say that the first rule of purchasing equipment is: First decide what you want to do; second, find the programming or software to do it; and third, then, and only then, buy the hardware to run the system. Otherwise, you might end up with cumbersome, expensive or incompatible mismatches.

As of September 1983, Buller, Scheets and I were on version 39 of the software program. We have made that many revisions to incorporate these features in the Automate 64

- adds flexibility of a 400-event time file and four 200-event format files. The four format files can be combined to form an 800-event format file or "day-parted" to change formats as the day progresses. All files can be repeated endlessly.
- prompts the user in simple English during format and time file input routines, and allows replay using easily remembered abbreviations (not number code).
- controls up to 15 audio sources (up to six cart machines, six reel-to-reel decks, two remote or network lines and the fader).
- works with a station's present audio source and control equipment.
- allows you to enter only the events you want to occur—no need to bypass hundreds of pre-programmed avails that you cannot use on a slow day.
- runs any kind of music rotation and any kind of spot/PSA clusters.
- permits resetting of the format file to the first event every hour to follow a format clock, or only resetting of the first event when all format events have been played.

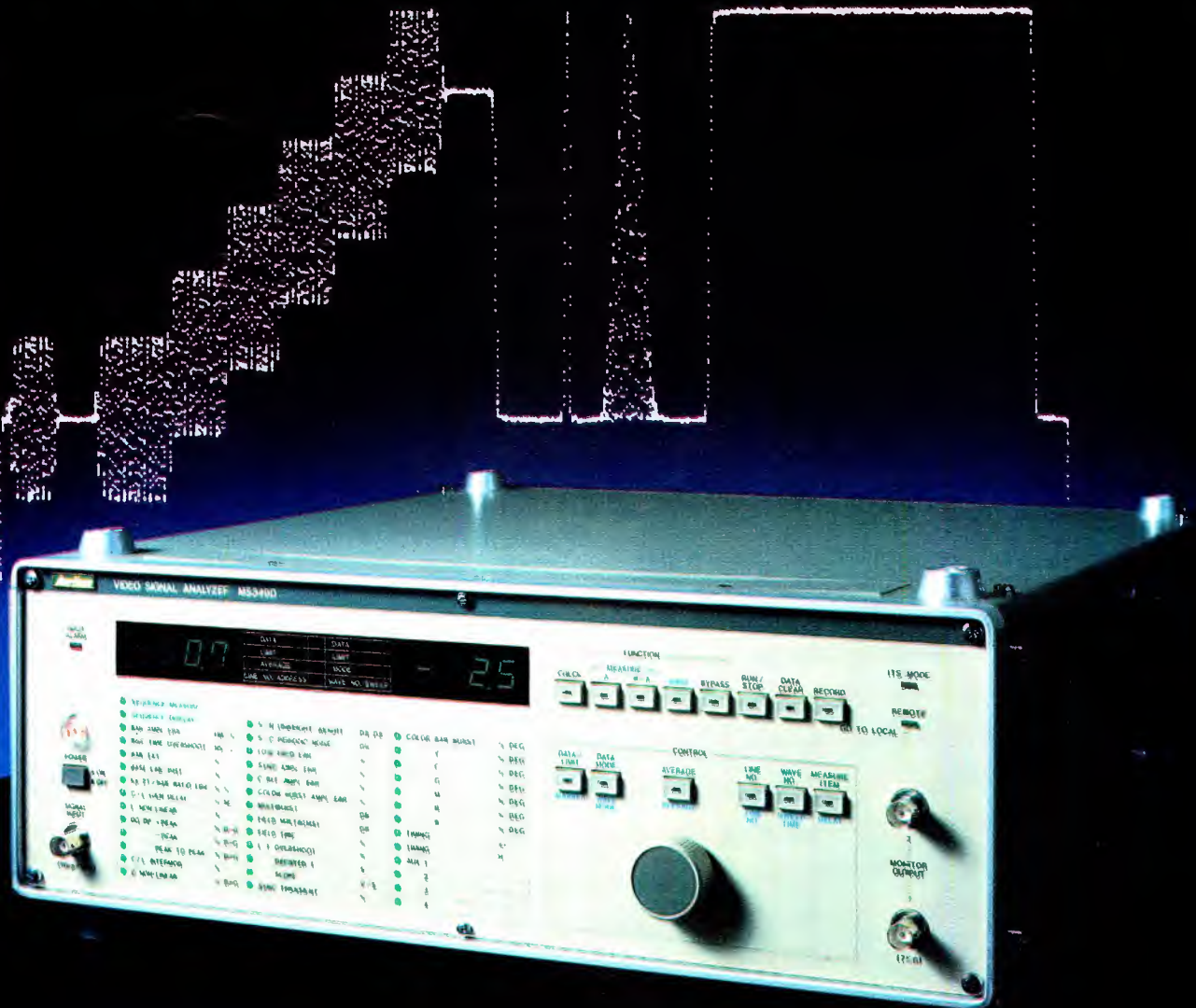


The author (right) checks the running screen display of the Automate-64 system in the KSDB-FM control room. Co-developers of the system, George Scheets (left) and Lee Buller, watch the system go through its paces.



The power supply, unique logic circuitry and relays of the Automate-64 system fit in a 2-inch-high standard rack.

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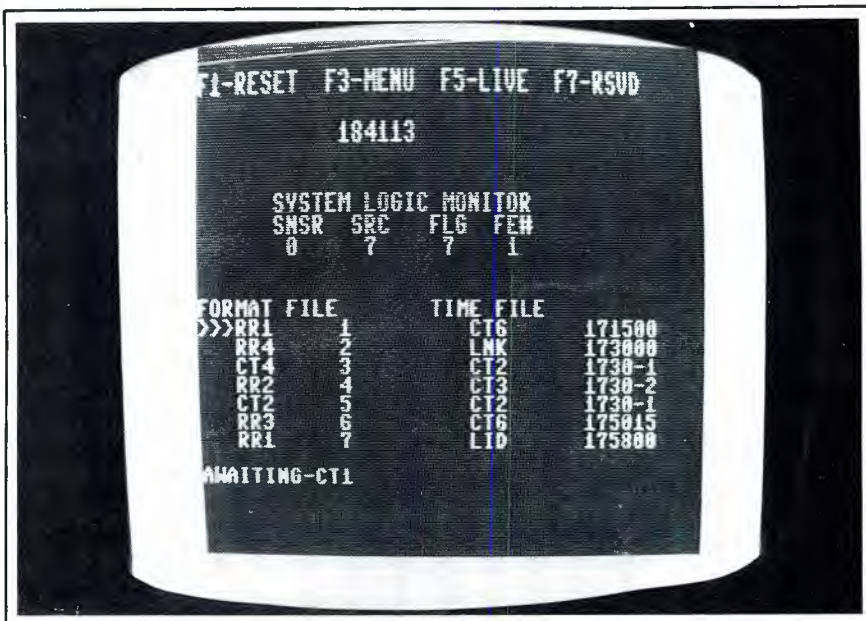


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Circle (44) on Reply Card

60 **Broadcast Engineering** November 1983



An early Automate-64 running display screen. Lines show system options, 24-hour time clock, a check on the computer's logic, current and upcoming events in the format and time files, and prompts for time events waiting to play.

- permits changes to time or format files at any time, no matter what is playing.
- enables fast automatic recovery from most types of miscues, plus instant manual reset.
- saves user-defined time and format files on tape for fast reloading.
- joins networks or remotes at exact times or with network cue tones.
- prints a log, if desired.
- runs standard syndicated music tapes or station-brewed music and chatter.
- allows operator to go live at any time, then to resume automation from the keyboard or with a tone.
- allows flexibility in the amount of tightness of production to suit the format, or even the time of day.
- automatically controls the operation of the silence sensor to pause longer during network and remote feeds as protection against dropout or scheduled pauses.
- allows linked events ahead of real time events (such as legal IDs preceding network joins).
- handles joins of real time events differently depending on preceding event. (In other words, when joining a network, if voice cart is playing, system waits for cart to finish; if music is playing, music is faded to join on time.)
- provides a clean, easily understood monitor display of system status, showing current format event, next format event, pending time event, next time event, any time events waiting to execute, status of system logic and prompts to the user for resetting, going live or making format and time file changes.

Because Automate 64 meets all these specifications, a station using the system does not sound automated. While running an announced album rock format on KSDB-FM during summer vacation, the station continued to get calls asking the DJ to play requests, even though Scheets was the only person around.

The concept of a user-friendly system has gotten a lot of attention from designers of the Automate-64. Logical abbreviations, such as RR2 for reel-to-reel deck 2, and CT3 for cartridge deck 3, are used in the format file input routine. Similarly, the time file input routine uses such terms as NTJ for a network join, and LID for a legal ID.

The user is guided by on-screen prompts for all input and operating functions, so that even the neophyte student operator can make the system work. A different screen display keeps the operator informed of where the system is in the time and format files, and displays the internal clock for comparison. Prompts telling the operator which function keys to press to see the menu, to reset the system or to go live are also displayed.

Commercial broadcasters that have watched the system operate generally are impressed with its capability, and two have offered to buy a system as soon as one becomes available. A commercial system of the type used at KSDB should prove popular with small market stations that have never before been able to afford automation. The total system, including the Commodore 64 computer, the interface boards and the software package, costs about \$2500. | = { ~ =)))))

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Computing for broadcasters: An STL path analysis program

By Robert L. Chamberlin,
United Technimedia, Park City, UT

This microcomputer program is designed to assist broadcast engineers in path analysis, selection of cost-effective antenna systems, troubleshooting existing systems and relocation of existing systems. The software also provides license application data for the latest version of FCC Form 313.

Calculations within the program are based on a clear path, free of obstructions, grazing and Fresnel zone attenuation. Adjustments may be made to compensate for such factors by adding to the fade margin. Reference material for compensations is available in the *NAB Engineering Handbook* or the *ITT Radio Engineers Handbook*. The fade margin, a safety allowance for the effects of precipitation, heating effect, sunspots, etc., varies with manufacturers, but generally 20dB is considered safe.

The program can help engineers plan, purchase equipment and apply for FCC licenses. It may be used to study the effects of various types of coaxial cable and lengths, thus possibly avoiding remote control of an STL transmitter by properly choosing low loss coax. Various types of antennas may be checked by the software to find the most cost-effective antenna system. Calculations allow data to be entered for different transmit and receive antennas.

The program data assists system troubleshooting. For example, a directional wattmeter could be used to verify calculated line losses. Poor original design of the system also could be identified.

A visual inspection should always be made to ensure that the path is free of obstructions. Check with local planning and zoning departments to be sure your clear path will remain clear. A consulting engineer should be retained if there is evidence of critical obstructions.

All calculations required to prepare FCC Form 313 are provided. The form requests information about antenna input power, effective radiated power and azimuth bearing. The program tabulates the information only if the path is calculated to be acceptable.

The software is written to operate

```

0 'STLPATH.BAS

1 '          FREE SPACE STL PATH STUDY ROUTINE
2 '          By Robert L. Chamberlin
6 CLS: CLEAR 500: K=57.2958
10 INPUT"TITLE OF STUDY";A$
20 GOSUB 500
30 INPUT"TRANSMITTER COAX CABLE LOSS (DB)";C1
35 INPUT"RECEIVER COAX CABLE LOSS (DB)";C2
40 INPUT"FADE MARGIN (DB)";FM
50 INPUT"RECEIVING ANTENNA GAIN (DB)";RA
60 INPUT"TRANSMITTING ANTENNA GAIN (DB)";TA
70 INPUT"RECEIVER SENSITIVITY FOR DESIRED SNR (DBM)";SN
80 INPUT"TRANSMITTER POWER OUTPUT (WATTS)";TP
90 INPUT"TRANSMITTER FREQUENCY (MHZ)";F
100 'CALCULATE PATH LOSS FOR ISOTROPIC RADIATOR IN FREE SPACE
110 'PL=36.6 + 20 LOG F (MHZ) + 20 LOG D (MILES) COMMON LOG
120 PL=36.6+20*(LOG(F)/2.30259)+20*(LOG(SM)/2.30259)
130 'CALCULATE TRANSMITTER POWER IN DB
140 '10 LOG P/1 MW = DBM COMMON LOG
150 PDB=10*(LOG(TP/.001)/2.30259)
160 'CALCULATE SIGNAL INPUT TO RECEIVER
170 RS=ABS(PDB)-ABS(C1)-ABS(C2)-ABS(PL)+ABS(RA)+ABS(TA)-ABS(FM)
175 'CALCULATE POWER INPUT TO ANTENNA
180 PA=TP/EXP(C1*2.30259/10)
185 'CALCULATE EFFECTIVE RADIATED POWER
190 ERP=PA*EXP(TA*2.30259/10)
200 LPRINT:LPRINT:LPRINT:LPRINTTAB(37-LEN(A$)/2)A$:LPRINT:LPRINT:LPRINT
210 LPRINT"LENGTH OF PATH: ";SM;" MILES"
220 LPRINT"FRQUENCY OF TRANSMITTER: ";F;" MHZ"
230 LPRINT"TRANSMISSION LINE LOSS: ";-ABS(C1);" DB"
235 LPRINT"RECEIVER COAX LINE LOSS: ";-ABS(C2);" DB"
240 LPRINT"RECEIVING ANTENNA GAIN: "+ABS(RA);" DB"
250 LPRINT"TRANSMITTING ANTENNA GAIN: "+ABS(TA);" DB"
260 LPRINT"FADE MARGIN: ";-ABS(FM);" DB"
270 LPRINT"PATH LOSS: ";-ABS(PL);"DB"
280 LPRINT:LPRINT"NET SIGNAL TO RECEIVER ANTENNA TERMINAL: ";RS;" DBM"
290 LPRINT"NET SIGNAL REQUIRED FOR ADEQUATE SN/SNR: ";-ABS(SN);" DBM"
300 IF -ABS(SN) > RS THEN LPRINT" *** CAUTION INADEQUATE SIGNAL ***":END
310 LPRINT:LPRINT"LICENSE APPLICATION DATA:"
315 LPRINT"TRANSMITTER POWER OUTPUT";TP;"WATTS"
320 LPRINT"ANTENNA POWER INPUT: ";PA;"WATTS"
330 LPRINT"EFFECTIVE RADIATED POWER: ";ERP;"WATTS"
339 ' IF BEARING AND DIST ARE KNOWN DELETE LINES 340 TO 730
AND CHANGE LINE 20 TO READ " 20 INPUT"PATH DISTANCE IN MI";SM
340 LPRINT"TRANSMITTER NORTH LATITUDE: ";D(1);M(1);S(1)
350 LPRINT"          WEST LONGITUDE: ";D(2);M(2);S(2)
360 LPRINT"RECEIVE SITE NORTH LATITUDE: ";D(3);M(3);S(3)
370 LPRINT"          WEST LONGITUDE: ";D(4);M(4);S(4)
380 LPRINT"RADIATION LOBE BEARING: ";BRG;"DEG TRUE"
400 END
499 '          GET COORDINATE DATA
500 PRINT"COORDINATES OF STL TRANSMITTER ANTENNA"
510 INPUT"LATITUDE (D,M,S) N: ";D(1),M(1),S(1)
520 LA(1)=D(1)+M(1)/60+S(1)/3600
530 INPUT"LONGITUDE (D,M,S) W: ";D(2),M(2),S(2)
540 LO(1)=D(2)+M(2)/60+S(2)/3600
550 PRINT"COORDINATES OF RECEIVE ANTENNA (D,M,S)"
560 INPUT"LATITUDE (D,M,S) N: ";D(3),M(3),S(3)
570 LA(2)=D(3)+M(3)/60+S(3)/3600
580 INPUT"LONGITUDE (D,M,S) W: ";D(4),M(4),S(4)
590 LO(2)=D(4)+M(4)/60+S(4)/3600
600 '          CALCULATE DISTANCE AND BEARING OF RADIATION
610 A=LO(1)-LO(2):B=LA(1)-LA(2)
620 C=COS(LA(1)/K)*COS(LA(2)/K)
630 D=C*COS(ABS(A/K))+COS(ABS(B/K))-C
640 E=ATN(SQR(1-D^2)/D)
650 SM=E*K*60*1.1508
660 F=SIN(ABS(A/2)/K)*COS(((LA(1)+LA(2))/2)/K)/SIN(E/2)
670 IF INT(F)=1 THEN F=90: GOTO 690
680 F=ATN(F/SQR(1-F^2))*K
690 IF A>0 AND B<=0 THEN BRG = F: GOTO 730
700 IF A <= 0 AND B > 0 THEN BRG=180-F: GOTO 730
710 IF A < 0 AND B > 0 THEN BRG = 180 + F: GOTO 730
720 BRG=360-F
730 RETURN

```


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SAM-82 shown in attractive "quick-install" desk top console



SAM-42

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SAM-82

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```
LENGTH OF PATH: 11.3051 MILES
FREQUENCY OF TRANSMITTER: 951.5 MHZ
TRANSMISSION LINE LOSS: -1.5 DB
RECEIVER COAX LINE LOSS: -2.5 DB
RECEIVING ANTENNA GAIN: + 18.5 DB
TRANSMITTING ANTENNA GAIN: + 18.5 DB
FADE MARGIN: -20 DB
PATH LOSS: -117.234 DB
```

```
NET SIGNAL TO RECEIVER ANTENNA TERMINAL: -65.7826 DBM
NET SIGNAL REQUIRED FOR ADEQUATE SN/SNR: -70 DBM
```

```
LICENSE APPLICATION DATA:
TRANSMITTER POWER OUTPUT 7 WATTS
ANTENNA POWER INPUT: 4.95562 WATTS
EFFECTIVE RADIATED POWER: 350.834 WATTS
TRANSMITTER NORTH LATITUDE: 40 46 59
WEST LONGITUDE: 111 57 57
RECEIVE SITE NORTH LATITUDE: 40 36 59
WEST LONGITUDE: 111 57 57
RADIATION LOBE BEARING: 180 DEG TRUE
```

Figure 1. Computer printout for an acceptable STL installation.

```
LENGTH OF PATH: 11.3051 MILES
FREQUENCY OF TRANSMITTER: 951.5 MHZ
TRANSMISSION LINE LOSS: -1.5 DB
RECEIVER COAX LINE LOSS: -2.5 DB
RECEIVING ANTENNA GAIN: + 12.5 DB
TRANSMITTING ANTENNA GAIN: + 12.5 DB
FADE MARGIN: -20 DB
PATH LOSS: -117.234 DB
```

```
NET SIGNAL TO RECEIVER ANTENNA TERMINAL: -77.7826 DBM
NET SIGNAL REQUIRED FOR ADEQUATE SN/SNR: -70 DBM
*** CAUTION INADEQUATE SIGNAL ***
```

Figure 2. Computer printout for an unacceptable installation.

on most versions of BASIC. Uncommon function calls have been avoided. Your version of BASIC must include the following math functions: LOG*, EXP, ATN, SIN, COS, X* π and SQR. If the distance and bearing are known, or determined with another *Great Circle program*, you may delete lines 339-720 and change line 20 to read 20 INPUT "PATH LENGTH IN MILES"; SM. The bearing and distance, calculated by the Great Circle method, will work in the Northern Hemisphere

with any latitude-longitude combination, including direct N, S, E or W lines.

This simple program is designed to assist engineers in evaluating an STL path, but should be considered a tool, not a decision maker. It will not replace sound judgment and careful study. Using the program may help avoid installing a marginal system, by providing an easy means by which various equipment may be studied.

Two samples of the program output are shown. Figure 1 illustrates an acceptable STL installation, with license application data also printed. In Figure 2, inadequate parameters have suppressed the license data printout.

*Computer functions LOG and EXP are natural log functions. If a calculator is used, be sure to use the natural log function or remove the conversion factor of 2.30259 from lines 120, 150, 180 and 190. Trig functions are computed in radians.

!:(=))))))



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The SM63.

No matter how rough things get in the field, the Shure SM63 Omnidirectional Dynamic Microphone gives your crew the whole story with a lot less handling noise than any microphone in its class. When Shure's engineers developed the SM63 and SM63L (with longer handle), their objective was to create a high-output, lightweight microphone perfect for the needs of electronic news journalists.

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The output of the SM63 is a full 6 dB higher than comparable hand-held interview microphones.

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The Shure SM63. The hard-working microphone for the working press.

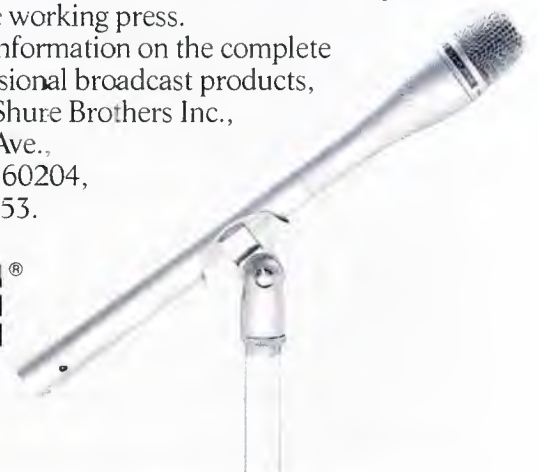
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1 Harris' new IRIS Composition Station (ICS) solves your video production problems with these exclusive features:

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Adda doesn't. Ampex doesn't. Quantel doesn't.

The ICS is sophisticated enough to complement an artist's imagination, yet simple enough for use in the hectic pace of on-air production. And it's based on Harris' new *four frame* synchronizer, the 650.

Here's why.

2 Harris' IRIS II offers you simultaneous access by up to six users, without costly networking of separate systems.

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Now when you want to expand, you can—cost effectively. Your system can grow just by adding inexpensive user stations.

3 IRIS II lets you title stills from each user station.

IRIS II gives you character generation with multiple fonts. It lets you title stills directly from *each* user station without tying up expensive character generation equipment.

4 IRIS II solves your still sorting and locating problems with an integral library.

In fact, IRIS II offers the most powerful search routines of *any* still store. Its library is also accessible by each user station, and has a capacity of over 80,000 stills.

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You can get complete information on *all* the stills in your list, with full description, date, sequence, and I.D. information.

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IRIS II interfaces with the largest variety of storage drives of any still store. Several types of fixed and removable drives give you the capability of over 17,000 on-line stills. No other still store offers this flexibility. Period.

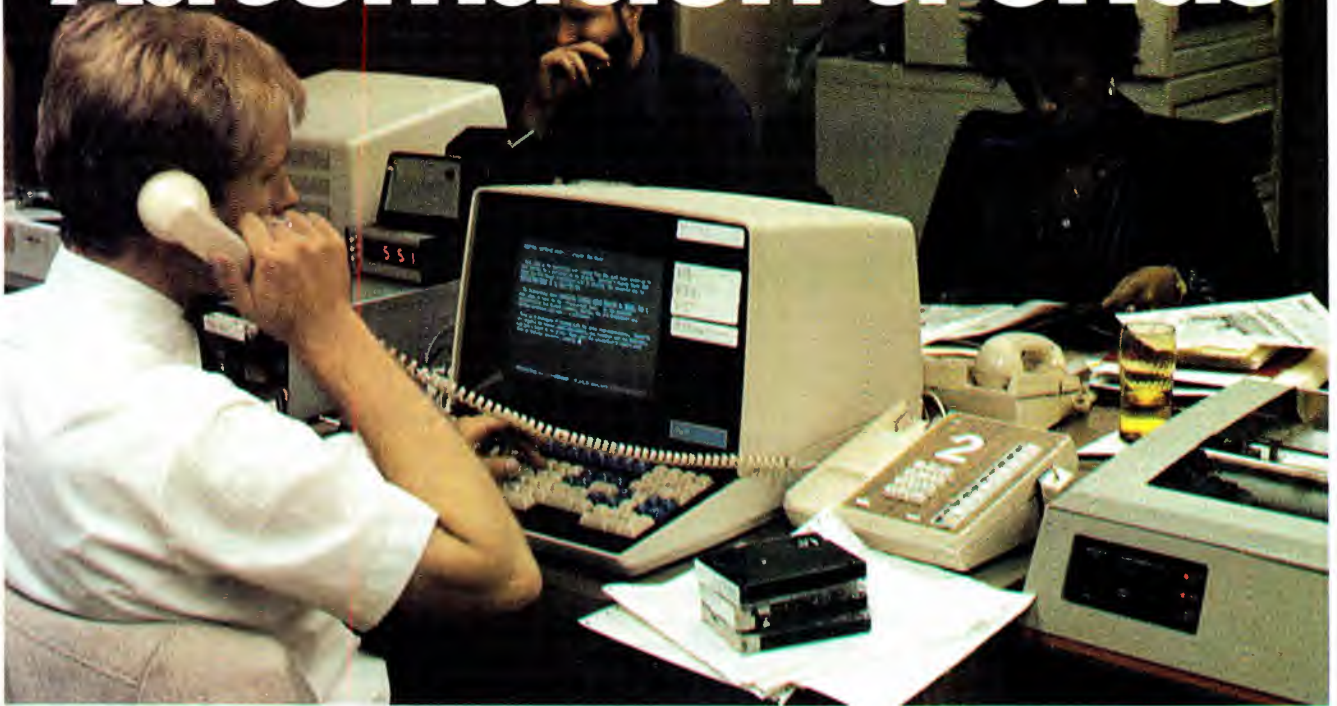
We think you get the idea. *We build the most powerful, and the most flexible, still store there is.* Whatever your business, if your problem is storing and manipulating video images, the best choice is the Harris IRIS II.

For more information about this superior solution to your video problems, call Dave Fabian, Product Manager at (408) 737-2100, or contact **Harris Corporation, Harris Video Systems, 1255 E. Arques Ave., Sunnyvale, CA 94086 Telex: 4992172**



HARRIS

Automation trends



One of several terminals used in the automated newsroom of KIRO, Seattle. When completed, both radio and television will be linked into the system. Radio is already linked, and television is being linked as this issue goes to press.

By Bill Rhodes, editorial director,
and Carl Bentz, television editor

Microprocessors, small computers and PCs (personal computers) are the topics of conversation everywhere. There is no exception in the field of broadcasting.

Dedicated microprocessors allow machines to improve speed and accuracy in performance and offer features that have never before been practical. Self-diagnostics for performance and maintenance keep systems in check. Engineers with home computers can patch through to their station units to monitor progress, check the status of systems and do design work without leaving the comfort of their homes. Various departments, such as news, business, avails, logs and programs, can be automated, giving the creative people more time for performing other tasks. Field staffs can tap the plant systems to speed up sales and communications.

Articles elsewhere in this issue describe a variety of automation techniques that two small market radio stations have put into use to address their unique problems. But, they represent only the tip of the iceberg. Thousands of other stations—both radio and television—also have shifted to automation in recent years, all to varying degrees depending on their

Category listed	Year	Number of companies listed	
		1978	1983
1. Automated testing systems	.....		13
2. ATS (Automated Transmission Systems)	18		10
3. Automation, audio production	.....		19
4. Automation, equipment control, radio	28		28
5. Automation, equipment control, TV	30		42
6. Automation, lighting control	11		14
7. Automation, newsroom systems	.....		15
8. Automation, program control	39		42
9. Automation, program logging	28		35
10. Automation, projector	7		6
11. Automation, switching	33		37
12. Automation, systems, business	.....		26
13. Automation, tape control, cartridges	28		27
14. Automation, tape control, reel	27		28
15. Automation, transmitter logging	15		12
16. Automation, video display terminal	2		14
17. Automation, video testing	.....		6
18. Automation, videotape machine	16		29
19. Weather display systems	.....		10

situations. Here, **BE** looks at other automation trends with special emphasis on how a few selected broadcasters have adapted computers for their operations.

Measuring the impact

The impact of microprocessors and computers on broadcasting is difficult to measure. But we see the evidence of this impact in the new hardware exhibited at industry trade shows, in many broadcasting articles and in

new equipment literature.

As an indicator of the scope of this market trend, we compared this year's September *Buyers' Guide* with its counterpart of five years ago. The results are shown in Table I.

Table I shows the number of companies currently providing equipment in the various categories. It also shows five categories of automation equipment plus weather display systems, which were not part of our directory five years ago.

World's most accommodating camera.

You'd expect the Ikegami HK-322 to make beautiful, crisp, color-true pictures. It does. You'd also expect it to offer the latest in computer set-up convenience with its third generation microprocessor control plus comprehensive operational automatics and 8 scene files and 8 lens files. It does that too. But what you might not expect, is just how incredibly flexible the HK-322 is.

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Ikegami HK-322

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Tests & measurements

Automated measurement systems are becoming more common, improving measurement accuracy and reducing time for engineers to take readings. The Tektronix 1980 ANSWER system checks almost every parameter of the video path. In conjunction with the 1910 programmable test signal generator, the measurements could free all but one of the VBI lines from test signals, leaving the others available for text and data transmissions. For audio, TEK offers the SG5010 generator and associated signal analyzer, both GPIB-compatible.

Sound Technology provides innovative test systems for tape recording equipment. Introduced at the 1983 NAB exhibit, the 1510A gives completely automated testing of tape recorders, as well as other audio systems. The

1510A is programmable through the GPIB bus.

Marconi's bus-compatible 2305 modulation monitor performs programmable measurements on AM, FM and PM signals from 0.5MHz-2GHz. Represented by Marconi, the Amalgamated Wireless Australasia (AWA) S1100 system requires four seconds to make 38 separate measurements on any audio transmission system, wired or otherwise, between the test transmitter and test receiver.

Rohde & Schwarz products include an IEC 625-1 bus-compatible system for audio- and video-quality measurements. For radio and TV installations, and even multiple-station applications, this package may combine with a TEK 4051 or TEK 4052 intelligent terminal for greater flexibility.

Other automated stations

With the recent installation of the NewStar system from Integrated Technology/Colorgraphics Systems in the newsroom at WKYT-TV, Lexington, KY, the speed of composing news stories increased by about 50% over the previous use of typewriters, according to news director Bob Speaks. After the equipment was installed, Speaks encouraged his staff to work with its terminals as much as possible. One month later, the typewriters were taken away, leaving the staff with the computer for all composing, editing, filing, organizing and script generation. Although the staff has become familiar with the system since early August, the NewStar system will not be put into the full production mode until Colorgraphics Systems electronic teleprompter units are available late this year.

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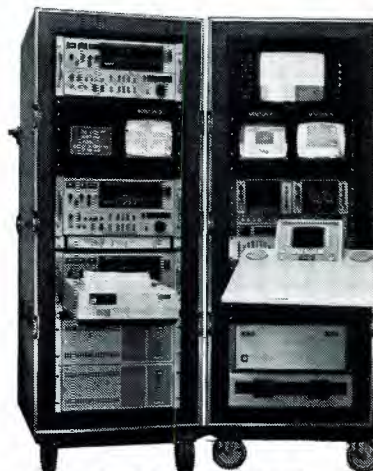
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Dual/Triple Feed Options.

Comtech 3.8 and 5 Meter Antennas provide crystal-clear simultaneous transmissions from up to three adjacent satellites. Dual/Triple feed retrofit's available.

Installation Simplicity.

The 3-piece fiberglass panels (3.0, 3.8 and 5.0 meter) go together swiftly to form an accurate parabolic reflective surface utilizing Comtech's unique splice-strap design. Comtech's polar or EL/AZ mounts are simple to install and aim.

Automated Pointing System.

In addition to manual and motorized drive systems, you can specify a fully automated microprocessor-controlled drive system.

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Low-profile 3.8 and 5 meter transportable versions are available. Both units also have uplink capability.

Complete TVRO Communications Systems.

Comtech designed and produced components include down converters, low noise amplifiers, agile satellite receivers, RF modulators, combiners and headend systems. These products are available individually or as complete systems from one single source—Comtech.

Price and Delivery.

When it comes to performance, reliability and high-tech quality, Comtech Antennas are one of the best buys on the market today and are available from stock.

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When you purchase a Comtech product, you are purchasing the finest engineering and service backup team in the country.

*At Comtech Antenna performance comes first. You have our name on it. Call **Comtech Antenna Corporation**, 3100 Communications Road, St. Cloud, Florida 32769.*

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3.0 and 3.8 Meter



3.8 and 5.0 Meter Dual/Triple Feed



5.0 Meter



7.3 Meter

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Inputs to the NewStar system at WKYT come from various sources. NewScope and a high speed AP wire service, received on a newly installed satellite receiving system, bring in the bulk of non-local material. For local stories, nine terminals, operating at a 9600-baud rate, are available in the station facilities. A 10th terminal is interconnected via a 1200-baud modem and microwave links at a news bureau office in Frankfurt, KY, the state capitol. All terminals include complete word processing

capabilities, and may be used to file completed stories in the main CPU hard disc memory. Any terminal also may be used to retrieve material from the memory. Additional inputs may soon come from reporters equipped with the new Radio Shack portable terminal via telephone lines.

WKYT is no newcomer to computerization. The weather department has used a Colorgraphics LiveLine III weather display system for some time. Up to 15 levels of data are brought in from

the WSI weather service, with each level individually controllable to meet the station's production requirements for color and format. Steve Arnold, systems manager for the station, said that the WSI service actually could provide an overkill on information, as there was far more data than could ever be used in a 3½-minute weather segment. Usually, only an isotherm map and super-satellite photographs are used from the service.

Much of the station's business functions are handled by an IBM-based computer with software by Columbine of Golden, CO. An IBM System 34, with continuous updates, was installed in April 1978 and currently provides basic traffic functions, accounts receivable and general ledger, with plans to add accounts payable and payroll. Consideration is being given to updating to a System 36, as the current system's six terminals and two printers constantly are busy.

The automation system at WISH-TV 8, Indianapolis, IN (BE April 1983), does not yet include a newsroom system. The station does have the BIAS traffic system from Data Communications Corporation, Memphis, TN, as well as minicomputers, for accounting functions, word processing and the feature film file records. Not only does the computer system allow chief engineer John Demshock to access files for engineering purposes from his personal computer at home, but also an interface to the BIAS equipment provides conversation to a DDC MCA Master Control Automation unit that controls Grass Valley Group 400 and 1600 series automation switching equipment. Simultaneously, the BIAS business system is accessible to the sales force through personal computers via telephone lines, should they need to look at sales records or wish to input sales information from the field. New software added since the article about WISH includes fixed assets accounting. IBM PCs are planned for more word processing functions.

Recent updating of station facilities at KMBC-TV 9 and KSHB-TV 41, both in Kansas City, MO, include the Grass Valley Group M200 master control automation system. Various levels of automation in the M200 series include the M204 equipment that has been updated with a random access control capability for various still-store units. GVG equipment already has been interfaced to the DCC BIAS, Kaman Science/BCS and Station Business Systems computers. An interconnect currently is under development by Columbine and several others.

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Continued on page 75



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RM1608

SPECIFICATIONS

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Less than 0.1% at +4dB *output, 20Hz to 20kHz (all Faders and controls at nominal)

HUM & NOISE (20Hz to 20kHz) $R_s = 150$ ohms (INPUT GAIN "-60")

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- 80dB (84dB S/N) PGM Master volume control at maximum and all CH PGM assign switches off.
- 64dB (68dB S/N) PGM Master volume control at maximum and one CH Fader at nominal level.
- 73dB (77dB S/N) STEREO Master Fader at maximum and all CH STEREO level controls at minimum level.
- 64dB (68dB S/N) STEREO Master Fader at maximum and one CH STEREO level control at nominal level.
- 80dB (70dB S/N) ECHO SEND volume at maximum and all CH ECHO volumes at minimum level.
- 75dB (65dB S/N) ECHO SEND volume at maximum and one CH ECHO volume at nominal level.

CROSSTALK

- 70dB at 1kHz: adjacent Input.
- 70dB at 1kHz: Input to Output.

MAXIMUM VOLTAGE GAIN (INPUT GAIN "-60")

PGM	74dB: MIC IN to PGM OUT.	ECHO	70dB: MIC IN to ECHO SEND.
	24dB: TAPE IN to PGM OUT.	C/R	74dB: MIC IN to C/R OUT.
	34dB: ECHO RETURN to PGM OUT.		24dB: 2 TRK IN to C/R OUT.
	14dB: PGM SUB IN to PGM OUT.	STUDIO	74dB: MIC IN to STUDIO OUT.
STEREO	74dB: MIC IN to STEREO OUT.		24dB: 2 TRK IN to STUDIO OUT.
	24dB: TAPE IN to STEREO OUT.		
	34dB: ECHO RETURN to STEREO OUT.		

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HIGH: from 2k to 20kHz PEAKING. MID: from 0.35k to 5kHz PEAKING. LOW: from 50 to 700 Hz PEAKING.

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PHANTOM POWER 48V DC is applied to XLR type connector's 2 pin and 3 pin for powering condenser microphone.

DIMENSION (W x H x D) 37-1/2" x 11" x 30-1/4" (953 mm x 279.6 mm x 769 mm)

Hum and Noise are measured with a -6dB/octave filter at 12.47kHz; equivalent to a 20 kHz filter with infinite dB/octave attenuation.

*0dB is referenced to 0.775V RMS.

• Sensitivity is the lowest level that will produce an output of -10dB (245mV), or the nominal output level when the unit is set to maximum gain.

• All specifications subject to change without notice.

The specs speak for themselves. But they can't tell you how natural, logical and easy the RM1608 is to work. All the controls and switches are logically arranged to help you get the job done quickly and accurately.

And in the tradition of Yamaha's sound reinforcement mixers, the RM1608 sets new standards of reliability as well as ease of operation. For complete information, write: Yamaha International Corporation, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont. M1S 3R1.

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Table II.

Expanded listings for six categories from Table I that were not in the **BE Buyers' Guide** five years ago.**Automated testing systems**

A.D. Data Systems	(455)†
Amber Electro Design	(456)
Asaca/Shibasoku	(457)
Datatron	(458)
Marconi Instruments	(459)
Narda Microwave	(460)
Ortofon Instruments A/S	(461)
Pinzone	(462)
Polarad Electronics	(463)
Rohde & Schwarz	(464)
Sound Technology	(465)
Tektronix	(466)
UREI	(467)

Automation, audio production

Audio Kinetics	(468)
Central Dynamics	(469)
Century 21 Programming	(470)
Clyde Electronics Ltd.	(471)
Datatronix	(472)
Harrison Systems	(473)
King Instrument	(474)
Kinotone	(475)
Microprobe Electronics	(476)
Rupert Neve	(477)
Quad-Eight Electronics	(478)
Richmond Sound Design Ltd.	(479)
Solid State Logic	(480)
Station Research Systems	(481)
Studio Systems	(482)
Systemation	(483)
Trident (USA)	(484)
Valley People	(485)

Automation, newsroom systems

BASYS	(486)
Beston Electronics	(487)
Colorgraphics Systems	(488)
Computer Concepts	(489)
Data Communications	(490)
Harris Broadcast	(491)
Integrated Technology	(492)
Interface Data Systems	(493)
Kaman Sciences/BCS	(494)
McInnis, Skinner & Associates	(495)
Phoenix Systems/ Briner Chase	(496)
Quanta	(497)
Studio Systems	(498)
Telesource Comm.	(499)
UMC Electronics	(500)

Automation systems, business

Paul Adams & Assoc.	(501)
Anacomp, CMS Div.	(502)
CBSI-Custom Business Systems	(503)
Central Dynamics	(504)
Central Dynamics Ltd.	(505)
Cetec Broadcast	(506)
Columbine	(507)
Computer Concepts	(508)
Data Communications	(509)
Datatron	(510)
Gill Management Services	(511)
Groton Computer	(512)
Harris Broadcast	(513)
Integrated Technology	(514)

Jefferson Data Systems	(515)
Kaman Sciences/BCS	(516)
MIS Div. Whitedove Showsystems	(517)
MPB Technologies	(518)
Magnicom Systems	(519)††
The Management	(520)
Microprobe Electronics	(521)
Phoenix Systems/ Briner Chase	(522)
RTI-Research Tech. Int'l.	(523)
Register Data Systems	(524)
Video Masters	(525)

Automation, video testing

A.D. Data Systems	(526)
Asaca/Shibasoku	(527)
Grumman Aerospace	(528)
Pinzone	(529)
Rohde & Schwarz	(530)
Tektronix	(531)

Weather display systems

Arvin/Diamond	(532)
Colorgraphics Systems	(533)
Denrad Technical	(534)
Dubner Computer Systems	(535)
Environmental Satellite Data	(536)
Interand Telestrator	(537)
Kavouras	(538)
McInnis, Skinner & Associates	(539)
Texas Electronics	(540)
WSI	(541)

* Parenthetical listings are those added from **BE** records. All others were checked on computer forms by the manufacturers. Also, data has been updated since the *Buyers' Guide* was printed.

† Use the Reader Service Card to request manufacturers' literature.

†† Magnicom Systems - formerly Station Business Systems.

A complete listing of these categories and companies providing equipment for them is provided in Table II. Reader Service Numbers are included so that you can request literature on any systems appropriate to your station. Data on equipment for the remaining categories may be obtained by using the September 1983 issue (pages 137 and 138).

Radio

Radio stations have led the way in automation trends. In the other automation articles in this issue, two small stations describe how they have implemented automation on their own. But most stations have taken advantage of the wide spectrum of equipment available from manufacturers specializing in serving radio and TV broadcasters.

Over the years, we have published many articles on how radio broad-

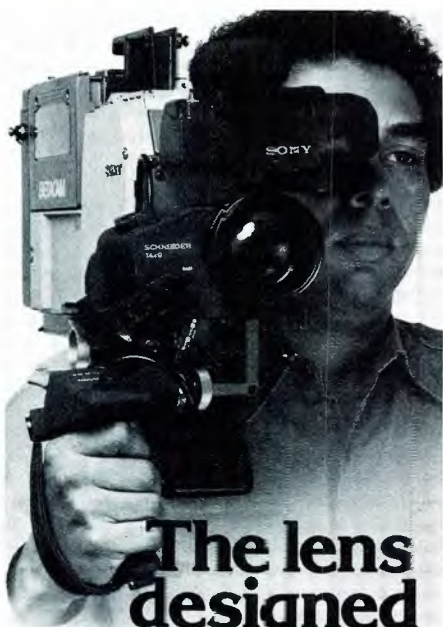
casters' stations have undertaken automation within their stations. One station worth mentioning is KCBS in San Francisco. (See **BE** July 1981, page 20.) The efforts at KCBS represent milestones in automation. First, KCBS boasts of being the world's first broadcast station, but remains a leader in adapting new technologies. Second, we showed slides of photos used in this article to broadcasters in China. They became excited about adapting these new techniques in their stations. And finally, Larry Cooper, who wrote the article, has since moved to CBS Radio in New York to revamp operations there.

The CBS Radio shift to automation is barely underway, with only five terminals and four printers. These currently are being used to let editors scan the wire services for bulletins and urgent notifications in keeping feature stories up to date.

Planning is in progress to expand this embryo system to 20 terminals, with schedules calling for 1984 implementation. Under full operation, CBS Radio will collect wire service data and inputs from CBS exclusive reports with computer processing and editing. When in operation, typewriters will be machines of the past.

In appearance, the New York CBS Radio system resembles the KCBS system shown on the cover of the July 1981 issue of **BE**. However, considerable advances have been made in the equipment and software, and the latest technology will be used in the final system.

Plans also are under way to automate the CBS Television newsroom operations. This system, interlinked with the CBS Radio system, will have some 60 terminals and will be capable of being linked to all CBS news bureaus worldwide.



The lens designed with the cameraman in mind.

The Schneider 14X ENG/EFP lens is economical, lightweight, and has all the features it should have. It brings out the best in the best cameras available today.

This lens is packed with conveniences that help the cameraman get the most out of every situation. It has a pistol-grip with built-in iris control that has all controls available within a thumb's touch. It has a generously sized rocker control that makes it easier to control the zoom. And because the iris and zoom electronics are in a weather-resistant housing, there are no shorts from moisture in the field.

The lens can power zoom from 9mm to 126mm. Or with the 2X built-in extender from 18 to 252mm. With the low distortion 6.3mm, to 9mm aspheric lens attachment, it can power zoom on the super wide angle shots. Schneider broadcast lenses are available throughout the United States and Canada from:
Tele-Cine Corp.
400 Crossways Park Drive
Woodbury, NY 11797
(516) 496-8500

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14X ENG/EFP
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Some bits on computerized broadcasting

It is probably safe to say that nearly every radio and TV station in the world has considered some form of automation or computerization. Indeed, many of them already have implemented these new technologies, and others are about to do so. We contacted a few manufacturers concerning their sales and perspectives on automation.

- **ColorGraphics/Integrated Technology**, Madison, WI, reports extensive advances in hardware and software for broadcasters. As this issue was being prepared, it reported the shipment of the 200th LiveLine weather display system for television. For newsroom automation, it is directing its attention to both radio and television, referencing progress with CBS, WGN in Chicago and KIRO in Seattle as examples in which both operations are being automated.

In terms of industry trends, it sees significant advances occurring in the use of personal and home computers to link into the stations' data files.

- **Phoenix Systems**, formerly known as Chase Media, has 120 automation systems in operation. Covering business, music, machine control and word processor functions adaptable to newsroom editing, its systems are different for every installation, based on the needs of the individual stations. Forecast graphing features and an *inquiry* to obtain data not provided by the normal reports are offered in the software.

- The 250 installations by **Data Communications Corporation** include 200 for television and 50 for radio automation, according to recent marketing figures. The trend is for DCC's BIAS equipment to be interfaced to IBM personal computers, which are involved in a number of *local* data processing jobs beyond the typical BIAS traffic activities.

- **Columbine** systems may be found in 450 stations around the world, dealing with tasks such as traffic, billing and logging. IBM hardware is supported by the Columbine software and may include Systems 32, 34, 36 and 38, depending on speed capabilities required by the station's operation.

- Alliances between companies are also appearing as trends in the automation business. **Beston Electronics**, Olathe, KS, whose captioning and character generation system serves the KCTV-TV 5 (Kansas City, MO) newsroom with closed captions and teleprompter capabilities, has developed interfacing to the McInnis-Skinner & Associates (Oklahoma City) NEWSAN and Weathergraphics equipment. In a similar team effort, **Jefferson Data Systems**, Charlotte, NC, and **BASYS**, Mountain View, CA, have combined for a highly automated station operation from ENP (electronic news processing), feature film records and program management to traffic, sales and accounting uses.

Station automation remains a high interest area at trade shows. Seven exhibitors at the 1983 NRBA convention included equipment for program and business automation, while a new entry into full automation for satellite-programmed or live-assist use, the Systemation (Decatur, IL) cassette automation, was found in a hospitality suite. The Systemation concept uses a Wintek computer to drive up to 63 cassette machines from a CBM Vic-20 terminal. The system requires a modification to microprocessor-controlled cassette transports to interface properly. A production system "hard sectors" a cassette to allow up to 70 30-second spots, while the operations system searches out the proper spot and signals when it's ready to play. The low cost system was shown with Sansui and Revox equipment, but other units, including a TASCAM cassette deck, are applicable, according to Steve Bellinger, Systemation president and designer. More than 30 of the systems currently are in use in the United States and New Zealand.



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Reel-to-reel audiotape recorder roundup

After World War II, American Radio broadcasters were still skeptical about using magnetic tape to time-delay and produce network programs. The rugged design of the Ampex model 200 (produced in 1948), as well as financial and political support from Bing Crosby, turned industry skepticism about magnetic recording into widespread confidence. Shown in this 1948 photo is Harold Lindsay, model 200 chief designer, doing a final check on Serial #1 of the model 200.

By Roger Karwoski, operations manager, KBIA, Columbia, MO, and Carl Bentz, television editor*

The world's first magnetic recorder, called the Telegraphone, used wire. It was built in 1898 by Valdemar Poulsen in Copenhagen.

Sometimes, to fully appreciate what technology affords us today, it's useful to look at where we were yesterday. And so, I dug deeply into my old stockpiles of odds and ends and found some past issues of **Broadcast Engineering**. I found an informative article in the December 1964 issue titled, "Audiotape Equipment," by

*Karwoski prepared the introduction, and Bentz assembled the coverage of manufacturers' equipment.

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For more information, please contact International Products Marketing Manager, ITT Cannon, a division of International Telephone and Telegraph Corporation, 10550 Talbert Avenue, Fountain Valley, CA 92708, (714) 964-7400.

CANNON ITT
The Global Connection

Thomas Haskett. The article summed up features and performance of the then-current state-of-the-art tape equipment. Some interesting facts worth noting include these excerpts:

"Today (1964), nearly a hundred firms manufacture commercial audio machines..."

"Although some stations use the same control room for both air and recording, because of studio recorders' high cost and continuous use, they are usually installed in a separate recording control room. Remote controls permit their takeover by master control."

"While all (studio recorders) employ the NAB characteristic, which furnishes treble boost in recording and bass boost in playback, NAB standards are for full-track mono, and make no provision for stereo. Hence, most recorders permit the user to optimize equalization according to use."

"At least four manufacturers offer transistors in the electronic section."

"One new machine...has provision for switching any record head to temporary playback during recording, thus allowing sound-on-sound and other special effects."

"A recently developed accessory permits changing the playback speed of a tape without altering pitch of the recorded signals...It uses a multiple-head assembly which rotates in the direction of tape travel; thus, reel-to-reel tape speed may be varied while the rotating assembly holds head-to-tape speed constant."

"...hysteresis-synchronous motor driving capstan (and some with three motors)."

"...a machine with a low flutter figure often applies high stress to tape during shuttling. For precise applications, you might best use such a recorder for recording or playback, rewinding on a separate machine."

Overall typical electrical performance of 1964 vintage recorders is shown in Table I.

Today, of course, improvements in frequency response, distortion, signal-to-noise, etc., have been made because



In this 1947 photo, Jack Mullin (left) shows Murdo MacKenzie, Bing Crosby's technical producer, how to edit tape using a pair of scissors. Shown is the Ampex model 200 prototype. In 1945, Mullin had sent two German AEG Magnetophons and 50 reels of BASF/Agfa tape home to San Francisco, where he modified them with ac bias and other improvements. Mullin's Magnetophons later inspired that first Ampex machine.

of better tape formulations, quieter electronics, better heads and improved solid-state circuitry. From a price standpoint, after factoring in inflation over the past years, today's machines are a better bargain than ever.

But, what would be the greatest area of improvement in tape recorders during the last 10-20 years? I put that question to several vendors at the SBE Central States Convention held in St. Louis in September. The answer I heard most often was "operator convenience." The best explanation I got was from Dave Velsma of Audio Broadcast Group. He offered the analogy of air conditioning in cars: several years ago, auto air conditioning was considered a luxury. Today more and more cars owners consider

it a necessity.

So it is with tape recorders: features that were considered a luxury 10 or 20 years ago (if they were offered at all!), today are considered by producers and operators as necessities. High tape stress is no longer necessary to get good wow-and-flutter figures; stretched tapes are almost a thing of the past. Today's machines handle tape gently, yet quickly. Many models offer constant tension designs that optimize tape handling, head wear and electrical performance. The advent of microprocessor control has given us almost-digital machines. On some models, everything is made digital except the audio. These advanced models are a cross between a computer and a tape deck.

What follows is a roundup of today's audio recorders, which feature better sound and easier operation, all at competitive prices.

Reel-to-reel roundup

Analog audio reel-to-reel recording equipment manufacturers were contacted to provide information for this listing of models currently available in the marketplace. The listing is presented in a format similar to the **BE Spec Book**, to be used for initial comparisons—not final purchasing decisions. Reader Service Numbers are provided for access to detailed information on the equipment listed.

Continued on page 84

Table I.

	Studio recorder ± 2dB, 30-18kHz at 15ips	ac portable ± 2dB, 40-12kHz
Frequency response		
Signal-to-noise (full track)	50-60dB	greater than 55dB
Distortion	1%	
Wow-and-flutter	less than 0.1%	less than 0.2%
Timing accuracy	± 0.2%	± 0.2%
Price range	\$730-\$10,000	\$525-\$1255

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November 1983 *Broadcast Engineering* 85

AUDIO RECORDER, Reel-to-Reel

Manufacturer	Leavers Rich	TR-55	Lyrec Manufacturing A/S Free Editor "FRED"	TR 532	MBI/AHB Series M
Model/Series	Proline 1000SC				
Number of Tracks	1, 2	2	2	24	16, 24
Tape Width (inches)	1/4	1/4, 1/2	1/4	2	2
Tape Speeds	A/B/C	B,C,D	B/C	C/D	C, D
Variable Speed Range	Yes	-50%, +100%	7.5-45ips	7.5-60ips	-50%, +100%
Reel Size Max/Hub Type	11"	14"/NAB, DIN, CINE	10.5"/NAB	10.5"/NAB	14"
Number of Heads	.....	.....	1	3	3
Capstan Motor Type	.....dc servo	dc servo	dc servo	dc servo	dc servo
Reel Motor Type	.....dc servo	dc servo	ac hyst sync	dc servo	dc servo
Metering Types	.....VU	.....	.....	VU	LED 1/2dB resolution
Equalization	.....NAB, DIN	NAB, CCIR	CCIR	NAB, CCIR	NAB, IEC, AES
Editing Function	.....No	Yes	Yes	Yes	.....
SMPT/Editor Interface	.....No	Yes	No	Yes	.....
Tape Timer	.....Mechanical	Electronic	Electronic	Electronic	Electronic
Cueing Feature	.....	Search cue, zero; Auto-locate	No	Search cue, zero; Auto-locate	Search cue, zero; Auto-locate
Input Connection	.....	.....	.....	Bal floating	Bal Active
Output Connection	.....	.....	.....	Bal floating	Bal Active
AF Response (\pm dB/Hz)	.....1/100-10k, 15ips	1/60-18k, 15ips	.....	1/60-16k, 15ips	2/30-20k, 15ips
Harmonic Distortion	.....1%, 15ips	.....	.....	.....	1% 320nWb/m ³
S/N Ratio (R-to-P)	.....58dB, 2-TR, 15ips	68dB, 15ips	.....	63dB, RMS A wtd 15ips	65dB 510nWb/m
Crosstalk (Adj. Tracks)	.....x +55dB, 1kHz	-40dB, 510nWb/m, 1kHz	.....	-46dB, 1kHz	-50dB, 1kHz
Related Models	.....Proline 1000.....Proline 2000	.....	.....	.....	.....
Reader Service Number411	412	413	414	415

(5) Ref with 1kHz and Ampex 456 tape.



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With new programming constantly being added, you may want to pick up programs from several satellites. Previously, this would involve the expense of another dish. Now with Microdyne's new multiple feed system you may be able to add programming from additional satellites at about 1/5 the cost of a new dish.

The MSF-16 Multiple Satellite Feed System can receive up to five satellites on the same parabolic reflector when the satellites are located in close proximity. In a TVRO system designed with adequate margins, the MSF-16

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Existing Microdyne/AFC antennas can be easily retrofitted to accommodate this new system. Only the spars and brackets of the feed support hardware must be changed — no other antenna changes are required. This simple modification can be done by the user or by Microdyne field service personnel.

Even if you purchased your existing antenna from another manufacturer, it may still be possible to modify it for use with the Microdyne

Multiple Satellite Feed System. Please give us a call.



So, whether you are planning a new system or expanding an existing installation, the MSF-16 can provide increased capability while saving both the cost and the real estate required by a second dish.

We have prepared a brochure to help you to determine if the MSF-16 is suitable for your system. For a free copy, write on your company letterhead to Microdyne Corporation, TV Sales, Dept. F, P.O. Box 7213, Ocala, FL 32672.

Microdyne Corporation

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AUDIO RECORDER, Reel-to-Reel

Manufacturer	MCI/Sony	Mechlabor/ Electroimpex	Nagra/Kudelski T-Audio		
Model/Series	JH-110B Series	JH-24 Series	300 Series		
Number of Tracks	3	1, 2, 4	8, 16, 24	2	1, 2
Tape Width (inches)	1" C Video	1/4, 1/2	to 2	1/4	1/4
Tape Speeds	9.606ips	B/C/D	C/D	B/C	A/B/C/D
Variable Speed Range	± 20%	± 20%	± 20%	No	± 6%
Reel Size Max/Hub Type	10.5"/NAB	14"/NAB	11.8"/NAB, AEG	../DIN, NAB, CINE	11.8"/NAB, AEG
Number of Heads	3	3	3	.....	4
Capstan Motor Type	dc servo	dc servo	dc servo	ac	dual dc servo
Reel Motor Type	dc servo	dc servo	dc servo	ac	.....
Metering Types	VU	VU	VU	.....	VU
Equalization	NAB	NAB, IEC	NAB, IEC	NAB or CCIR	NAB, CCIR
Editing Function	No	No	Electronic	No	Servo ctl option
SMPTE/Editor Interface	Yes	Yes	Yes	No	Option
Tape Timer	Electronic	Electronic	Electronic	.....	Electronic
Cueing Feature	Auto-locate	Auto-locate	Auto-locate	Manual w/cue amp	Yes
Input Connection	Bal	Bal	Bal	.....	Bal floating
Output Connection	Bal	Bal	Bal	.....	Bal floating
AF Response (± dB/Hz)	0.75, - 1.5/30-20k	0.75, - 2/30-24k, 15ips	1.5, - 3/36-24k	- /30-15k, 15ips	1/30-20k
Harmonic Distortion	.....	<0.52%, 1020nWb/m	0.35%	.....	0.7% NAB, 15ips
S/N Ratio (R-to-P)	61dB	>64dB, 2-Tr	67dB, 30ips	67dB, 15ips	>73.5dB NAB, 15ips
Crosstalk (Adj. Tracks)	.....	.....	.....	.....	< -40dB, 10kHz
Related Models	JH-110C-8 8-Track
Reader Service Number	416	417	418	419	420

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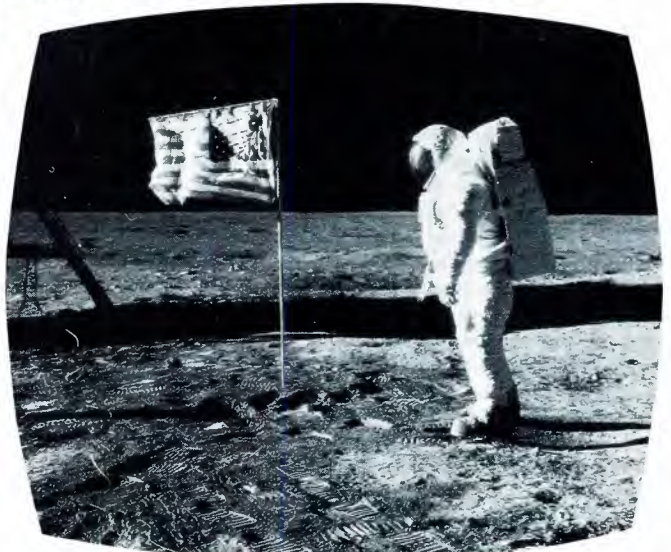
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Digital reel-to-reel

Particularly in the area of audio mastering, where other formats will ultimately be used as the consumer distribution media, digital reel-to-reel recording systems continue to command a growing share of the recording market. The interest in digital stems from a wide dynamic range (over 90dB), a low noise figure (also in the 90dB region) and low distortion (typical-

ly less than 0.05%). Additional benefits include improved overall product quality when multiple generations are involved in production mixdowns. Editing also is simplified electronically when working from digitally mastered material.

A tentative agreement by digital audio system manufacturers has resulted in a common sampling

frequency of 48kHz with a 16-bit linear quantization. Pulse-coded modulation (PCM) also is generally the standard recording signal format. In order to make recorders more compatible with other digital equipment, for example, digital disc and VHS-based cassette systems, other sampling frequencies usually are offered.

The following companies currently offer digital recording equipment. For complete details, Reader Service Numbers are given.

Mitsubishi Electric

Marketed by Digital Entertainment Corporation, the X-80 series recorder offers two digital audio, one mono analog cue and one SMPTE time code channels on 1/4-inch tape. The 15ips tape speed is standard with variable speed options. The X-800 system records 32 digital audio, two analog cue, one SMPTE code and two auxiliary digital data channels on 1-inch tape with a nominal speed of 30ips and $\pm 10\%$ speed variation. The 48kHz sample rate is joined by a 50.4kHz rate for other equipment compatibility. Various synchronizers and the XE-1 editor interface with the recorder.

In Europe, the equipment is available through AEG-Telefunken as the MX-80 and MX-800. For more information, circle (380) on Reply Card.



Mitsubishi X-800

Sony Corporation

The PCM-3324 records 24 PCM audio, two analog cue, one control and two external data channels. At the 48kHz sample rate, the tape speed is 72.38cm/s or about 29ips, giving a recording time of 60 minutes on a 14-inch reel. A second sample rate of 44.1kHz is included in a system compatible with the Studer units. Synchronization of two recorders allows recording capability to 48 channels with a remote control/editing console. Interfacing for video post-production is available for video production. A cross-fade plan on editing virtually eliminates signal discontinuity effects created by punch-in/punch-out. For more in-

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Here are all the improvements audio engineers have asked for.

Every channel on the mixer now has a mic/line level switch for maximum flexibility. There's also a built-in limiter to keep the M267 from overloading at critical moments. The unit contains a built-in battery pack that utilizes three standard 9-volt batteries. Simplex (phantom)

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The M267 oscillator provides a clean 1 kHz tone, and is located on the front of the unit for simple access. The headphone output is also on the front and includes a level control.

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AUDIO RECORDER, Reel-to-Reel

Manufacturer Model/Series	Otarl Corporation			
	MX5050 BQ-II	MTR-10	MTR-90-II	MX 7800
Number of Tracks	2, 4	2, 4	8, 16, 24	8
Tape Width (inches)	1/4	1/4, 1/2	1, 2	1
Tape Speeds	A, B, C	A, B, C, D	C/D	B/C/D
Variable Speed Range	± 0.2%	± 20%	± 20%	± 15%
Reel Size Max/Hub Type	10.5"/NAB	10.5"/NAB	14"/NAB	10.5"/NAB
Number of Heads	4	.....	.....	.....
Capstan Motor Type	dc servo	dc servo	dc servo	dc servo
Reel Motor Type	ac sync	dc servo	dc servo	ac servo
Metering Types	VU	VU	VU	.....
Equalization	NAB, CCIR	NAB, IEC	NAB, DIN, IEC, CCIR	NAB, IEC
Editing Function	No	No	Electronic	Yes
SMPTE/Editor Interface	Yes	Note 6	Note 6	Yes
Tape Timer	Electronic	Electronic	Electronic	Electronic
Cueing Feature	Yes	No	Search zero;	Search zero
	.....	Auto-locate	Auto-locate	.....
Input Connection	Unbal Active	Bal Active	Bal Active	.....
Output Connection	Unbal Active	Bal Active	Bal Active	.....
AF Response (± dB/Hz)	2/50-15k	2/30-20k ⁷	0.5-2/55-26k ⁸	1.5-3/42-29kHz ⁹
Harmonic Distortion	<0.9%	0.7%	0.2%	0.1%
S/N Ratio (R-to-P)	62dB wtd	66dB 3% THD	75dB 3% THD	75dB, 3% THD
Crosstalk (Adj. Tracks)	n.a.	-55dB, 1kHz	-45dB, 12kHz	-55dB, 1kHz
Related Models	MX5050B-II	.....	.....	.....
	5050 Mark III ^a	.....	.....	.....
Reader Service Number	421	422	423	424

(6) Adams-Smith, Audio Kinetics, BTX, Convergence and EECO interfaces available. (7) Ref. to 250nWb/m, 15ips. (8) 5050 Mark III is 2, 4, 8-track and does have auto-locate cueing. (9) Ref. 250nWb/m, 30ips.

Manufacturer Model/Series	L J Scully Mfg. Corp. LJ-7	Solldyne s.r.l. GMS-202	Soundcraft Electronics SCM760	Stellavox SP8 Portable TD88
	Number of Tracks	2	2	24	1, 2, 3
Tape Width (inches)	1/4	1/4	2	1/4
Tape Speeds	A, B, C, D	A/B/C	C, D	B
Variable Speed Range	± 20%	± 20%	+ 10%, - 50%	± 10%
Reel Size Max/Hub Type	11.5"/NAB, EIA	10.5"	.....	5"
Number of Heads	5 positions	.....	.....	3 or 4
Capstan Motor Type	dc servo	dc servo	dc servo	dc servo
Reel Motor Type	dc servo	dc servo	dc servo	Patented
Metering Types	VU, peak LED	.....	.....	.....
Equalization	NAB, IEC	NAB, IEC, CCIR	NAB, DIN, IEC, CCIR, AES	Option
Editing Function	No	Yes	.....	No
SMPTE/Editor Interface	Via accessory conx	CP-900	Type D only	SQS Option
Tape Timer	Electronic	Electronic	Electronic	Mechanical
Cueing Feature	Search zero	Search cue, zero;	Search cue, zero;	No
	.....	Auto-locate	Auto-locate	.....
Input Connection	Bal Active	.....	Bal Active	Bal
Output Connection	Bal Active	.....	Bal Active	Bal
AF Response (± dB/Hz)	1, - 2/30-24K ¹⁰	- /to 15k	1, - 2/40-20k ¹¹	2/30-18k
Harmonic Distortion	0.75%	0.05%, 400Hz	.....	2%
S/N Ratio (R-to-P)	65dB 510nWb/m	74dB ANSI wtd	.....	67dB
Crosstalk (Adj. Tracks)	- 60dB	60dB, 1kHz	- 55dB	45dB, 1kHz
Related Models	.....	.....	.....	.....
Reader Service Number	426	427	428	429

(10) Ref. 200nWb/m, 1kHz, 15ips. (11) Ref. 320nWb/m, 1kHz, 15ips.

How to Build a Better Compact Professional Recorder

Follow this step-by-step guide to build your own rugged, reliable, high-performance professional recorder.

1. For your design team, hire the same engineers responsible for world's premier multi-track recorder, the *STUDER A80C*.
2. Employ meticulous Swiss and German craftsmen for all fabrication and assembly.
3. Use solid aluminum alloy die-castings for transport chassis and headblock.
4. Use the finest Swiss and German machine tools for milling, drilling, and tapping.
5. Use only professional-grade mechanical and electronic components.
6. Make your own audio heads to ensure the highest quality.
7. Apply gold plating to audio switching contacts.
8. Include the following standard features: Balanced and floating + 4 inputs and outputs • Calibrate/uncalibrate switches • Self-sync • Tape dump • Edit mode • Full logic transport control • Servo controlled capstan motor • Front panel input and output mode switching • Universal power supply • Rack mount.
9. Provide the following options: Rugged, steel-legged console • Transport case • Monitor panel • Remote control • Vari-speed control • Balanced mike inputs.
10. Support your finished product with a worldwide parts and service network.

If you can do all of this for under \$2100*—by all means go ahead! (Even Dr. Willi Studer would be proud of you.) But first, we suggest you consult with your *Revox Professional Products* dealer. He'll provide you with a ready-built *PR99*...so you can concentrate on building your reputation as an audio professional.

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*Manufacturer's suggested list price \$2095.00. Contact dealer for further pricing information.

Circle (69) on Reply Card

November 1983 **Broadcast Engineering** 93



The ENGINEER'S audio processor..... designed for PROGRAMMING!

Our 250 gives you the ultimate in audio processing with advanced programmable circuitry offering total control of your broadcast sound.

Multiple presets can be custom tailored for different program sources, for changing formats during a broadcast day or for other programming variables. The result? Uncompromised audio quality for each program source or format. No more tweaking for the best sound. The 250 lets you adjust any processing function digitally and with complete repeatability.

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The 250 has been designed to meet the present and future demands of quality audio in AM stereo, FM stereo and TV stereo.

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Telephone: (408) 374-8300

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Circle (70) on Reply Card

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U.S.A.



Circle (71) on Reply Card

formation, circle (381) on Reply Card.



Sony PCM-3324

Studer Revox

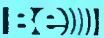
An 8-channel, 1/4-inch format is offered in the A808PCM recorder, listed as compatible with Sony equipment. Input/output interfacing is compatible with that proposed by the EBU. Both 48kHz and 44.1kHz sampling to 16-bit quantization are used. For remote control, audio control, level metering and autolocator functions, individual control units may be used separately or combined into a Studer remote stand. For more information, circle (382) on Reply Card.



Studer A808PCM

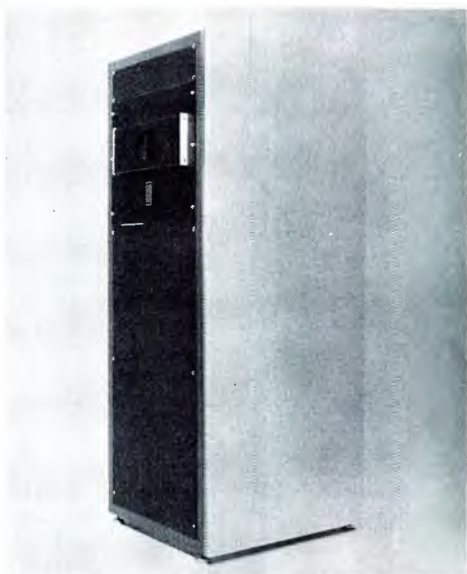
3M Company

Equipment from 3M provides four digital channels on 1/2-inch tape or 16- and 32-channel formats on 1-inch material. The typical tape speed for 48kHz sampling is 43.2ips with ±10% speed variation. As with the others, the system's response is +0.5dB and -3dB from 10Hz-20kHz. 3M spec sheets claim THD and IMD at less than 0.03%. Electronic editing provides complete control over the record and play machines. For more information, circle (383) on Reply Card.



THE NEW HCF-ONE TELECINE CAMERA...

**It looks as good on air as it does on
your bottom line.**



The Hubbard Communications, Inc. Telecine color camera was designed to replace older, large or small image systems... at a significant saving.

A high performance unit in every respect, the camera utilizes Hitachi-developed electronics employing 2/3 inch electro-statically focused/magnetically deflected Saticon* tubes with low lag and negligible image retention characteristics.

Camera setup, auto white/auto black and horizontal/vertical centering are controlled by a microcomputer which also provides limited fault diagnostic functions. For ease of installation an optical alignment and grey scale transparency setup system is provided.

Call or write for more information, specifications and an introductory price that will look good on *your* bottom line.

*Hitachi Trademark

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HUBBARD COMMUNICATIONS, INC.

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(813) 577-7759 TWX: 810-863-0417

AUDIO RECORDER, Reel-to-Reel

Manufacturer	Studer Revox America			TASCAM	
Model/Series	A810	PR99	A800 Mk III	32	58
Number of Tracks	1, 2	1, 2	8, 16, 24	2	8
Tape Width (inches)	1/4	1/4	1, 2	1/4	1/2
Tape Speeds	A, B, C, D	A/B C/D	C, D	B/C	B, C
Variable Speed Range	± 45%	± 30%	± 45%	± 12%	± 15%
Reel Size Max/Hub Type	11.1"/NAB, EIA, DIN IEC, CCIR, AEG, CINE	10.5"/NAB, DIN	14"/NAB, EIA, DIN	10.5"/NAB, EIA	10.5"/NAB
Number of Heads	3	3	3	3	3
Capstan Motor Type	ac servo	ac servo	ac servo	dc servo	dc servo
Reel Motor Type	2 ac servo	2 ac servo	2 ac servo	dc	servo ctl dc
Metering Types	VU/PPM switchable	VU, peak LED	VU	.....	VU, peak LED
Equalization	NAB, CCIR	NAB, CCIR	NAB, CCIR	NAB	IEC
Editing Function	Yes	Yes	Yes	Yes	Dump
SMPT/Editor Interface	Yes	No	Yes	No	Yes
Tape Timer	Electronic	Manual	Electronic	Electronic	Electronic
Cueing Feature	Search cue, zero; Auto-locate	No	Search cue, zero; Auto-locate	Search zero	Search cue, zero; Auto-location option
Input Connection	Bal Xfmr or Active	Bal Xfmr	Bal Xfmr or Active	.....	Bal Active
Output Connection	Bal Xfmr or Active	Bal Xfmr	Bal Xfmr or active	.....	Bal Active
AF Response (± dB/Hz)	1/20-30k ¹²	2, -3/30-22k ¹³	2/30-20k ¹²	.....	3/40-24k ¹³
Harmonic Distortion	1%	0.1%	1%	0.8%, 250nWb/m 1kHz	0.8% Note 14
S/N Ratio (R-to-P)	72dB 2-Tr, Ref + 6dB	66dB, 500nWb/m	70dB 8Tr, 1020nWb/m	68dB, NAB A wtd	69dB NAB wtd
Crosstalk (Adj. Tracks)	-70dB	-60dB 225nWb/m	-40dB, 80Hz-12kHz	50dB, 250nWb/m 1kHz	≤ -55dB, 1kHz
Related Models	.....	.....	.....	34-4-Track 38-8-Track	Model 48 Model 44 1/4" 4-Track
Reader Service Number	431	432	433	434	435

(12) Ref. 510nWb/m, 1kHz, 15ips. (13) Ref. 250nWb/m, 1kHz, 15 ips. (14) 3% THD is Ref + 13dB, 1kHz.

Manufacturer	TASCAM	Technics/Panasonic	Telex Communications		Trident
Model/Series	52	RS-10A02	Model 3000	1400	TSR Series
Number of Tracks	2	2	1, 2, 4	1, 2, 4	24, 16
Tape Width (inches)	1/4	1/4	1/4	1/4	2
Tape Speeds	B, C	A, B, C	A, B, C	A/B/C & 1 1/2	C/D, B/C option
Variable Speed Range	± 15%	± 6%	No	No	8-42ips
Reel Size Max/Hub Type	10.5"/NAB	10.5"/NAB, EIA	10"/NAB	10"/NAB, EIA	14"/NAB
Number of Heads	3	3	To 4	.....	.....
Capstan Motor Type	dc servo	dc servo	ac sync	dc servo	dc servo
Reel Motor Type	dc servo ctl	dc	ac sync	ac	dc servo
Metering Types	VU, peak LED	.....	.....	.....	VU
Equalization	NAB, IEC, CCIR	NAB, IEC, CCIR	NAB, EIA, DIN, IEC, CCIR	NAB, EIA	.....
Editing Function	Dump	No	Dump	Yes	Yes
SMPT/Editor Interface	Yes	No	No	No	Yes
Tape Timer	Electronic	Mechanical	Mechanical	.....	Electronic
Cueing Feature	Search cue, zero;	.....	Search cue	Search cue	Auto-locator
Input Connection	Bal Active	.....	Bal Xfmr	.....	Bal
Output Connection	Bal Active	.....	Bal Xfmr	.....	Bal
AF Response (± dB/Hz)	2/30-24k ¹⁵	3/20-20k, 7.5ips	3/30-18k ¹⁵	.....	2/40-20k, 15ips
Harmonic Distortion	0.8% Note 14	0.8% 185nWb/m	0.2% 160nWb/m	1%	0.5%, 1kHz 250nWb/m
S/N Ratio (R-to-P)	70dB NAB wtd	67dB A wtd	55dB 160nWb/m	60dB NAB wtd	63dB, 15ips 520nWb/m
Crosstalk (Adj. Tracks)	-60dB, 1kHz	-50dB, 1kHz	50dB 250nWb/m	50dB	-50dB, 1kHz
Related Models	Model 42 with mic/line input mixing	.....	.....	.....	.....
Reader Service Number	436	437	438	439	440

(15) Ref 160nWb/m, 1kHz, 7.5ips.

The new Saticon II camera tube. Clearly superior to lead oxide.

Compare the unretouched photos below and see for yourself how the new RCA Saticon* II camera tube reduces specular highlight memory, without red trail.

You no longer have to choose between lead oxide's good handling of highlights and Saticon's well known superiority in other critical performance factors. Now it's a whole new ball game.

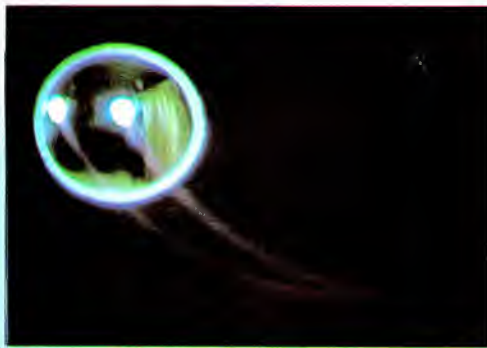
Computer-aided deposition and advanced material purification technologies have given Saticon II a considerably improved photoconductor. Your benefits: less highlight trail, reduced highlight memory (as much as 75% less than that experienced with earlier Saticon tubes), improved resistance to image burn.

What's more, you still get all of the recognized advantages of Saticon: high resolution,

distortion-free colors, very low lag, and extremely long tube life. And Saticon II is backed by a warranty that's second to none. RCA offers full replacement for any failure in normal use for six months, compared with only two months for Plumbicon™.

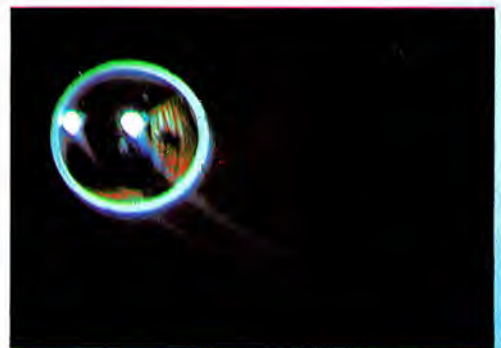
Your choice is now clear. For more information on the complete Saticon line, contact your RCA distributor or write to RCA Camera Tube Marketing, New Holland Avenue, Lancaster, PA 17603. Or call (800) 233-0155. In Penna., phone collect to (717) 397-7661. Overseas, contact RCA Brussels, Belgium. Sao Paulo, Brazil. Sunbury-on-Thames, Middlesex, England. Paris, France. Munich, W. Germany. Hong Kong. Mexico 16 DF, Mexico.

*Used by permission of trade mark owner.



Good. Plumbicon XQ1427.

Photograph of direct reflection of flood lamps, produced by camera with CTS circuitry. Note highlight memory with red trail.



Better. Saticon II BC4390.

Same subject and conditions as in photograph at left. Note reduced highlight memory without red trail.



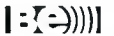
RCA

Circle (57) on Reply Card

AUDIO RECORDER, Reel-to-Reel

Manufacturer	United Research Labs	VIF International	Tandberg of America
Model/Series	Auto-Tec Model S	VIF450 ¹⁶	TB15 20A SE
Number of Tracks	4	2, 4	2, 4
Tape Width (inches)	¼, ½	¼	¼
Tape Speeds	A/B/C/D	A, B	A/B, 1-7/8ips
Variable Speed Range	No	No	No
Reel Size Max/Hub Type	10.5"/14" option	14"/NAB	7"
Number of Heads	.....	2	.....
Capstan Motor Type	ac hyst sync	ac sync	2-pole asynchronous
Reel Motor Type	ac induction	ac sync	.....
Metering Types	.....	None	.....
Equalization	NAB	NAB	NAB
Editing Function	Yes	No	No
SMPT/Editor Interface	No	No	Yes
Tape Timer	No	No	Mechanical
Cueing Feature	No	No	.....
Input Connection	.....	n.a.	.....
Output Connection	.....	Bal Xfmr	.....
AF Response (± dB/Hz)	.....	+1, 0/50-15k	.....
Harmonic Distortion	0.5%	n.a.	3% 370nWb/m 1kHz
S/N Ratio (R-to-P)	66dB A wtd	55dB 2-Tr	57dB
Crosstalk (Adj. Tracks)	70dB, 1kHz, 185nWb/m	n.a.	50dB 370nWb/m 1kHz
Related Models	.....	.....	.....
Reader Service Number	441	442	443
			444

(16) Designed for background music, play-only, auto-reverse.



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Cost effective, modular, and expandable



Component Switching and Processing

Modified ¾" U-Matic Players with

Y-C/DOC outputs or ½" Type M with YIQ outputs are switched through our vertical interval Matrix Switcher into a component TBC.

Automatic Directory Reading

Cassettes are loaded randomly into any empty deck. They rewind automatically to the head and the directory, containing a 4-digit reel ID number with precise start and finish times of each segment according to their location with reference to SMPT/ time code is read into memory. The status indicating ID found and VTR location is displayed on the terminal.

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1000 EVENTS Or more with 68K Multi-Event Programmer and Disc Drive.

The computer identifies, searches out, and activates tape segments to be cued and aired in the order scheduled.

Lease Plans Available

LA-KARTTM
LAKE SYSTEMS CORPORATION

Prices Start at \$89,900

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"Exceeds all my expectations. Great performance and range. Unexpected power and performance." That's three experienced broadcasters talking about the new Andrew TRASAR™ UHF-TV transmitting antennas recently installed at their stations.

Here are some important features that convinced them to buy TRASAR™: • Unique traveling-wave slotted array design • Excellent null fill • Up to 2.5° beam tilt without loss in gain • High power rating with reserve capability • Very low VSWR • Fiberglass radome for protection from the elements • And there's more! Obtain complete information in Bulletin 1083 or contact your Andrew Sales Engineer.

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Channel 66, Chicago



Robert Porter
Director of Engineering
Spanish Int'l. Network

Circle (75) on Reply Card

P196 13:00:31 Mon Nov29 P196 ELECTRA

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P171 12:37 Mon Nov29 P171 ELECTRA

WHAT'S ON

THIS WEEK Nov 29-Dec 3

CINCINNATI ART MUSEUM FILM SERIES
Fire Over England, Thursday 8pm

BOYS FROM THE ATTIC EXHIBIT Warren County Historical Society in Lebanon, Wednesday through December 31, 9am-4pm Tuesday-Saturday and noon-4pm Sunday Admission is \$1.50 for adults and 50 cents for children.

Zino's Before or after the show Always delicious - 3 locations - more in a moment

Local interest items are combined with advertisements.

P126 12:24:58 Mon Nov29 P126 ELECTRA

IRA JOE'S FORECAST

TODAY
morning fog
sunny
high 57

TONIGHT
variable
cloudiness
low 38

TOMORROW
morning sun,
chance of
afternoon
showers
high 57

EXTENDED OUTLOOK 127



Taft teletext weather is tied into WKRC's broadcast weather show and weatherman "Ira Joe."

Taft airs affordable teletext

By Bebe F. McClain, president, B.F. McClain Productions, Asheville, NC

For more than a year, Taft Broadcastings' Cincinnati TV station, WKRC-TV, has been airing a 100-page teletext magazine in the vertical blanking interval using the British World Standard system. Looking

back, Taft is amazed at its low startup and operating costs, the ease of generating text and the great interest aroused in local advertisers. Taft's experience can be helpful to other broadcasters desiring to produce tele-

text programming.

One of the main concerns Taft believes it has dispelled is the idea that stations should not enter into teletext until a standard is adopted in the United States. Taft knows that the

Winsted THE PERFECT MATCH for your video equipment

ROLLING CABINETS

Double your tape storage space!



TC-8B TYPE

Store up to 161 of the 3/4" videocassette tapes in each of these space-saving cabinets' units move effortlessly on low-profile steel tracks to give you easy access to cabinets positioned behind them. Similar storage systems available for 1"-2" video tapes, cartridges & film

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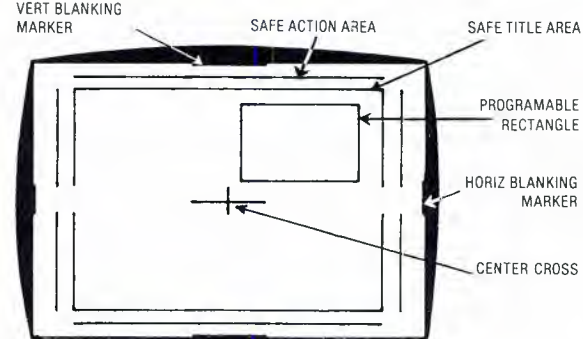
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- Remote pattern selection, black/white, on/off for each channel
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- 10 rectangles can be programed from remote panel—any size, any position and stored in internal memory for display on any channel

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Only the beginning

A thing of beauty . . . this Dynair System 21.

Begin with this single, high density frame using as few as 10 inputs and 10 outputs. Select combinations of video, audio, time code, data, tally, or machine control switch modules.

Grow sensibly, easily and cost-effectively to impressive matrices of one thousand inputs and one thousand outputs of every module type by simply adding frames and modules.

Grow into high definition TV, if this possibility is in your future, without changing a thing. Bandwidth of the System 21 is already 30 MHz.

Write or phone. We would like to send you additional information. Give us a chance to begin with you as you upgrade your plant.

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Circle (76) on Reply Card

AM BROADCASTING - HIGH FIDELITY

Are these terms mutually exclusive?

YES NO DON'T KNOW

Suprisingly, many broadcasters may not know that the correct answer to this question is no. Large sums of money are spent each year to purchase new transmitters, new studio equipment, new audio processing equipment and to modify antenna systems for improved AM sound. Unfortunately, until now, there has been no such thing as a professional quality AM monitor receiver. As a result, the perceived fidelity of an AM signal has been severely restricted by receiver performance.

Potomac has developed the SMR-11 Synthesized Monitor Receiver which will let you hear and measure the quality of your transmitted AM signal ... perhaps for the first time. Features include: Crystal Stability; 60 dB Signal to Noise Ratio; Audio Frequency Response ± 0.5 dB, 20 Hz to 8 kHz; Total Harmonic Distortion less than 0.2% (95% Modulation) at audio frequencies above 40 Hz ... please write for complete descriptive brochure.



THIS DIAL WILL TUNE YOU IN TO THE NEW SOUND OF AM BROADCASTING

POTOMAC INSTRUMENTS

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SILVER SPRING, MD. 20910
(301) 589-2662

Circle (77) on Reply Card

production equipment, which represents a significant investment, remains essentially the same no matter what system is adopted. Primarily, the decoding device and/or some transmission equipment (depending on the requirements to decode before or after the signal reaches the TV set) will differ among the various standards.

Although Taft would be able to easily and inexpensively convert from the World System, if another standard were to prevail, it thinks that US broadcasters will reach the same conclusion as it did, after investigating various teletext possibilities. Some of the networks disagree with the company, but Taft has taken the stance that, to be successful, teletext should be generated locally. Therefore, Taft does not want the vertical blanking interval, the last piece of TV real estate, to become subject to network control, especially with the long-range plans of the networks being unclear.

No matter what standard the marketplace ultimately embraces, Taft has proven that stations in medium-sized markets can create their own 100-page teletext magazine with an investment less than the price of a good color camera.

Choosing the World System

John Owen, vice president of TV engineering, and Terry Connelly, vice president of news operations for Taft, looked intensively at all teletext systems before they decided the system widely used in England (often called the British System, or, as it has come to be known, the World System) would be best from technical and programming viewpoints.

Of greatest importance to Taft was that the BBC and Britain's Independent Television (ITV) have been successfully using the teletext system for six years. In comparison, the French Antiope system, although greatly publicized through CBS experiments, has yet to become a commercial venture; and the Telidon system is reaching a few thousand viewers, primarily in Canada. However, more than two million TV sets in 14 countries are equipped with decoding devices based on the World System. Sony, Panasonic, Sanyo and Philips are providing TV sets with built-in decoders to consumers in England, Australia, Germany and elsewhere. Now Zenith offers a set-top decoder using the World System for the US market.*

*At the Summer CES convention in June 1983 in Chicago, General Electric (in a private showing) displayed a TV system with built-in teletext adapter.

Harris 9000 Program Automation...

Smooth sound for a rough market

CKJY-FM broadcasts in the highly competitive Detroit market. Program Director Ronald Burgoyne believes that the Harris 9000 Program Automation System is an essential element in programming strategy:

"I am extremely pleased with the Harris 9000 System. Our sound is much smoother and more consistent. The flexibility and reliable operation in all areas is astounding. The Harris MULTI-FILE™ System, permitting unlimited format variations, is of extreme importance to me in programming the station."

The tight format and "live" sound of Harris 9000 Program Automation are provided by a host of features, including ability to provide voice tracking; voice-over; time announce and back-timing; real-time program update for news, weather, EBS, contests, and more.

For more information, contact Harris Corporation, Studio Division, P. O. Box 4290, Quincy, Illinois 62305-4290. 217/222-8200.



Ronald Burgoyne: "The Harris 9000 System is an asset to any station."

 **HARRIS**

Circle (81) on Reply Card

November 1983 *Broadcast Engineering* 103

The difference is what you don't hear



Each inner conductor has 40 strands of small diameter (.00315") copper wire that provide maximum flexibility and avoid breakage.

"Star-Quad" configuration with 4 inner conductors provides a substantial improvement in rejection of EMI.

Polyethylene insulation is a better dielectric than rubber insulation, thereby reducing capacitive coupling for improved high frequency response.

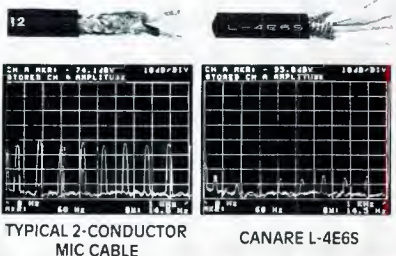
Cotton filler acts as strain relief and also reduces handling noise by preventing changes in stray capacitance.

Very high density, braided shield blocks most static and other noise.

Tough yet very flexible jacket can be unpacked from extreme cold and used immediately. The brittle point is -56°F (-49°C).

Available with a satin finish in 10 attractive colors to aid channel identification and/or to complement visual appearance. Fits standard XLR connectors.

You don't hear the fluorescent lights, motors, SCR dimmers, static, buzz, hum and handling noise with Canare L-4E6S. This shielded professional microphone cable is immune to electro magnetic noise due to its unique Star-Quad configuration. Compared to the leading 2-conductor microphone cable, Canare L-4E6S offers 10 times more rejection of the worst source of EMI...impulse noise from SCR dimmers. This cable blocks the noise, but not the program. Its low series resistance and low capacitance give L-4E6S extended frequency response, in mic runs of over 300 feet the 3 dB downpoint is at 50 kHz.



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(213) 506-7602 / (213) 980-8092

Circle (82) on Reply Card

■ **COLUMBUS** Commuters scrambled again for rides this morning as the bus drivers' strike enters its second week. Talks between the city and the drivers' union broke off Friday and have not been rescheduled. The main problem now is a dispute over sick pay for the drivers.

■ **OHIO LOTTERY** The winning number in Saturday's daily game: **066**. The winning Pick-4 number: **7073**.

Headlines 101 Round-up 199

A regional news page generated at Taft.

The World System, with its 24 lines of 40 characters each, was designed for broadcast situations. Its synchronous format interfaces with the broadcast signal and, because the text is transmitted in 30 groups of 32 characters, there is little problem if slight interruptions occur during a broadcast. More than likely, only a few characters would be affected. Even in Cincinnati, where an uneven terrain creates a TV transmission nightmare, users are experiencing 100% reliability in teletext reception with rabbit ears.

During evaluation of proposed systems, Taft found the NABTS system, being experimented with at NBC and CBS, to be more advantageous to those employing cable transmission. Because NABTS uses an asynchronous format, any disturbance to the broadcasted signal could knock out all the text.

The capability for digitizing graphics by placing artwork on a copystand, as opposed to drawing on an electronic palette, was another convincing factor for Taft, as was the easy inclusion of closed captioning. Over all, the World System seemed to be more flexible and less costly—a more suitable choice for the typical TV station. After its operating experiences, Taft still thinks that its original assessment was correct.

Taft's Electra magazine

The teletext magazine generated for WKRC-TV/Channel 12, Cincinnati, is more a newspaper than a magazine. Although it is touted as 100 pages, it

■ **WASHINGTON** US park police say the first tourists to arrive yesterday morning at the grave of President John F Kennedy found a badly burned body at the site. One report suggests it was actually lying in the eternal flame. An autopsy will be conducted today.

■ **NEW JERSEY** After two years without a job, 30-year-old George Epp became a cab driver in Atlantic City. Early this morning he began to play the slot machines during his break. After 20 minutes and \$30, he won \$250,000 - the biggest payoff in history.

Round-up 199 News Index 124

A national news page generated at Taft.

usually runs closer to 125, because many pages have up to nine cycling subpages. With the all-important news, there are many features and advertisements, just as in a newspaper.

To view the text, you push the Text button on the TV's special remote controller, a part of the decoder package placed atop the set. The "cover page" appears with the headline of the top story of the day, the time, date and a partial index, listing the pages where news, sports, business and a full index can be found. It is interesting that the same page numbers are always used for the main categories, such as news, weather, stock reports, business, etc. Viewers tend to memorize these numbers and soon do not need to refer to the index. The first 65 pages are used for these high interest items, which are continuously updated throughout the day. The maximum length of a

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CHAPTER II

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The best selling professional two track audio recorder has finally been improved. We've added the refinements you asked for: The inputs and outputs of the new B-II are transformerless, balanced. The elapsed time indicator is a real-time hours/minutes/seconds L.E.D. display—tape accurate at all speeds. The built-in oscillator provides both 1kHz and 10kHz calibration tones. And we added a low frequency adjustment to the reproduce equalizers.

Behind the clean, new look of the B-II are the same features, performance and reliability you expect from our famous 5050B. We didn't change the rugged quarter-inch thick deckplate or the cast aluminum frame. We kept the switch selectable NAB/IEC equalization, +4dBm/-10dBu output levels, half-track and quarter-track playback heads and three standard reference fluxivity levels. And, of course, the B-II still features three tape speeds, XL type connectors, front panel record equalization and bias adjustments, variable speed, "dump edit" function, and an integral splicing block.

The 5050B-II has been engineered like no other tape machine in the world. When you check out the specifications you'll know why we say it's the best \$5,000.00 tape recorder available for under \$2,500.00. When you work with it, you'll know that we've just raised the industry standard.

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Tel: (415) 592-8311 Telex: 510-376-4890


Circle (83) on Reply Card



A teletext commercial designed for Sears at Taft requires no fancy graphics.

P186 13:30:56 Mon Nov29 P186 ELECTRA

BACK TO SCHOOL



TI-35 calculator \$17.99

10 pencils with eraser tops 59cents

Eraser Mate 2 pen, erasable ink 59cents

Electric typewriter with correction \$159.99

YOU CAN COUNT ON **SEARS**

news report is 70-80 words. The text can be superimposed over the regular program on WKRC.

The last 35 pages are devoted to book and movie reviews, jokes, special events, TV listings, kids' stories, classified and advertisements. Because the system is interactive, puzzles also are offered. Questions are answered by pushing a *Reveal* button on the controller.

Taft's system has the capability for producing 16 independent 100-page magazines. This capacity is used to backlog stories and to prepare holiday editions. A library of features and graphics, such as maps and pictures of celebrities, can be stored in memory. These graphics are produced from monochrome or color drawings or photos under an inexpensive monochrome camera. The resulting image may be modified using a *light pen* on the screen. Color can be assigned to any part of the graphic.

Another special feature allows viewers to read the normal-sized text, or switch to a mode that displays the page expanded to twice the original size, but separated into two consecutive pages, thus helping the visually impaired.

Audience appeal

During the test period, Taft and Zenith placed dozens of decoders into Cincinnati-area homes, periodically moving them, to discover a great deal about the use and appeal of teletext. Viewers did not often use the mode with the text superimposed over a transmitted program. They found graphics to be relatively unimportant, taking up too much room on the page. The audience seemed to want teletext for information, not for the sophistication of network graphics. It would seem that teletext is emerging as its own medium, not another TV program. The audience evidently is able to accept this more readily than many broadcasters who long to incorporate the capabilities offered by a 525- or 625-line system.

Taft found that viewers want the news delivered to them in capsule form the moment they get home. The only faster means than teletext of acquiring this updated news might be to install one's own UPI or AP terminal at home. Viewers want the closing prices of stocks at 4:15 p.m.—ahead of the evening news and tomorrow's newspaper. And, they like having the full list of major stocks and local-interest stocks *Electra* offers, as opposed to brief presentations given by both the national and local news.

Because viewers want TV listings,

This Should Settle It... Smallest Size/Biggest Sound!

HME's New System 85 Hand-Held Wireless Microphone System



HME just designed an all-new system around the superb Shure SM85 element. We did so well that Shure Brothers Engineering verified its audio performance as being identical in all respects to the SM85.

Here's what you get for features:

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- Mike mute switch on side of transmitter, RF carrier switch on bottom . . . no confusing them. Plus, the mute switch can be easily disabled.
- Advanced squelch circuit provides silent quieting whenever the transmitter/receiver link is broken. No more audible dropouts.

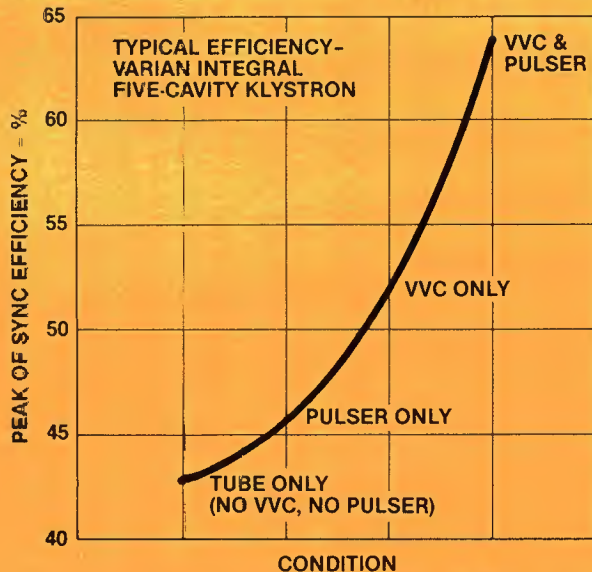


HME ELECTRONICS, INC.

6151 Fairmount Ave.
San Diego, CA 92120
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Telex: 697-122



Circle (56) on Reply Card



Obtain the highest UHF efficiency with Varian's new Variable Visual Coupler.

Broadcasters realize up to 64% efficiency from integral cavity "H" tubes.

At Varian, "H" stands for High Efficiency which the VA953H and VA 946H Series integral five-cavity tubes deliver. From a stand-alone tube, typical efficiency is 43% peak-of-sync. Add a mod-anode pulser and increase efficiency to 46%. Attach a variable visual coupler and, without pulsing, improve efficiency up to 52%. With the variable visual coupler installed and the pulser operating, 62% to 64% peak-of-sync efficiency can typically be obtained.

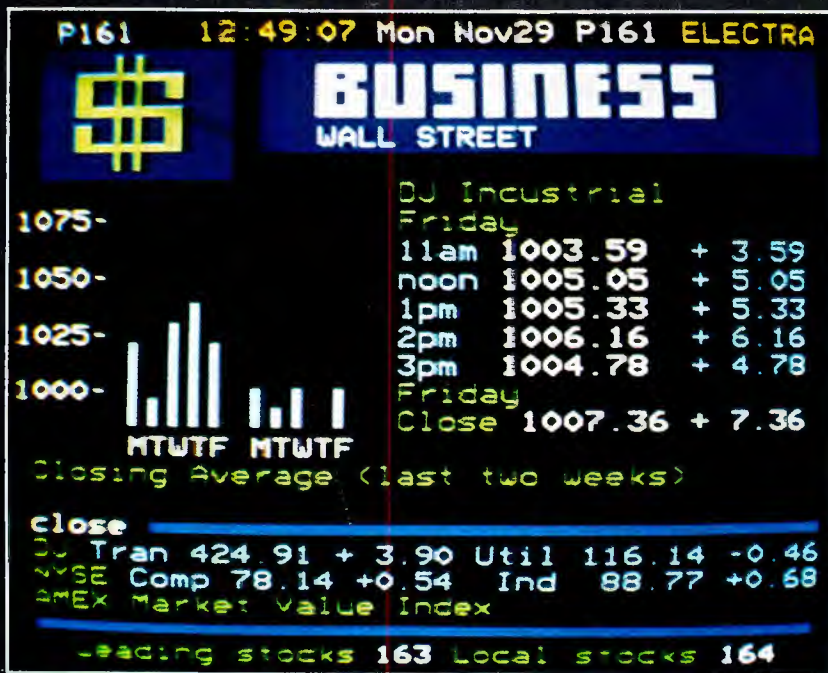
Improved efficiency reduces operating cost.

The payback period realized over the cost of installation of a Varian variable visual coupler can be surprisingly short. Considering the rising cost of electric power, broadcasters will make a sound investment with the inclusion of variable visual couplers.

For more information on efficiency improvement, contact your original equipment manufacturer or Varian Microwave Tube Division.

Varian Microwave Tube Division
611 Hansen Way
Palo Alto, California 94303
Telephone: 415 • 493-5675





The *Electra* stock report is updated throughout the day.

sports and weather, Channel 12 uses cross-promotional efforts to direct the audience to follow up by watching scheduled programs. For example, to promote WKRC's own sports program, the sports section of *Electra*, "Denny's Picks," refers to WKRC's sportscaster. And the weather is listed as "Ira Joe's Report" after Channel 12's popular number-one-rated weatherman. Also, daily program information is given only for Channel 12 to encourage follow-up viewing and to keep people in Cincinnati tuned to WKRC.

Local vs. national

The test period confirmed to Taft that a key to success lies in generating the text locally. Taft's writers edit stories used on the air and work directly from UPI and AP wire stories. UPI, a believer in the teletext concept, provides international, national and state news, sports and financial stories to the operations that, in turn, supply end users (TV stations, etc.) with pre-prepared information. The items are delivered in a condensed word format, justified and centered, ready for direct broadcast or computer reformatting. Contelvision, Manassas, VA, offers this UPI service to broadcasters and cable operators.

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Circle (85) on Reply Card

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Circle (86) on Reply Card

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Circle (87) on Reply Card



Hilary Goodall, manager of Taft Teletext, joins colleagues in the operation area.



A sample of closed captioning on the Taft teletext system.

Although Taft thinks the UPI service will be a good resource, it plans to continue generating most of the 100 pages itself. Taft's belief in maintaining local control is one of the reasons it does not wish to surrender this vertical interval to the networks. Just as national, all-day radio programs have never been able to compete with local stations, Taft thinks that national teletext will be of little interest compared to local information interspersed with national interest items.

Taft is encouraging other local stations to begin their own teletext services. Connelly said, "The best way to foster creativity in our own people is by having competition. Local competition would be a great incentive."

Easy startup

Owen readily admits that he was a

bit intimidated by the new technology. His initial impression was that teletext was complicated, highly technical and that teletext writers had not been born. But because Taft has never hesitated to enter new fields of technology (among the first to downlink and uplink), the station tackled teletext and found it to be a paper tiger. Owen said, "We set up the equipment one day and were on the air the next."

Taft hired a managing editor of teletext from the BBC, Hilary Goodall, who, in turn, hired three journalism graduates from area colleges. These four people, scheduled in shifts, seven days a week, have no problems creating 100 pages and updating stories many times each day. The graduates, with no experience in computers, much less teletext, have

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PHILIPS



Goodall uses a simple, monochrome camera to digitize graphics from the copystand, then to add color.

personnel found was overcoming the initial fear and starting to produce. After the writers developed the knack of brevity, they found themselves becoming creative generating graphics and actually producing drawings with no training or prior experience.

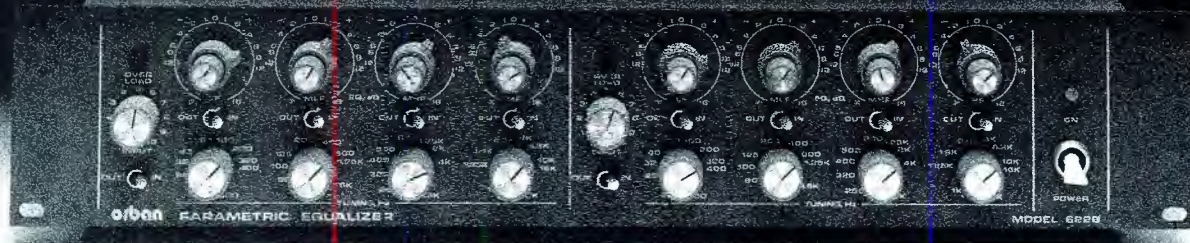
Terry Connelly, Taft vice president of news, shows Zenith set-top decoder and remote control unit now offered for sale in Cincinnati.



trained themselves to compose brief (70-80 word) stories at the keyboard. Then they press one button to transmit the story, or another one to place it in memory.

This effort at Channel 12, the first commercial teletext operation in the country, is no longer an experiment. It is a functioning venture to produce income. The biggest obstacle that Taft

“



”

It speaks for itself.

The Orban 622B Parametric Equalizer has achieved near-legendary status in the broadcast industry for good reason. It is the most flexible, musically-useful equalizer on the market today. And, it offers the broadcaster unlimited versatility in production room sweetening as well as the capability to be used on the program line to tailor the sound of the station.

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Circle (52) on Reply Card

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Crosstalk Video to Video	-65/4.43	-60/4.43	-60/5	-60/5.5	-60.4.4
Hum & Noise (0-4.2 MHz) (IRE WEIGHTING)	-75	-75	-65	-75	-
Frequency Response (dB to MHz)	±.1/5.5	±.1/5.5	±.1/5	±.1/5	±.1/5
Diff Gain (10-90%)	3.5%	.1%	.1%	.25%	.1%
Diff Phase	.1°	.1°	.25°	.1°	.12°
AUDIO					
Crosstalk (dB/kHz) Audio to Audio	-38/20	-85/15	-80/15	-80/15	-75/20
Hum & Noise (dB below out) / FILTER	-122/15k	-109/*	-92/15k	-104/15k	-109/15k
Freq Resp ³⁰ Max Out (dB/dBm)	±.1/30	±.2/24	±.1/24	±.1/24	±.2/24
Over Freq Range	20-20k	30-15k	20-20k	30-15k	30-15k
Com Mode Rej Ratio (dB)	-80	-75	-80	-65	-70

*Data not available

Data based on manufacturers specification as of 4/83

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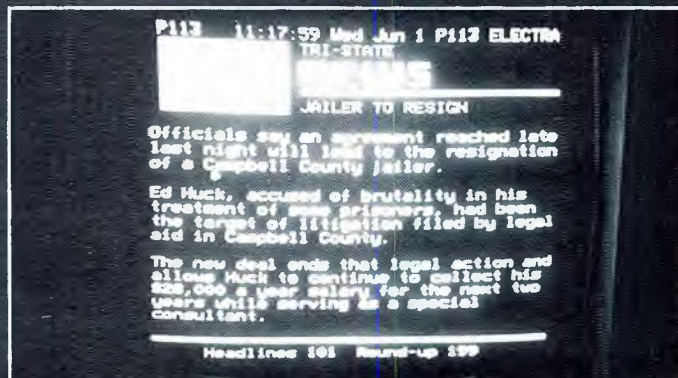
Comex's new Bleepmate-675/II a simple yet sophisticated, fixed, 6-second solid-state delay, has no moving parts (so technical and on-air talent aren't bothered by endless tape/head upkeep). And the 675/II has a broad \pm 1dB, 20Hz to 7.5KHz response. Its low price makes systems redundancy practical, too.

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Circle (91) on Reply Card



News on *Electra* as it normally appears can be expanded in display size. Each expanded page displays two screen pages.

Investment can vary

Taft invested \$50,000 in the teletext venture. The money bought a computer, two terminals and peripheral gear to put a 100-page magazine on the air. Even if standards were to change many times, most of this origination equipment still could be used. The investment increases as embellishments are added. For graphic capability, add \$25,000, and for 3-color text, add \$10,000.

Now, for approximately \$180,000, Taft thinks it has as sophisticated a system as anyone would ever need. Included with the computer are four terminals, full graphics, color, all the monitors and peripherals. Add to this the salaries of a manager and a few writers, plus area to house the department, usually one room. Going into its second year of teletext operation, Taft can advise others wishing to take the teletext step.

Zenith agrees with Taft

On June 23, 1983, Zenith offered decoders to the general public priced around \$300. These decoders install easily onto any Zenith receivers manufactured since 1982. Zenith, as the first US manufacturer to provide the decoders, is showing confidence in the World System. Zenith plans to market receivers with built-in decoders for about half the cost of the

present external set-top decoder. Both types of decoders use hand-held remote controllers to change stations and to bring up teletext or closed captioning.

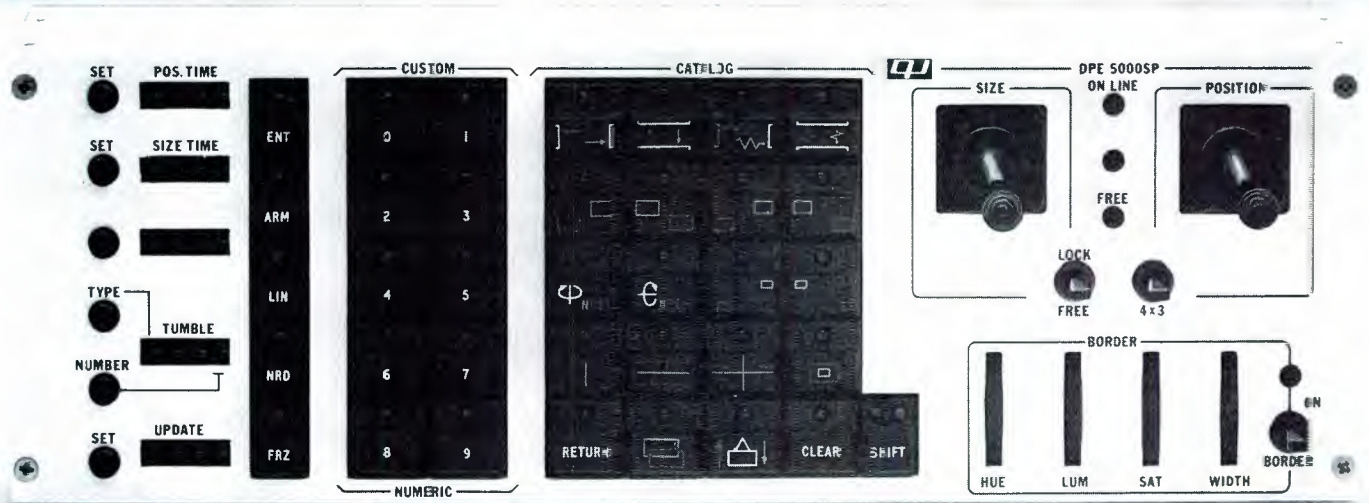
Zenith spokesman Bill Thomas said the company plans to expand the offering of decoders based on the success in Cincinnati. Because it is using its normal distribution system to sell the decoders, Zenith expects to use the Cincinnati market as a model for future distributions and sales training.

A corporate commitment

The venture into teletext is not merely an experiment by one station in Cincinnati, but rather is part of an organized plan by a broadcasting corporation. Taft owns seven commercial TV, five AM radio and six FM radio stations. Aware of alternatives to television competing for viewing audiences, Taft also owns four theme parks and has interests in film and cable ventures.

Taft thinks that broadcast stations can and will lose some of their audiences if they do not present other offerings—especially ones that do not require that the viewer leave the TV set or even change the channel. Electronic journalism is here and Taft wants its audience to remain with it and not go elsewhere for fast news and information. Others seem to

The Quantel DPE 5000/SP.



Now every broadcaster can afford digital effects.

The Quantel DPE 5000/SP makes digital effects affordable by every broadcaster. Every facility.

This exciting single- or multi-channel system gives you infinite compression. Zoom expansion. Variable picture positioning. Freeze and update. Variable border generation. Horizontal squeeze. Vertical squeeze. Even picture splits.

Not bad for a unit that's only 8 3/4 inches high. Perfectly sized for your studio—or mobile unit.

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Circle (92) on Reply Card

November 1983 *Broadcast Engineering* 115



A research engineer at the Zenith Technical Center in Glenview, IL, tests a new decoder developed for sale to consumers in the Cincinnati area.

agree. Broadcast groups, such as Bonnevill, Group W and Keycom, also have adopted the World System.

Taft has decided it is in its best interest to offer to help train those wishing to enter the field. A videotape about its teletext operation is available to those interested. Taft has offered assistance to those wishing to come to its headquarters in Cincinnati for instruction.

Taft believes in teletext and the World System because of the reaction in Cincinnati and the worldwide success of that system. Owen summed up the corporate attitude, saying, "The future of teletext in Cincinnati is very good. We expect growth of the system and the viewer use of this new technology, because it is easily installed and easily operated. It should be considered immediately for use by other broadcasters at the local level. Once they discover how easy it is, they will wonder why they hesitated."

|:~:~)))))

Until now, no component video system on Earth has been complete.

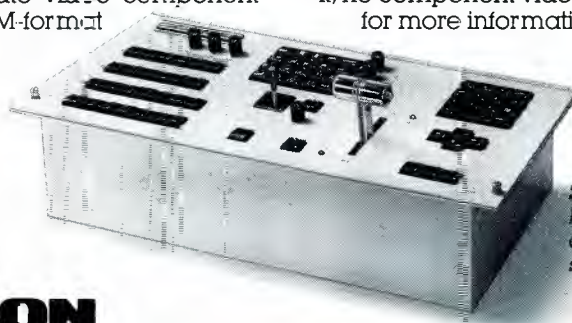
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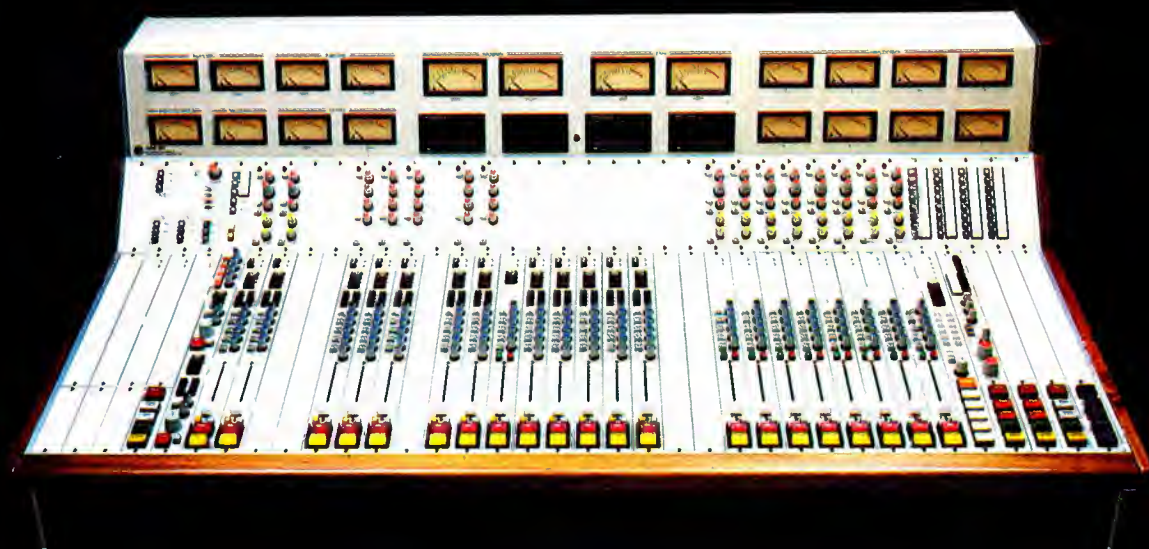
Shintron 390 lets you mix, wipe, key, edit, and post-produce component video tapes with the same flexibility of NTSC systems.

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news

Harris exciter back in operation

The FCC granted temporary authority allowing AM radio stations using the Harris STX-1 AM stereo exciter to resume stereo broadcasting pending the company's type-acceptance test.

A month ago, the commission had requested that Harris inform the 71 stations using the AM stereo exciter to cease transmission in stereo.

"The granting of the special temporary authorization (STAs) came after the FCC's type-acceptance laboratory completed their initial review of the Harris type-acceptance application recently submitted along with actual measurements on Harris' AM stereo exciters, which was provided to the FCC Science & Technology labs," Peter Carney, Harris' spokesman, said.

Rao awarded diode-gun patent

Amperex Electronic Corporation recently honored Dr. N.V. Rao, technical manager of its Imaging Products Group, who has been awarded US Patent Number 4,388,556 for his invention of the diode gun for use in TV pickup tubes.

L.A. Arpino, Amperex vice president, presented Rao with a bronze plaque reproducing the patent award.

Rao's patent was applied for in 1977 and granted in June 1983. The first production diode gun was introduced at the NAB Convention in 1978 and revolutionized the TV broadcasting industry because of its improved resolution, lag performance, handling of highlights and dynamic range.

Skyband DBS system receives FCC go-ahead

Harvey L. Schein, president and CEO of Skyband, has announced that action recently taken by the FCC cleared the way for the startup of Skyband's direct satellite-to-home TV service. Skyband will be the first nationwide service to offer premium TV programming to rural, non-cabled homes across the United States beginning late this year.

The FCC action came in connection with an application filed by Satellite Business Systems to lease five channels of its newest satellite to News Satellite Television Ltd., a wholly owned subsidiary of Rupert Murdoch's News International.

By deciding that the satellite-to-home service is not broadcasting, the FCC freed it from complying with such broadcasting laws as the equal time provision and the fairness doctrine. The commission decided that

the proposed service falls within the category of "hybrid communications." In other words, the service exhibits characteristics of both broadcasting and point-to-point services and need not be subject to broadcast regulation.

Monitor Award for engineering achievement

The 1983 Video Production Association's Monitor Award for engineering achievement has been presented to Lexicon for introduction of the model 1200 time compressor and in recognition of its contribution in digital processing.

USCI signs agreement for bias traffic system

Data Communications Corporation signed United Satellite Communications, Northvale, NJ, for the BIAS (Broadcast Industry Automation System) traffic system, beginning in September.

USCI represents the first DBS service in North America. Backed by the Prudential Insurance Company, the service planned to begin multichannel transmission by midmonth.

USCI will provide programming on five channels, three of which will be advertiser-supported. The contract calls for the BIAS system to automate scheduling for all five channels with billing and other accounting functions for the commercial channels.

AM stereo briefs

Delco Electronics has announced its intention to build AM stereo radios for selected Buick Motor Division 1984 models. The radios will receive AM stereo broadcast signals using a C-QUAM decoder IC.

In September, 1050 CHUM became Toronto's first AM stereo station. CHUM selected the Kahn/Hazeltine independent side-band stereo system.

Continental Electronics Manufacturing Company has signed a sharing agreement with NAP Consumer Electronics Corporation to manufacture and market Magnavox PMX AM stereo equipment needed by AM radio stations to transmit stereo programming.



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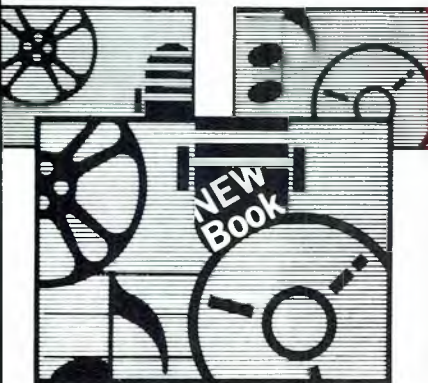
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NRBA reiterates plea for deregulation

Testifying before the House Subcommittee on Telecommunications Oct. 6, NRBA's new president, Bernie Mann, called for the complete deregulation of radio and for the ending of all radio regulation except technical.

The House Subcommittee on Telecommunications, led by Chairman Tim Wirth (D-CO), at press time planned to reach a consensus and to have a "broadcast reform" bill ready for mark-up by late October.

NRBA convention report

- Oct. 4-7, 1983
- New Orleans, LA
- Attendance—4500
- Exhibitors—83
- Hospitality suites—68
- Discussion groups—47

When radio broadcasters met at the 1983 NRBA Convention, AM stereo continued to be a hotly discussed topic. Much of discussion centered on the FCC's recent orders to cease using the Harris system, a move that was reversed soon after, while the commission considered questions of type acceptance.

Motorola invited attendees to listen to its system while seated in a new Buick automobile, which was part of its exhibit. Continental Electronics Manufacturing Company announced the assumption of manufacturing of transmission and monitoring facilities for the Magnavox PMX equipment, while Kahn Communications showed a line of reception systems. Sony stressed the SRF-A100 AM stereo receiver, and Broadcast Electronics showed a prototype of a Motorola system AM stereo exciter.

The use of SCA subcarriers captured the attention of many broadcasters. Besides the possibilities of data or audio services as extra revenue sources, paging systems were highlighted by Reach, BBL Industries and Motorola Communications & Electronics.

Jim McKinney, FCC Mass Media bureau chief, outlined benefits of recent rule changes to the Daytime

Broadcast Association meeting. McKinney also took part in the Docket 80-90 panel discussion and advised broadcasters that as many as 1500 new FM stations ultimately will result within the next five years, from rule changes. The docket has been controversial, because of the possibility of reclassifying some FM stations if certain power and antenna height requirements are not met.

Notable events and comments included:

- Keynote speaker, Mark Fowler, FCC chairman, after receiving a standing ovation, stressed the 80% reduction in paperwork that has resulted from FCC deregulation of radio broadcasting, but said that the broadcasters must work with the FCC to achieve complete First Amendment freedom.
- Walter Cronkite, recipient of the 1983 NRBA Golden Radio award, warned against excessive compression of news to make clever headlines. Cronkite expressed a grave concern about possible distortion of information and indicated that it would be better to do no news at all, rather than to distort the information presented to the public.
- WFMT-FM, Chicago, was cited by the Armstrong Memorial Research Foundation for its continued excellence in engineering.
- Abe Voron, executive vice president of NRBA, was honored by the executive board of directors when a memorial educational fund was established in his name. In announcing the fund, Bob Herpe of the board lauded Voron's unceasing dedication to the causes of the broadcasters.

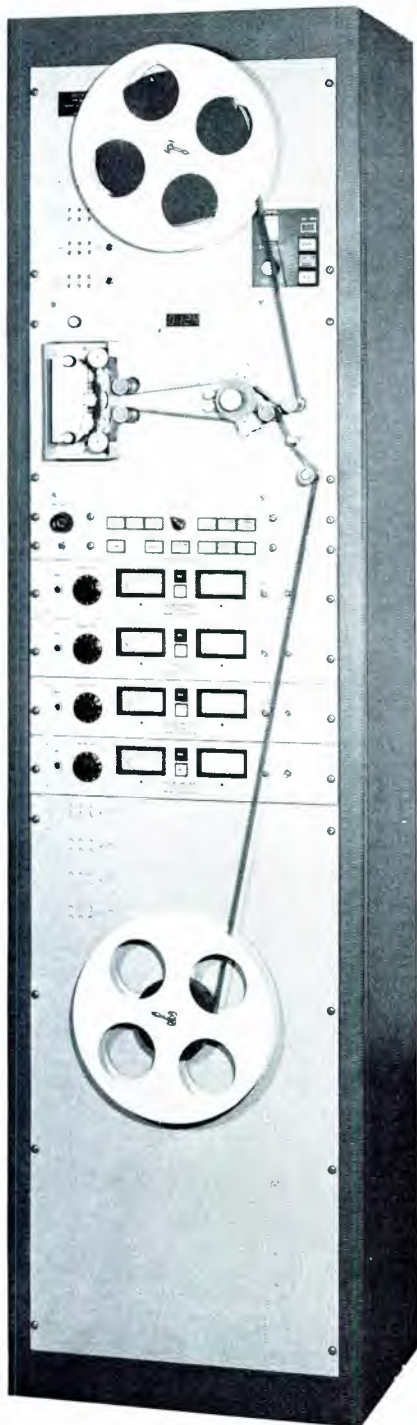


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FCC asked to investigate AT&T retroactive billing

The NAB has asked the FCC to act promptly on a complaint by WLWT-TV, Cincinnati, and to investigate other instances in which stations have been improperly charged by AT&T for use of Type 7004 interexchange channel service.



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Last September, AT&T raised its rates but failed to properly notify at least 12 TV stations of the retroactive increase until months after the new tariff went into effect. NAB urges the commission to undertake an investigation of the matter in order to determine the precise scope of the illegal conduct. NAB said that although some stations have paid under protest, others have refused to pay the charges pending an FCC decision.

The association said that had stations been properly notified, as required by FCC rules, they would have had the opportunity to avoid the "severe economic impact of the retroactive rate increase by either budgeting for the new rates or switching to an alternative transmission service."

Radio Marti bill passes

In a major victory for radio broadcasters, the Senate recently passed the *Broadcasting to Cuba* bill, encompassing the NAB's Voice of America amendment to protect US stations from Cuban retaliatory interference. NAB President Edward O. Fritts issued the following statement on the unanimous consent action on Capitol Hill:

"The vote by the Senate is a major victory for radio broadcasters and the public. The bill places Radio Marti under Voice of America jurisdiction, on the VOA frequency, operating in compliance with VOA standards. It will ensure a more objective, accurate and balanced standard of broadcasting with a less likely possibility of Cuban retaliatory action.

"This legislation is a tribute to the effectiveness and persuasiveness of American radio broadcasters. Capping months of effort, over 300 telegrams from stations across the country were delivered to the Senate within the last week. Their persistence has helped assure interference-free maintenance to our system of broadcasting. Further, the bill strongly encourages the administration to pursue resolution of any existing and future Cuban interference problems."

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- **John L. Baptista**, director of Processing Technology, MGM Laboratories. He holds responsibility for the areas of processing efficiency, chemical use efficiency and silver recovery optimization.
- **Bernard L. Dickens**, senior staff engineer, CBS Technology Center. He is responsible for the determination of performance criteria for analog component recorders in broadcast video recording systems.
- **Leo Diner** of Carmel Valley, CA, founder of Diner Films. His ability to understand engineering problems and to create innovative cinematic equipment and put it to practical use in his work enabled him to design and build laboratory equipment often not available in the marketplace.
- **Joseph Flaherty, Sr.**, who began his career as an engineer with WDAF, one of the original NBC Radio Network stations, in 1925.
- **Ronald N. Haig**, consultant to the motion picture field.
- **Thomas E. Mehrens**, senior broadcast engineering specialist at Sony Broadcast Products Company.
- **Michael J. Milne-Smith**, technical manager of Rank Film Laboratories, England. He is responsible for the company's technical operations.
- **Kerns H. Powers**, staff vice president, Communications Research, for RCA Laboratories.
- **John P. Pytlak**, photographic engineer and group leader of the Motion Picture Pilot Laboratory and Motion Picture Applications Technology Groups for Eastman Kodak Company.
- **Donald C. Rogers**, vice president of the Academy of Motion Picture Arts & Sciences.
- **Charles A. Steinberg**, executive vice president and chief operating officer at Ampex Corporation in Redwood City, CA.
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new products

Transmitter

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Video camera

Sony Video Communications has set pricing and availability of its new color video camera, the DXC-M3. The 3-tube, ultracompact unit will have a suggested end user price of \$6990 and is available for immediate delivery. The unit has ultrahigh resolution of 650 horizontal lines, geometric distortion of less than 1.5% in all zones and a signal-to-noise ratio of 57dB.

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Equalizer

The Pro-Graph PEQ-1 16-band equalizer from Polyfusion Electronics allows programming of 64 response curves in memory. A display screen, comprised of the lighted graticule and a 240-LED matrix, indicates the attenuation of each band center when a stored program is recalled.

Circle (315) on Reply Card

Data links

Lightwave Communications has announced the development of the second in a series of fiber-optic RS-232C data links. The FO-232LD optical modem extends the operating distance of the original FO-232 from 1.25 to 2.5 miles. Both units are used for the transmission of asynchronous data via fiber-optic cable at speeds up to 100kbits/s. Each system is completely plug-to-plug compatible with existing RS-232C 25-pin connectors meeting EIA RS-232C and CCITT V.24.

Circle (316) on Reply Card

Wireless microphone receiver

Cetec Vega's new model R-42 Pro Plus wireless microphone receiver offers switch-selectable DYNEX II, a new audio processing technique. System dynamic range with DYNEX II is typically 108dB, A-weighted. Even with DYNEX II switched out, the ultralow noise receiver has a 92dB signal-to-noise ratio. Highest adjacent-channel rejection is achieved with 16 poles of IF filtering.

Circle (320) on Reply Card

Cable

Belden Electronic Wire and Cable has designed a hybrid wire and optical fiber duplex cable for use with

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The professional VTR battery.



Exclusive Features:

- **Value...**the Pro Pac 90 is a long life, dependable performer...it is not a conventional throw-away VTR battery.
- **100% computer tested...**a printout of test results is delivered with each battery.
- **100% overcharge protection...**every cell is individually monitored; the danger of overcharging is eliminated.
- **Triconn™ connector...**includes cell monitor output for safe and dependable charging. (Patent Pending)
- **High Impact molded case...**special ribbed construction protects NiCad cells from damage.
- **Accessible fuse...**professional design includes snap-in fuse and spare fuse.
- **Special premium grade fast charge NiCad cells.**
- **Direct replacement for Sony BP-90 VTR battery.**



Lifesaver 8 Hour Quad, LSQ4, can charge any combination of up to 4 Pro Pac 90 VTR batteries or Snap-On™ batteries. The Pro Pac 90 can also be safely charged in one hour with the Lifesaver Fast Charger, LSFC. The Lifesaver chargers prolong battery life and keep batteries fully topped indefinitely.

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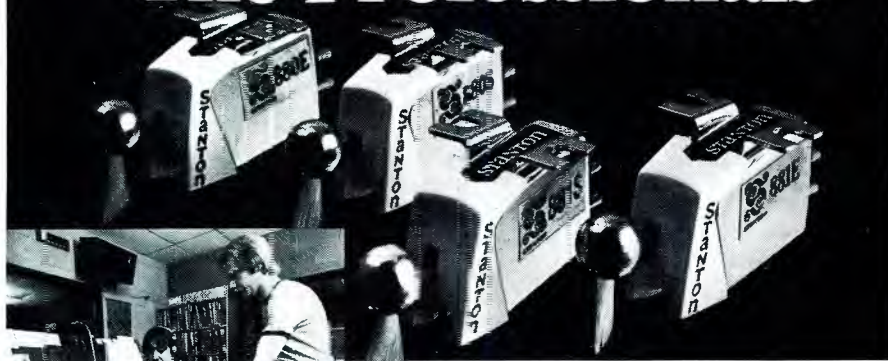
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The "Professionals" a series of four cartridges featuring all the famous Stanton performance features at different price levels, designed for every budget requirement.

For further information write to Stanton Magnetics Inc., Terminal Drive, Plainview, N.Y. 11803



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Circle (110) on Reply Card

computer terminal systems. The cable is composed of one optical fiber and two 20 AWG tinned copper conductors with one 20 AWG tinned copper drain wire.

Circle (317) on Reply Card

Transformers

Multiproducts International has introduced a new line of telephone coupling transformers. Designed for use with telephone equipment, modems and a variety of other communications products, the new transformers measure less than 1" x 1" x 1" and are available in 600Ω/600Ω and 600Ω/900Ω impedances.

Circle (300) on Reply Card

Editing console

A new editing console from Winsted Corporation has an adjustable monitor bridge that provides a choice of height selections. The model 3500E editing console is designed especially for the new Type C 1-inch compact VTRs. The top cabinet with 14 inches of rack space holds a 12-inch monitor, waveform monitor and vectorscope, as well as associated video equipment.

Circle (301) on Reply Card

Cable clips

Lynx has recently introduced its new line of cable clips, the Lynxclips. Used to secure cable in the CATV, interconnect and telecommunications industries, the clips are molded from high impact natural or weather-resistant black plastic to ensure that it will not shatter on installation. The nails are made from high carbon, annealed steel, which gives them added durability.

Circle (302) on Reply Card

DBS antenna

M/A-COM has introduced a 1.2m DBS antenna system for home and commercial use. The antenna, composed of 1-piece compression molded fiber glass, is packaged with mount off-set feed and pre-tested cable kits. The unit is designed for 12GHz Ku-Band and meets the new 2° spacing requirement. The mount design is adaptable to slanted and flat roofs, as well as ground installations.

Circle (303) on Reply Card

Image correction amplifiers

Siegel-Electronics has updated new models of image correction amplifiers—the ICA series 1105 through 1108. These units currently offer RGB color correction, two lines of delay for vertical enhancement and 200ns of delay for horizontal enhancement, camera/tape switcher, RS-170A sync generator and optional RGB inputs and outputs.

Circle (304) on Reply Card | :(-:)))

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Other activity areas of ANT Nachrichtentechnik in Backnang, West Germany, are:
multiplex systems – radio-relay systems – telecommunication cable systems – communication satellites and earth stations – special communication systems.

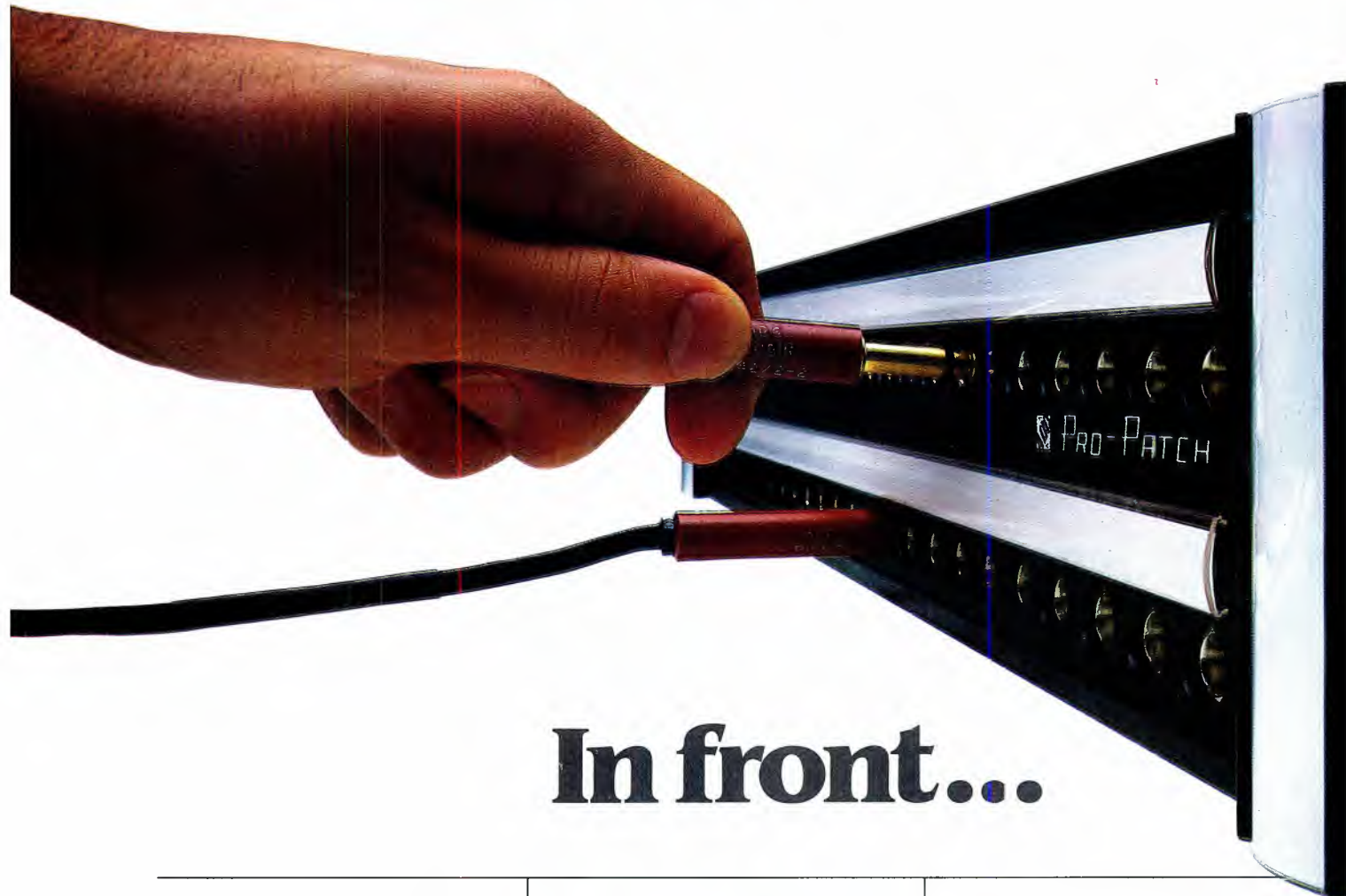
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Nachrichtentechnik

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PRE-WIRED JACKFIELDS



In front...

Your engineering staff has more important things to do than soldering patch panels. That's why you'll find a big advantage in ADC's 100% pre-wired Pro-Patch™ jackfields and Ultra-Patch™ panels. Featuring ADC's new split cylinder contacts, these units allow for fast, reliable, hassle-free installation.

Fully assembled, computer tested and ready to hook up, Pro-Patch and Ultra-Patch completely eliminate labor intensive soldering or crimping operations.

In fact, hooking up to the back of a Pro-Patch unit is

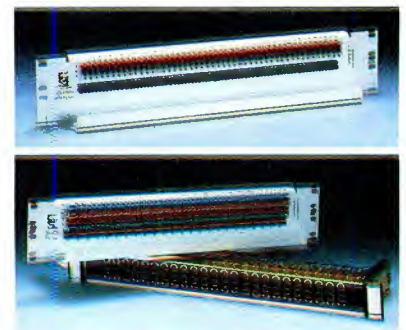


Pro-Patch jackfields and Ultra-Patch panels cut installation time from hours to minutes and allow circuit or normalizing configuration changes in seconds.

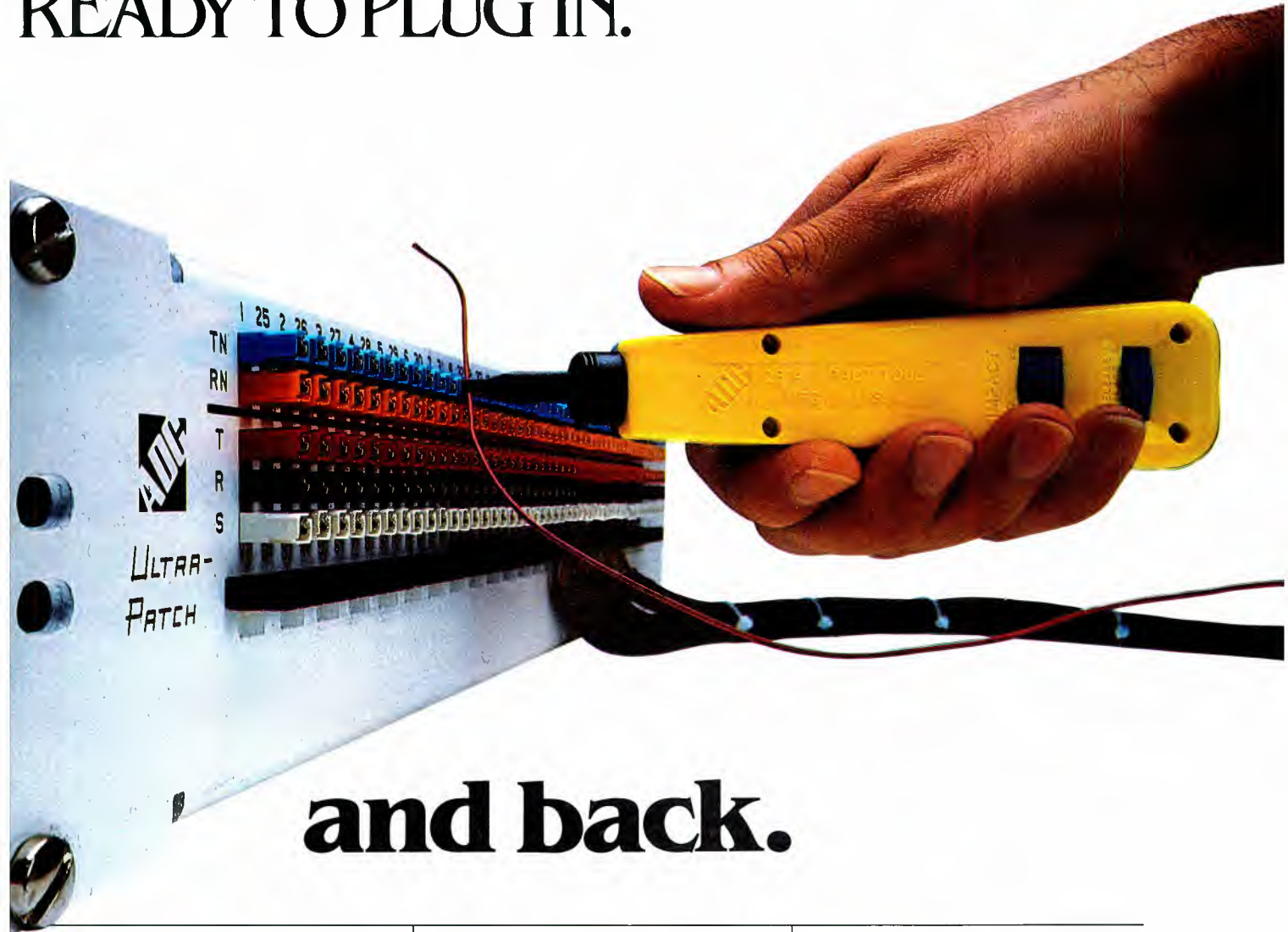
almost as easy as plugging into the front. Just a push on a special hand tool bares a wire, locks it into a split-cylinder contact inside an insulated

housing and trims off excess length.

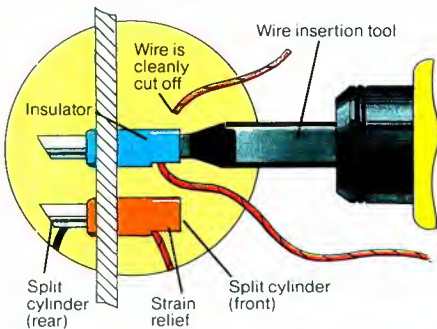
Since their introduction last April at NAB, Pro-Patch jackfields and Ultra-Patch panels have appeared in virtually every segment of the Broadcast industry.



READY TO PLUG IN.



and back.



ADC's unique split-cylinder system features contacts that will accept 22, 24 or 26 AWG solid or stranded wires. The cylinders are housed in plastic insulating modules and are recessed to virtually eliminate shorting at the contacts. Both sides of the contact have two-wire capability providing for four gas-tight terminations per contact. The cylinders are also rated for a minimum 100 cycles and are easily replaceable. Triple strain relieving is provided on all units.

Pro-Patch and Ultra-Patch — as well as many custom configurations incorporating the split-cylinder contacts — are fast setting the stage for a new industry standard of wire termination.

For more information on these truly state-of-the-art audio patching systems — or our over 300 other standard audio and video patching systems — write or call ADC Magnetic Controls Co., 4900 West 78th Street, Minneapolis, Minnesota 55435, (612) 893-3000.

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Circle (126) on Reply Card

people

The Tektronix Communications Division has announced key reassignments within its Television Products Business Unit. **Larry Kaplan** has been named business unit general manager. Kaplan replaces **Chuck Barrows**, who has been named strategic business and engineering development manager for the Communications Division. **Austin Basso**, 17-year Tektronix veteran, has been named national sales manager. **Steve Kerman**, a 23-year Tektronix veteran, has been named marketing manager. Both Basso and Kerman will report to Kaplan.

Thomson-CSF Broadcast has announced the appointment of **John W. "Bill" Park** as vice president of marketing and sales. Park joins Thomson-CSF from the Sony Corporation, Broadcast Products, where he was vice president of marketing. At Thomson-CSF, he will be responsible for all sales, marketing and service functions of its line of professional broadcast products.

Two executives of the Mutual Broadcasting System have been selected to chair committees of the National Association of Broadcasters for the coming year. **Martin Rubenstein**, president and chief executive officer of Mutual, will serve a second term as chairman of the First Amendment Committee, which identifies issues affecting broadcasters' freedom of speech and press. **William Wisniewski**, vice president for communications services, was appointed chairman of the Broadcast Engineering Conference Committee after serving as chairman of its Engineering Achievement Award subcommittee in 1982.

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A Complete Family of Rack Mounting Self Contained Audio Distribution Amplifiers

- OUTPUT NOISE: -90 dBm
- DISTORTION: TYP. 0.1% LINE IN
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- ISOLATION: 80 db BETWEEN OUTPUTS AND OUTPUT TO INPUT

FEATURES

- Transformer coupled floating MIC input
- Balanced bridging line input
- 8 balanced transformerless outputs
- 16 balanced transformer less outputs
- Adjustable gain
- Metered input & output (switchable)
- "Softknee" variable 30dB compressor

MODEL NOS.

	7821	7822	7823	7833
<input type="checkbox"/> Transformer coupled floating MIC input			✓	✓
<input type="checkbox"/> Balanced bridging line input	✓	✓	✓	✓
<input type="checkbox"/> 8 balanced transformerless outputs	✓		✓	✓
<input type="checkbox"/> 16 balanced transformer less outputs		✓	✓	✓
<input type="checkbox"/> Adjustable gain	✓	✓	✓	✓
<input type="checkbox"/> Metered input & output (switchable)	✓	✓	✓	✓
<input type="checkbox"/> "Softknee" variable 30dB compressor				✓

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**Don't wade through 1,000
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Use BE's 3rd Annual Spec Book instead

**Watch for it
in November!**

Broadcast Engineering's *Spec Book* is the industry's only available single-source broadcast equipment reference encyclopedia. *Spec Book* is designed to save you time by providing reliable specs for making easy equipment comparisons. On nearly 1,000 different products. And, based on your input from last year's edition—and your suggestions for enhancing *Spec Book '83*—this year's *Spec Book* will be more comprehensive than ever before. Offering you valuable reference data, like:

- * **Comprehensive category listings** — of available broadcast and broadcast-related equipment. Including manufacturer names, model numbers, product specifications and special features for each listed model.

- * **Reader service numbers** — for each listed product. So you can request additional manufacturer information quickly and easily.

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All in a convenient, easy-to-read format.

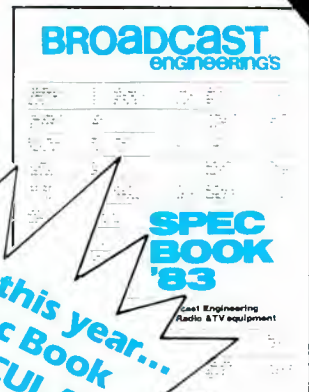
Now — something to make *Spec Book* even more valuable...

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You've told us that *Spec Book* is a big winner with you. And here's how *Spec Book* can make you a big winner — of a \$1,000 digital audio disc player!

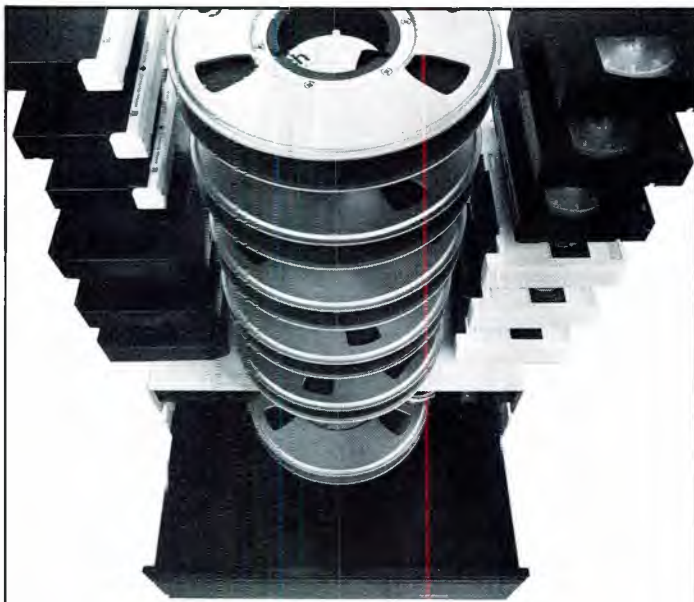
On the front cover of the forthcoming November issue you'll see 25 sections of equipment specs carefully selected from inside the issue. If you can match the cover specs with their exact location inside *Spec Book*, you can win a digital audio disc player valued at \$1,000.

You'll find complete contest rules and an entry blank inside the **3rd Annual 1983 *Spec Book***. Don't miss your chance to win a state-of-the-art digital audio disc player — enter the ***Spec Book* SPEC*TACULAR** contest! Coming to you in November.

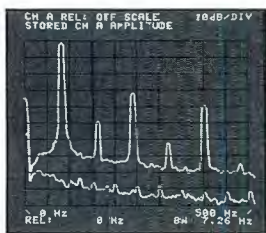


BROADCAST
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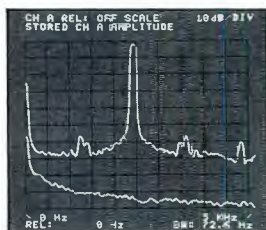
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To erase today's tapes . . . particularly 1-inch C-Format 3/4- and 1/2-inch cassettes . . . you need twice the erasure power to eliminate all residual signals of low-frequency recordings.



Videomax TD-800 tape demagnetizer has enough power to erase the most persistent videotape . . . even audio and time code . . . at a full 80 dB. That's 10 dB more than any 1-inch VTR.



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Andrew V. Juettner, Jr. has been appointed director of engineering of Townsend Associates. Juettner was formerly vice president of engineering of Harris' Broadcast Products Division.

C. F. Rockhill, vice president, sales and marketing of Moseley Associates, has announced the appointment of **Weldon Squyres** as manager of international sales. Squyres, formerly with Ampex Corporation's International Division, will be responsible for the sales of all Moseley manufactured products through a distributor network of 44 representatives in more than 80 countries.

Acquis Ltd. has announced the appointment of **Max Morgan** as distributor sales manager. Morgan will be based in the Acquis Ltd. office in London, and will be responsible for all distributor sales in the United Kingdom, Europe, Africa, Far East and Australia.

Dr. John J. Guarrera, who has served as the National Computer Graphics Association's (NCGA) treasurer during the last year, has been elected president of the association beginning Oct. 1, 1984. He will serve this year as NCGA president-elect. Last year's president-elect, **Ellen M. Knapp**, took office as president on Oct. 1. NCGA members also elected **Morris L. Samit** as a vice president; **Dr. Phillip S. Mittelman** as treasurer; **Gary Romans** as secretary; **Dr. James D. Foley** as the new academia representative, **Joel N. Orr** as consulting representative, and **Dale Christensen** as a government representative.

Ira Porter has been appointed regional sales manager for Dearborn Wire & Cable Company's newly opened office and warehouse in Chino, CA.

Greg Gambill and **David Diels** have been named district managers for MCI/Quantel. Former district managers **Paul Fletcher**, **Charles Martin** and **David Dever** have been promoted to regional managers.

Clear-Com Intercom Systems has appointed **Gerow D. (Gerry) Brill** as national sales manager. Brill will conduct a series of dealer/consultant seminars throughout the country, highlighting Clear-Com's new broadcast systems and interfaces.

Franklyn R. Beemish of Editel, New York, has been elected to the board of directors of A.B.P. Systems and will join the company as corporate vice president.

Sharp Electronics Corporation has announced the appointment of two new regional sales managers in the company's Professional Products Division. **Ron Parker** has been appointed sales manager of the division's Southern region, and **Paul Insko** has been named sales manager of the Midwestern region. In their new positions, they will be responsible for the sales and marketing of Sharp Broadcast Video and A-V products within their own regions.

Conrac Corporation announced that **Warren O'Buch** has been named president of the company's Conrac Division located in Covina, CA. O'Buch joined the Conrac Division in May 1982 as director of marketing. He had previously held finance, manufacturing and marketing positions with Hewlett-Packard Corporation.

Comtech Antenna Corporation has announced the appointment of **Thomas C. Christy** to director of marketing. Christy will assume responsibility for the overall marketing activities of the corporation. ☺

calendar

Nov. 28-Dec. 1

GLOBECOM '83, *The Global Telecommunications Conference*, will be held at the Town & Country Hotel & Convention Center in San Diego. It will feature 48 technical sessions covering more than 20 topics. The technical program includes two sets of coordinated topic sessions: encryption and interactive communications and television. For more information, contact Dr. Estil Hoversten, general chairman, M/A-COM Linkabit, at 619-457-2340, or Jane Riley, registration chairman, Burroughs, at 619-451-4901.

Jan. 23-25, 1984

The Hyatt Regency in New Orleans will be the site of OFC-84, a topical meeting on optical fiber communication. Topics will range from basic research to hardware manufacture and systems development and applications. For more information, contact, OFC-84, c/o Optical Society of America, 1816 Jefferson Place, NW, Washington, DC 20036.

Feb. 9-14, 1984

"The Road to the Future" will be the theme of the 21st Annual NATPE (*National Association of TV Program Executives*) International Conference at the Moscone Center in San Francisco. Two futurists, John Naisbitt and Robert Waterman, Jr., each with a best seller on the book lists for the past year, have been signed to make special presentations. Joan Rivers will headline the Iris Awards evening. For more information, contact NATPE, Suite 1205, 30 E. 42nd St., New York, NY 10017, 212-687-3484.

Feb. 10-11, 1984

The 18th Annual SMPTE TV Conference will be held in the Queen Elizabeth Hotel in Montreal. For more information, contact the SMPTE, 862 Scarsdale Ave., Scarsdale, NY 10583.

March 12-14, 1984

The Fifth Annual Fiber Optical Communications short course will be offered by the Center for Professional Development of Arizona State University's College of Engineering and Applied Sciences. The course is designed for those entering the fiber-optics industry—systems and component designers, manufacturing engineers, engineering managers, marketing managers, sales engineers, teachers, and others who require an understanding of optical waveguide communications. More information is available from the ASU Center for Professional Development at 602-965-1740.

April 25-27, 1984

EDS '84, the 1984 *Electronic Distribution Show and Conference*, will be held in the Las Vegas Hilton Hotel, Las Vegas, NV. For the first time in the convention's 47-year history, distributors are invited as exhibitors. For more information, contact Electronic Industry Show Corporation, 222 S. Riverside Plaza, Suite 1606, Chicago, IL 60606; 312-648-1140.

April 29-May 2, 1984

The NAB 62nd Annual Convention and Exhibition will be held at the Convention Center in Las Vegas, NV. The show, which features radio seminars, discussions of TV trends, exhibits and demonstrations, will bring all the latest equipment under one roof. For more information, contact: NAB Convention Information, 1771 N St., NW, Washington, DC 20036.

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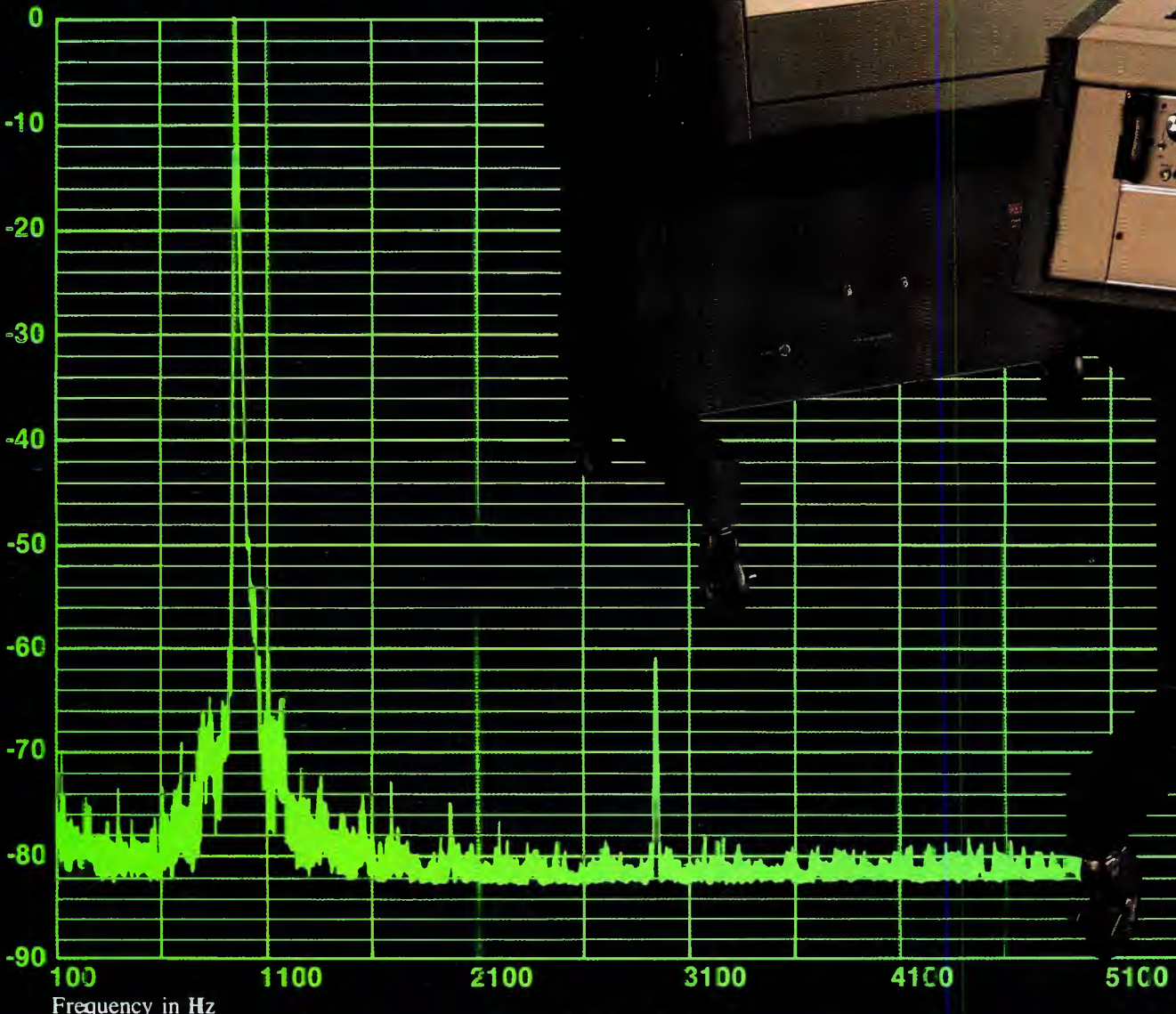
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JH-1108-2-HP

Amplitude in dBm



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In a world filled with claims and counter claims for high performance audio products, sometimes it's hard to separate opinion from fact. That's why MCI has provided complete graphic proof of all important tape recorder/reproducer performance characteristics. Now available in a handy Engineering Notebook, these curves and their accompanying methodology form the standard by which all other tape recorders must be judged.

If performance matters in your broadcast or teleproduction application, don't be fooled by "simple specmanship." And if you want to decide for yourself how the JH-110 Series measures up to comparable units, just ask Sony Broadcast to arrange for a demonstration.

Does MCI really outperform the rest? We'll let you decide. For your free copy of the Engineering Notebook and more information about our demonstrator program, call Tony Dean, Eastern Regional Sales Manager, Audio Products, (305) 771-3997, or Holmes Ives, Western Regional Sales Manager, Audio Products, (213) 841-8711.

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JH-110B-2-VP

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CHINA

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Broadcast Engineering invites you to join this high level delegation.

You and a limited number of other select international broadcast executives and equipment manufacturers will have a rare opportunity to meet with China's top broadcast station and equipment manufacturing officials and specialists. You will participate in one of the most complete technical tours of the Chinese broadcast industry ever organized. And the first such tour ever offered to the entire broadcast industry.

Sponsored by BROADCAST ENGINEERING in cooperation with The Ministry of Broadcasting and Television, this exclusive technical tour delegation is open to international broadcast station executives, consultants, equipment manufacturers and prominent educators.

Itinerary:

Organized with your needs and interests in mind, the itinerary includes each Chinese city visited. Delegates will have the opportunity to talk frankly with Chinese broadcast facility and plant operators at the plant and facility sites.

visits to key technical facilities in Chinese broadcast facility and plant operators at the plant and facility sites.

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- Shanghai
- Guangzhou
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- Broadcast Technical Institute
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Special Note:

The number of tour delegates will be strictly limited. Persons interested in participating should inquire early.



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May 15-18, 1984

Communications 84, an international exhibition, will be held in Birmingham, England. A 3-day conference program, organized by the IEE, will complement the exhibition activity. For more information, contact Kallman Associates, US Representative, 5 Maple Court, Ridgewood, NJ 07450; 201-652-7070.

May 14-17, 1984

The International Conference on Communications (ICC-84) will be held in Amsterdam, the Netherlands. Topics include communication switching, communication networks, radio communications, and satellite and space communications. For more information, contact Dr. T.A.C.M. Classen, Secretary ICC-84, Philips Research Laboratories, WY-2, 5600 MD Eindhoven, the Netherlands.

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Editorial

Continued from page 8

wish to do so; it must select some and reject others. Charles Firestone (of the UCLA Law Project) put it simply, "As long as there is not free entry in and out, there isn't a marketplace."

Finally, are Federal regulations of any kind an unconstitutional abridgement of the First Amendment? The best answer is that the Supreme Court several times has said, "No, they are not."

I personally believe broadcasting's fairness doctrine is not a restraint on the First Amendment, but a stimulus to it. It is not censorship of broadcasting, but rather the public's best protection against censorship.

Let me hasten to say that I am a businessman and that I am heartily in favor of governmental deregulation in the many areas where I think it would prove beneficial. I think, for example, that a wide variety of FCC technical regulations are outmoded and unnecessary—and that broadcasters are fully capable of determining how best to equip and maintain their physical plants. I believe in the marketplace. I think that a reliance on the marketplace will often, and even usually, make all our lives more productive, more free and more fair. It's just that I don't think it will always do that.

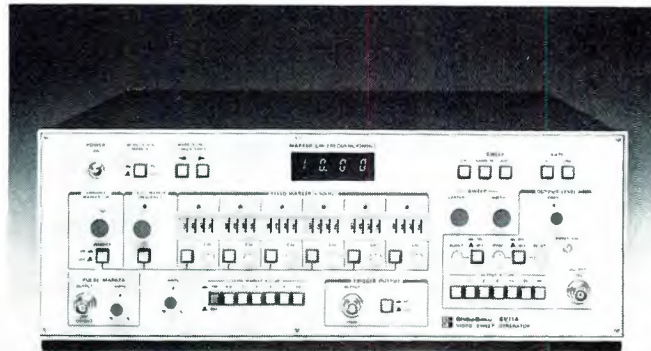
There are many other issues of broadcast regulation we broadcasters must consider. Foremost among these, in my opinion, is affirmative action to increase participation in the broadcast and cable world by women and racial minorities. None of us can be indifferent to the recent spectacle of the Christine Craft case. None of us can be satisfied when we attend a network affiliates' meeting and look around and have the truth thrust upon us. Ours is an industry that, at the top and near the top, is still a world of white, well-to-do men.

We have to address problems like that, but I'm afraid we can't ask the nation to rely merely on our own virtue and wisdom. Granted, we can't rely on the FCC either. The commission can't do the job alone. But fortunately, there's a third leg on the tripod. Because of the regulatory framework that many would now have us abandon, there is a way for outside parties to be heard. Because there is a regulatory framework, we broadcasters can all be faced with important truths. The public's right of access is far too precious, I think, for us blithely to throw it away while we chase after such phantoms as a "totally free marketplace of information abundance."

I believe that American broadcasters have, on the whole, and especially in TV journalism, served this country well. But I do not see how our past service within a system of public accountability can prove that very system now to be unnecessary. The need to protect the public interest by a system of checks and balances isn't obsolete.

⌋:~(-)⌋⌋⌋⌋⌋⌋

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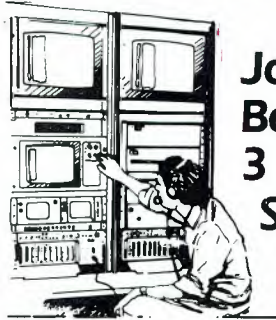
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Responsibilities will include performing maintenance sweeps to discover items in need of repair, diagnosing problems, ordering needed parts, effecting their repair, and follow-up report writing; plus interfacing with other consultants.

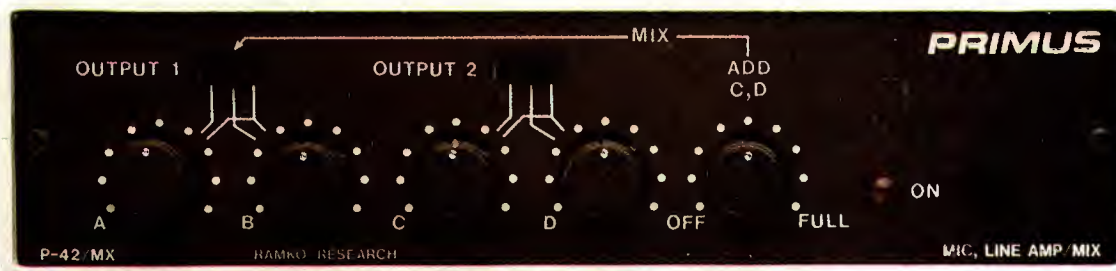
These are great opportunities for professionally-oriented individuals who appreciate a real challenge and want to be rewarded handsomely with attractive salaries, generous project completion bonuses, and excellent benefits including health, life, dental coverages and actual equity participation in our employee-owned company.

So if you're looking for a position where you work on new and different problems and assignments daily and have what it takes to handle them, we would like to talk with you. Forward your resume with salary history, in strictest confidence to: **Ron White, Avtec Industries, Inc., 39B Industrial Avenue, Teterboro, New Jersey 07608.**

AVTEC
Industries, Inc.

—a world leader in custom-designed turnkey communications systems

INTRODUCING THE NEW PRIMUS™ AUDIO COMPONENTS



**CERTIFIED
PERFORMANCE**

Powerful performance in the palm of your hand.

PRIMUS (Pree-mūs): an array of compact, performance-engineered audio electronics from Ramko Research.

The new PRIMUS components are unlike any professional audio equipment you've ever used. Never before has so much advanced performance been put into such compact and rugged packages. Rarely have you had available so many features and options to help get the job done. Never have you had a three-year warranty that's backed up by factory certified proof-of-performance.

PRIMUS is a comprehensive range of components that give you the flexibility to configure an audio system limited only by your imagination. Whether you choose from tabletop or rack mounting versions, there's hardly an audio job that can't be improved upon.

Here's a partial list of models currently available:

- Lab standard mono or stereo turntable preamplifiers.
- Dual and quad input, gain selectable microphone/line amplifier mixers.
- Audio distribution amps from three (3) stereo/six (6) mono up to eight (8) stereo/sixteen (16) mono outputs. All models feature individual recessed front panel adjustments or optional high resolution, conductive plastic potentiometers.
- Mic/Line equalizer amplifiers with balanced I/O and up to ± 15 db of reciprocal equalization.
- Expandable audio console mixers with cueing, selectable EQ, metering phones and monitor.
- Voicegard™ combination limiter/compressor, noise gate with variable threshold and slope ratio; gain reduction metering.
- Signal processing VCA's with six (6) independently controlled channels. DC remote control with balanced outputs.
- R/P and playback, stereo and mono NAB cart machines.

Whichever combination of precision PRIMUS audio components you choose, you're guaranteed outstanding specifications. For example, our stereo turntable preamplifier measures:

Signal-to-noise Ratio: -93 dB (A weighted)
 Total Harmonic Distortion: Below .0018%
 Frequency Response: 10 Hz to 20 kHz, $\pm .25$ dB
 Stereo Separation: -70 dB @ 1 kHz
 Output Level: $+25$ dBm (10 Hz - 20 kHz)

The simplified and modular packaging of PRIMUS allows us to concentrate the quality where it belongs: in state-of-the-art circuitry. High slew-rate integrated circuits and extensive ground planes insure the highest RFI protection.

All IC's plug into gold plated sockets. All models feature quick disconnect I/O connectors and require only 1 3/4 inch standard rack height.

We've taken another important step, too.

When you invest in PRIMUS, you receive a *Certified Performance Gold Card* that instantly puts you in touch with our Technical Assistance Department on a toll-free line. Just call in your registered serial number and you're in touch with the advice you need.

To put PRIMUS audio components to task on a free two-week trial, call toll free (800) 821-2545 or contact your nearest Ramko Research sales representative or distributor. Put the powerful performance of PRIMUS in the palm of your hand.



PRIMUS audio components are an array of compact, performance-engineered rack mounting or tabletop packages.



PRIMUS is a division of Ramko Research, Inc. 11355-A Folsom Blvd., Rancho Cordova, California 95670

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Circle (1) on Reply Card

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