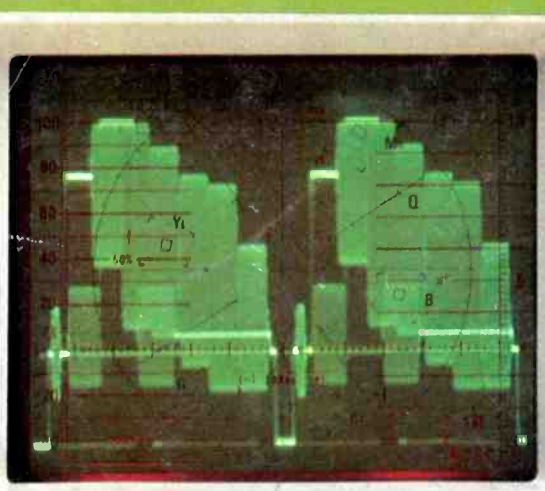
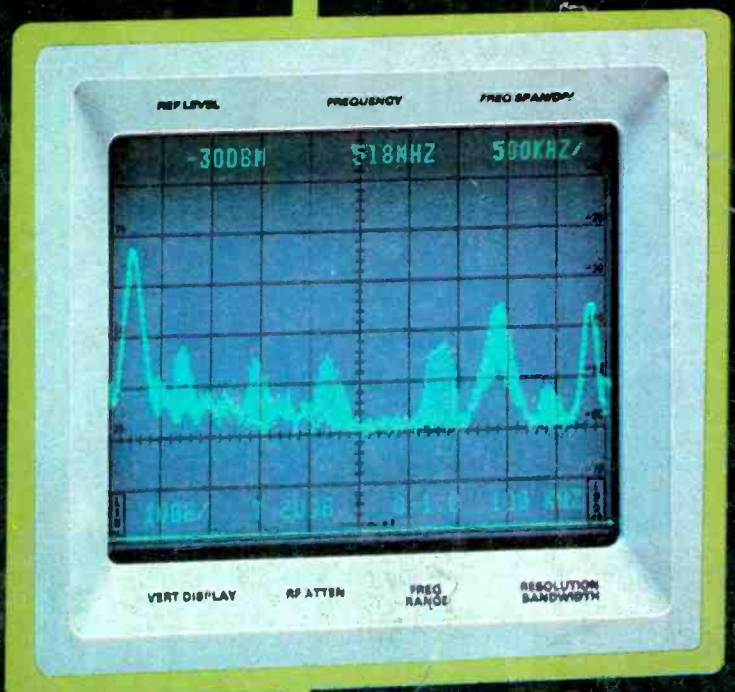
BROADCAST ENGINEERING

May 1982/$2





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BROADCAST engineering

The journal of broadcast technology

May 1982 • Volume 24 • No. 5

ISSN 0007-1994.

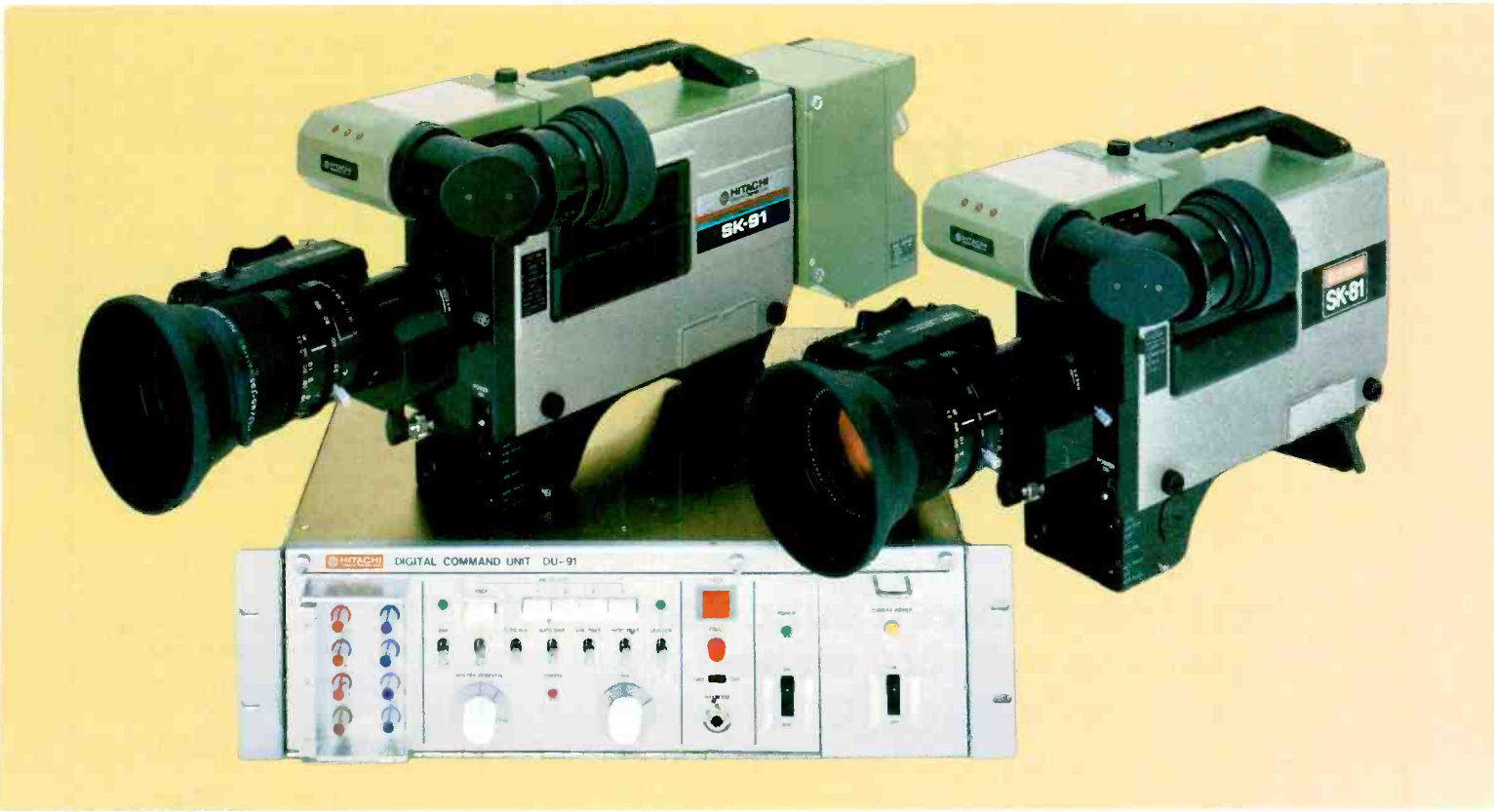
BROADCAST ENGINEERING (USPS 338-130) is published monthly by Intertec Publishing Corporation, 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212-9981. Postmaster, return form 3579 to the above address.

THE COVER this month reflects monitor waveforms seen daily in the TV station from the waveform monitor, the vectorscope and the spectrum analyzer. These three pieces of equipment, with precision demodulators, are vital for the day-to-day monitoring of signal quality as well as for proof-of-performance tests. "TV Test Equipment: Monitoring Video Parameters," an article by Carl Bentz, surveys the growing range of such equipment available to broadcasters.

The cover artwork, provided by Tektronix, shows a display provided by the 380 NTSC test monitor, the 520A vectorscope and the 496 spectrum analyzer.

NEXT MONTH we will feature in-depth coverage of events and exhibits of the NAB-'82/Dallas Convention. Special emphasis will be given to covering advancing technology as brought out in technical sessions and workshops and to new equipment introduced by exhibitors.

"I want a world-class camera I can take a mile from the van, and still get 57 dB S/N and 600-line resolution."



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Then you're looking for broadcast-quality. Then you're looking for lightweight equipment you can carry unencumbered by anything but a lightweight triax cable.

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It has an auto-iris closure. A +9/18 dB high-grain switch. Horizontal and vertical blanking widths adjustable over a wide range. An auto black balance control as well as an auto white balance control.

The SK-81 gives you just a shade less performance for $22,000. The DU-91 at $18,900 lets you get great pictures with either the SK-91 or SK-81 whether you're shooting at the low-light levels of a coal mine or going to the top of the world. Who from? Who else? Hitachi Denshi America, Ltd., 175 Crossways Park West, Woodbury, NY 11797. (516) 921-7200. Offices also in Chicago, Los Angeles, Atlanta, Cincinnati, Dallas, Denver, Seattle and Washington, D.C.

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BROADCAST ENGINEERING (USPS 338-130) is published monthly by Intertec Publishing Corporation, 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212-9981. Postmaster, return form 3579 to the above address.

BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons also include consulting engineers and dealer/distributors of broadcast equipment.

SUBSCRIPTIONS: **BROADCAST ENGINEERING** is mailed free to qualified persons in occupations described above. Non-qualified persons may subscribe at the following rates: United States, one year, $25; all other countries, one year, $30. Back issue rates, $5, except for the September Buyers' Guide issue, which is $15. Rates include postage. Adjustments necessitated by subscription termination at single copy rate. Allow 6-8 weeks for new subscriptions or for change of address. Controlled circulation postage paid at Shawnee Mission, KS.

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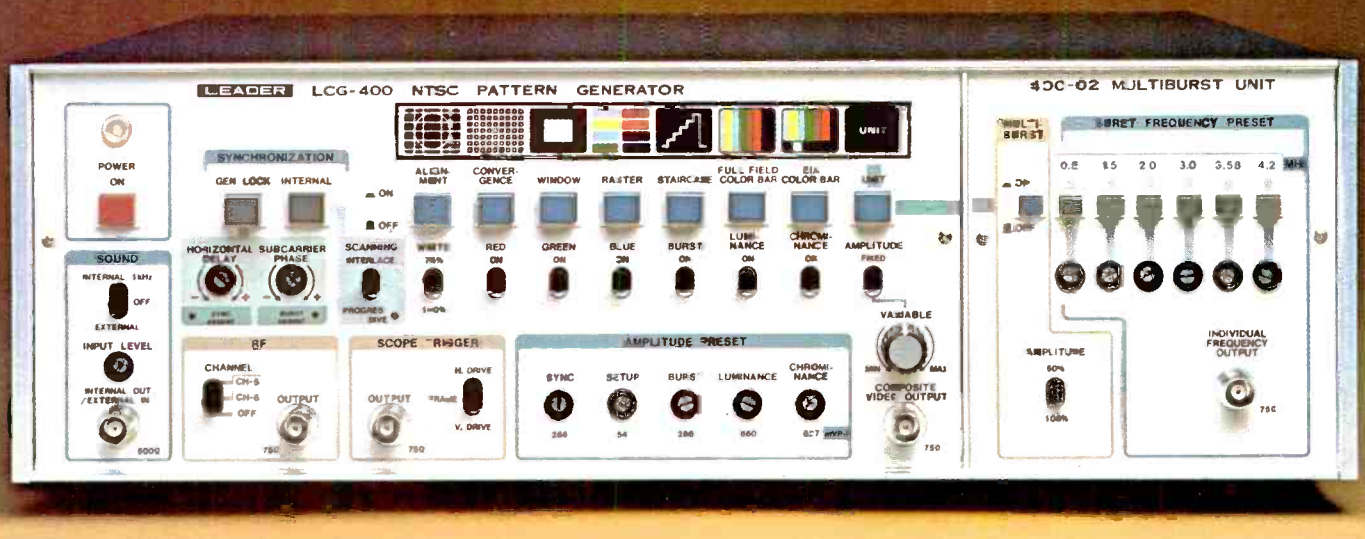

Precise NTSC sync/test pattern generators.

Leader's LCG-400 series sync/test generators provide accurate reference signals for any off-the-air broadcast or non-broadcast operation. Available in either multi-burst or sweep marker configurations, the LCG-400 provides EIA and full-field color bars as well as staircase, raster (in eight colors), window, convergence and cross-hatch test signals...plus gen-lock capabilities and a host of auxiliary outputs. As a matter of fact, Leader's sync/test generators do virtually everything the $4,000 generators do... except cost as much.

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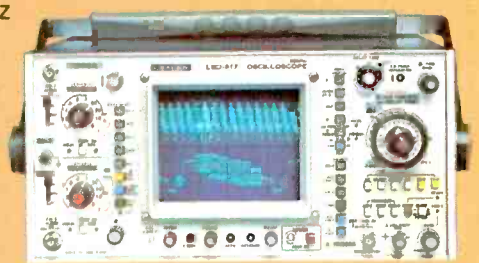
The Leader LBO-517 oscilloscope makes accurate and detailed measurements. It offers sensitivities of 1 mV to 10 MHz and 5 mV to 50 MHz. Two main and two auxilliary channels can be displayed on main and delayed time bases (8 traces) simultaneously while intensifying the delayed portion. Composite triggering provides *stable* viewing of two asynchronous inputs. Positive, stable triggering on composite video signals, at either H or V rates, is automatic. Leader's new dome-mesh 20 kV CRT assures bright, clearly defined displays, even at the highest or lowest sweep rates. All for under $2,000.



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FCC update

May 1982

LPTV service authorized

The commission recently voted to establish a low power TV service to provide new broadcast programming and ownership opportunities. The service will operate on a secondary noninterference basis to full-service TV stations. Except for strict compliance with technical standards to minimize radio frequency interference, the LPTV service will be essentially unregulated, based on the commission's belief that market forces should dictate such operational and structural aspects as programming and ownership patterns in a new service whose viability is undetermined.

Noting that public comments overwhelmingly favored the LPTV service, the FCC stressed that it was providing an opportunity for a new and needed broadcast service, not a guarantee of success for LPTV licensees.

"As the public has been reminded, a low power license may not be a license to print money," the FCC said. "It certainly is, however, a license to serve the public. It is in this spirit that we authorize this service. The commission expects that low power will succeed, increasing competition in telecommunications and acting as a bellwether for unregulation of the broadcast services generally."

The distinction between translators and low power stations is that translators rebroadcast a full-service station's signal, while LPTV stations *may* originate programming, but are not required to do so. Low power stations must be used for broadcast, not private, purposes, as broadcast is defined in the Communications Act and FCC rules.

The LPTV proceeding started in 1978 as an inquiry into the role of LPTV broadcasting in the overall national telecommunications system. In September 1980, the agency proposed the low power TV service and established interim processing procedures for handling translator applications, including those seeking waivers for low power features, pending the outcome of the rulemaking. In April 1981, faced with nearly 5000 on-file applications and with insufficient staff and computer capability to handle them, the commission stopped accepting new applications, with limited exceptions. That moratorium will not be lifted until the application backlog has been reduced.

In July 1981, the agency proposed technical standards for processing translator and LPTV applications using a computerized prohibited contour overlap approach to whittle the application backlog. This report and order adopts those standards.

Meanwhile, approximately 80 interim translator grants have been made in the continental United States, 10 including waivers for low power features. More than 100 interim grants have been made for low power operations in Alaska.

It is estimated that, over the next few years, as many as 1000 LPTV stations could be authorized, many in rural areas, under the recently adopted rules. To facilitate service to rural America, a primary goal of the rulemaking, the FCC is implementing a phased processing program, beginning with applications for rural areas.

This proceeding was based on the following criteria set forth in the 1978 inquiry notice as the framework for initial policy development:

- public need for program diversity. There is a public desire for additional TV service, which low power stations can provide. However, the nature of that programming is properly left to the licensees' discretion, based on market forces.
- spectrum requirements and interference to communications services. Despite the concerns of full-service broadcasters, cable operators and land mobile radio services, among other broadcast spectrum users, all competing uses for TV spectrum can be accommodated to some degree, with full-service stations assured primary use.
- media competition and economic impact, low power/translator economic viability and ownership. There is no convincing evidence that LPTV could have a competitively destructive impact on existing broadcast, cable or microwave stations; nor any assurance of LPTV's viability. For the latter reason, existing licensees will be permitted to own low power stations within the limits of the comparative criterion favoring diversification of broadcast interests. LPTV, as authorized, largely unregulated, will foster a service that may provide programming alternatives, increasing competition and enhancing telecommunications services for the public.

impact on FCC resources and service implementation delays. Applications received have strapped the commission's ability to process them. Therefore, to facilitate processing of the applications on hand, the freeze on new applications will not now be lifted. The agency will use a tiered processing system, evaluating the most rural applications first and working through to the pending urban applications before the freeze is lifted fully.

To shorten the hearing process, the commission has streamlined its comparative hearing procedures and will use largely paper hearings. When and if the commission adopts a lottery system for choosing among competing broadcast applications, it will be used in low power. Until then, competing applicants are encouraged to settle conflicts and resolve mutual exclusivities themselves. The commission strongly encourages plans for time-sharing and resource pooling (which could be beneficial because the service's viability has not been proven) and will try to rule promptly on all such settlements.

The following is background information supporting the FCC action in low power television.

LPTV chronology

- Aug. 8, 1978
  Notice of inquiry issued initiating the proceeding.
- Sept. 9, 1980
  Notice of proposed rulemaking adopted.
- April 9, 1981
  FCC votes to stop accepting applications.
- May 14, 1981
  First low power application granted.
- July 30, 1981
  Further notice of proposed rulemaking adopted.
- March 4, 1982
  Report and order.

On Sept. 9, 1980, the FCC issued a notice of proposed rulemaking proposing to authorize a new broadcast service consisting of low powered TV stations. The principal rule change proposed was that TV translators, at

Continued on page 126

AFFORDABLE ONE-INCH

Introducing the Ampex VPR-80.
Type "C" broadcast quality on a budget.

Excellent picture quality and low cost. That's what you get with the VPR-80, the new professional video recorder from Ampex. Whether you're adding to your present facility, or moving into the professional video market, you'll find the VPR-80 to be a totally new concept. Yet, it incorporates the most demanded features of the world's most popular one-inch Type "C" VTR, the VPR-2, plus several new and advanced capabilities.

The VPR-80 provides the latest in recording technology. You get a transport designed for superior tape handling of all reel sizes from 6½ inch "spots" to 2-hour, 11¾ inch reels. It has dual microprocessors to control all VTR functions and servo systems, a universal power supply, built-in audio monitoring and a power-down feature that remembers the control panel setup even when the power's off. Plus built-in diagnostics to keep operation and maintenance costs to a minimum. But there's more.

You also get as standard the Ampex exclusive AST™ automatic scan tracking for perfect slow motion and still frame pictures, plus frame-accurate editing with simple, operator-oriented controls. Not to mention table-top or rack-mount versatility and compatibility with the entire family of Ampex VPR accessories. With the VPR-80, everything from setup to servicing can be accomplished with a minimum of effort and time.

The VPR-80 was truly designed for the operator. And it's backed by the unique worldwide service and support that Ampex is known for. To find out how the VPR-80 fits into your application, contact your Ampex representative or write Ampex Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, CA 94063 (415) 367-2011.

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From the top, front and back with hinged door assemblies providing easy access to the audio system, major plug-in printed wiring assemblies and power system.

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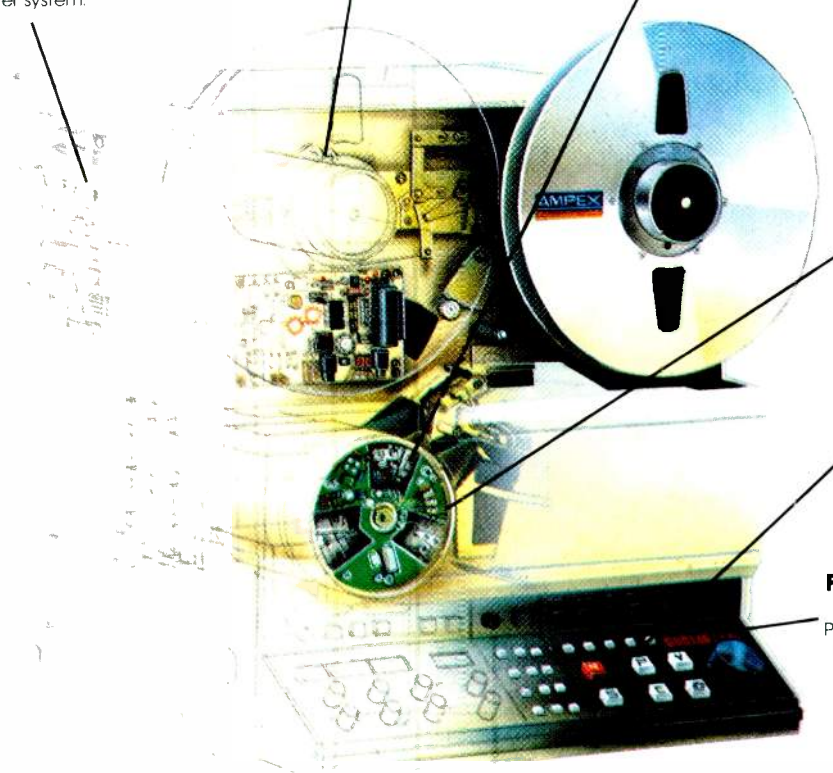
For fast and gentle tape handling of all reel sizes from 6½ inch "spots" to 2-hour, 11¾ inch reels.

AST™ Automatic Scan Tracking
Delivers disturbance-free slow motion from play to still frame mode.



Individual Head Replacement
Quickly with only a screwdriver. No mechanical adjustment or drum change required.

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Results from the VPR-80's precise tape timer and search system, AST™ and simple edit controls.

Fault And Non-Standard Operation Detection
Performed as part of the power-up sequence. If detected, the specific condition appears as a unique code in the timer display.

news

NASA device may reduce UHF power needs

A radio wave amplifier invented by Dr. Henry G. Kosmahl, an electron physicist at NASA's Lewis Research Center, may benefit UHF TV stations by reducing electrical power requirements significantly.

This has potential advantages especially for US non-commercial public TV stations, because the majority of them transmit on the UHF TV band.

The device, a multistage depressed collector, was originally invented by Kosmahl to improve communications satellite efficiencies. The device increases the intensity of radio signals transmitted by communications satellites without increasing power consumption—a real benefit for solar-cell-operated spacecraft. The device can also be used for terrestrial microwave or ultra-high frequency (UHF) TV transmissions.

A typical, large, 200kW UHF TV station in a medium to large metropolitan area requires about $300,000 worth of electricity per year to stay on the air. By 1985, with expected fuel surcharge and inflation increases, the electric bill for US UHF broadcasters could reach $100 million.

The application of the multistage depressed collector to transmitter amplifier tubes now installed at UHF stations could reduce electric consumption by as much as one-third to one-half. This could amount to a savings of about $45 million beginning in 1985. Installation and equipment charges for this device are expected to pay for themselves in one year.

UHF TV stations presently use devices called klystrons to generate and amplify the ultra-high frequency current. Klystrons operate at efficiencies of only about 10 to 15%. By modifying the klystrons to include the multistage depressed collector, efficiencies of up to 30% are achievable. These higher efficiencies reduce power consumption levels correspondingly.

Communications satellites use microwave frequency amplifiers for transmission to earth antennas. These amplifiers convert only about 20% of available electricity into radio waves. The remaining 80% of the electricity—produced by solar cells—becomes waste heat within the satellite and must be dissipated by a cooling device. Kosmahl's device recaptures this waste energy to strengthen the microwave signal, reducing on-board

Continued on page 128

MORE THAN A PORTABLE

Acquisition plus studio-type control makes the Ampex VPR-20B your professional portable.

If you need more than just a portable acquisition recorder, choose the improved Ampex VPR-20B. When you go into the field for realism and immediacy, you'll know you've got it. Right the first time with videotape you've already reviewed, edited and played back—on location, ready to air.

It's the VPR-20B's exclusive dual-cue editing that gives it studio-type control in the field. From instant reviews with precise return to the next edit point, to total control when replacing undesired material with mid-segment, color-frame accurate edits. You can now have it all in one easy-to-use portable.

With the VPR-20B you also get top quality audio and video every time. The built-in video confidence and color stabilizer features play the picture back from the tape into the camera viewfinder, or any color monitor, during recording. So you'll know that the picture you see is the one you've got! And, unlike other portables, the VPR-20B has a simple plug-in AC power pack which replaces the battery. You can forget about bulky external power supplies.

Most of all, the VPR-20B is backed by the unique worldwide service and support that Ampex is known for. So before your next field production, find out more from your Ampex representative. Or write Ampex Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, CA 94063 (415) 367-2011.

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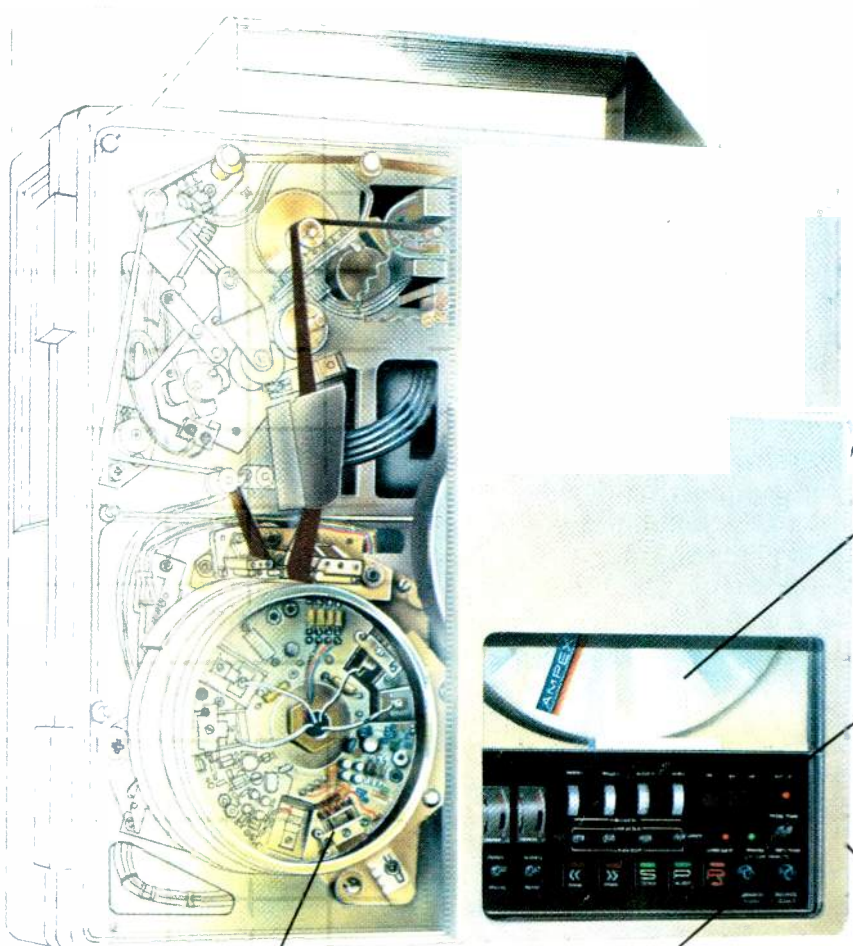

Built-In Color Stabilizer
Lets you show full color in the field without time base correction.

One-hour-plus Tape Capacity
With long battery life.

Tape Timer And Servo System
Makes cues fast, edits clean and color-frame accurate.

Plug-In AC Power Pack
Replaces battery and eliminates bulky external power supplies.

Individual Head Replacement
Quickly with only a screwdriver. No mechanical adjustment or drum change required.

Exclusive Dual-cue Edit Control
Lets you review, return to next edit and replace unacceptable material with mid-segment edits.

Engineers: An endangered species?

According to views expressed recently by several video and audio equipment manufacturers, engineering departments in radio and TV broadcast facilities serve little purpose beyond providing high-cost labor. In *their* opinion, the engineering staff has little say in decision-making that leads to upgrading current station facilities or toward acquiring new equipment. Further, because deregulation has reduced the legal staffing requirements of engineering expertise, manufacturers seem to be saying that engineers may soon be an extinct breed.

Bunk.

It seems that these manufacturers have failed to study the FCC ruling. Although the ruling called for a reduction in staffing requirements, stations still remain accountable for the quality of the broadcast product in terms of technical standards. And although some pressure has been removed from individual staff members, management personnel assumed additional responsibilities to maintain the signal parameters within industry-accepted limits. The regulatory reduction places a competency judgment upon the shoulders of those ultimately in charge of total station operation, rather than depending on an *official* engineering license. That license, according to the commission, was not always a true indicator of an engineer's competence, but often signified only the ability to pass a technical exam. A key factor in the engineering deregulation action was the inability to pinpoint a technical person's skill.

In our experience, a progressive broadcast station is one that successfully coordinates the efforts of every department, with engineering, production, promotion, finance and general management working as a team toward a common goal. Thus, each segment of the organization has its own area of expertise and responsibility.

It is not intended that engineers provide ideas for new programming or for new effects, but they certainly can offer critical input to those areas. Naturally, programming concepts are the realm of the production staff. In their planning, they approach managers concerning budgets, and engineers about applicability of particular equipment to a production need. Such communication between production and engineering is crucial for the adaptation of new technologies and techniques in station use. Thus, engineers are involved from the very beginning if a more efficient operation is to be achieved or a more salable signal delivered. Only in a small station—in which the production manager, general manager, financial officer and chief engineer is the same person—can change occur without dialogue.

To those of you who think that engineers are *not* crucial members of a station's operating team, we offer these challenges: interface new equipment based upon the information given in the sales pitch and the technical manual; keep new equipment functional relying on manufacturers' customer service departments; design a new facility or revamp a department; and, at the same time, keep the signal quality within the specifications laid out by the industry. Attempting any of these on your own will give you a whole new perspective on the support provided by engineers.

To state, as some manufacturers have, that decision-making about equipment purchases should be left solely to the production department or to the general manager, without a major input from engineering, makes us wonder if they would also ask a pastry chef to repair the engine of a Peterbilt truck.

What do you think?

"I have never been as impressed with a new piece of gear as I am with our programmable SatCom Technologies earth station antenna."

Dave Frasier Technical Operations Manager
WWBT-Richmond, Virginia

WWBT is a technical leader that installs a lot of equipment. According to Dave Frasier, "The technical quality of our new SatCom Technologies' 9.2-meter antenna is excellent, and it has brought new flexibility and a more competitive edge to our programming."

The Model 920C 9.2-meter antenna incorporates high speed drives (2°/sec.) directed by a micro-processor-based programmable controller. The controller can store and access up to 39 satellite positions. WWBT is using the controller's scheduling function to move the antenna automatically from one satellite to another at specific times throughout the day to receive syndicated programming, sports events and feeds from its Washington news bureau.

SatCom Technologies' high-technology antennas are available in sizes ranging from 3-meters to 13-meters. We also offer the exclusive Torus multiple-beam antenna in 4.5-meter and 7-meter equivalent sizes. Each antenna combines the extraordinary high surface accuracy of RSi's AccuShape aluminum reflector with an extremely rigid mount. This means greatly improved sidelobe performance and the ability to upgrade to Ku-band.

Mr. Frasier continues, "We beat our competition, we save ourselves money and headaches. We give our viewers the best service and the best programming, whether it comes from across the state or across the country."

For more information on SatCom Technologies' earth station antennas, call David Speed at (404) 448-2116.

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Photographs courtesy of WWBT Richmond.

Although hazardous weather and rush-hour traffic hindered their efforts, ENG news crews assembled the limited details surrounding the crash. Here, John Goldsmith, WDVM, provides the first broadcast of those facts.

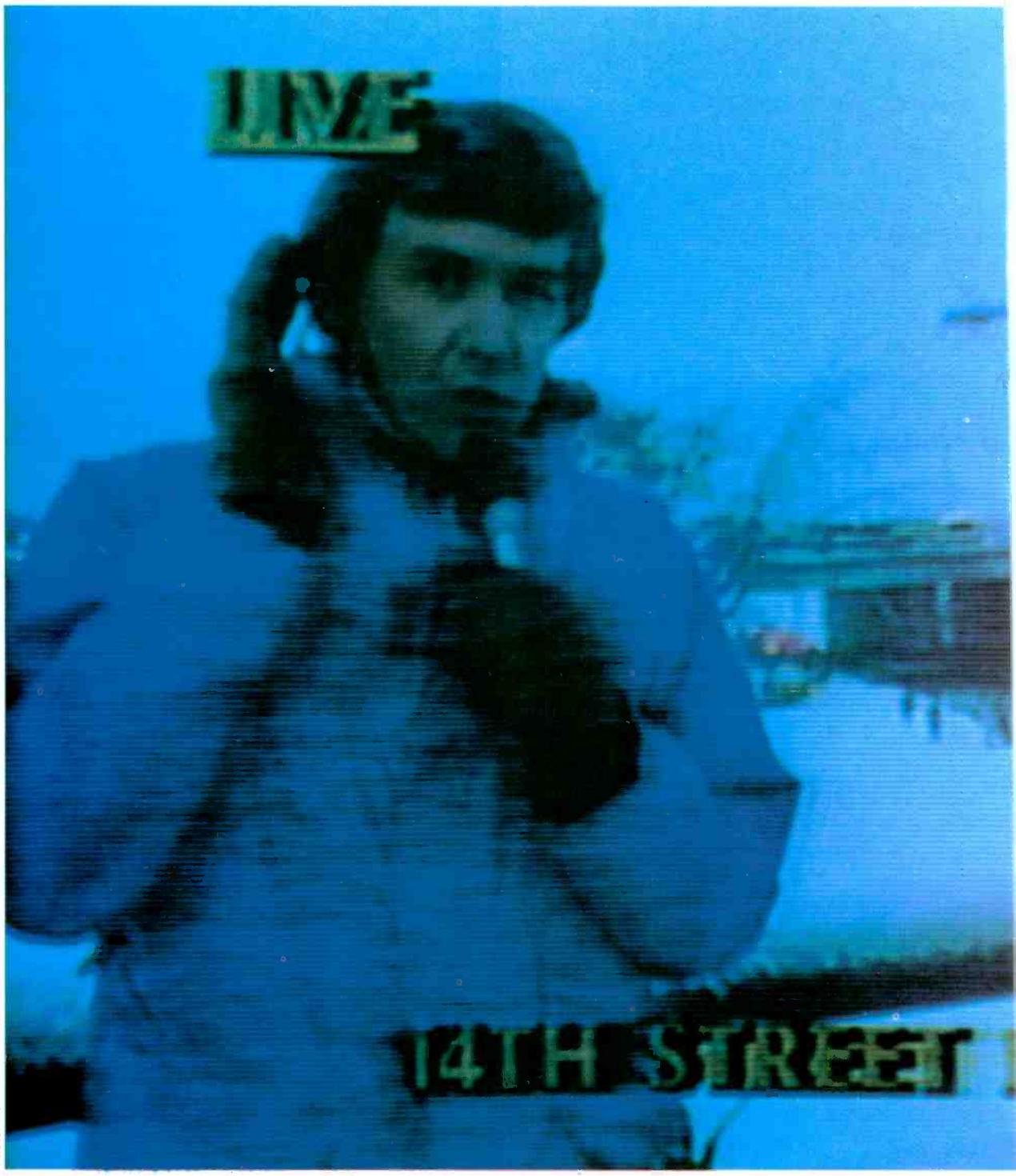
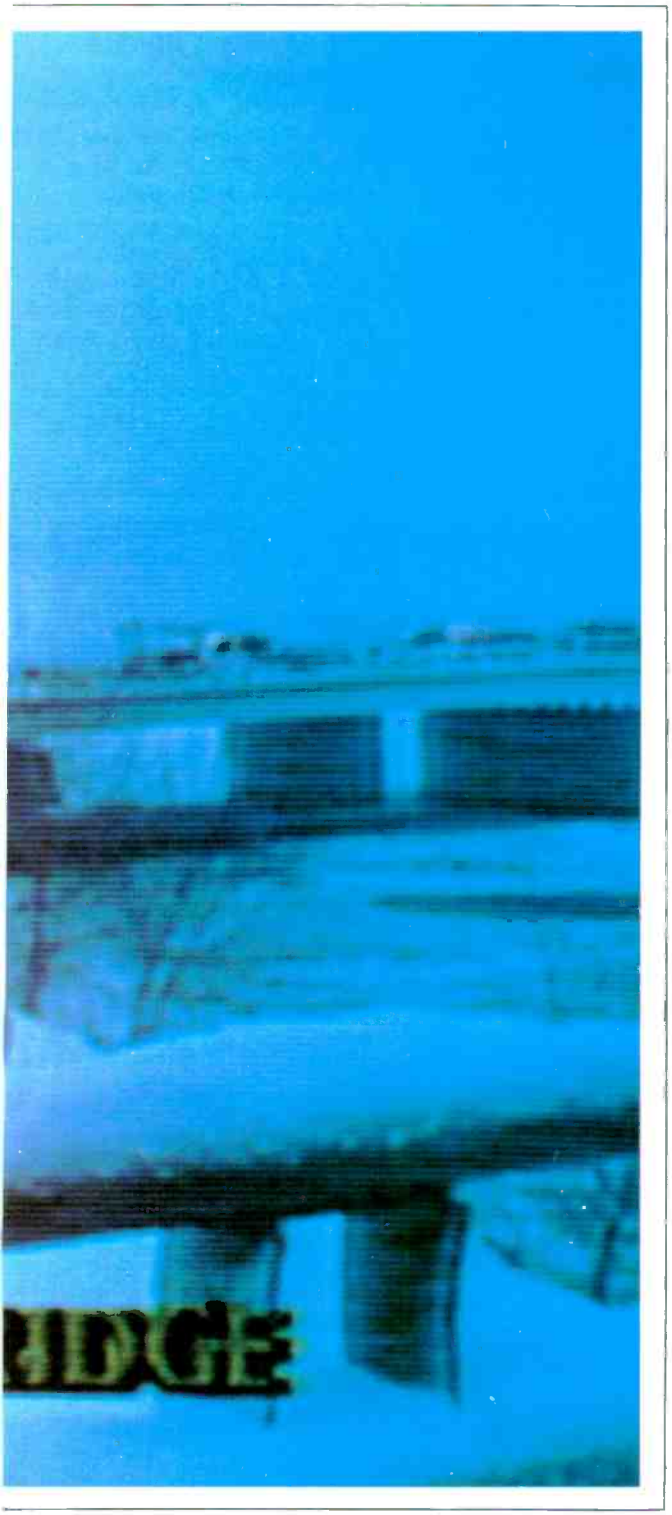


Photo: WDVM



Thick, wet snow covered the city, choking off traffic, closing public and private businesses, and slowing pedestrian movement. Despite these conditions, the news crews knew that they *had* to get to the site of the crash, the 14th Street Bridge, where Air Florida Flight 90 had come down.

Photo: Dan Beigel/Sygma

Emergency vehicles at the Potomac

ENG crisis coverage:

The crash of Flight 90

By Deborah Gerhard, technician, CBS, Washington, DC

Anyone who has fought a midtown rush-hour traffic jam can sympathize with the news crews who tried to get to the bridge on the cold Wednesday afternoon, Jan. 13, 1982, when Air Florida Flight 90 crashed. The

worst storm in two years had hit Washington, DC, causing many federal and District of Columbia employees to empty into the streets in an attempt to leave the city early, before traffic became heavy.The crash of the jetliner had closed the 14th Street Bridge, a main artery into Virginia, adding to the transportation problem.

Word of the crash first came into the CBS News Bureau in Washington, DC, over the police scanner. It did not seem as though it would amount to much; most airplane crashes involve small planes and are not covered by the networks. But as more information came over the scanners and the wire copy began to move, the full extent of the damage began to be realized.

An attempt to confirm the type of aircraft and the location of the accident with the Federal Aviation Administration failed because the FAA was one of the government offices closed due to the snowstorm. Finally, confirmation was obtained by calling the Chicago bureau of the FAA and local officials.

Even before official confirmation of the crash was received, CTN, the technical arm of CBS Washington, was notified of the accident and began covering the story. As an organizationally separate unit of CBS

Photo: Dan Beigel/Sygma

Rescuers battle ice in search of survivors

Washington, CTN provides facilities and personnel to CND, the journalistic unit of the bureau. Both are coordinated by Jack Smith, the bureau chief.

As soon as CTN was notified of the accident, a 2-man microwave crew was organized and sent into the traffic jam to negotiate their way to the Potomac in one of the two vans used by CBS for microwave relays in the Washington area. The closing of the bridge had caused a huge traffic backup, forcing many motorists to abandon their cars in frustration.

As luck would have it, WDVM, Channel 9, the CBS affiliate in Washington, had a camera crew and microwave truck between National Airport and the 14th Street Bridge, covering the weather-related closing of the airport. The crew had even taken pictures of the doomed Boeing 737 minutes before it took off.

John Goldsmith, from WDVM, was the first reporter to arrive at the scene of the crash, and his crew took pictures of the injured on the bridge and the helicopter rescues of those in the water. He interviewed eyewitnesses and provided the first live reports of the disaster.

WJLA, Channel 7, the Washington ABC affiliate, had a cameraman between the Memorial and 14th Street Bridges taking pictures of the traffic problems caused by the storm. When he heard of the accident he pulled off the road and ran back to the bridge with his equipment. He was able to get close-ups of the passengers being pulled from the water to the river bank.

The first CBS network crew to arrive at the scene was at the White House when it heard of the accident. Fearing that they would be unable to reach the river by car, they ran more than a mile and a half to the scene with a Sony BVP 300 and BVU 110, wearing suits and dress shoes. They covered the catastrophe for three hours, without warm clothing, before relief could be arranged.

By that time the police had closed off the bridge and river banks so that the closest camera positions available were at the end of the Virginia side of the bridge. The CBS microwave truck was parked on the south side of the highway, more than 800 feet from the camera position. The cables lying across the road were constantly run over by police cruisers, rescue vehicles, snow plows and mobile units.

Electronic videographic of Flight 90

CBS had recorded the first WDVM bulletins off the air and fed them to New York on the permanent transmit line that links the two cities. Dan Rather narrated the first report out of the *Evening News* studio in New York. The crash had occurred at 4:01 p.m. Bulletins went out at 4:17, 4:23 and 4:25 p.m. from NBC, CBS and ABC, respectively.

CBS has a 2GHz microwave downlink from the WDVM transmitter tower to the CBS bureau located at 2020 M St., NW. The input to this downlink can be switched at the WDVM master control center. According to an agreement that CBS has with its affiliates, the raw footage was made available to CBS and transmitted via this fixed microwave link.

The pictures being transmitted were powerful. They showed a helicopter darting dangerously close to the ice, a frail woman hanging from a line to the helicopter, and hands waving for help from the water. The raw footage was especially gory: decapitated bodies slumping in the automobiles that had been sheared off by the falling airplane, mangled bodies floating in the water, and a mittened hand sticking out of an automobile.

Steven Gendel, WDVM anchorman, said, "We apologize for the dramatic nature of these pictures, but the story is dramatic and we haven't had a chance to edit them."

CBS elected not to use some of the more gruesome footage, deciding that the story could be covered better by showing wide shots of the rescue and interviewing witnesses of the unusual crash. Most airplane crashes burn and there are no bodies to be recovered, but because of the icy crash of this plane, more than 74 bodies remained under water.

By 5:30 p.m. the microwave truck was beginning to transmit pictures from the scene using a direct shot to the CBS microwave receiver on the WDVM tower. Dusk had begun to fall soon after the crash, and by 9 p.m. the darkness and bitter cold temperatures had halted rescue attempts for the evening.

The lead piece in the *CBS Evening News* was produced by Susan Zirinsky, associate producer. Bob Schieffer, anchorman, narrated the story as it was aired from the studio, because the information on the crash was still scant and changing. Part of John Goldsmith's original track was used, as were some of the eyewitness interviews he had provided. Schieffer made notes while Zirinsky and Charlie Wilson, editor, pieced together the 4-minute insert.

By the end of the 6:30 edition of the *CBS Evening News*, Deborah Potter was able to make an on-the-scene report that became the lead story on the 7p.m. edition. Back at the accident site, lights had to be set up. Little more could be seen of the rescue attempts than the search lights used to look for remaining bodies.

News correspondent Robert Schakne's interview with one of the victims, along with the footage obtained during the afternoon, was used for the 11:30 p.m. *CBS Special Report* on the tragedy.

Meanwhile, CBS News faced different, and in some ways, more demanding circumstances than they did in covering the first few hours after the crash. Developments at various locations required additional coverage. A long-term monitoring system had to be set up to cover the bridge—from both the center span of the bridge and the river bank, for radio and unilateral television. Also, a briefing station had been set up on the bridge for police liaison officers, rescue workers and relatives that had gathered to watch the salvage operations. The National Transportation Safety Board (NTSB) had decided to hold nightly briefings in the Twin Bridges Marriott, which would have to be covered. The Crystal City Marriott, where relatives of the passengers were gathered waiting definitive word on the victims, was also covered.

Another difficulty was that President Reagan was leaving the next day on a trip and reporters were dispatched to cover that story, reducing the manpower available.

Forecasts from the National Weather Bureau indicated that temperatures would plummet during the next week, and near daybreak more than four inches of snow was predicted. Visibility was less than half a mile and traffic was still a problem on the snowbound streets.

Two live inserts were transmitted from the bridge for the *Morning News* on Jan. 14. However, the transmitter used for a return cue from New York was found to be intermittent so the cues would have to be taken off the air. A small Sony monitor was found so that the reporter could hear the program, which meant no mix-minus was available. The reporter heard himself on the program return, a less than optimum situation.

The first insert went well, but 15 minutes before the second one was to go on the air, a police car with a dragging muffler tore the cables leading to the microwave truck from their connectors. The audio—four cables, 800 feet each—was broken. Only one twin lead that had video remained. Just enough cable was found to reach the camera position before the insert went on the air.

Coordination of the various feeds was accomplished by designating one of the six 2-way frequencies in the 450MHz band used by CBS as the bridge channel. Because of the large number of 2-way transmitters in such a small area, intermodulation distortion was a persistent problem during the coverage.

On Friday, Jan. 15, a microwave truck went to the hotel where the NTSB briefings were being held and sent a straight shot to the WDVM tower. CBS has two remote-controlled microwave receivers on the WDVM tower, a Nurad quad horn and a Nurad Superquad antenna. On Sunday, Jan. 17, a second feed from the bridge to the WDVM tower was needed; one for the pool feed and one for unilateral.

An alternative hop was set up from the Twin Bridges to 2030 M St., where the receivers for the news bureau are located. A room was rented on the third floor and a 13GHz link was directed toward the microwave truck on the bridge to a fixed receiver on the Chanin Building via a 2-foot Farinon dish. The signal then went via a fixed downlink on 2GHz to 2030 M St., a tall building adjacent to the 3-story CBS bureau. Interference from other microwave sources

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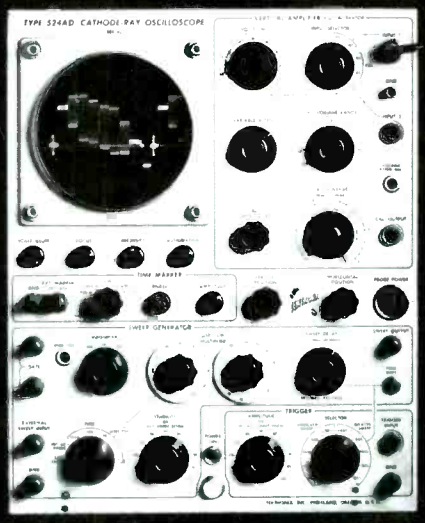

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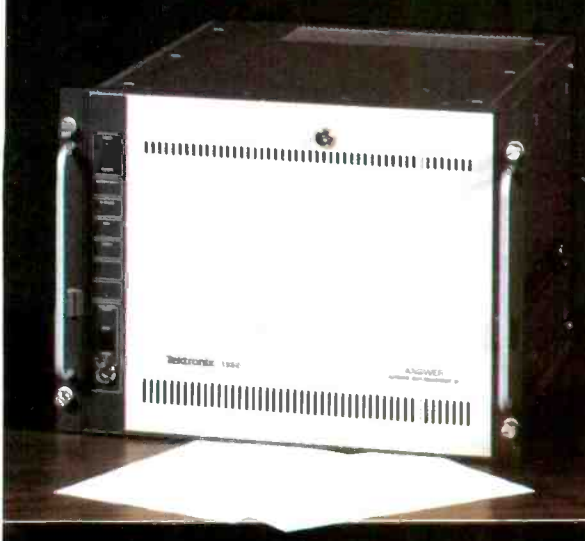

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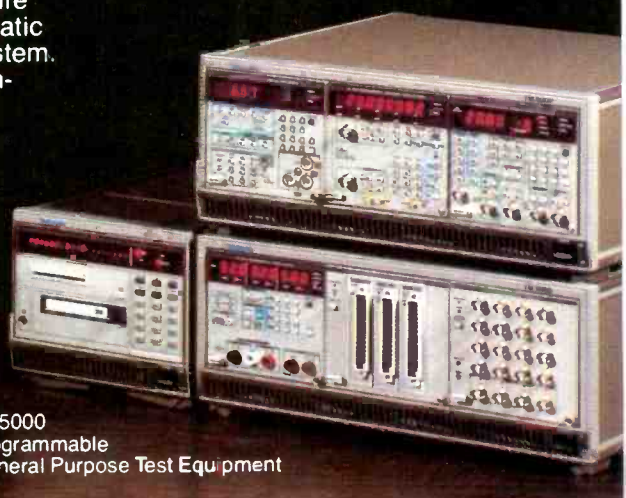

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was minimized by using split channels and opposite polarization.

Almost immediately after the crash, a pool feed was set up. When the police decided to reopen the 14th Street Bridge and moved the trucks to the center span of the 3-span bridge, only one optimal camera position was available. That position became a pool position that the networks rotated on a daily basis. The jetliner had fallen very close to the bridge, and to see the salvage operations the pool camera had to lean over the railing. In order to accomplish this, two legs of the tripod were placed over the railing and the camera was taped to the rail. The cameraman sat on the railing with a safety harness as a restraint. A second pool position was established on the river bank. The police would allow one camera on the shore as long as no close-ups of the bodies were shown, as a courtesy to the relatives of the victims.

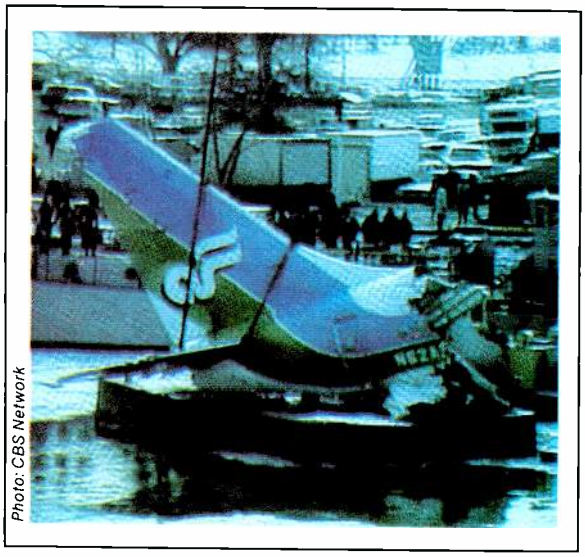
The microwave truck was now feeding two microwave signals (one designated as the pool feed and the other a switchable feed of the unilateral camera), uncorrected videotape from the shore camera position, a feed from the NTSB briefing room and radio audio. Power on the bridge was provided by three Honda generators: two 300W generators for the cameras and one 1.5kW for the truck.

On Sunday, Jan. 17, the temperature dropped to 5°F, and on the bridge, the wind chill factor was −43°F. Sleet fell throughout the day, covering the cables on the bridge with ice and causing connectors to freeze. The connectors had to be periodically reseated to ensure conduction.

The weather made staying outside for any length of time impossible, so a recreational vehicle was rented by CBS. Feeds for five monitors and a Sony BVU 200 VTR had to be run to it so that the producer and reporter at the scene could view the material being sent to the bureau and make a backup recording in case of microwave trouble. Three color monitors were used to preview the pool and unilateral cameras, as well as the tape playback. Two black-and-white monitors were used to monitor the pool and unilateral feeds. The extreme cold shortened the average life of the batteries for the 2-way transmitters, so the camper was equipped with four battery chargers for the 2-ways and two battery chargers for the portable shore camera.

Traffic to the bridge was still a problem, even four days after crash, which caused a considerable delay in the delivery of any equipment requested from the CBS bureau. Food arrived frozen, so propane was brought in, allowing food to be reheated in the camper. Gasoline for the 4kHz generator in the camper was delivered by courier. The cables were in constant danger from the snow plows that were trying to keep the bridge cleared.

On Tuesday night, Jan. 19, the police requested that the trucks be moved again in order to open the center span of the bridge. When they learned that the cables were frozen to the bridge, they relented and allowed the trucks to stay for the rest of the coverage.



Recovery of the flight recorders

The flight recorders, a vital link in the accident investigation, were still missing. Finally, on Jan. 20, a week after the crash, the recorders were located and pulled from the water. News coverage from the river ended.

The key to providing initial coverage of any crisis may well be a matter of where the news crews are at the time of the accident, as was the case with the Air Florida disaster. However, the coverage that follows is the product of the skill, experience and commitment of the crews, as well as the amount and quality of their equipment.

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Application of digital technology to the delay and time compression of audio signals provides valuable capabilities to the radio talk show as well as the TV production house. Manufacturers are taking advantage of this new frontier by refining existing systems.

Digital audio delay & time compression

By Dennis Ciapura, group vice president, telecommunications, Greater Media, East Brunswick, NJ

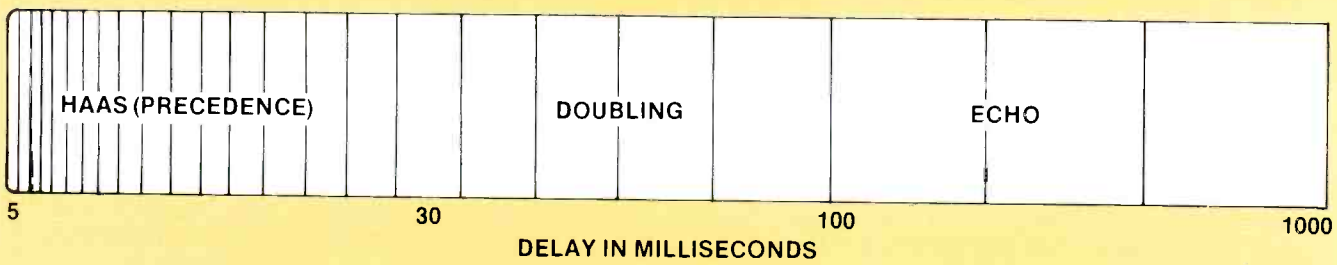
The first delightful pangs of spring fever lighten my spirits as I gaze through the production studio window to catch a glimpse of a freshly painted world. The calendar balancing precariously on one edge of the console shows that it is some day in May 1970. Unfortunately, my spell is to be short-lived. My attention is forcibly diverted to threading several feet of magnetic tape through an ungodly maze of rollers and tape guides that trace an absurd path around the perimeters of two Ampex 350s. Each time I execute the procedure, I stand embarrassed before some imaginary tribunal that judges studio practice to see that it is state-of-the-art, for I know that *this* is not.

Well, that was 1970 and, for all *practical* purposes, that was the state of the art! The digital time delay devices that we all dreamed about were yet to be developed in a form that was economically feasible for broadcast application. Like most technological developments, digital audio delay has enjoyed an exponential rate of improvement in the last few years.

Although a non-mechanical method of achieving the few seconds of delay required to perform "bleeper" functions during live broadcasts was the first and most attractive application of this technology, many others have found acceptance in radio and TV operations. Before reviewing these newer applications and taking a look at some of the equipment that is available, let's take stock of the effects that can be achieved with various degrees of audio delay.

Figure 1 illustrates the audible effects that can be expected within popular ranges of delay. The limits of these ranges are not absolute and experienced engineers may differ with points where one effect ends and another picks up. However, the chart, which may be used as an aid in understanding how digital delays work, can be considered to be generally accurate and useful for planning purposes.

Figure 1. Audible effects as the delay increases



The Haas Effect area is useful for shifting stereo images without unbalancing levels. This is the famed precedence effect that fools the ear into thinking that the first of two closely time-spaced signals is dominant. If a piano is recorded at equal levels in each channel, but with one channel delayed a few milliseconds, the listener will perceive the reproduced sound as coming from the channel that radiates the leading signal. One obvious application of this effect is the capability of placing an instrument or voice on one side of the stereo stage without having to lower the level in the opposite channel, thus preserving maximum loudness of that source in both stereo and mono.

As the delay is lengthened, the ear begins to discern two separate sounds and an audio doubling effect is heard. This effect can be useful if the fuller sound of an extra instrument or voice is desired. The more sophisticated digital delay devices can even shift the pitch a bit to electronically simulate real harmony.

The longer delays impart an echo-like characteristic and, if recirculation is provided, a realistic reverberation simulation is generated. It is important to understand the role of the recirculation, or feedback loop, in determining the character of the reverb. A delayed portion of the audio

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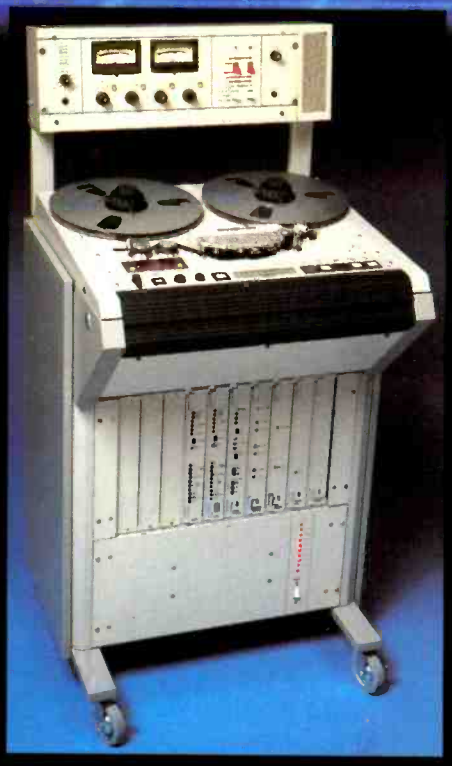

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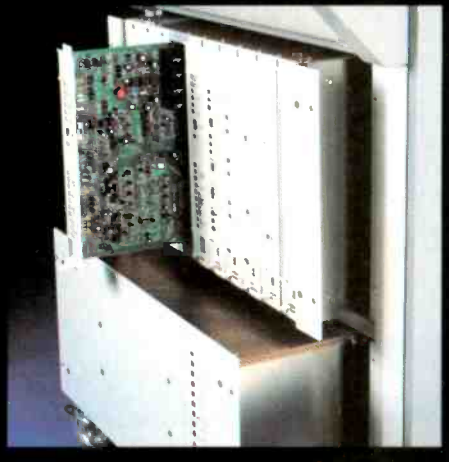

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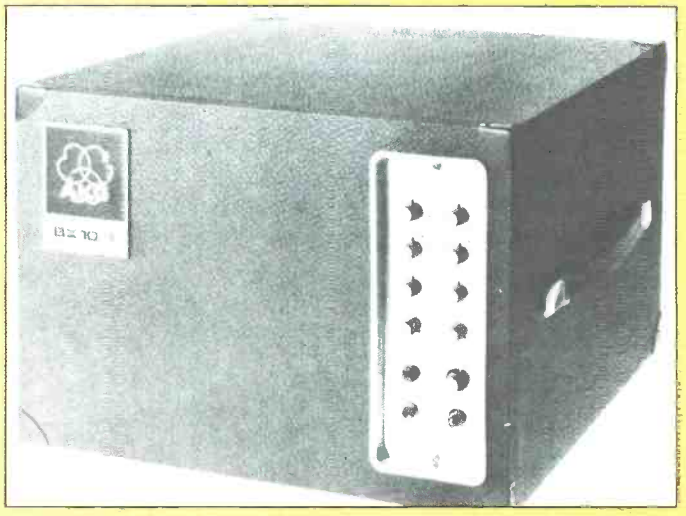
input may be recirculated through the delay system several times before decaying, thus providing ultimate reverberations of several seconds from a delay line capable of a few hundred milliseconds. The feedback or recirculation path can be EQed to simulate hard (treble-boosted) or soft (highs flat or rolled) reflections.

Staggered delays without recirculation can be mixed to simulate natural room reflections, complete with comb-filter effects. This approach can be useful in restoring ambiance to a closely mic'd source. In this application we are not looking for any reverberation, but rather a reconstruction of the pattern of short-term reflections that would be heard from a normal listening position. A microphone placed close to a source will pick up all source and no reflections, thus lacking liveness. Close mic'ing has become a necessary evil in broadcast studios to inhibit room-noise pickup and in recording studios to prevent crossfeeding of instruments. Clever use of delay devices can restore life to these artificially deadened sound sources.

Digital delays can also be modulated to produce flanging effects. As broadcast production departments strive to be more creative, digitally generated special audio effects provide the opportunity to produce truly unique spots at relatively low cost. Modern broadcast production consoles are leaning more and more to professional recording configurations, so it is easy to interface the new digital delay gear, simply and conveniently for operator use.



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In the past year or so, digital time compression devices have blossomed, particularly in TV production. In this application, a tape transport speed control device is married to a digital pitch changer so that a tape can be speeded up without changing the pitch of the audio. The value of this maneuver is obvious. The running time of any program source can be shortened (or lengthened) without the listener being aware of the change. Over the course of a 90-minute movie, several minutes may be shaved without perceptible visual impact or audible change in pitch. This means that for a given amount of commercial content, less deletion editing is required to fit a fixed time slot.

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Offer expires May 31, 1982.

Send to: Ampex Corporation, Magnetic Tape Division, 401 Broadway MS 22-02, Redwood City, CA 94063

BE

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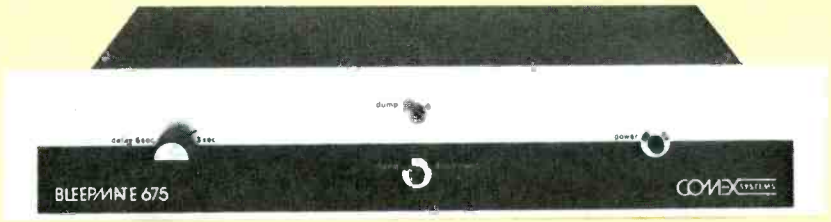

Comex Systems Bleepmate 675

and tight copy virtually ceases to be a problem. In terms of reduced labor costs for redoing ill-timed spots, many stations may find that a digital time compression unit will pay for itself in a short time.

In the more traditional application of digital delay, the bleeper, the big advances have been in the area of price reduction. Delay devices with excellent performance and superb reliability are now within the reach of virtually every broadcaster. Shopping for a delay unit can be a lot of fun. Here is a rundown on some of the many that are currently available.

A.K.G. Acoustics offers an excellent reverb system called the BX-10E2. This unit combines digital delay with springs and transducers to achieve natural reverb quality. A.K.G. calls this approach a Torsional Transmission Line, or TTL. The system is small enough (12" x 17" x 19") to be used in the field and good enough to replace much larger foil and plate systems in fixed studio applications. High and low frequency EQ is provided and the unit is insensitive to acoustic feedback so that it can even be used near monitor speakers.

Another A.K.G. unit, the TDU 7000, offers up to 399ms of delay with 30Hz to 15kHz response and 90dB of dynamic range. This unit employs 16k RAMs and is supplied in modular form so that the user may assemble various combinations of input, output and delay modules for custom applications.

Broadcasters who are into remotes that involve sound reinforcement will be interested in Altec Lansing's 1640 and 1641 time delay systems. These units provide six outputs with progressive delay so that speakers placed farther and farther from the stage can receive properly timed inputs and thus avoid the annoying loss of intelligibility that usually occurs when instant arrivals from nearby speakers mix with acoustically delayed sound from up front. The solution is to progressively delay each bank of speakers so that the audience always hears audio in time with the performance. The 1640 provides outputs at 20ms intervals from 20ms to 120ms, while the 1641 ranges from 10ms to 60ms. Frequency response is 3dB down at 12kHz and distortion is specified at less than 1%.

Comex can provide six seconds of 7.5kHz bandwidth delay for less than $2000 with its Bleepmate 675. This unity gain device provides 72dB of dynamic range and selectable 3- or 6-second delay modes. The 675 is designed for conventional rack mounting and requires 3¼ inches of rack space. Distortion is under 1% THD at 0dBm output, maximum output is + 12dBm and response is maintained within ± 1dB out of 5kHz with the -3dB point at 7.5kHz. This level of performance is adequate for speech work and amazing for the price. As a matter of fact, only intensely maintained tape delay units will match that performance on a daily basis.

As we go to press, Eventide

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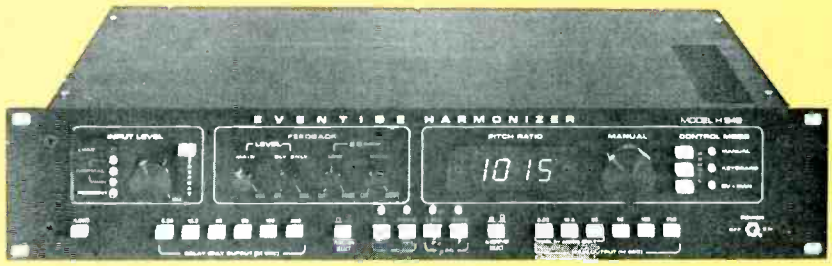


Eventide Clockworks H949 harmonizer

Clockworks plans to market six seconds of 7.5kHz delay for less than $2000. A stereo version is planned for less than $3000. These units will be similar to the now famous BD955 except for deletion of the unique "catch up" feature that allows the system to drift gradually back to real time at a preselected rate. The BD955 features either 7.5 or 15kHz bandwidth (-1dB), 90dB of dynamic range and less than 0.2% distortion at 1kHz.

Eventide's 949 harmonizer offers a low cost (about $3500) route to time compression. When used as a pitch change device, the 949 can be teamed up with any tape deck equipped with variable speed. The tape deck is simply speeded up to achieve the desired playing time while the harmonizer is used to restore normal pitch. They can even be synchronized for automatic compensation.

The Eventide line includes the SP2016 programmable effects processor. For use in stereo systems, the SP2016 handles a dynamic range of 86dB with 8 or 16kHz bandwidths. A maximum of 32 programs may be stored, with 18 presets within each one for full bandwidth delays to 1.6s in 25μs steps, selective band delays to 3.2s, flanging, phasing and classical digital filters. Software plug-in units for the "effects of the month" have been considered for user operational ease.

Digital delay systems 1745M, JJ193 and CD254 give variable time control whether the use involves a recording studio, concert hall or broadcast facility.

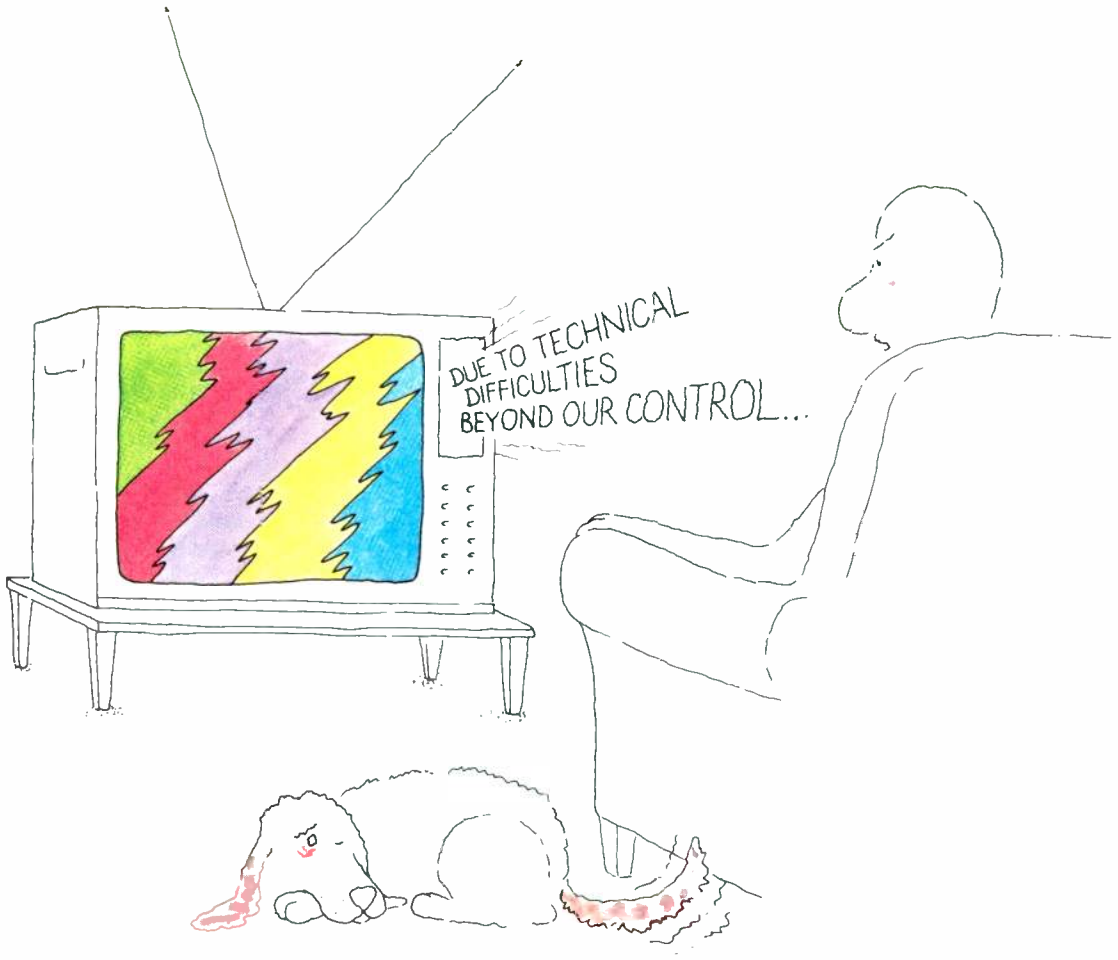
Also available from Eventide is the Timesqueeze System, which combines the H949 harmonizer, the PTC945 precision tape controller and a microcomputer (Hewlett-Packard HP-85), which interfaces with a 1-inch video recorder audiotape machine or film projector. Based on the IEEE-488 standard interface, this system allows running time compression or expansion without pitch change to 400% speed-up or 50% slow-down.

Industrial Research Products has just introduced its new model DF-4015 digital delay unit. This company's equipment has found its way into sound reinforcement applications from Westminster Abbey to the Superdome, and has an excellent reputation. The DF-4015 features 12Hz to 15kHz response (±2dB), 90dB dynamic range and 0.2% THD plus noise at +4dBm. 192ms of delay is available in 3ms increments.

The company also builds a 96ms delay called the DC-4011, which also provides 90dB dynamic range and 15kHz bandwidth. Several other models providing a wide range of delay combinations are also available.

Industrial Research Products DF-4015 delay

Integrated Sound Systems employs some interesting concepts in its TDM-8000 audio time compressor. The company says that a patent pending design innovation allows the signal to be analyzed in digital form while the audio remains in the analog domain. The TDM-8000 is also said to be a super performer on complex inputs such as singers with accompaniment. The system provides 20Hz to 15kHz response, 81dB dynamic range and 0.1% THD plus noise. Keyboard entry of pitch shift ratio and a digital readout are provided. The manufacturer has also taken steps to RF proof the unit to ensure normal operation in tough broadcast environments.



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Lexicon 1200 compressor/expander

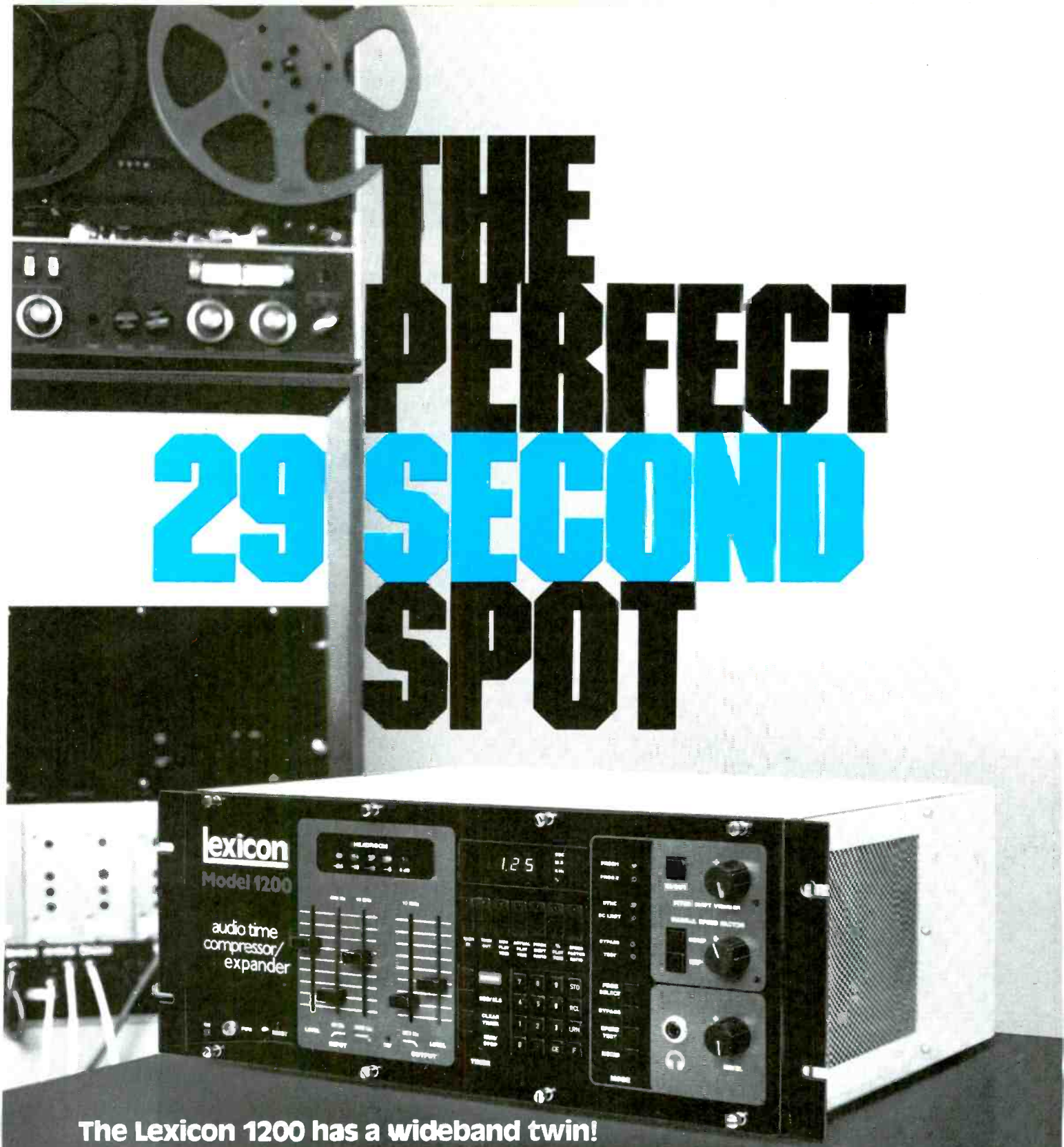
Lexicon makes a wide range of delay devices, including the model 92, which features less than 0.08% THD plus noise, 90dB of dynamic range and two independent outputs with up to 120ms of delay. Lexicon's model 93 is a complete delay processor with an integral VCO for Doppler pitch shift, flanging, etc. This unit also allows EQ'd recirculation for long delay reverb effects. The model 1200 takes care of time compression assignments. Up to 2X speed variation can be obtained with the 1200. The manufacturer claims artifact-free playback up to 25% speed change, which is more than most broadcast applications ever require. Lexicon also offers a model 91 programmable digital reverb and several other delay devices.

Sony has just introduced a new digital delay system for broadcast applications that has been dubbed the DDU-1530. This system features 44.1kHz sampling for 20Hz to 20kHz bandwidth +0.05, -1dB. The unit's basic memory allows up to 1.45 seconds of delay in 1ms increments. Additional memory cards can be installed to obtain up to 4.35 seconds of delay. Sixteen-bit technology is employed for super quality. Sony was one of the pioneers in digital recording and has developed many digital peripherals for the recording industry, such as a delay system for anticipating levels into disc cutters to conserve disc *land* without fear of overcutting. The DDU series is designed to offer recording industry performance and should, therefore, be of interest to audio purists.

The UREI model 927 digital delay line provides four outputs with individually adjustable delays. Each output is capable of up to 127ms of delay in 1ms steps with ± .05ms accuracy. Response is ± .05dB, 30Hz to 12kHz and dynamic range is more than 90dB. Eighth-order Cauer filters are incorporated in the design to prevent birdies when input frequencies near the limits of the system's bandwidth are encountered; 150dB/octave does the trick. No pre-emphasis is employed, so that full-level high frequency inputs can be accommodated without risk of overload and distortion. Gain is adjustable up to +18dB and up to +20dBm of output is available from the unit. Thumbwheel switches select the delay. Front panel input and output level controls are provided. A security panel is also provided so that presets can be protected, if that is what the application calls for.

Ursa Major calls its model SST-282 the Space Station, and for good reason. This unique performer consists of a 255ms long RAM with 20 taps spaced along its length. Eight of these are used for delay effects and the others for reverb effects. The interesting feature of this system is that the position of the taps can be varied according to several preselected pro-

THE PERFECT 29 SECOND SPOT



The Lexicon 1200 has a wideband twin!

With the Lexicon Model 1200, you can speed up taped material, or slow it down, and still maintain true broadcast-quality sound.

And now the 1200 has a wideband twin: the Model 1200B.

The 1200B does everything the 1200 does, with the added feature of wideband (15 KHz) operation to meet network TV and AM radio broadcasting standards.

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Circle (21) on Reply Card

AES explores digital audio

Mark June 4-6, 1982, on the calendar. On those days the AES Premier Conference exploring digital audio in-depth will be held at the Rye Town Hilton, Rye, NY. Attendance for this conference will be limited to 300.

Nine specific areas will be covered during the conference, titled the "New World of Digital Audio." The following is a list of these topics:

- An overview on the Present State-of-the-Art
- The Digital Disc
- High-Density Magnetic Recording
- High-Density Optical Recording
- Digital Data Protection
- Digital Data Preservation
- Error Correction
- Encoding and Transcoding
- Digital Music

For more information regarding this meeting, contact the AES Headquarters, 60 E. 42nd St., New York, NY 10165; 1-212-661-8528.

Ursa Major SST-282 Space Station

grams, and some of these contain randomized variables. This approach opens the door for some interesting effects. EQ and a feedback loop are also provided to enable long delay reverb effects with the desired color. Response is 20Hz to 7kHz, dynamic range is at least 80dB and distortion is typically 0.1%.

In addition to the Space Station, Ursa Major markets the 8X32 digital reverb system. Thirty-two non-volatile registers retain stored instructions for recall of 32 complete reverb setups. Once recalled, a setup may be changed by front panel controls. Point and 7-segment LED displays indicate control settings and selected programs. Four basic programs, Plate I, Plate II, Hall and Space, offer general starting points, with delay levels (eight steps) and times (from 6 to 96ms in 16 steps) selectable. Within each program, 16 decay times give the user additional choices and include individual trim adjustment for LF and HF decays.

As the prices of digital delay systems have come down, an increasing number of progressive broadcasters have found new and exciting ways to put these systems to work. Production timing problems are being solved, live mic sources are being enhanced, and maintenance-free talk show bleepers have made life a little easier for everybody. All of these improvements would have been out of the reach of most broadcasters a decade ago, and we wonder what new advances the next decade will bring. For the present, there is a digital delay system available to fit every application and budget and creative engineers are finding new uses for them every day.

Now Technics lets you hear nothing but the sound of the source. Introducing the SV-P100 Digital Cassette Recorder.

No tape hiss. No wow and flutter. Not even head contact distortion. With Technics new SV-P100, they no longer exist. The result—now you listen to the actual music...the source, not the tape or the tape player

Utilizing the Pulse Code Modulation (PCM) digital process, the SV-P100 instantaneously translates musical notes into an exact numerical code, stores them on any standard VHS cassette, then "translates" them back into music on playback. Duplicate tapes are exactly the same as the original. Thus, every recording and every copy is a "master."

The revolutionary size of the new Technics SV-P100 recorder (17"x11"x10") is the result of state-of-the-art semiconductor technology. The built-in videotape transport mechanism brings the convenience normally associated with conventional front-loading cassette decks to a digital application. Tape loading is now fully automatic. And, frequently used controls are grouped together on a slanted panel with LED's to confirm operating status.

Despite its compact size, the SV-P100 recorder offers performance beyond even professional open reel decks. Since the digital signal is recorded on the video track, the space usually available for audio can therefore be used for editing "jump" and "search" marks. The unit employs the EIAJ standard for PCM recording. And, in addition, editing and purely digital dubbing are easily accomplished with any videotape deck employing the NTSC format.

Technics new SV-P100 is available at selected audio dealers. To say that it must be heard to be appreciated is an incredible understatement.

Technics
The science of sound.

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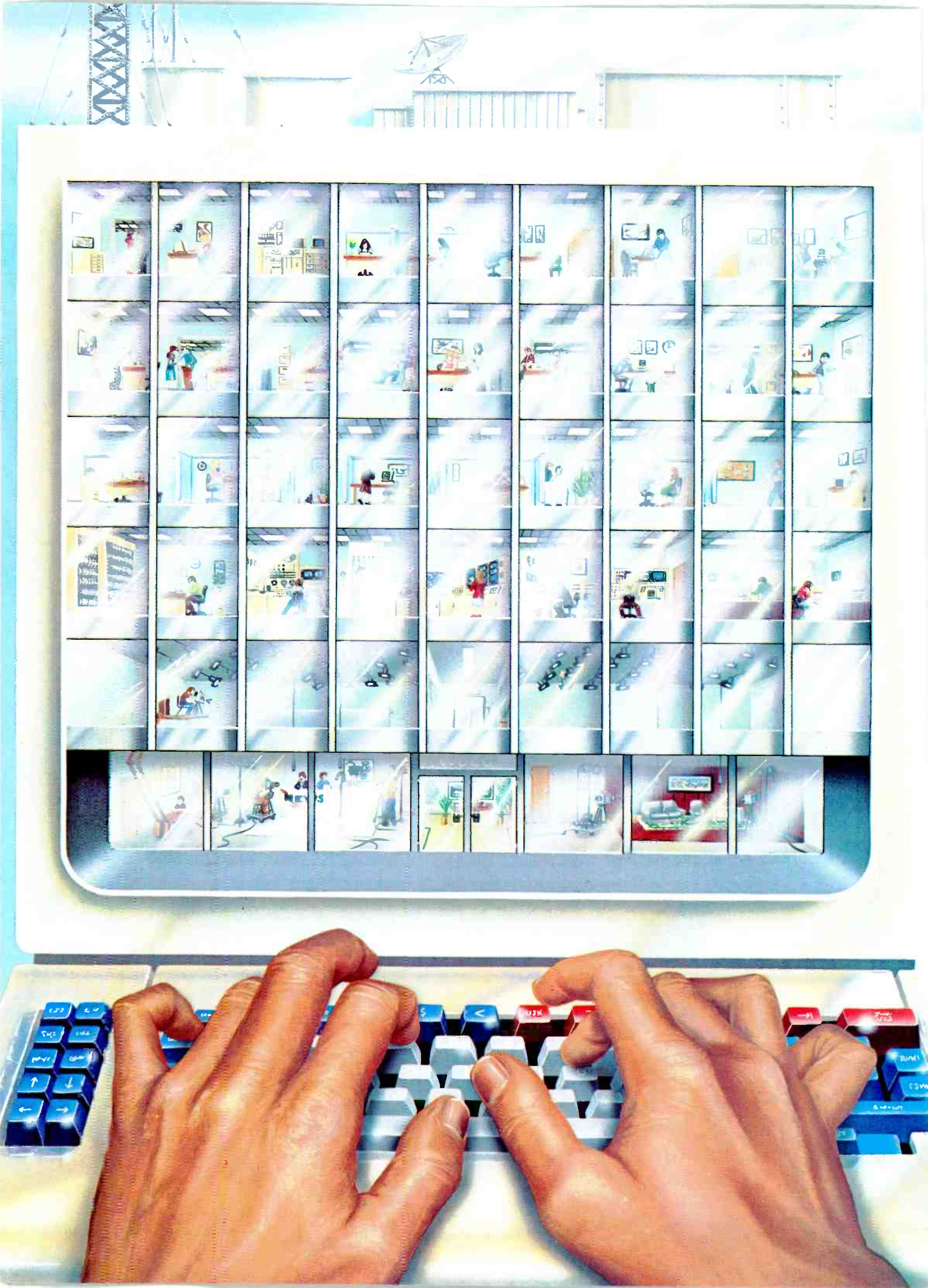

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Generate avails quickly, accurately, and tailored to each client. BUY LINE produces a professional presentation in less time than conventional hand-researched methods. Your sales people are no longer tied to a desk, can spend more time in front of the buyer, create more sales. BUY LINE also means faster, completely confidential communications with your national rep.

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TV test equipment survey

Monitoring video parameters

By Carl Bentz, technical editor

Monitoring devices remain an essential part of any broadcast TV station. Although requirements placed on engineering staff personnel have been eased by deregulation, rules for technical quality of the transmitted signal have changed little. Periodic checks by the FCC assure that broadcasters provide viewers the best possible signal. A station should also strive for the best output because picture quality will have a great deal to do with the *salability* of the station's programming.

On a daily basis and for proof-of-performance checks, four pieces of equipment give needed information about the quality passed on to the viewer. They are waveform monitors, vectorscopes, precision demodulators and RF spectrum analyzers.

Waveform monitors are used to determine luminance characteristics, while vectorscopes provide chroma level and phase relationships. These two types of equipment are needed in every area of the visual path prior to transmission. And, in conjunction with a precision demodulator, they are also required to determine proper alignment of many portions of the transmitter. Still another check on proper transmitter operation may be derived from use of an RF spectrum analyzer.

Sources of vector and waveform monitoring equipment were limited at one time. Now several manufacturers have developed units that fit the multifaceted needs of broadcasting and production. Multipurpose designs have also appeared, combining waveform monitor features with regular oscilloscope functions to facilitate equipment test and maintenance work. Other modules include vectorscope circuitry for combined luminance and chrominance monitoring with reduced space requirements (and some reduced costs), often advantageous for small scale studios and mobile production vehicles where equipment space may be limited.

Watching your signal to make sure you are on the air can be done with an inexpensive TV receiver. Yet, recent studies have shown that precision demodulation of the video carrier is extremely important to station operation, on a daily basis, for proof tests and for periodic maintenance of the transmitter/antenna plant. Dependence on envelope demodulation, the most easily implemented type, will not answer some of the questions, particularly when operational parameters such as incidental phase modulation must be considered. As a result, synchronous detection has become increasingly valued in a demod.

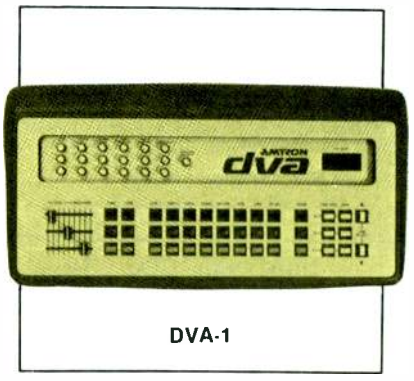
A precision demodulator cannot tell the entire story either. The properly transmitted visual signal must also fall within certain bounds. A great deal of effort must be put into measurements with a signal generator and a diode probe attached to the feed line from the transmitter to trace out the transmitter attenuation characteristics. A spectrum analyzer is by far an easier and more accurate method of attenuation plotting and may be used to show effects of the transmitter and the antenna combined. In addition, the RF spectrum analyzer will prove invaluable in determining sources of interference, spurious signals and harmonic radiations as more signals go on the air with the recent commission approval of LPTV licensing.

Early last February, **Broadcast Engineering** contacted manufacturers of waveform monitors, vectorscopes, precision demodulators and RF spectrum analyzers to obtain the latest information for our files. Those companies included manufacturers listed in the 1981 *Buyers' Guide* issue and other product files. The following survey covers the materials provided.

It should be noted that most oscilloscope manufacturers provide instrument models that include TV H and V sync detectors that trigger the scope sweep circuitry with a high degree of accuracy. Although such test instruments may certainly be used in a pinch, they are intended primarily for use in service shops and maintenance of TV related equipment, not as daily monitoring equipment. Few include the filtering needed for viewing separated luminance or chrominance, although some manufacturers provide filter circuits as optional accessories. Several unusual items "made for TV" have been included, however.

Spectrum analyzers can be confusing. It is suggested that the analyzer purchased be capable of seeing at least the third harmonic of the visual carrier. If the station uses microwave or earth station equipment, some consideration may be given to models that cover frequencies higher than the 1.6GHz limit used in this survey.

Finally, for those who think some of their equipment needs are periodic, a rental or lease arrangement might be more economically feasible than purchase, particularly for expensive spectrum analyzers. Two organizations that offer rental/lease plans for such equipment are Leasametric, 1164 Triton Drive, Foster City, CA 94404, and US Instrument Rentals, 2988 Campus Drive, San Mateo, CA 94403. Readers may wish to refer to the *Buyer's Guide* for other possibilities.



DVA-1

Amtron

The DVA-1 digital video analyzer may accept three synchronous or non-synchronous video signals for display on a precision picture monitor. These

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America, like most of the world, will see the game on tape. In fact, many of the events at Lake Placid will be broadcast and rebroadcast to the world on tape under the most demanding time and temperature conditions. It's a one-chance situation all the way and the stakes are always high.

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signals may be stored for later recall or comparative evaluation. A reference graticule is internally generated for the display.

Each channel may select one H-line, one V-field, the vertical interval (with 25 lines of either Field 1 or 2), a vector display, one V-frame, a display of differential phase or gain, or the VITS/VIRS signals. Dedicated push-buttons select the desired parameters for display, singly, to three at a time in different colors or superimposed on a picture.

Digital technology uses a 7-bit sample (or optional 8-bit) at a 4X sample rate. Processed signals are combined into a single composite video signal. The memory output may serve as a test signal source.

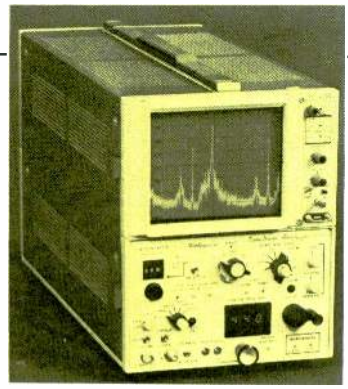
Circle (200) on Reply Card

Broadcast Video Systems Ltd.

The PW-200 pulse width measuring set provides continuous monitoring and measurement of any pulse duration occurring during vertical or horizontal intervals within a TV waveform. The system locks to station sync or incoming video. From that synchronization, markers are generated and inserted into incoming video for viewing on a picture monitor or waveform monitor.

One output provides the picture display, another the waveform display, while a 4-digit readout gives the values in microseconds or in lines of a vertical measurement. An internal 10MHz clock is used for calculating the measurements.

Circle (205) on Reply Card



SA440

Comsonics

The SA440 spectrum analyzer module is acceptable to the Tektronix 5100 series oscilloscope mainframe. A 500kHz to 440MHz range is useful for some VHF TV and CATV applications, with input signals from -52 to +90dBmV(75Ω). FAST, SLOW, SINGLE SHOT and LINE LOCK modes may trigger scanning on nine calibrated sweep settings from 0.01 to 44MHz/div. Bandwidth resolution provides choice between 1, 30 or 300kHz and 1MHz.

An on-screen dynamic range of 72dB at 1kHz may be displayed on a storage or non-storage screen, depending upon the mainframe chosen. A video output to 3MHz is available for other monitoring purposes.

Circle (201) on Reply Card

Electronic Visuals Ltd.

Available in NTSC or PAL, the EV4020 vector monitor may display 2.5%, 2.5° vectors in addition to 20%, 10° indications on an 8 x 10cm flat CRT. Burst vector amplitudes are marked for 75 and 100% saturations, while I and Q axes include component amplitude markings.

After checking the CAL level, input A or B may be adjusted with the variable gain control. The display may be referenced to the displayed video signal or to an input subcarrier reference signal. The unit is packaged in a portable bench case and is also available for mounting in a 19-inch rack unit for a 2-wide format.

Circle (202) on Reply Card

The maximum for the minimum

In designing the HK-302, Ikegami kept the frills —and the price—to a minimum while maximizing the performance. And that helps keep a moderate equipment budget from interfering with first-quality program origination.

However, staying with the basics doesn't mean sacrificing advanced technology. The HK-302's highly efficient optical system coupled to ⅔" low capacitance diode-gun Plumbicon* tubes and high transconductance FET pre-amps deliver sharp, low noise pictures (S/N 57 dB) with excellent colorimetry. And the compact camera head includes a full range of operational automatics to ensure consistent signal quality.

Built-in test, maintenance and operational features are integral parts of this camera's "basics" as well. A comprehensive test pulse system lets you adjust the video with the pick-up tubes off or removed. Complete monitoring circuitry and a broadcast quality sync generator with genlock are also standard features.

To add to the versatility of the HK-302, use the Ikegami automatic highlight compression option. It ensures highly detailed pictures even in high contrast scenes.

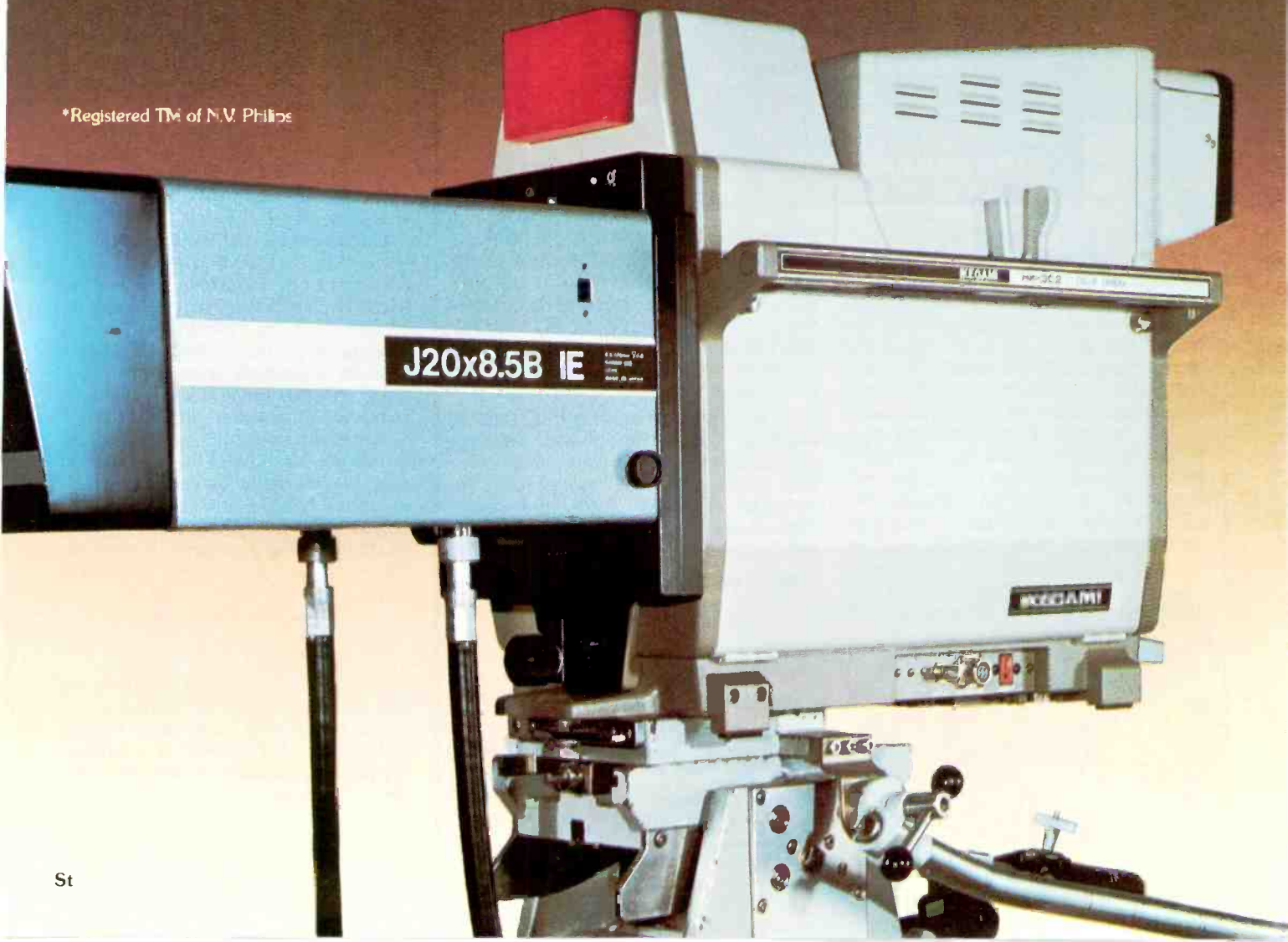
With the HK-302 you don't have to mortgage your station to afford prime time performance. So if you're looking for the maximum in studio production capability with a minimum of cost and maintenance, look over the Ikegami HK-302. For complete information and a demonstration, contact Ikegami.

Ikegami HK-302

Ikegami Electronics (USA) Inc., 37 Brook Avenue, Maywood, NJ 07607, (201) 368-9171
Northeast: (201) 368-9171 ☐ West Coast: (213) 534-0050 ☐ Southwest: (713) 445-0100 ☐ Southeast: (912) 924-0061 ☐ Canada: (201) 368-9179

Circle (28) on Reply Card

*Registered TM of N.V. Philips



St

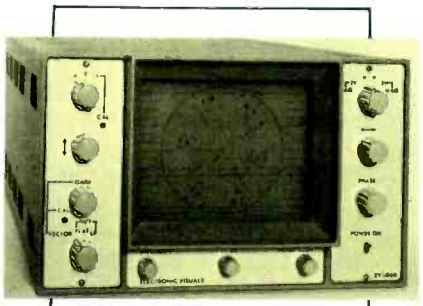
A companion to the EV4020, the EV4040 waveform monitor may mount beside the vector display for in-studio video monitoring of A or B video. Its 8 x 10cm CRT graticule may indicate 1 or 4V full-scale selected inputs or a 1V p-p calibrate waveform. Vertical channel responses include flat, low pass, chroma, differential gain and linearity filtering. Dc restoration maintains the back porch level, keyed by sync, with stable operation in the presence of sound-in-sync.

Internal or external synchronization triggers six timebase speeds: 1H, 2H 1μs/div., 1V, 2V and 200μs/div. A rear panel remote command input connector selects timing for a YRGB parade display with 3-level RGB optimizing possible.

Circle (203) on Reply Card

The EV4060 color signal monitor combines waveform and vector display modes from the A or B input with square wave calibration or a test circle included for setup. All references for sync and burst are derived from the A channel. A buffered video output follows the displayed signal.

Vertical response may be selected for a flat or low-pass mode for display on the 8 x 10cm CRT. Dc restoration sets the back porch level, even in the presence of sound-in-sync. 1H, 2H, 2H Mag, 1V, 2V and 2V Mag timebase sweep rates are available for waveforms. The 10-unit division graticule



EV4060

extends from -40 to +100 IRE units and includes the 7½-unit setup reference.

With the vertical response switch set to vector, the vector display graticule is illuminated to show ±2.5%, ±2° and ±20%, ±10° boxes. Burst, I and Q axes are marked for phase and amplitude setting with gain and phase controls. The unit requires 8½-inch mounting for side-by-side use with similar units or picture monitors.

Circle (204) on Reply Card

Hewlett Packard

The 8554B spectrum analyzer covers frequencies from 100kHz to 1.256GHz with a frequency resolution of 100Hz. Signal levels from -122 to +10dBm can be handled with +13dBm as the maximum peak to be applied to the 50Ω input. A 65dB display range is provided on the log display. The linear vertical scale includes 0.1μV to 100mV/div. Vertical filtering with 10 or 100Hz and 10kHz circuits is possible prior to the internal graticule storage display available in the 141T display mainframe.

Sweep ranges from 0.1ms to 10s and sweep widths of 2kHz to 100MHz/div. may be internally or externally triggered or placed under manual or single-sweep push-button control. The 8444A tracking generator is available for use as a signal source for sweep testing.

Circle (206) on Reply Card

The 8557A spectrum analyzer is useful in low band VHF stations. The 10kHz to 350MHz range of the 8557A handles signals from -117 to +20dBm. Frequency resolution to 1kHz is possible with a dynamic display range of 8 or 70dB full screen; the linear vertical scale range is 2.2μV to 2.24V. Variable

CONRAC

INNER VIEW:
A closer look at Conrac Monitors

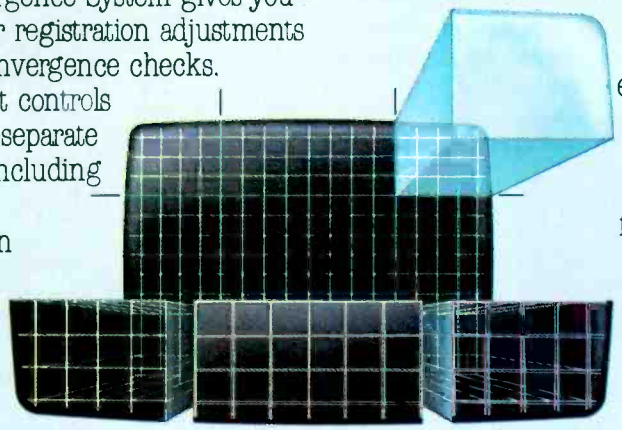
Active Convergence: Registration made simple.

Conrac's Active Convergence System gives you complete control over color registration adjustments and greatly streamlines convergence checks.

It uses 36 independent controls to individually adjust nine separate areas on the CRT screen – including corners!

You spend less time on convergence checks — and the adjustments you make will be much more accurate.

Conrac's system uses 24 operational amplifiers to independently control red, green, and blue in each screen area. Vertical and horizontal waveforms are referenced for shaping the signals that excite the convergence yoke assembly. Dynamic blue lateral convergence is achieved with operational amplifiers.



Conrac's Active Convergence system lets you adjust color registration on nine separate areas of the CRT.

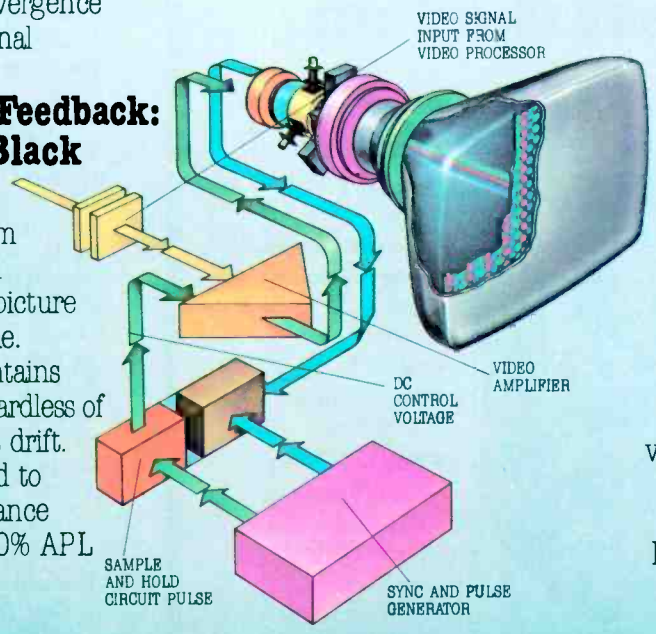
Beam Current Feedback: The Ultimate in Black Level Stability.

Conrac's unique Beam Current Feedback system maintains a more stable picture for a longer period of time.

It automatically maintains black level stability — regardless of CRT aging or component drift. In fact, black level is held to within 1% of peak luminance level between 10% and 90% APL (Average Picture Level).

Conrac's unique system uses a keyed back porch video amplifier and beam current sensing that occurs during the vertical interval. The video signal is ac coupled to the video amplifier, thus eliminating the dc component and retaining the level between black and white. It is then amplified and applied to G1 of the CRT. The feedback loop is completed when a sample cathode current (gated by the brightness pulse) is applied to a sample and hold circuit. If the cathode current changes for any reason, the video amplifier's dc level is automatically adjusted. Result: reference black level will remain constant.

Conrac's exclusive Beam Current Feedback system automatically maintains black level stability.



Conrac Technology: 30 years of leadership.

Conrac's track record of technical innovation stretches back nearly three decades. And what we've learned since then goes into every monitor we make today. That's important to you. Because the more technology we pack into each monitor, the more performance you'll receive from it. Active Convergence and Beam Current Feedback are just two ways Conrac technology can save you time and money.

For the complete inner view of Conrac technology, call or write us today: Conrac Division, Conrac Corporation, 600 North Rimsdale Ave., Covina, CA 91722, Telephone: (213) 966-3511, Telex: 67-0437

Quality you can take for granted.

Circle (30) on Reply Card

filtering including 1.5Hz may be used with the internal graticule display on a 181T display mainframe.

The sweep range covers 0.1ms to 10s with a sweep width from 5kHz to 20MHz/div. Triggering may be internal, line lock or single shot.

Circle (207) on Reply Card

Covering the range from 100kHz to 1.5GHz, the 8558B spectrum analyzer offers 3-knob operation. A frequency tuning control selects the center or start frequency that will be displayed digitally. A frequency span control provides full-screen spans from 100MHz to 50kHz with automatic optimum resolution bandwidth and scan time selection. The amplitude reference level control indicates the level in dBm represented by the top CRT internal graticule line.

The 50Ω input level may vary from -115dBm to +30dBm (7V, 1W) maximum with built-in protection up to the +30dBm level. Signals are shown on the 182T display with an 8 to 70dB dynamic range. A vertical scale also offers 2.2μV to 7.1V linear.

A sweep range of 0.1ms to 10s is triggered internally, with line lock or from a single sweep button. Sweep widths range from 1kHz to 3MHz. The sweep system may be complemented with the 8444A tracking generator.

Circle (208) on Reply Card

A frequency range of 100Hz to 1.5GHz is covered by the 8568A spectrum analyzer for signal measurement from -135 to +30dBm on a 90dB calibrated display. Other units include dBmV, dBμV and volts for signals on the 50Ω input.

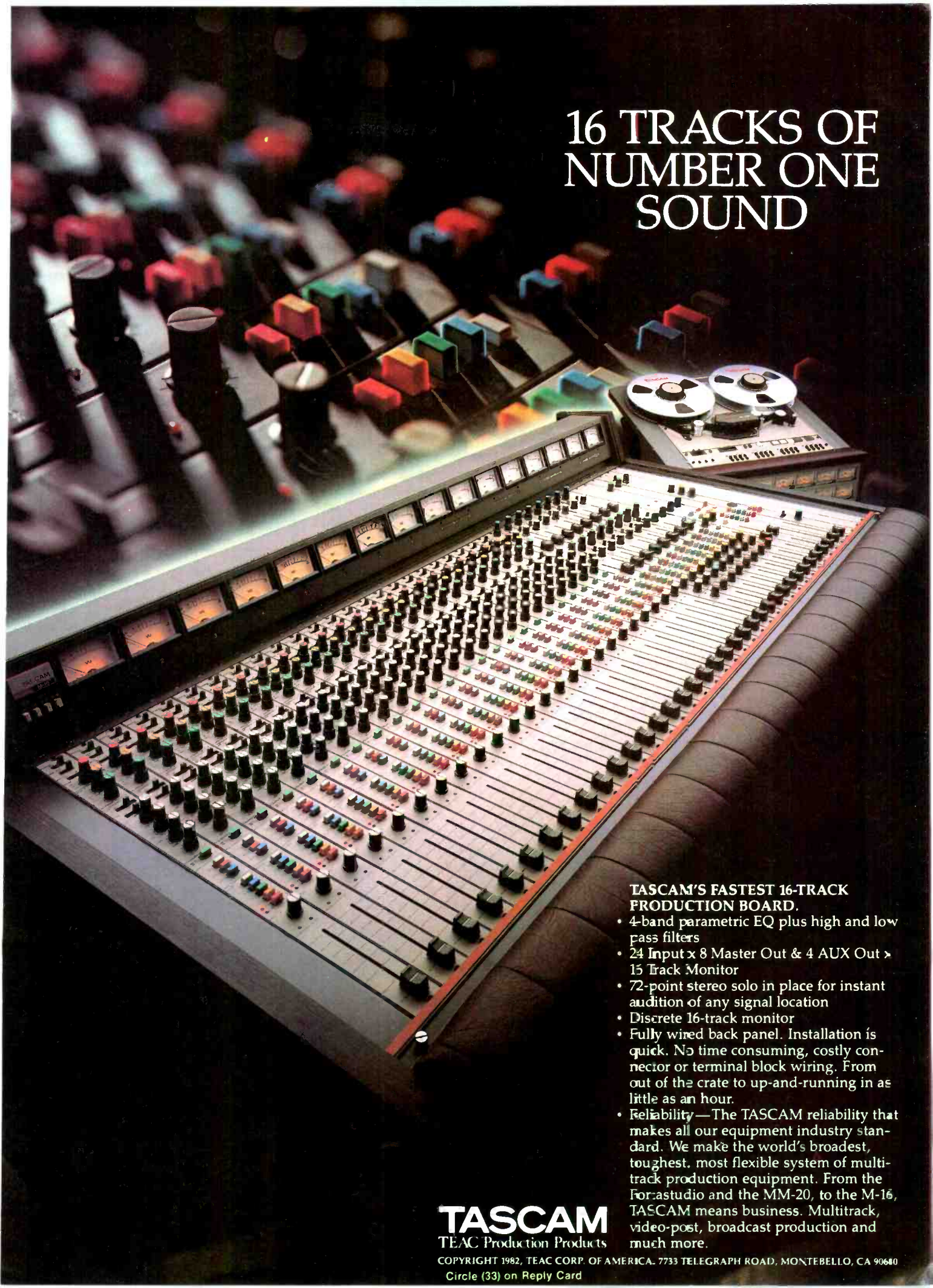
For use with the HP-IB IEEE-488 system, bandwidth resolution from 10Hz to 3MHz is possible. All displayed information is held in a digital buffer, updated at the sweep rate and displayed flicker-free against an electronically generated graticule. X, Y and Z outputs are available for auxiliary display as well as X (horizontal), Y (video), and Z (pen-lifter) signals for an X-Y recorder.

Circle (209) on Reply Card

Hitachi Denshi Ltd.

The reduction of the CRT to a 3½-inch diagonal allows the V-099 (NTSC) TV waveform monitor to be placed 3-across in a 19-inch rack. For portable use, the AD-099 battery pack supplies power in a 11.5 to 14Vdc range, for 2-hour operation.

Either of two inputs may be viewed at 1 or 4V sensitivity levels with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Circle (33) on Reply Card

V-099

response filtering in flat, IRE or 3.58 bandpass modes. A calibrated signal is included. The selected video input is delivered to a real panel video output jack.

The horizontal timebase includes 2V, 2V Mag (x20), 2H and 1μs/div rates. That timebase may reference input video or external sync drive. The dc restoration clamps the back porch to the zero level on the graticule.

Circle (210) on Reply Card

LVS-5850

Leader Instruments Corporation

The LVS-5850 NTSC vectorscope includes 20%, 10° limits on the graticule at all times with 2.5%, 2.5° boxes internally generated. Packaging may be a portable carrying case or a half-rack mounting bracket.

A or B inputs may be displayed with a phase reference to the A input or to an external burst signal. Both 75 and 100% saturation marks are provided for the burst axis. A test circle is push-button selected. The gain control includes a detent calibration position in addition to continuous adjustment.

Circle (211) on Reply Card

For use with video picture monitors having R-Y/B-Y demodulator outputs, the LBO-51M X-Y display may provide a vector display on the 8 x 10cm CRT if a special graticule is requested. Dc to 3MHz bandwidths may be passed in the X and Y channels with Z-axis response to 4MHz. The 100mV/div. sensitivities include ±50% gain adjustments. Display rotation is available for vector positioning with maximum phase shifts of 3° at 1MHz. The unit fits a half-rack 8½" x 5¼" format if removed from its portable case.

Circle (212) on Reply Card

LBO-5860

A companion to the Leader vectorscope, the LBO-5860 waveform monitor (LBO-5861 for PAL and

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Circle (35) on Reply Card

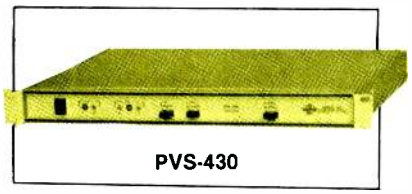
Circle (46) on Reply Card

SECAM) mounts side-by-side in a 19-inch rack frame. A and B inputs are looping, with front panel switch selection and either 1 or 4V full scale sensitivity.

Horizontal timing is selectable for 2H, 1μsec/div, 2V and 2V MAG waveforms. A 9-pin connector on the rear panel allows remote switching for an RGB parade display. YRGB is also possible.

The LBO-5860 provides a line-by-line selection of VITS signals on vertical interval Lines 14 through 21, with a rotary switch. A special output on the rear panel for vectorscope use yields active line blanking, thus allowing VITS displays on the vectorscope as viewed on the waveform monitor.

Circle (213) on Reply Card

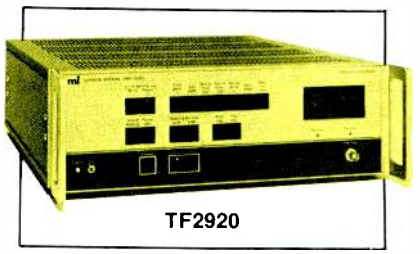


PVS-430

Lenco, Electronics Division

The PVS-430 videoscope provides a display of the SC/H phase relationship required for proper horizontal and subcarrier phase timing by driving a video picture monitor. The output signal consists of a single vertical line that corresponds to the leading edge of Line 10, Field 1 and a single sine wave representing the subcarrier phase with respect to Line 10. A horizontal reference line shows zero crossing at the 50% point. A bypass switch allows the output to be the video signal being checked or the typical picture signal.

Circle (214) on Reply Card



TF2920

Marconi Instruments

With the TF2920 TV interval timer, all RS-170A intervals may be timed within an NTSC 525-line signal measuring 0.5 to 1.5V p-p. Two looping video inputs allow timing measurements with pre- and post-transmission sources. Measurements may be made on pulse widths and amplitudes of the signal, then presented on the digital display. Vertical blanking measurement is unaffected by VIRS, VITS, teletext or source code identification data.

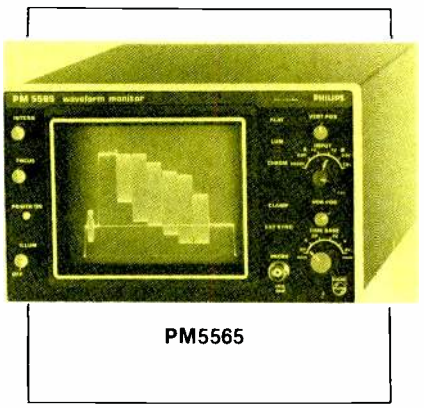
Circle (215) on Reply Card

With the TF2914A insertion signal analyzer, digital indications of video parameters based upon VIRS or VITS signals read up to 24 separate signal characteristics. From five different video inputs and in conjunction with the TF2915 data monitor or TK2917 data selector, the TF2914A can automatically sequence and read luminance bar or sync amplitudes; 2T pulse/bar ratios; C/L gain inequality, delay or crosstalk; signal-to-noise ratio; luminance non-linearity; low frequency or bar tilt; 2T 'K' factor; differential phase and gain; and individual multiburst frequency amplitudes.

Circle (216) on Reply Card

The TF2370 spectrum analyzer reads 50Ω signal sources from 30Hz to 110MHz. By addition of the TK2373 frequency extender, the range is expanded to 1.25GHz, still retaining the 5Hz resolution on the digital counter and a vertical scale range from -159 to +30dBm on either a 100dB display range or vertical resolution to 0.1dB. A linear scale provides 300nV to 300mV/div, with the CRT graticule internally generated. Auto, manual and single-sweep modes trigger sweep ranges from 100ms to 100s, with sweep widths of 200Hz to 100MHz/div. Narrow, normal and wide vertical filtering is available. as well as a dual but independent storage display system. Digital technology provides independent update/refresh capabilities of each display. A maximum input signal to +25dBm (4Vrms) continuous is allowed. An integral tracking generator is correct within 2Hz of the analyzer tuning.

Circle (217) on Reply Card



PM5565

Philips Test & Measuring Instruments

Available in a portable case, the half-rack format PM5565 waveform monitor also fits a 5¼-inch high rack panel. Its internal graticule 8 x 10cm CRT allows precise measurement with NTSC as well as PAL G, M or N color models.

The vertical input selector may choose a 0.2 or 1V deflection sensitivity A or B video, a 1V calibration waveform and an auxiliary front panel probe input. Variable control reduces the sensitivity by a factor of five. Vertical filtering selects flat, IRE luminance or chroma responses for the display from looping inputs.

Horizontal sweep includes 1H, 2H, 2H MAG, 1V, 2V and 2VMAG positions. Synchronization may be to the displayed video or a looped external input. Remote control through a rear-panel 9-pin jack switches the timebase for internally selected RGB/YRGB parade presentations.

Circle (218) on Reply Card

PM5567

Complementary to the PM5565, the PM5567 vectorscope is available with portable case or in the half-rack, uncased form. It displays NTSC or model-specified PAL standard signals on a 8 x 10cm internal graticule CRT. A or B video from looping inputs may be viewed in 75 and 100% saturation calibration levels. Variable gain control offers a -6 to +15dB range. The subcarrier may be referenced to displayed signal or an external burst or composite signal from a third looped input. On PAL versions, a +V switch rejects all -(R-Y) vectors of the PAL signal.

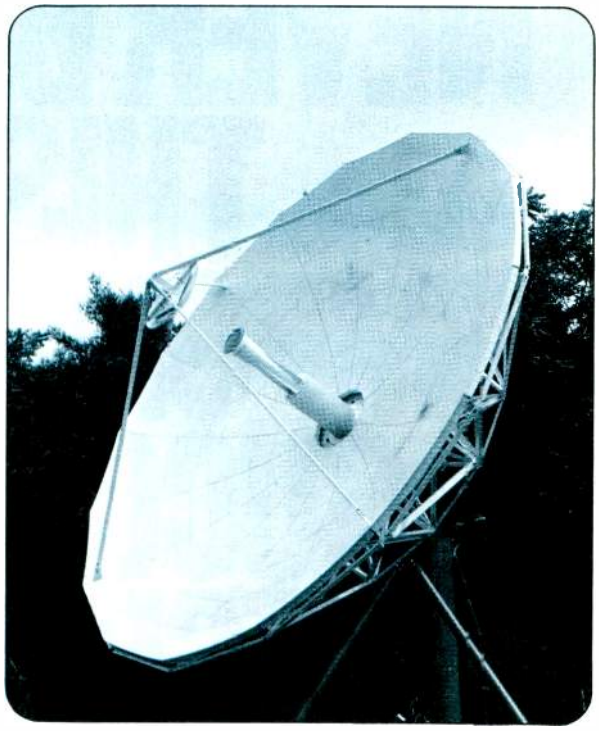
Circle (219) on Reply Card

PM5548

The PM5548 video level meter uses digital techniques for signal level measurement. Front panel thumbwheels select the line number on which a sample is to start. A height control determines how many lines

If you're looking for low-cost TV programming with broadcast quality...

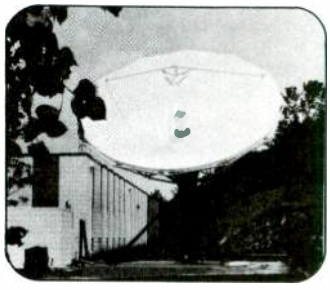
There's a Harris earth station system to fit your needs



9.0 meter

The Harris SSL* family offers a variety of satellite earth stations *specifically designed for broadcasters.* Whatever your system requirement—large or small, downlink or uplink—Harris has the complete package for you, including total planning, rapid reposition antennas, video receivers, exciter-high power amplifiers, microwave links, remote control and complete installation. All backed by Harris 24-hour-a-day service—the most responsive in the broadcast industry.

The high-speed drive system of the Harris kingpost pedestal allows rapid and accurate repositioning of the antenna, so that it can be rotated automatically between any domestic communications satellites in less time than a normal commercial break.



6.1 meter

The Harris 9.0 meter SSL provides the industry's most advanced feed horn antenna design, with video receive S/N (signal-to-noise) in the high 50s for network quality broadcasting. This antenna is also designed for uplink service, *where specifications and price outperform 10 meter designs!*

The 6.1 meter SSL provides *highly cost effective* TV receive only (TVRO) service for broadcasters, with S/N performance in the mid-50s.

Set your sights on a whole new universe of TV program sources. Contact Harris Corporation, Broadcast Products Division, Quincy, Illinois 62305-4290. 217-222-8200.

*Satellite to Studio Link

HARRIS

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SONY INTRODUCES A 1" VIDEO RECORDER TAILORED TO THE PEOPLE WHO USE IT: THE BVH-2000.

Because Sony probably has more experience selling and servicing 1" VTR's than anyone else, we're in an unequaled position to understand the wishes of 1" video users.

And now, Sony announces wish fulfillment for the broadcast industry: the new BVH-2000 1" video recorder.

WHY "BVH-2000" WILL MEAN DIFFERENT THINGS TO DIFFERENT PEOPLE.

In broadcast recording, there is no such thing as one typical situation.

That's why there's no one single BVH-2000.

The BVH-2000 actually allows you to "design" the VTR you need for your own particular applications and budget.

You can choose among three different control panels—ranging from a basic model to one with virtually every possible feature and function.

And the tape transport system, signal system, and control section can either be combined into a single unit, or separated easily and installed in a 19" rack or console.

The BVH-2000 (shown with Type-III control panel).

The BVH-2000 also gives you far greater latitude in setting up your entire recording system. Various remote-control connectors enable you to interface your system in a variety of ways for studio, mobile, and editing configurations. Direct interface with U-matic® and Betacam™ is possible, too. The BVH-2000 also has an optional plug-in time base corrector.


Plug-in time base corrector (optional).

What's more, the BVH-2000's lighter weight and smaller size (almost 50% less than its predecessor) make it as ideal on the road as it is in the studio.

And because of the ever-increasing number of applications requiring longer program times, the BHV-2000 provides up to 2 hours of tape time.

A VTR THAT LEADS THE SIMPLE LIFE.

In the BVH-2000, unlike most other VTR's, microprocessors are used to their full advantage. All data necessary for servo control are channeled into a central processing unit, making the operator's control over all systems and functions simpler and more precise.

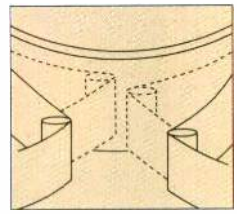
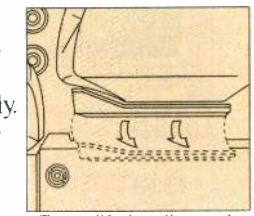
Life is made simpler yet by the fact that every necessary function control, metering facility, and electronic module is accessible from the front.

Even the way the tape moves through the recorder has been simplified. One innovation—an extremely precise servo mechanism—permits the entrance and exit guide posts to move about 10mm away from the drum during threading. The result is the easiest threading system ever in a 1" video recorder.

THE MOST ARTICULATE VTR EVER BUILT.

The BVH-2000 removes much of the mystery from maintenance, too. It literally tells you about malfunctions—usually well before you'd notice them yourself—through a microprocessor-governed self-diagnostic system.

The system includes various alarm functions and numerous checks to confirm that everything is working properly. Most defects can be easily found—allowing for far less complicated maintenance and repairs, and reducing downtime considerably.

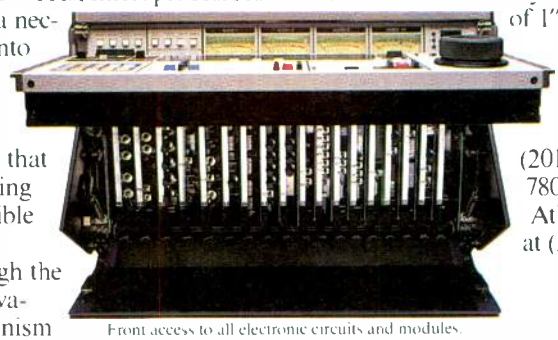


To simplify threading, guide posts automatically move away from drum, and audio head cover opens.

And because the best way to simplify maintenance is by lessening the need for it, the Sony BVH-2000 has been designed to be virtually maintenance-free down to the last detail. For example, only brushless DC motors are used, and all incandescent lamps have been replaced with high-brightness LED's.

Other welcome advances include a greatly expanded dynamic tracking range (from reverse at normal speed to forward at 3 times normal); programmed play (allowing you to vary playback speed across a range of ±20% of normal speed); and video and audio confidence.

Display board for self-diagnostics and other data-processing functions.

Remarkably, these are only some of the Sony BVH-2000's innovations. All of them add up to form the answer to virtually every need ever expressed by the users of 1" video.


Front access to all electronic circuits and modules.

To find out how it can answer yours, write Sony Broadcast, 9 West 57th St., New York, NY 10019. Or call us in New York/New Jersey at (201) 368-5085; in Chicago at (312) 860-7800; in Los Angeles at (213) 537-4300; in Atlanta at (404) 451-7671; or in Dallas at (214) 659-3600.

SONY®
Broadcast

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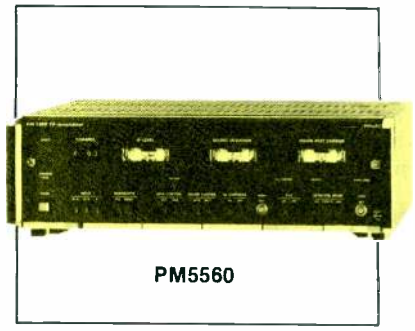
will be sampled; the delay multi-turn potentiometer fixes the sampling point on the selected line. A width control determines the width of the sampling pulse. Results of the measurement are presented on Nixie displays with an optional output providing for digital printing or remote monitoring.

Two signals may be connected to the unit for measurement: one via a real-panel jack and a second through the front panel, with a switch to choose between them. Sync is looped through the rear panel.

Two outputs include front and rear panel video jacks that will include the video signal with a marker pulse. A second front panel output provides only the marker pulse for use with other equipment.

Sampling may start on any line from 1 to 525/625 (models may accept 3.58 or 4.43MHz subcarrier), with a height from 1 to 50 lines. The sample may begin at 1 to 64μs from the leading edge of sync with a width of 0.3 to 10μs. The package fits the half-rack 5-1/4" x8-4/5" format.

Circle (220) on Reply Card



PM5560

Dual level inputs for UHF and VHF (100mV or 1V) and an IF input (70mV) allow multiple channel use with the thumbwheel-selected PLL tuner of the PM5560 demodulator. A ±6dB AGC control may be disabled for manual gain control. A zero level clamp input eases modulation depth measurement. One front and two rear panel video output jacks provide 1V p-p 75Ω signals. Two composite sync outputs and a field drive output are also available on the rear panel.

Horizontal edge-on meters indicate vision rest carrier, IF level and sound deviation signals. Detection of those signals may be selected for envelope or synchronous modes, with both intercarrier and split audio detection possible. In synchronous mode differential phase less than 1° and gain less than 1% with a 1kHz to 6MHz signal-to-noise ratio greater than 60dB. Two sound outputs are provided, with the main output on a 5-pin DIN connector at +6dBm for ±25kHz deviation across 600Ω.

Circle (221) on Reply Card

632B-1

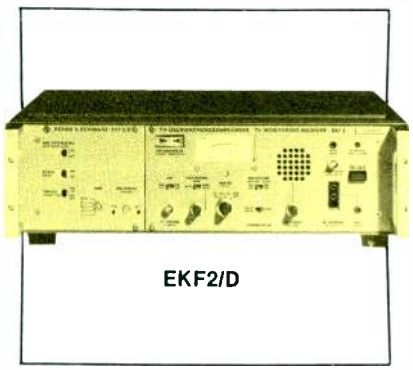
Polarad Electronics

Covering the band from 100kHz to 2GHz, the model 632B-1 spectrum analyzer is useful for measurements to -120dBm levels at a 1kHz bandwidth. Those signals within the band may be displayed on the 8 x 10cm CRT with an 80dB on-scale dynamic range. The graticule is internal. The maximum safe power for application to the RF attenuator, via a 50Ω input connector, is 30dBm.

Scan widths from 500Hz to 200MHz/div are provided in a 1-2-5 sequence, with a zero span (receiver) mode available for modulation analysis. A variable scan control gives an additional capability to less than 200Hz/div. In auto mode resolution, the unit optimizes the resolution bandwidth, while the manual mode switch selects 300Hz to 1MHz widths. Scan times range from 2ms to 2s/div with triggering for single shot mode, manual mode and auto.

The CRT is controlled through a storage memory system that may include full memory erasing and recall of stored data as well as half-memory split, in which half of memory addresses retain the desired display with the other half displaying incoming signals.

Circle (222) on Reply Card



EKF2/D

Rohde & Schwarz Sales Company

With the EKF2/D TV monitoring receiver, input level range selection provides monitoring capability on any

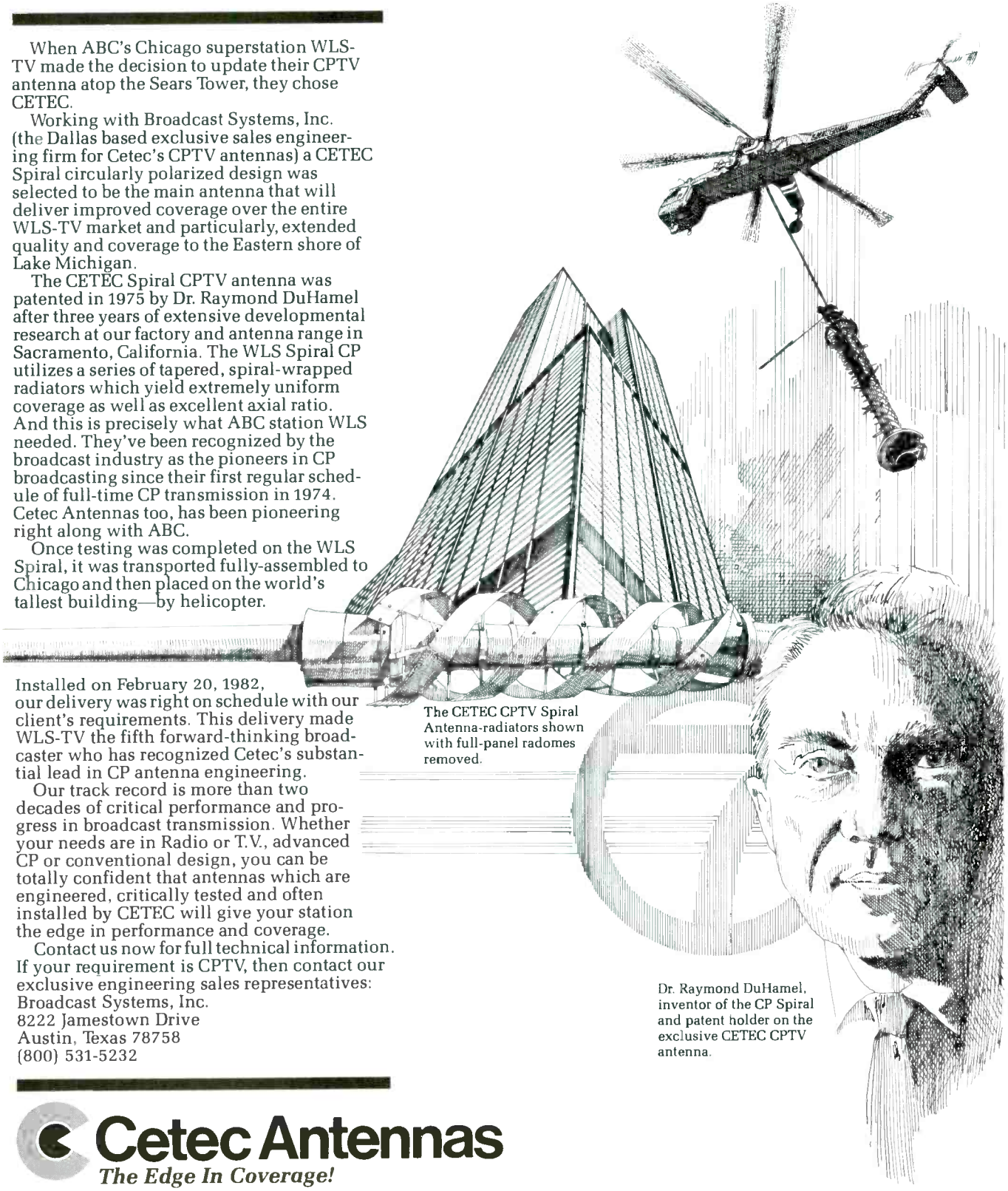
A CETEC CPTV ANTENNA TOPS THE WORLD'S TALLEST!

When ABC's Chicago superstation WLS-TV made the decision to update their CPTV antenna atop the Sears Tower, they chose CETEC.

Working with Broadcast Systems, Inc. (the Dallas based exclusive sales engineering firm for Cetec's CPTV antennas) a CETEC Spiral circularly polarized design was selected to be the main antenna that will deliver improved coverage over the entire WLS-TV market and particularly, extended quality and coverage to the Eastern shore of Lake Michigan.

The CETEC Spiral CPTV antenna was patented in 1975 by Dr. Raymond DuHamel after three years of extensive developmental research at our factory and antenna range in Sacramento, California. The WLS Spiral CP utilizes a series of tapered, spiral-wrapped radiators which yield extremely uniform coverage as well as excellent axial ratio. And this is precisely what ABC station WLS needed. They've been recognized by the broadcast industry as the pioneers in CP broadcasting since their first regular schedule of full-time CP transmission in 1974. Cetec Antennas too, has been pioneering right along with ABC.

Once testing was completed on the WLS Spiral, it was transported fully-assembled to Chicago and then placed on the world's tallest building—by helicopter.



The CETEC CPTV Spiral Antenna-radiators shown with full-panel radomes removed.

Dr. Raymond DuHamel, inventor of the CP Spiral and patent holder on the exclusive CETEC CPTV antenna.

Installed on February 20, 1982, our delivery was right on schedule with our client's requirements. This delivery made WLS-TV the fifth forward-thinking broadcaster who has recognized Cetec's substantial lead in CP antenna engineering.

Our track record is more than two decades of critical performance and progress in broadcast transmission. Whether your needs are in Radio or T.V., advanced CP or conventional design, you can be totally confident that antennas which are engineered, critically tested and often installed by CETEC will give your station the edge in performance and coverage.

Contact us now for full technical information. If your requirement is CPTV, then contact our exclusive engineering sales representatives:
Broadcast Systems, Inc.
8222 Jamestown Drive
Austin, Texas 78758
(800) 531-5232

Cetec Antennas
The Edge In Coverage!

6939 Power Inn Road, Sacramento, California 95828
(916) 383-1177 Telex: 377321

Circle (39) on Reply Card

THE $250,000 CART MACHINE.

by Ray M. Kohfeld, President, Ramko Research

PhaseMaster, The industry's most advanced broadcast reproduction system.

From the beginning of the PhaseMaster cart machine project more than two years ago, we were convinced there was an electronic solution to the problem of stereo phase stability. Consistent stereo reproduction and machine-to-machine compatability could be solved. We believed that for many crucial system parameters, performance could be achieved in a cart system that would meet or exceed the best reel-to-reel machines.

What we didn't realize however, is that the development of the "ultimate" cart machine would cost over a quarter of a million dollars and take thousands of man-hours to accomplish. We finally achieved what we were after—no, what you were *after*—but not without some very trying times.

Early on, the goals were clear.

By employing leading-edge technology throughout each area of the tape system, we felt that the PhaseMaster could out-perform everything in the audio chain. Right on through the transmitter. The signal-to-noise, distortion and wow and flutter performance criteria had to rival reel-to-reel specs while retaining all the conveniences and benefits of the standard plastic tape cart. The major problems of tape skew and guidance had to be overcome in order to deliver a system which would, once and for all, take care of phase problems. This problem was judged by us to be absolutely critical for proper and consistent stereo reproduction. FM now, and AM just around the corner.

The final goal we set for ourselves was to design a cart system that offered automatic machine-to-machine compatability—an important benefit that to our knowledge no other reel-to-reel, cartridge machine or add-on processing system offers. We believe that it is a significant factor for the broadcaster to be able to pickup anyone's cart at random, record it on any PhaseMaster and then play it back on any PhaseMaster; the program material being precisely locked in-phase. Whatever the phasing of the original source, the signals will be automatically and faithfully reproduced. Ultimately, tape skew, chatter or even head misalignments would no longer be a problem.

Side-to-side stereo shift; holes in the mono mix or worse yet, reception; audio modulation due to tape chatter from the cart: major problems that we've lived with for years. You waste valuable time trying to get around it, cart manufacturers would like you to believe that it's solved in their carts, programming and management don't want to hear about it, and your audiences reach for the dial when your station doesn't sound good because of it.

To have introduced another cart ma-

chine that didn't solve all these persistent problems would have been negligent. To say the least, another mousetrap. As we've stated, the goals were clear from the onset, but not the solution(s).

Our attempts at phase correction: shortcuts aren't our way of doing things.

When we first looked at the problem, there existed only one other means of phase correction. This is an electromechanical approach which adjusts head alignment for each cart prior to the initial recording. Although this is certainly an improvement over what had existed (nothing), we felt it had many shortcomings. It can't correct phasing in real-time, the compatability factor is not high enough, it's overly complex-subject to breakdowns, and it adds valuable, additional time to a producer's already busy schedule of production.

What about stereo matrix?

Another approach which initially offered some technical promise at the outset was stereo matrixing. We went down this road early and discovered that a matrix system not only added unwanted electronic noise (something we were taking great pains to get rid-of) but it did very little to accomplish our goal of machine-to-machine compatibility. These fundamental drawbacks are inherent in this design approach and we eventually discarded it after many attempts to make it do things it just couldn't do.

Cross-correlation and signal injection: not the answers either.

After discarding the stereo matrix approach, we researched the viability of mixing timing signals onto the Left and Right audio tracks. This was closer to what we had in mind but detracted from the end result in that the audio had to be reprocessed which naturally degraded the high quality audio we were aiming for.

The third technique investigated was a cross correlation scheme that is essentially a form of probability theory with user adjustments. This also was eventually dismissed because of its inability to second-guess many complex waveforms and the necessity to readjust for various types of program material.

Although all of these approaches have some merit and have since shown up in the marketplace, the individual shortcomings were too much of a compromise of the promises to ourselves that we could do it better. Much better.

The answer! Perfect phase correction via the Q-track.

The elegantly simple and totally unique answer to the phase-stability problem came because of persistence and, at times, downright obstinence to not accept anything less than what we set out to achieve: picture perfect phase accuracy and stability—an ultimate, real-time correcting solution to the biggest problem the cart system serves up to every broadcaster.

The phasing (or more accurately, time base) correction system in the new PhaseMaster cart machines takes a sample of the upper (Left) audio channel, encodes it and then records it on the cue track without interference to any other information. Upon playback, the encoded signal is reconstructed and compared to its mate on the upper track so that we now have two identical signals to compare with each other. This has been the key. We are now able to compare apples to apples. Dissimilar information normally found in Left and Right audio is no longer a limiting factor. After these two identical signals are compared by a clever signature-determining circuit, a control signal is developed. Any time-base differences between these signals are applied via control signals to timing circuitry in both the Left and Right audio for correction. The result? Phase correction in real-time... measured in microseconds. The heads, the tape or both can be severely out-of-whack and the PhaseMaster's phase compensating electronics don't care. The audio can be complex, sinousoidal or recorded only on one track.

You can record your program material on any PhaseMaster Record/Play machine and rest assured that it will reproduce exactly like the original source no matter it be across the hall or across the world.

Control instrumentation technology helped us find the solution and we're now preparing for patent application.

Compatability with your present system.

The new PhaseMaster also offers you compatability with all your present, previously recorded carts. An easy transition can be made at your own pace without having to rerecord your station's entire library. To state it simply, PhaseMaster now gives you a professional R/P system without the drawbacks you've grown accustomed to.

Last, but not least, the best mechanical design you've ever seen.

The deck is a ⅝" casting for stability, with a stainless steel cover plate for wear-resistance and EMI shielding. A crystal-controlled D.C. servo motor insures timing accuracy to within ±0.05% and, practically no heat generation. The speeds are field selectable: 3¾, 7½, and 15 ips.

Your carts are securely held in position by the edges to prevent distortion, using spring-loaded rollers. Insertion and withdrawal is smooth and positive-feeling. The machined head stack is rock stable, and we've included internal illumination for periodic inspections and maintenance. There are no microswitches to break or jam—and never any start-up wow because the motor is started by an optical sensor as you begin to insert the cart. To keep damaging heat away from the tape, the capstan is ceramic. And bearings have a longer life because the motor doesn't need to run continuously due to the cart sensing design and the ability of the motor to reach full speed by the time the cart is fully inserted. The pinch roller is engaged by an adjustable air-damped solenoid with a teflon coated plunger for fricton-free, quiet operation.

On the PhaseMaster R/P machine you get front panel switch selectable inputs; integral diagnostics for faster, easier maintenance; three cue tones are standard. An automatic 4½ digit timer is standard. Left/Right audio plus phase analysis solid-state meters, motor "out-of-speed" and "already played" indicators are standard, too.

With the kind of performance we didn't compromise.

We've set new standards for wow and flutter: .04-.07%. The amplifier's signal-to-noise is −65dB utilizing dynamic noise reduction without companding or expansion. Frequency Response is ±1.0dB. And, of course, there's balanced I/O's and a +25dBm output capability.

It's been worth the wait.

We call it the $250,000.00 cart machine. That's what we invested on our bottom line to engineer a system that you can have for less than $1,400.00.*

Call us collect at (916) 635-3600 or contact your Ramko sales rep for more information and a schedule of when you can have a free, two week trial of PhaseMaster—*the industry's most advanced broadcast reproduction system.*

*PhaseMaster playback machine. Prices subject to change without notice.

Engineered For Your Bottom Line.

RAMKO

Ramko Research, 11355-A Folsom Blvd., Rancho Cordova, California 95670 (916) 635-3600

Circle (40) on Reply Card

VHF or UHF channel from 20mV to 1.5V through a 50Ω type N rear panel connector. An IF input also allows application of 5 to 100mV level signals. The user may elect manual or automatic gain control for a 30dB range. Besides a PLL tuner, single channels (crystal controlled) may be monitored, the RF, IF and deviation values shown on a front panel meter.

Envelope and synchronous detection are available from either of two 75Ω outputs. For modulation depth observations, the zero reference pulse is used during the vertical interval or, externally triggered, it may be disabled. A sound trap may be inserted to remove possible audio disturbances from the visual output. Differential gain to a maximum of 3% and phase ± 2° are typical, with a video signal-to-noise ratio of 64dB normal if the RF inputs are greater than 250mV. A 400Hz, ± 25kHz deviated audio carrier provides paralleled front and rear panel balanced outputs at 0dBm across 600Ω.

Circle (223) on Reply Card

EKF2 standard M

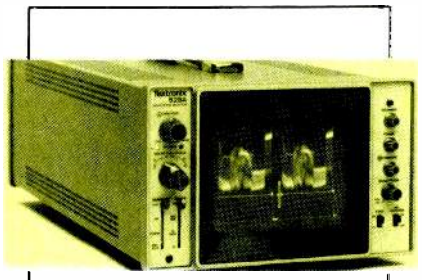
Up to eight preselected channels (two per band) with levels from 250μV to 150mV or an IF signal from 5 to 100mV may be monitored with the EKF2 standard M RV monitoring receiver. A sound trap is always in the circuit, but detection is switch selectable from envelope to synchronous modes. Two meters provide tuning information as well as RF, IF and deviation data. Gain control may be automatic or manual.

With greater than 3mV RF level, a video signal-to-noise ratio of 54dB is typical with differential gain less than 5%, phase at ± 2°.

Circle (224) on Reply Card

Tektronix

A or B inputs to the 528A waveform monitor may be displayed on a 8 x 10cm P31 CRT in 1 or 4V sensitivity levels with 1V calibration signal for setup. The variable control adjusts the display to the full 140IRE unit height. The rear panel video output follows the display selected. Vertical channel response choices include flat, IRE,



528A

chroma and differential gain with dc restoration acting on the back porch area.

The horizontal timebase allows 2V, 2V Mag (20x), 2H and 1μs/div sweep rates. Sync may reference input video or an external source. Further timebase control for a RGB parade display is through a rear panel 9-pin receptacle. The factory RGB wiring may be altered for a YRGB display.

This industry standard may be obtained without a case (Option 1), with a carrying case (Option 2), or with various mounting cradles for 2-wide rack implementation.

Circle (225) on Reply Card

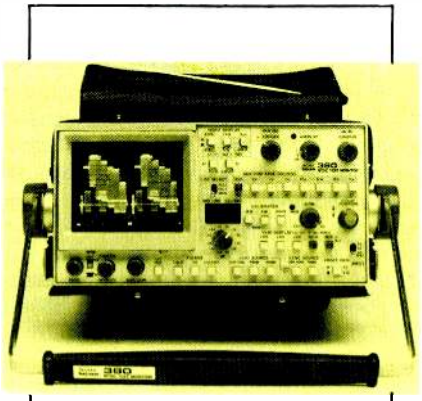
Replacing the well-known model 529, the 1480 series waveform monitor includes a NTSC version (1480), a PAL form (1481), a PAL-M monitor (1482) and the dual standard NTSC/PAL (1485). All are available in an 8¼"x 8½" cabinet format or a 19-inch wide unit.

The vertical channel may select video from A, B or an Aux input, as well as the 1V calibrator. A line strobe signal output (with its own jack) is also added to the picture monitor output signal to show those lines selected for individual viewing. A second video output connector is fed from the auxiliary input. Vertical response filters include flat, luminance, low-pass, 3.58 chroma, aux input and differentiated staircase (plus 4.43 chroma on 1485).

The horizontal timebase may lock to either A or B video or A or B external sync on a constant lock to the A input. Sweep rates may select 2-field (with magnifications of 1X, 5X, 10X, 20X, 25X and 50X), 5 or 10μs/div (with 5-step magnification up to 0.1μs/div) and external. Digital selection of Lines 9 through 22, Field 1 (322 to 335 of Field 2), allows viewing of an individual line, variable control of the viewed-line selection or grouping of 15 lines for VTR use. An overlay (sweep foldback) circuitry provides signal overlay for comparisons. An AFC system may be used to detect jitter in incoming video, while the dc restoration keys to the backporch or to sync tip.

The display may be set for 1, 0.5, 0.2 sensitivities with a 1V calibrator position. Both ac and dc coupling are available for A, B and A-B input modes. Ac coupling only applies to auxiliary probe input video.

Circle (226) on Reply Card



380

The 380 portable test monitor includes waveform, vector and oscilloscope displays into one portable unit, battery-powered for field use. Produced jointly with Sony Corporation, the package allows chroma, IRE and differential step filtering with ac or dc coupling, dc restoration and use of a looped input or probe input. The vertical display amplitude control includes a variable control along with 1, 0.5, 0.2 and 0.1V settings. A noise measurement function is built-in.

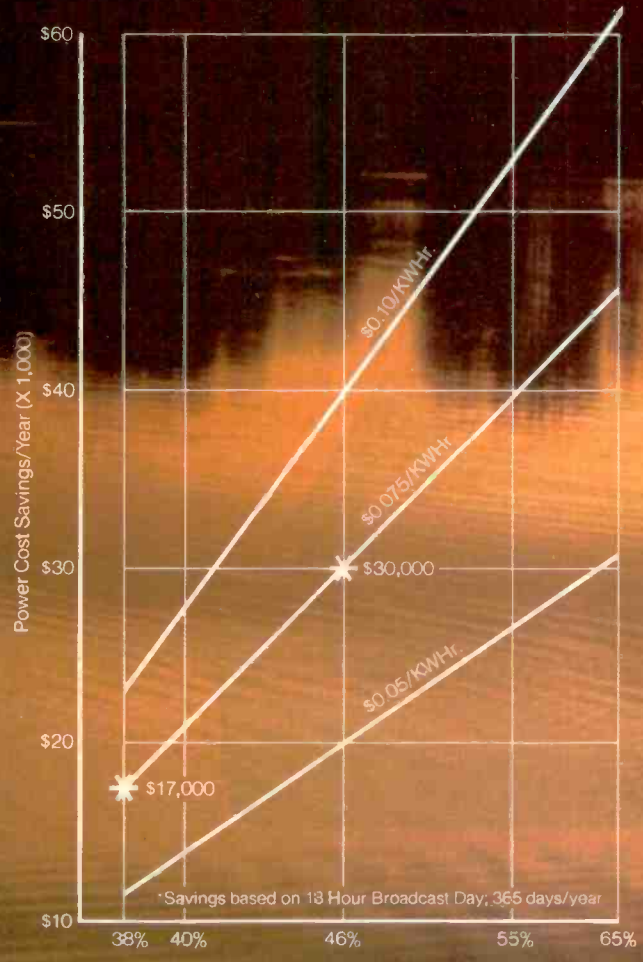
The timebase allows selection of traditional field and line displays along with a 7H display. Digital selection of lines 15 to 21 permits VITS measurement with full brightness. An overlay function displays small errors with high accuracy.

As a vectorscope, standard displays are given. Additional selections show vertical interval and differential phase and gain measurements. As an oscilloscope, vertical sensitivity ranges from 1mV/div to 0.5V/div with triggered sweeps from 0.2μs/div to 50ms/div. The 380 package weighs approximately 12 pounds with an additional 9 pounds for the battery pack.

Circle (227) on Reply Card

The 520A (NTSC) vectorscope is also available in PAL (521A) and PAL-M (522A), all in a 9-inch high, 19-inch rack format or optional cabinet. A or B inputs may be viewed separately or on a time-shared basis. Individual gain controls include 75 and 100% saturation calibrate positions, as well as a maximum gain detent. Phase reference may be to A, B or an external source. The video channels may show a calibration circle for gain setup prior to displaying full field

EEV high efficiency UHF klystrons pay for themselves...in 1 to 3 years!



Annual Power Cost Savings using EEV 55KW high efficiency klystron vs. older generation 30% efficiency klystron

These are the facts.

- Over 70 EEV 55KW high efficiency external cavity klystron installations made during the past three years.
- These klystrons are operating from 38% to 46% efficiency vs. average of 30% efficiency for older generation klystrons.
- Annual power cost savings from $17,000 to $30,000 for single tube installations.*
- Existing transmitters upgraded with new EEV klystrons operating from 38% to 40% Eff.
- New transmitter installations with EEV klystrons operating from 40% to 46% Eff.
- Life and reliability proven by 1400 installations worldwide logging over 9,000,000 hours/year.
- EEV 55KW high efficiency klystrons available for UHF channels 14 to 78.
- Development work being completed to attain 55%-65% efficiencies for external cavity klystrons with modulating anode or grid pulsing vs. kystron's intrinsic 46% efficiency.

With these facts you can predict your power cost savings when you install EEV's 55KW high efficiency external cavity klystron.

Start now.

Specify EEV for your existing or new transmitter, *or*...

Convert and upgrade your internal cavity klystron system to EEV's external cavity klystron.

Every week you delay installing an EEV 55KW high efficiency klystron can represent an additional 4400KW to 7500KW on your power bill.

*Based on an 18 Hour Broadcast Day and $0.75/KWHr.

EEV, INC.

7 Westchester Plaza, Elmsford, NY 10523, 914-592-6050, Telex 646180

In Canada: EEV CANADA, LTD., 67 Westmore Drive, Rexdale, Ontario, M9V 3Y6, 416-745-9494, Telex 06-989363

In Europe: English Electric Valve Co. Ltd., Chelmsford, England CM1 2QU Tel: 0245 61777, Telex 851-99103

video and Field 1 or Field 2 VITS with lines selectable from 15 through 21.

Also, line sweep displays may include Y, R, G, B, I and Q signals on the 5-inch circular CRT. Differential gain and phase measurements are possible. For use with selected line displays (as from the 1480 WFM), a Z-axis input allows trace brightening inputs if a certain portion of a display is of more interest.

Circle (228) on Reply Card

The 1420 NTSC vectorscope provides phase and chroma level monitoring where VITS indications are not required. Its size allows mounting side-by-side with a 528A waveform monitor.

There are two inputs, A and B, with reference burst selectable from A, B or an external burst source. The graticule includes markings to determine phase and gain errors with 5% and 2° from these video sources.

Circle (229) on Reply Card

When used with video picture monitors with R-Y, B-Y demodulation outputs, the 602 and 604A display monitors may offer a vectorscope display for VTR phasing adjustments. The X-Y color difference outputs from the picture monitor are displayed on the CTR with graticule markings for approximately 2° and 5% gain and phase errors. The CRT of the 604A is larger.

Circle (230) on Reply Card

1450-2

The 1450 series of TV demodulators include a System M for NTSC use and the 1450-2 for B/G signal demodulation. In each case, a TDC downconverter is required. The TDC1 tunes VHF Channels 2 to 13 and CATV Channels A to W; the TDC2 for UHF Channels 14 to 83 and the TDC for user-ordered fixed channel tuning. 50 Ω input levels from -69 to +27dBm are displayed on the LED readout, while -64 to -20dBm IF levels may be applied. The internal zero carrier reference is defeatable if external reference signals are used. Individual LED indicators show loss of aural or visual carriers.

Intercarrier or split audio modes are provided as is an aural carrier only mode, for measurements without a visual carrier. Manual and auto gain controls are available, along with back porch or sync tip dc restoration. Detection may be in envelope or synchronous modes with PLL references to the back porch and sync tip times or continuous referencing.

Differential gain and phase in the synchronous detection mode are less than 1% and 1° with a 60dB signal-to-noise ratio minimum (-24dBm input signal). Two 75 video outputs are available on the rear panel, as are audio outputs, an 8Ω speaker and a balanced 600Ω line adjustable from -10 to +15dBm, typically +10dBm. A headphone jack is on the front panel. A deviation output at 50mV/kHz at 600 Ω may indicate the aural carrier deviation on an external voltmeter.

Circle (231) on Reply Card

The 496 spectrum analyzer allows measurement portability from 1kHz to 1.8GHz for all broadcast TV applications. A type N connector accepts 50 Ω signals at levels to +30dBm (1W) continuously. Higher levels require special care. An 80dB dynamic range

DIGITAL TEST GENERATOR

DTG-1000N

- The DTG-1000N features five identical and independently microprocessor controlled 10-bit test signal data stores with precision D/A converters.
- Each data store contains 35 computer generated, standard and new test signals in EPROMs.
- Menu style listing of all available test signals on local and remote control panels together with full status indication makes test signal selection easy.
- Internal RS170A sync generator for genlock and accurate system phasing maintains zero SCH at all times.
- Five standard trigger signals can be locked to any test signal selection from data store #5 and retained in memory.
- Auto correlation of auxiliary trigger signals to data store #5.
- Power down memory.
- Remote control up to 1000 feet for each data store.

LEITCH

Progressive Concepts in Television Technology

Circle (43) on Reply Card

Leitch Video of America, Inc.
825K Greenbrier Circle
Chesapeake, VA 23320
Tel: [804] 424-7920 Telex II: 710 882 4342

Leitch Video Limited
705 Progress Avenue
Scarborough, Ontario - M1H 2X1
Tel: [416] 438-5060 Telex: 065-25420

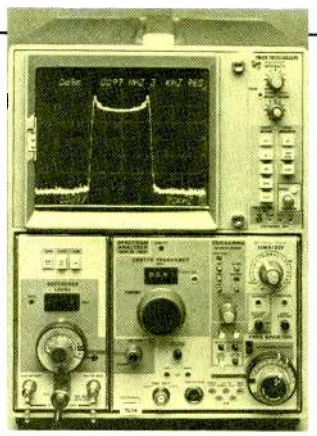
from -123 to +40dB inputs may be displayed on 2 or 10dB/div log modes or 20nV to 2V/div LIN modes.

A 1-2-5 sequence of scanning covers 50Hz to 100MHz/div with a time/div system switch-selected. Free run, internal/external and line lock triggering plus a single shot mode are push-button selected. Bandwidth resolution from 30Hz to 1MHz are possible.

The digital storage scheme gives *Save A, B minus Save A*, maximum hold and average display adjustments. Important parameters are displayed on the CRT screen via a character generator.

The unit is available as programmable and includes an interface for IEEE Std 488-1978 system operation.

Circle (232) on Reply Card



7L14

The 7L12 and 7L14 spectrum analyzer modules are used with the 7603 or 7613 mainframe display units to cover 100kHz to 1.8GHz and 10kHz to 1.8GHz ranges, respectively. Both units accept 50Ω inputs, the 7L14 being capable of withstanding a 1W input signal with dc and reference levels from -110 to +30dBm above 100kHz. The resolution bandwidth for the 7L14 is 30Hz to 3MHz (300Hz minimum for 7L12), while the frequency span of 200Hz to 100MHz/div (500Hz/div minimum for 7L12) is in 1-2-5 sequence. Either unit may be interfaced to other analyzer accessories, such as the 1405 sideband adapter. With the 1405, a modulation signal is applied to the transmitter from f_{VC} -15MHz to f_{VC} + 15MHz to precisely measure transmitter response characteristics.

Circle (233) on Reply Card

The 1980 ANSWER provides a complete set of amplitude, phase and timing information applicable to NTC7 and FCC regulations. Using digital technology, the measurement system allows programmed limits for *caution* and *alarm* points of the parameters. An associated printer gives the user hard copy of the measurements, while the system CRT/keyboard allows observation of the waveform, CRT readout of the parameters and an input to the programmable system.

Circle (234) on Reply Card

Telemet

With the model 3710 broadcast demodulator, a digital display indicates the signal level from 5mV to 1.8V RMS in a remote off-air situation. Transmitter feed line levels to 18V may be applied through a separate input connector. Special order models provide added sensitivity to 1mV. Any one VHF or UHF channel may be ordered; channel changing requires factory replacement of the down-converter.

Not only are synchronous and envelope demodulation available to the user, but demodulator testing circuitry is also included. A sound trap may be switched in and the internal zero carrier reference may be overridden to use an external reference. Four visual outputs on the rear panel provide two with each type of detection. A front panel output allows detection mode switching with high- or low-pass filtering. Differential gain and phase in synchronous mode are less than 2% and 1°.

AGC may be switched to manual control. Input level, deviation of the aural carrier, and + and -12V metering are given on the digital display. The indicated deviation shows an expected output from the 4.5MHz sound output, as well as on a 600Ω balanced pair, the level adjustable to +8dBm; an 8Ω 2W speaker output; and a speaker-output bridged headphone jack.

Circle (235) on Reply Card

The 4501 broadcast demodulator, coupled with the 4504 synchronous detector, offers total measurement capability. A front panel meter shows typical input levels from 5mV to 5V, with special order capability to 1mV RF input, for any single user-ordered UHF or VHF channel. An AGC range of 20dB may be overridden for manual gain. A loss-of-carrier alarm is provided.

At 100% modulation in synchronous detection the differential gain and phase are less than 2% and 1°, with the 4504 being fed an IF signal from the 4501 unit. Each unit then provides two 75Ω 1Vp-p outputs. Video gain control of 0.5 to 1.5V is offered.

For aural detection, one 4.5MHz output is available from the 4501, as well as a 600Ω balanced connection with level adjustment from -6dBm to +3dBm. A sound trap may be switched into the circuitry prior to the IF section.

Circle (236) on Reply Card

The front panel meter of the 3709 spectrum/sideband analyzer indicates point-to-point responses, while output connectors provide signals for visual presentation with an oscilloscope of the circuitry response characteristics. The unit provides a representation of the transmitter system bandpass from f_{VC}-14MHz to f_{VC} + 14MHz. Seven critical frequencies are pinpointed by markers with crystal accuracy. Sweep rates vary from 1Hz to 60Hz and include a manual sweep control.

With switch selection, the 3709 becomes a more typical spectrum analyzer. The channel coverage in VHF is altered by interchangeable fixed plug-in local oscillators,. while the 3707 expands the system with UHF conversion.

Circle (237) on Reply Card

Texscan Corporation

Using microprocessor control, the AL-57 spectrum analyzer covers a frequency range from 1MHz to 1.6GHz, with operation from 115/230Vac or internal/external 12Vdc. Digital storage of information to be displayed is optional.

A dynamic range of 70dB may be displayed from signals as low as -117dBm for 10kHz resolution, using 5 or 10dB/div or linear display scales. Filtering at 10Hz or 1kHz may be applied to the vertical channel information.

Dispersion from 20kHz to 1GHz is possible, with horizontal sweep control for single trigger, free running or manual sweep modes. Markers for 1, 10 or 50MHz are selected from touch switches. Resolution may be automatically selected or manually chosen from 0.3kHz or 1MHz.

Circle (239) on Reply Card

Video Aids of Colorado

A phase measurement unit, the BPM-1 burst phase meter can replace the vectorscope in some applications. With a loop through video input and reference subcarrier, the burst phase meter indicates a phase shift in the video burst relative to the reference subcarrier.

The BPM-1 is available with an Option 02 H Phase circuit to compare the input composite video sync to system sync and to indicate the difference in fractions of a microsecond on the front panel meter. The meter provides indications with an accuracy to ± ½° phase error and ± 50ns H phase error.

Circle (238) on Reply Card

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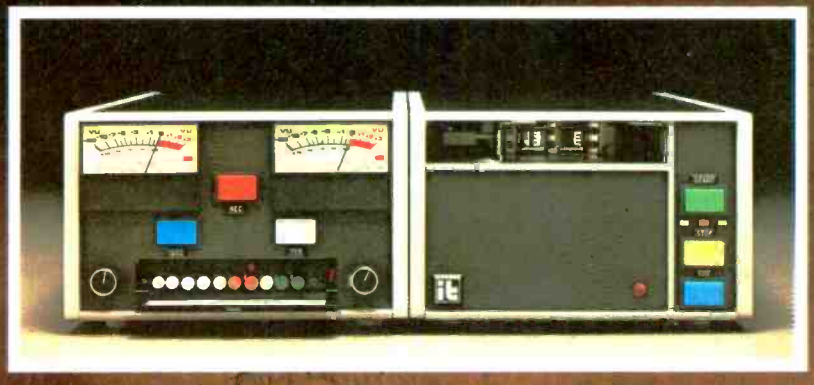
...Crisp, Clean, Brilliant Sound



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Circle (240) on Reply Card

A companion to the TSM-5, the VSM-5 vectorscope may be portable or mount side-by-side in 5¼-inch vertical 19-inch rack space. A and B inputs are available for viewing with subcarrier reference taken from A, B or an external source.

The graticule on the 5-inch diagonal CRT includes 75 and 100% saturation levels on the burst axis, I and Q axes markings and large and small error limits. A special graticule marking determines 2°, 5% errors in phase and gain measurements.

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Production Studio. WRBR-FM. South Bend, Indiana.

Electro-Voice's Greg Silsby talks about the Sentry 100 studio monitor

When I first described to Electro-Voice engineers what I knew the Sentry 100 had to be, I felt like a "kid in a candy store." I told them that size was critical. Because broadcast environment working space is often limited, the Sentry 100 had to fit in a standard 19" rack, and it had to fit *from the front, not the back*. But the mounting hardware had to be optional so that broadcasters who didn't want it wouldn't have to pay for it.

The Sentry 100 also had to be both efficient and accurate. It had to be able to be driven to sound pressure levels a rock 'n roll D.J. could be happy with by the low output available from a console's internal monitor amplifier.

The Sentry 100 also had to have a tweeter that wouldn't go up in smoke the first time someone accidentally shifted into fast forward with the tape heads engaged and the monitor amp on. This meant high-frequency power handling capability on the order of five times that of conventional high-frequency drivers.

Plus it had to have a 3-dB-down point of 45 Hz, and response that extended to 18,000 Hz with no more than a 3-dB variation.

Since it's just not practical for the engineer to always be directly on-axis of the tweeter, the Sentry 100 must have a uniform polar response. The engineer has to be able to hear exactly the same sound 30° off-axis as he does directly in front of the system.

I wanted the Sentry 100 equipped with a high-frequency control that offered boost as well as cut, and it had to be mounted on the front of the loudspeaker where it not only could be seen but was accessible with the grille on or off.

I also didn't feel broadcasters should have to pay for form at the expense of function. The Sentry 100 had to be attractive, but another furniture-styled cabinet with a fancy polyester or die-cut foam grille wasn't the answer to the broadcast industry's real needs.

And for a close I told E-V's engineers that a studio had to be able to purchase the Sentry 100 for essentially the same money as the current best-selling monitor system.

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Greg Silsby

Market Development Manager,
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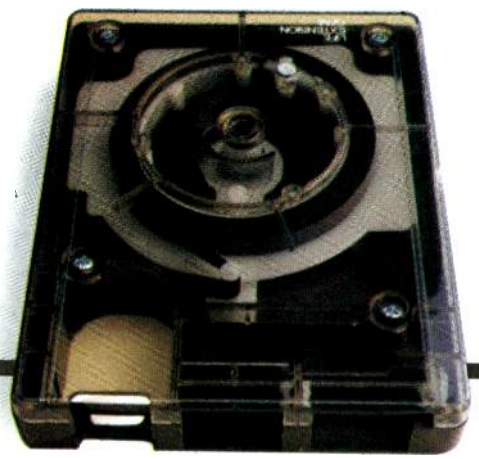

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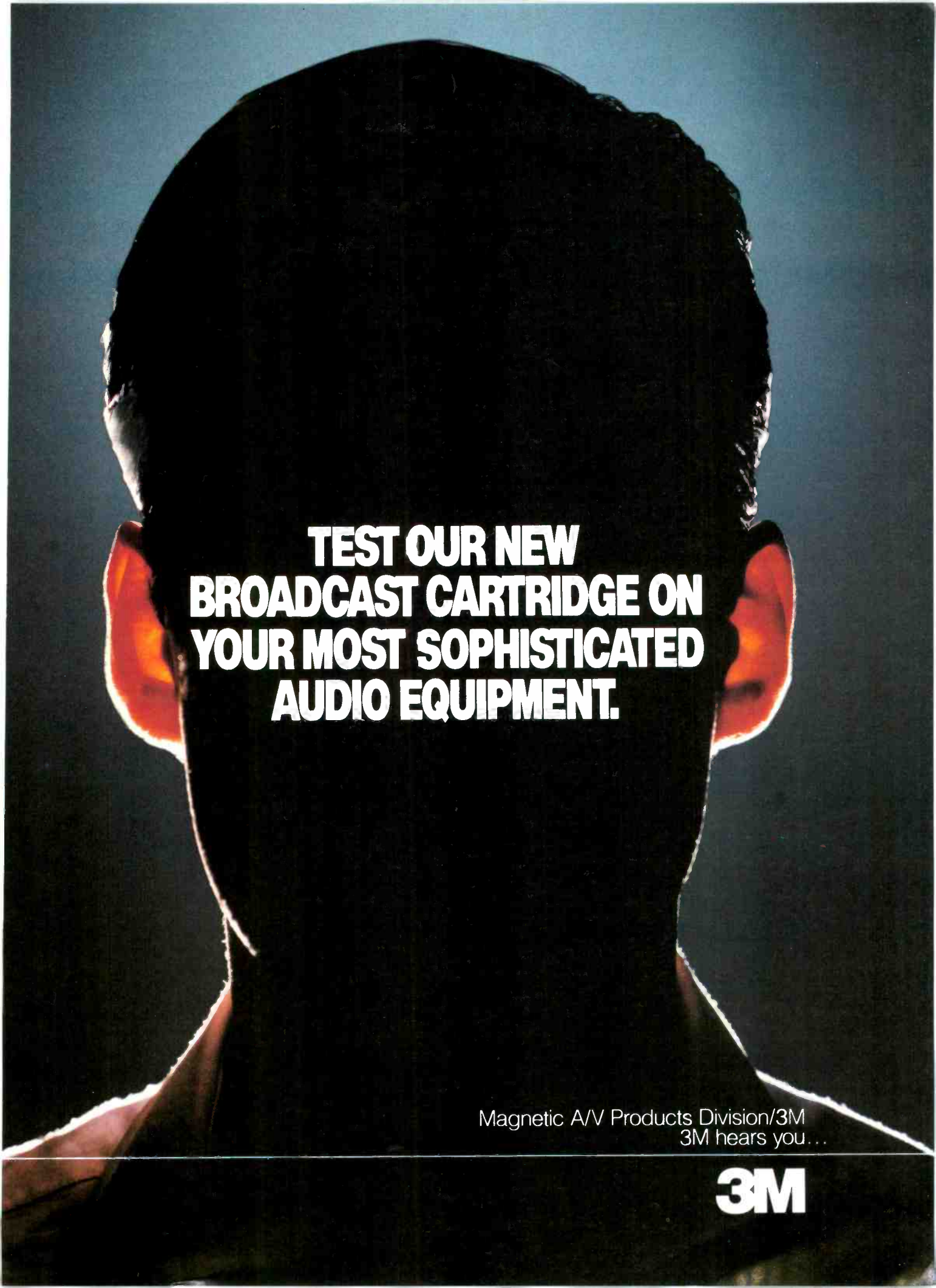
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Measuring TV sidebands & spurious emissions

Many TV citations are issued by the FCC because operators fail to understand or realize possible deviations caused by differing references. This article derives a correction factor applicable to sideband and spurious measurements.

By Dane E. Ericksen, FM and TV specialist, FCC, San Francisco, CA

Most engineering personnel at TV broadcast stations are aware that the FCC requires the lower sideband and spurious emissions to be attenuated to certain levels. What may not be well-known is that lower sideband attenuation seen on a spectrum analyzer during in-service observations is 16.4 to 18dB too optimistic. Failure to appreciate this fact can cause a station to believe that its lower sideband (LSB) attenuation is within tolerance when in reality it is out of tolerance.

In-band and out-of-band emissions

There are two rule sections that specify allowable bandwidths for TV broadcast signals. For out-of-band response—response that is more than 3MHz below lower channel edge or more than 3MHz above upper channel edge—Section 73.687(i)(1) applies. This section references required attenuation to peak visual power, therefore the ratio seen on a spectrum analyzer applies directly. A uniform attenuation of at least 60dB is required for all out-of-band emissions.

For in-band response—response from 3MHz below lower channel edge to 3MHz above upper channel edge—Section 73.687(a)(3) applies. This section references required attenuation to the response at +200kHz when a sine wave as video modulation is applied. Section 73.687(a)(4) requires that this sine wave signal have a modulation axis of 50% of peak carrier level, not exceeding 75% modulation on modulation excursions. For in-service observations only the peak carrier level is normally available as a reference, so the question arises as to a conversion factor between the response at +200kHz and peak carrier level. Once this correction factor is known, the 20dB LSB attenuation and 42dB LSB color subcarrier notch at-

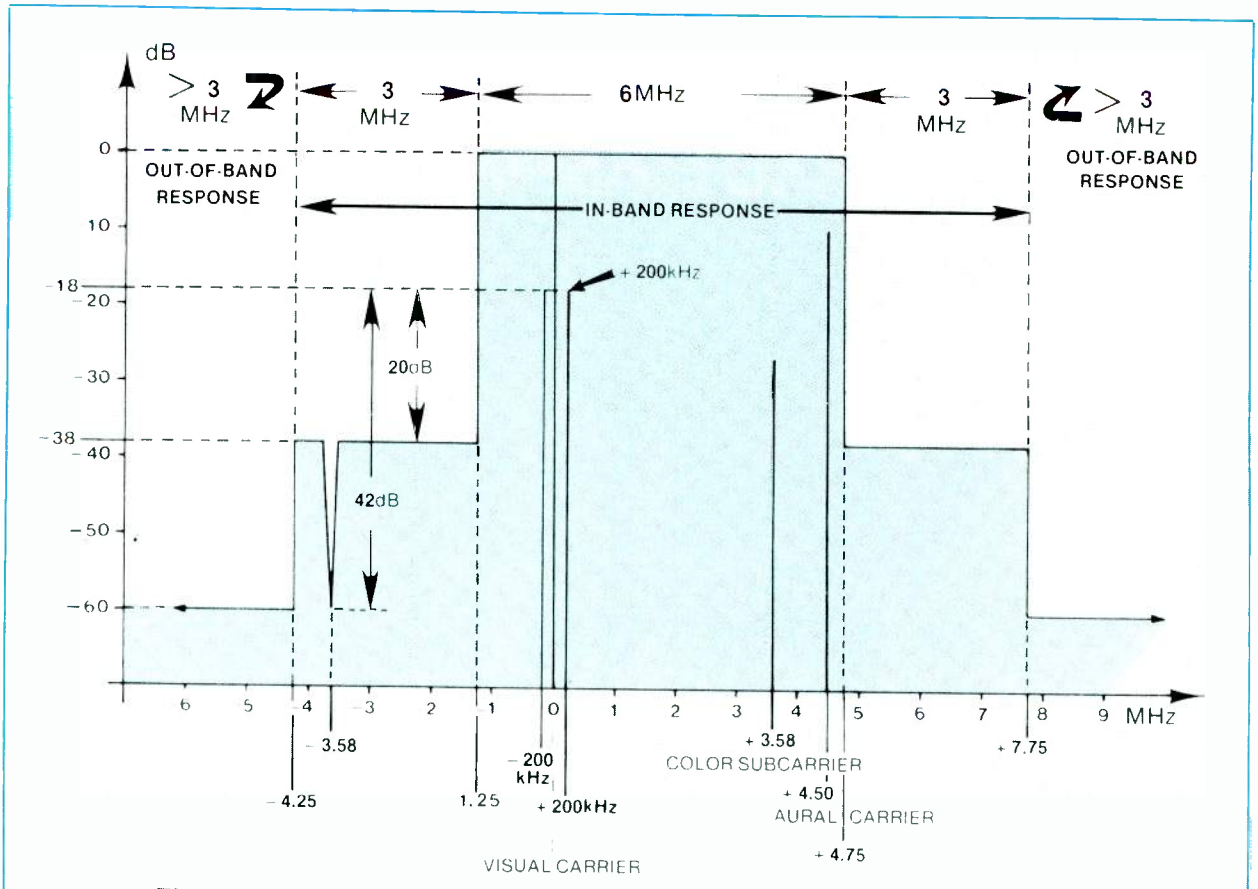

Figure 1. TV bandwidth criteria referenced to peak carrier level (73.687).

The views expressed in this article are those of the author and do not necessarily reflect the view of the Federal Communications Commission.

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tenuation required by Section 73.687(a)(3) can be converted to equivalent attenuation with respect to peak carrier level.

Correction factor derivation

The LSB correction factor is indirectly mentioned on page 1099, Chapter 40, of the sixth edition of the *NAB Engineering Handbook*. A fuller explanation of the three components comprising the correction factor is needed.

The first component is a -6dB term for the sideband of a 100% modulated AM signal. The second component is a -6.9dB term that allows for a modulation axis of 45%. The third component is a -3.5dB term that allows for symmetrical modulation of ± 30% around a 45% modulation axis (that is, from 75% modulation, or blanking level, to 15% modulation, or approximately reference white level). The combined correction factor therefore, is -16.4dB.

Note that the rules specify a modulation axis of 50%, not 45%; but a modulation axis of 50% would limit the modulation swing to ± 25%, that is, from 75% to 25%. From the reference white level of 12.5%, 25% modulation is excessively removed. Therefore, selecting a modulation axis of 45% with modulation swings of ± 30% more accurately tests the visual transmitter and is the practice more commonly used during TV proofs.

45% vs. 50% modulation axes

A comparison between a 45% modulation axis with ± 30% swings and a 50% modulation axis with ± 25% swings can be made with the following results:

45% Modulation, ± 30% Swings
- 6dB for 100% AM modulation
- 6.9dB for 45% modulation axis $(20 \log_{10}(0.45))$
- 3.5dB for modulation swings of ± 30% $\left[20 \log_{10} \frac{(75\% - 15\%)}{(2 \times 45\%)}\right]$

Total: - 16.4dB

50% Modulation, ± 25% Swings
- 6dB for 100% AM modulation
- 6dB for 50% modulation axis $(20 \log_{10}(0.50))$
- 6dB for modulation swings of ± 25% $\left[20 \log_{10} \frac{(75\% - 25\%)}{(2 \times 50\%)}\right]$

Total: - 18dB

Because the correction factor for the 50% modulation axis (18dB) is greater than the correction factor for the more commonly employed 45% modulation axis (16.4dB), use of the more stringent 18dB factor would be a conser-

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Dispersion	20 KHz-1000 MHz	50 KHz 1000 MHz	.5 KHz-1000 MHz
Frequency Accuracy	±.005%**	20% of Dispersion ± 5 MHz	20% of Dispersion ± 5 MHz
Amplitude Dynamic Range	70 dB	70 dB	80 dB
Average Noise Level	−117 dBm (10 KHz resolution)	−107 dBm (10 KHz resolution)	−105 dBm (10 KHz resolution)
Accuracy (worst case total)	±3.5 dB	±3.5 dB	±3.5 dB
Resolution (minimum)	.3 KHz	1 KHz	.03 KHz
Short Term Stability	.2 KHz (phaselocked)	1 KHz	.01 KHz (phaselocked)
Noise Sidebands	−60 dB 10 KHz away	−65 dB 50 KHz away	−75 dB 300 KHz away (10 KHz res.)
Operating Power	115/230V AC, 12V DC	115/230V AC	115V AC
Size In³	1367	2059	Not specified
Weight Lbs	40	40	Not specified
Internal Battery	Standard	Not offered	Not offered
External 12V DC oper	Standard	Not offered	Not offered
Phaselock	Standard	Not offered	Standard
Audio	Standard	Not offered	Not offered
Frequency Markers	Standard	Not offered	Not offered
Digital Storage	Optional	Optional	Standard
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vative practice that would ensure compliance with FCC rules.

Correction factor application

An application of the correction factor follows. When a TV transmitter is modulated with a 200kHz sine wave at a 50% modulation axis with excursions of ±25%, the relationship between peak visual carrier level and response at +200kHz is −18dB. The LSB chrominance subcarrier suppression would then have to be at least 60dB (42 + 18) with respect to peak carrier level, and the remainder of the LSB energy would have to be at least 38dB (20 + 18) below peak carrier level.

Therefore, when you observe a TV signal on a spectrum analyzer, you need to see at least 60dB suppression on the LSB chrominance subcarrier, not 42dB; and the remainder of the LSB energy would have to be at least 38dB (20 + 18) below peak carrier level. Therefore, when you observe a TV signal on a spectrum analyzer, you need to see at least 60dB suppression on the LSB chrominance subcarrier, not 42dB; and the remainder of the LSB energy must be suppressed at least 38dB, not 20dB. These specifications simply reflect the fact that only the peak carrier level is conveniently available as a reference for in-service spectrum analysis. This is not a tightening of the specification, but merely a transformation of the reference point.

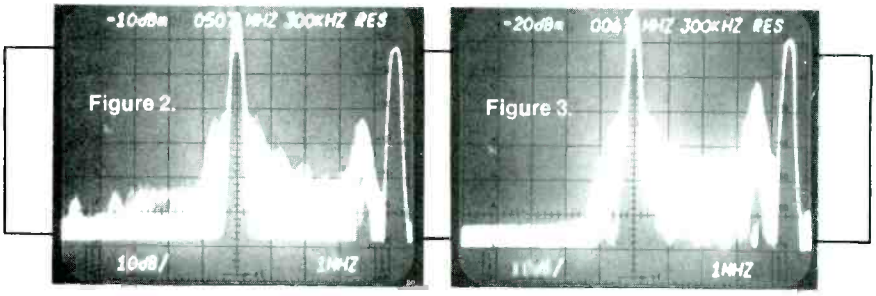

Figure 2 shows a LSB chrominance subcarrier attenuation of 53dB with respect to peak carrier level, equivalent to only −35dB with respect to the response at +200kHz. The impression that the station is exceeding the −42dB LSB color notch specification by 7dB is incorrect. It is actually failing to meet the requirement by 7dB. **Figure 3** shows the typical attenuation of most stations. The LSB is attenuated at least 64dB, equivalent to 46dB below the response at +200kHz—still complying with the 42dB required by Section 73.687(a)(3).

Most TV transmitters meet the transformed specifications of -60 and −38dB. A few stations will be observed to have energy 3.58MHz below visual carrier at less than 60dB below peak carrier, but still greater than the apparent limit of 42dB. A broadcast engineer not aware of the 18dB correction factor could incorrectly conclude that the LSB chrominance subcarrier attenuation was not perfect but was still within the 42dB limit specified in the rules.[1] Corrective action might not be taken and the station could unexpectedly receive an official notice of violation. The improperly suppressed LSB chrominance subcarrier would also normally trigger a full detailed inspection to investigate why the LSB attenuation was insufficient and to assist the station in correcting the problem.

[1]Because Section 73.687 refers to measurements "at the output terminals of the transmitter," direct off-air observations must be verified by a hard wire connection to the transmission line probe.

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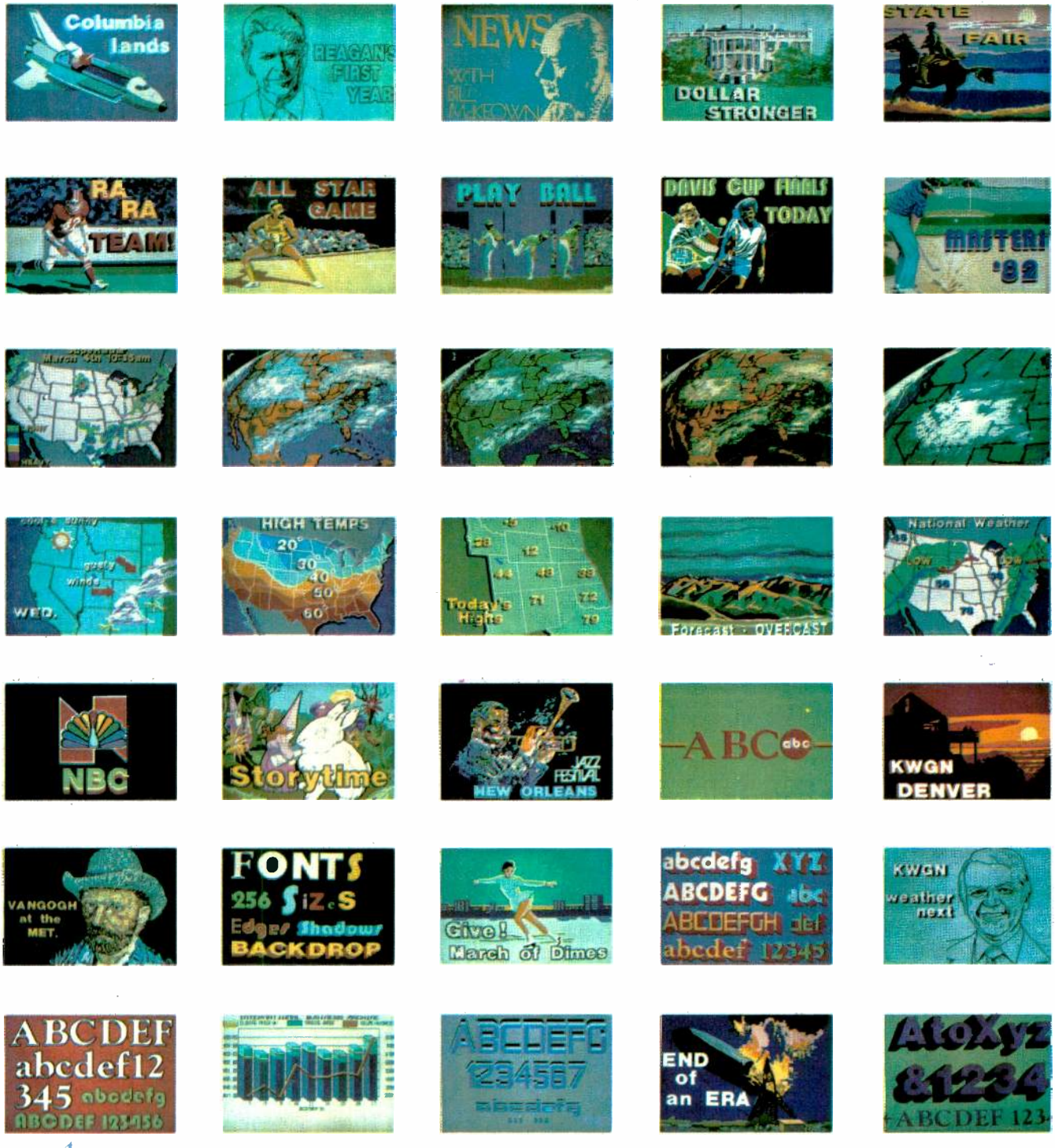

Teletext: A broadcast service in transition

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

Last year I, (Bill Rhodes), investigated the progress of the teletext and videotex technologies in England. I visited with broadcasters and private data bases serving as sources for the transmitted data; research groups optimizing captioning for the hearing impaired; and manufacturers of decoder chips, sets and processing equipment. Back in the United States, I visited with WFLD and Field Electronic Publishing to see their startup of teletext services in the Chicago area.

Since last summer, teletext has become a technology in rapid transition, mainly because of FCC decisions, but also because of an awakening interest in the United States and the world to this service. The following article reviews some of the latest activities related to teletext/videotex, highlights some of the industry trends and pinpoints teletext experiences to date.

FCC's open door on teletext

On Nov. 27, 1981, the FCC Notice on Proposed Rulemaking adopted an open-entry approach to teletext in the United States. There is both strong support and opposition to this decision, as might be expected where important services and potentially large dollar returns are concerned.

According to Alan Stiellwell, policy analyst and FCC spokesman, about 50 organizations have filed comments with the FCC regarding its teletext policy. About 60% of these have supported the FCC position; the rest have recommended that teletext standards should be established by the FCC.

Included among the 40% pushing for government-stipulated teletext standards are ABC, CBS, NBC, PBS, NAB, Antiope and Telematics Corporation, RCA, Time, Telidon Videotex Systems, and WGBH Captioning.

Those favoring a marketplace decision on adoption of teletext include the following organizations: Field Communications, Koplar Communications, Maximum Service Telecasters Association, NBC Affiliates, RBC Corporation, Subscription TV Association, Springfield Television, Taft Broadcasting, Times Mirror, United Kingdom Teletext Industry Group and Zenith.

In spite of industry pressures, Stiellwell said he was confident that the FCC would stick by its decision to leave teletext to a marketplace decision. However, no system for teletext will be acceptable if it interferes with regular broadcast programming services. Because of the backlog work currently before the commission, authorization of teletext transmission probably will not occur until summer or fall 1982.

Inherent in the FCC's decision to leave teletext to a marketplace decision is the lack of urgency in providing such a service. There is presently no strong demand from the public for a teletext service, nor any indications that substantial sums of money might readily be paid for teletext-adapted sets, regardless of the system used.

Thus, the FCC appears to be content to let the teletext market develop or die on its own merits, with the market rendering the decisive vote.

The following are excerpts from comments supporting the FCC's open-entry to teletext, and brief reviews of some teletext experiences in the United States and England.

UKTI

The United Kingdom Teletext Industry Group, chaired by Bernard J. Rogers, strongly supports the commission's proposed open market approach to teletext and urges its expeditious adoption. The marketplace, in its view, should be allowed to resolve the teletext standard debate uninhibited by government regulation.

"We are confident," they said, "that the British teletext technology will be highly competitive in the open market and will quickly form the basis for a widespread advertiser-supported teletext service in the United States.

"The open market approach will be a boon to broadcasters in their effort to compete with the teletext and 2-way videotex information services now rapidly being implemented by cable TV and telephone companies unhampered by government regulation.

"If the commission were to change direction now and attempt to choose a single standard, the regulatory process could take years. Throughout this period, broadcasters would increasingly lose audience and advertising dollars to cable companies providing teletext and to telephone companies, such as AT&T, which, under the Justice Department settlement, will be free to implement a full range of videotex services, including *Yellow Pages* advertisements. The delays would also disserve the public, particularly the hearing impaired, who have a strong interest in rapid availability of teletext.

"The commission's open-entry approach will allow the US market to take maximum advantage of the decade of practical experience with the British teletext system and to benefit from the substantial cost reductions already accomplished for British system semiconductor components. These components have been in volume production for six years and are now readily available for incorporation by US manufacturers in TV receivers.

"The ability of the British standard to provide a successful consumer service is beyond question: It forms the

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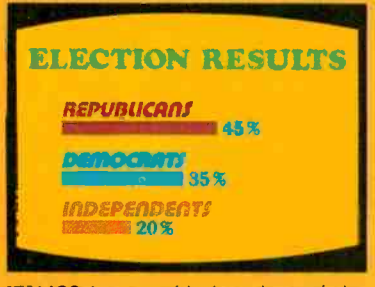

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basis for all teletext systems in eight countries around the world now providing a public service. Over 1 million British teletext-equipped sets are now in use and it is conservatively projected that another 1.5 million sets will be sold in 1982.

"Any claimed reluctance by broadcasters or equipment manufacturers to invest in teletext without a standard will rapidly dissolve if the FCC quickly adopts its proposed rule and makes clear its strong reluctance to intervene with market development. Potential system and decoder incompatibility problems can best be resolved by market forces and could not, at any rate, be eliminated by an FCC standard mandate.

"We urge the commission to quickly adopt its proposed rule with one minor modification to permit broadcasters to provide auxiliary teletext services such as telesoftware and transmissions for hard copy printers, which will enhance the basic teletext service."

Taft

The Taft Broadcasting Company also supported the FCC's action. The company said that the commission's open-entry approach would make possible the widespread rapid development of teletext by broadcasters and it urged the commission to adopt the proposed rule as soon as possible.

"Taft is now conducting a teletext experiment," it said, "under experimental authority, over station WKRC-TV, Cincinnati, OH, using the British teletext technology. Taft's choice of British teletext for this experiment was made after examination of the alternative technologies and our conclusion that the British system is best suited for development of teletext in this country. Not only are the broadcast equipment and decoders for the British system substantially less costly than those teletext equipped for the competing technologies, and in volume production (with 2 million sets projected for sale in 1982), but this system is inherently more resistant to disruption by interference and has the potential for substantial graphic sophistication, extending beyond that of the competing proposal, which can be implemented as consumer demand develops.

"Because of the advantages of the British system and the availability of equipment for that system at low cost, broadcasters will be able to implement teletext rapidly using the British standard upon adoption by the commission of its open market approach. Whatever the standard broadcasters choose, they will certainly have every incentive to implement teletext quickly in the open market in order to maintain their competitive position *vis a vis* cable and telephone companies who are now proceeding to, or have announced plans to, implement teletext and videotex services, without the need for government approval. If the commission adopts its proposed rule, Taft fully intends to offer teletext as a regular service."

Zenith

The Zenith Radio Corporation also has endorsed the FCC's proposal to let the marketplace resolve the broadcast teletext standards issue and urged the commission to authorize commercial teletext operations in the United States.

"Marketplace issues can best be resolved by the marketplace," Zenith said. "Broadcasters are ready. Decoders will be made available. There is no reason for further delay."

In its comments to the FCC, Zenith said, "It is not presently known whether there is even a viable commercial market for teletext service in the United States. The basic issues are marketplace issues concerning such matters as the need or desirability of high-resolution graphics, format flexibility, optional marketplace applications and cost/benefit trade-offs.

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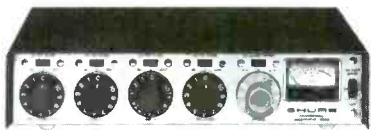

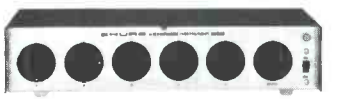

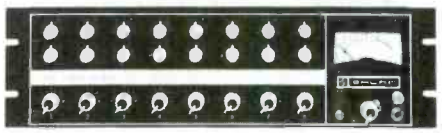

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"And the only way to gain such marketplace experience is to authorize commercial teletext operations as the commission now proposes to do."

Zenith said that the company was confident that teletext decoding equipment would be made available to fill marketplace demands when and if it should become apparent that teletext is a viable broadcast service.

"No amount of rationalization or argument in industry committees or FCC comments can match the experience of commercial marketplace operations in reaching an authoritative resolution of such issues," the company said.

"And if marketplace experience should establish that there would be a major benefit in reaching a common technical standard or format, such a *de facto* standard will undoubtedly be reached through a natural industry evolutionary process."

Koplar

Koplar Communications, considering the open-entry approach to teletext, said, "Koplar strongly supports the commission's proposal to allow broadcasters to begin offering teletext without the delays which would inevitably be caused by a commission proceeding to choose a single teletext standard. Early development of teletext is vitally important to TV broadcasters, particularly independent stations.

"Independent stations depend heavily on the appeal of local news and information and this is precisely the kind of service that teletext is best designed to provide. Because of the importance of teletext to broadcasters, Koplar also believes that cable companies should be required to carry the teletext service provided by over-the-air broadcasters on vertical blanking interval lines."

CBS network, New York

The network provides a full-blown teletext operation, including a 100-page magazine. Currently the entire operation is in a test phase to a limited number of receivers. Through a specially designed audiocassette recorder, data will be retrieved from those receivers to determine how the service is used. It is actually integrated into the receivers, rather than hanging on the back.

Captioning for network programs is done at the office of the Caption Center in Los Angeles. The captions are placed into the vertical interval of the master tape in Los Angeles, then shipped to New York for play. At KNXT, for example, the captioning is stripped out and reinserted into the magazine system that they transmit.

Although CBS is moving ahead with

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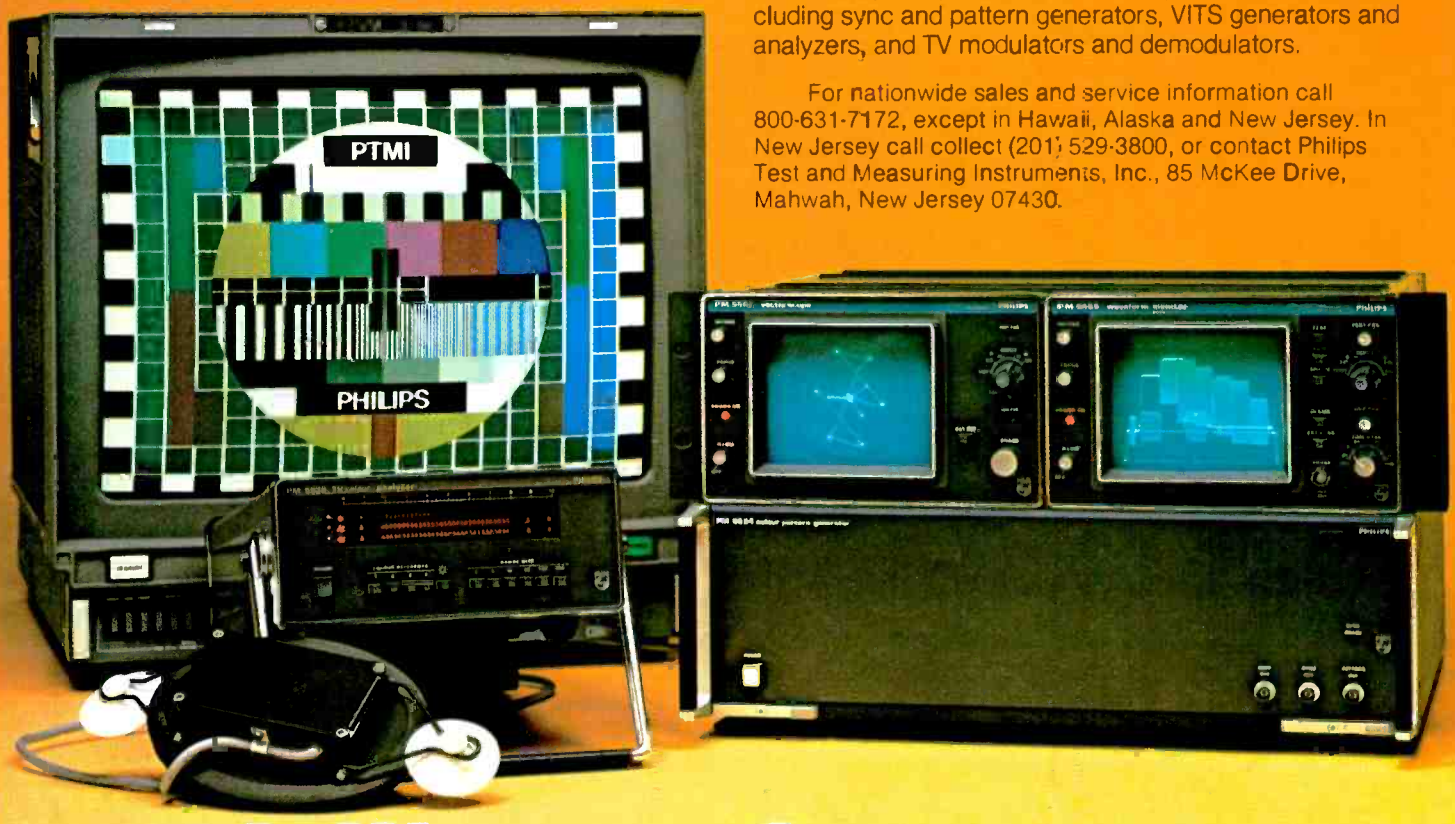

Philips, of course.

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the teletext operation, it has determined that the system initially should be done in the same manner as it will be ultimately accomplished. For that reason, implementation of the system, based on Antiope technology, has moved slowly, but progressively.

KCET-TV 28, Los Angeles

KCET transmits the *Now Electronic Magazine*, about 75 pages of information. Starting with a *front page*, highlighting four major stories in the magazine, *prompts* guide the user through the service. Local, state, national and international news is included, with hourly updating. Also in the format are sports and financial items. Each major department includes a quiz, answers to which are revealed when a button is pressed on the user control. An *LA Guide* gives information on "what's happening tonight or tomorrow night." Long form features take news stories apart and use separate pages to answer specific questions. *Popcycle* provides information for children.

KCET, a PBS affiliate, transmits educational programming for use in the schools. In the teletext operation, *Think Shop* uses 50 pages during school hours for supplementary materials to be used with the instructional programming.

Antiope technology is involved at KCET with about 100 homes and 20 public locations beings used as a test sample. From a metering system, cassette tapes store data regarding set-on times, page-access times and pages used. Tapes are collected every three weeks. The system has caused few problems since transmission was started in April 1981.

WETA-TV 26, Washington, DC

WETA, a PBS station, has used the Canadian Telidon system since March 1981. The project is being carried out by the Alternate Media Center of New York University.

About six pages of information are available, including stock market and weather information. Transmission is on Lines 15 through 18. Al Rioux, WETA chief engineer, said that phase modulation of the intercarrier caused buzzing on some sets at first, but proper adjustment of equipment reduced that malady. Otherwise, the primary problem experienced is one of multipath reception, which causes a lack of clarity in the printed matter.

Sets have been placed in about 40 homes with another 10 receivers in public places. The locations were selected to cover various areas and income levels of the station viewers. An audiotape recorder attached to the receiver logs page and time data of system usage. An intensive interview program is also being carried out with the users.

WFLD-TV 32, Chicago

WFLD in Chicago has used Ceefax since February 1981. The programming material is an electronic magazine, *Keyfax*. The majority of the 100 receivers are in homes of subscribers to the STV project. There are additional sets in public locations—libraries, banks, taverns and the veterans hospital. During the normal "off-air" hours the signal is used as a full-field format called *Night Owl*, transmitted to any interested viewers on Channel 32. It is backed by soft music.

The original STA for the Chicago operation was for the use of Lines 13 to 16. It was discovered that the use of Line 13 caused problems. In particular, some RCA, Sony and Zenith receivers tended to have retrace lines showing up whenever Line 13 was involved. When Line 13 was dropped, the problem disappeared.

It has been found that the rapid rise times of the signal information can cause some intercarrier buzzing if any parts of the system are misadjusted. Dwain Schoonover, WFLD engineering manager, said that he is interested

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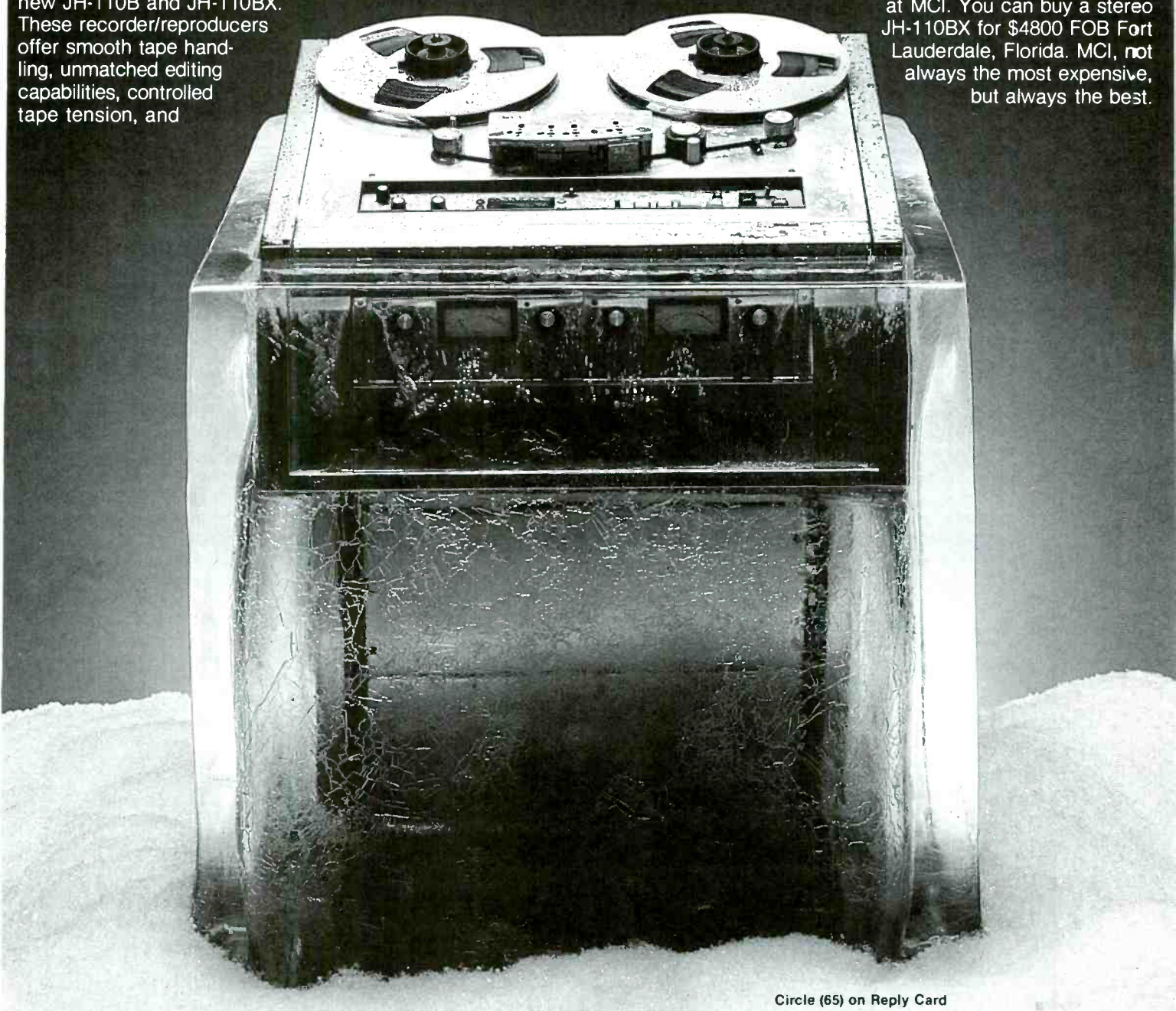

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TWA1100-0005-81

BBC demonstrates high quality pictures on Ceefax

During the first quarter of 1982, the BBC made the first public broadcast of high quality still pictures by means of the UK teletext system. The broadcast high-quality pictures and other enhancements were demonstrated to a technical committee of the European Broadcasting Union (EBU) on Feb. 11, and at a meeting of the Institution of Electrical Engineers (IEE) on March 8.

The UK teletext system has, for many years, represented an efficient and rugged way of transmitting, receiving and decoding data for display on a TV receiver. None of the efficiency or ruggedness is lost in the transmission of the enhancements. These include improved graphics, redefinable character sets, more readable character fonts, linked pages and broadcast software, as well as full broadcast-quality pictures. The recently broadcast enhancements preserved the compatibility of existing teletext decoders and demonstrated how teletext receivers of the future might look.

The recent transmissions were the culmination of several years work by engineers from the BBC's engineering research department. The equipment used to generate the enhancements contained a teletext generator, a microcomputer system and a high quality digital picture store, whose content was displayed on a screen. On the UK TV standard (System I), the store operates at the CCIR recommended sampling rate of 13.5MHz, with 8-bit Red, Green and Blue (RGB) samples, occupying some 1.2Mbytes of storage space. This represents an active picture size of 702 x 576 pixels, picture elements, to fill the TV screen with high quality pictures.

For the experimental transmission, a montage of the startling pictures of Saturn taken from the Voyager 2 spacecraft was used to demonstrate the capability of the system. The picture was fed from a conventional 35mm slide scanner into the digital picture store. After sampling at 13.5MHz, it was fed to a microcomputer and data generator that sorted the information into a form suitable for transmission. The special equipment was used temporarily to replace two of the conventional 4-line Ceefax signals on BBC 2 for the transmission.

The reception equipment was similar to the transmission equipment. After the off-air signals had been demodulated, the Ceefax data was fed to a decoder, the output of which controlled a microcomputer. This, in turn, fed a digital picture store where the data signal was reconstituted into its original RGB components. The picture was then displayed on a screen with the same high quality as had been seen at the scanner.

The Voyager 2 picture was included in a series of pages that displayed an improved character font. The new character generator in the decoding equipment enabled the characters to be more easily read, with individual characters being well-spaced in the words.

Another innovation that was broadcast was *linked pages*. In the present Ceefax system there are often pages where the content has some relevance to another page in the magazine. Viewers wishing to retrieve the additional pages need to reselect the page number and wait for the magazine to cycle round until they receive them. Using linked pages, the Ceefax editor would decide which pages were associated with each other, and would add extra information to link them together. In the enhanced decoder, the page would be stored and instantly displayed when the relevant linked page number was selected. For example, the news index on page 201 on BBC 2 could be linked to background information, news headlines, and complete news stories, which the viewer could retrieve at the touch of a button without waiting for the magazine to cycle round.

For some time now, the BBC Ceefax Unit has been transmitting teletext software in conjunction with Brighton Polytechnic and several schools to see if it could transmit computer programs that could be directly loaded into a microcomputer memory. With the advent of the BBC microcomputer, using the teletext adapter that will become available later this year, it will be possible to use the Ceefax service as a source of software for the computer system. It has been shown that, using prototype equipment, it is possible to download programs into the BBC microcomputer without the need to copy the program and then re-enter it via the computer keyboard. As well as being able to download teletext software, the teletext option associated with the BBC microcomputer will also respond to the *linked pages* that are now being transmitted.

Most of the enhancements to the Ceefax system require additional memory in the receiver decoder, and it is not likely that the full range of enhancements will become available until later in the decade. All of the enhancements are compatible with existing decoders. For example, viewers selecting the pages carrying the picture information will currently receive the text without decoding the picture information. The characters are displayed in the existing format. When the enhancements are transmitted as part of the service, it is likely that the editor will fill in the gaps where the picture would have been by a simple graphic so that the viewer is not left with a blank screen.

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in specific equipment manufactured for the purpose of programmable keying of the additional information into the signal. At present, he uses a modified VITS inserter for his purposes.

The use of three lines instead of four for transmission of the signal affects the speed of data distribution and system access, but Schoonover said currently it did not seem to be a drawback.

WGBH-TV 2, Boston

The WGBH operation with the Antiope system will not begin until midsummer 1982. Initially the project will be six to eight hours a day, and at least five days a week. Approximately 20 decoders will be involved, with at least 10 being in public places, such as government installations and libraries.

The system storage capacity will be about 100 pages. Thirty pages will be in the news area with 60 to 70 pages for targeted audiences.

The WGBH group involves a special department of three people who will handle the input of materials. Engineering of the project is being handled slowly to assure that all preliminary work is done properly.

WKRC-TV 12, Cincinnati

WKRC, an ABC affiliate of the Taft Broadcast Group, has been transmitting teletext signals for several months with British-designed equipment. The materials are currently static, provided by the computer with a 200-page capacity. The intent is to increase the service with input information from the various news services, and the Field service out of Chicago. The display will generally follow the magazine format.

There will be 40 receivers and 20 set-top tuners placed in the field for 30-day periods. Users will be asked to keep diaries of uses and their comments. From that information, people's opinions of what is and is not acceptable will be determined.

Current use involves Lines 15 and 16. When the experiment began, Line 14 was also used. There were some complaints at the start of vertical retrace troubles. Dialogue with local TV service people was held, and only about 20 such complaints were counted. Line 14 is not in use at present. There have been no other problems.

The choice of the British system for WKRC was based on a belief that for equipment availability, price and capability considerations, the British equipment far outweighs other systems.

KNBC-TV 4, Los Angeles

KNBC began working with the technology in September 1981 but did not begin actual on-air operation until November. The operation involves the Antiope system of equipment with a programming magazine called "Tempo." About 90 pages of information cover a *perishable* type of news, with weather, sports, stock market and traffic reports, as well as other fast-changing data for airline arrivals. Another department includes daily updated materials of theater fare, health and beauty tips and other less rapidly changeable items. These features also include an extensive children's department. Some advertising is included.

The users currently total about 20, with more sets being installed daily. Eventually there will be about 100 sets, including 90 in homes and 10 in public locations. As with the KCET receivers, a metering device will record the pertinent information on user access times on an audiocassette

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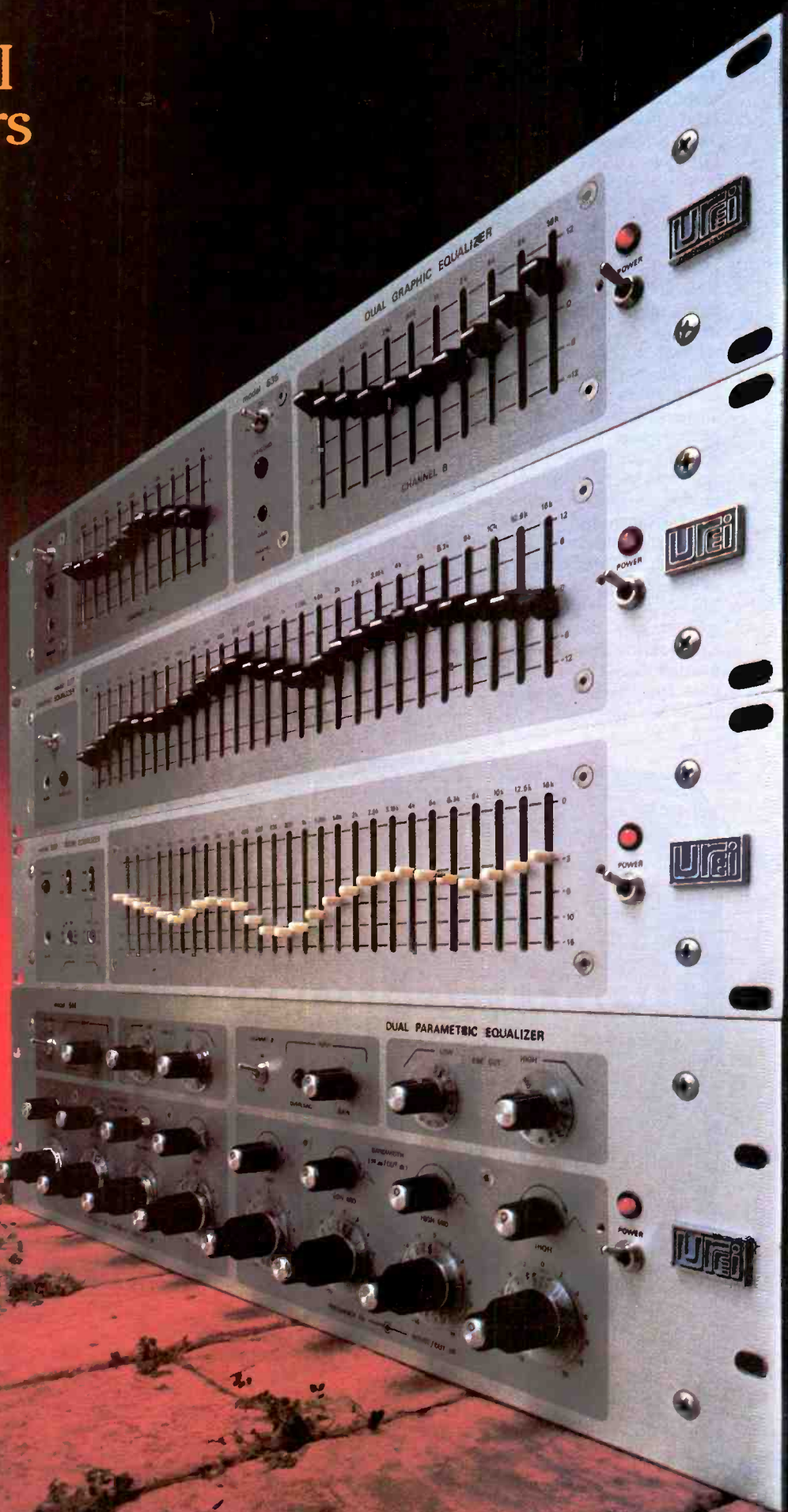

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that will be retrieved on a schedule by the study group.

Installation of the receiving equipment has been too slow, according to Ted Zee, teletext manager. Most of the installation problems have involved faulty decoder boards, with shipping damage being the primary cause of failures.

KNXT-TV 2, Los Angeles

KNXT is currently running the *Extravision* service using Antiope equipment. *Extravision*, a trade mark of KNXT and CBS, is a 100-page magazine-oriented format. It is more aimed at the distinctive competence of teletext to provide constant updating of perishable news materials than competitors in the Los Angeles area, according to David Percelay, director of teletext. In addition to the KNXT/CBS network service, the station transmits five hours per week of closed captions for selected CBS network programming.

Determination of use is based upon information received from audience meters designed into the receivers. The rather sophisticated metering system was developed by the CBS Engineering and Development Group, headed by Joe Flaherty, to provide data from user access to the teletext materials via cassette tape. The sets have been in public places until recently, with 100 receivers having been placed in homes during the first part of April. Since the system was first put into experimental use in April 1981, there have been few problems. Percelay believes that in dealing with a new service in a prototype system KNXT has met with unanticipated successes. Any challenges that have confronted the operation have been met a step at a time with no difficulties, he said.

KPIX-TV 5, San Francisco

KPIX, a CBS affiliate, began transmitting teletext signals in August 1981. Actual field tests by users, involving 30 receivers, will begin in June 1982 providing some problems are worked out by then. Although the other stations using the Antiope system have Unitel ancillary equipment, the KPIX experiment is scheduled to use XCOM equipment. The XCOM does provide some advantages over the Unitel, but because of greater complexity and more recent development, there are still hardware and software difficulties to be worked out. Merrill Weiss, director of engineering, said that the KPIX installation, to his knowledge, is the first installation with XCOM.

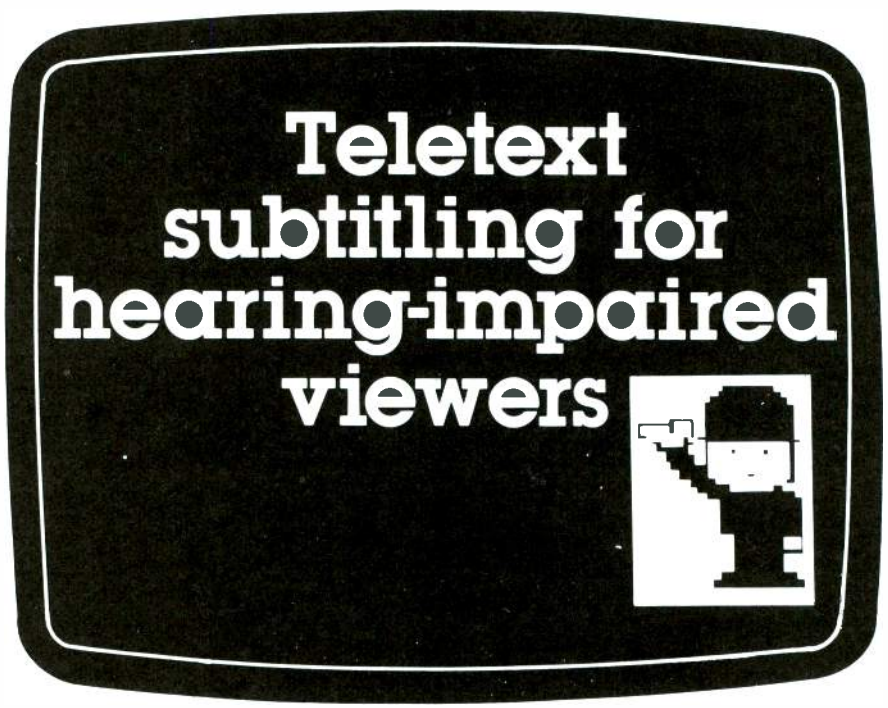
Since the beginning of the transmissions, reports of vertical retrace lines have included some receivers with Sears, Montgomery Wards and JC Penney labels. The transmissions being made are on Lines 15 through 18. Problems are found on Lines 15 and 16.

KSL-TV 5, Salt Lake City, UT

KSL, a CBS affiliate, uses the British teletext system. The operation first began in June 1978 as the first station in the United States to transmit the data. Information includes weather reports, airline and bus scheduling, financial reports and ski resort information.

Transmission has caused no particular problem, if the reception is good. Where reception is marginal, teletext reception is also marginal. Television in Utah is handled on a statewide translator system, so there are some users up to 300 miles from SLC via the translators. In addition, there is reception in a 6-state area.

Because the system is still considered experimental, Bill Loveless, vice president, engineering, Bonneville International Corporation, said the station is often "transmitting into the wall." There are not enough receiving sets to make any good statements about users and effectiveness.



Teletext subtitling for hearing-impaired viewers

By A. C. Downton and R. W. King, department of electronics, University of Southampton, England

The introduction of the broadcast teletext service in Britain by the BBC and Independent Television in 1975 provided, for the first time, a medium by which subtitles could be transmitted to a hearing-impaired audience without interfering with other viewers' enjoyment of television.

Subtitles are transmitted as part of a teletext page sequence during the field blanking period of the TV picture. Any viewer with a teletext set (or adapter) can thus receive them by selecting a subtitle page. These pages are transmitted in synchronism with the appropriate picture information by interrupting the normal cyclic teletext magazine transmission whenever necessary, a technique that results in a negligible increase in normal magazine access time for a typical subtitled program.[1]

Although some experience of subtitling television for the hearing impaired already existed in 1975 (for example, the BBC's *News Review* program, a 30-minute open-captioned program broadcast every Sunday evening), it was quickly realized that closed-captioning exclusively for the hearing impaired presented a number

The authors are lecturers in the department of electronics, University of Southampton, England, and lead a research group working in the fields of communications aids for the disabled and of man-machine systems. Apart from the work on TV subtitling described above, they are also investigating Palantype machine shorthand and written shorthand as aids for the deaf, and provision of *Prestel* and *Teletext* services for the blind.

[1]A.F. Newell and P.R. Hutt, "The Evolution of a Teletext Subtitle System for Hearing Impaired Viewers," IBC, 1978, pp. 308-311.

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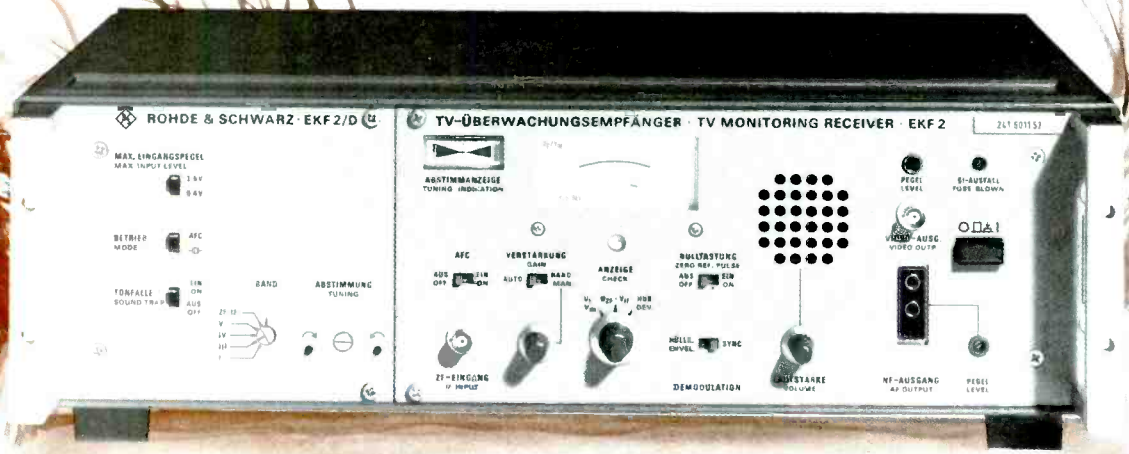

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of psycho-linguistic and display problems. Little was known about the program preferences of the hearing impaired, or about the style and presentation of subtitles intended for such an audience.

Computer problems

Experience gained in foreign language subtitling was not directly relevant, because viewers of these subtitles could be assumed to have normal literacy skills (for reading the subtitles) and could use their hearing to help identify speakers, mood, sound effects and other subsidiary audible information.

Conversely, open-caption subtitling (such as provided in *News Review*) had to be based upon the assumption that the majority audience of the program was not hearing impaired, and this imposed significant restrictions upon the style and content of subtitles. In addition to other requirements, subtitles, therefore, needed to be designed to avoid annoying the hearing viewer.

Another technical problem that rapidly became apparent was that the computer-based systems used to prepare the teletext magazine were not well-adapted for the more specialized requirements of subtitle preparation. Instead, these systems were designed to allow preparation of full pages using the complete range of teletext display capabilities including graphics, double-height chracters, color and boxing of characters.

Also, preparation of subtitles involves several tasks not encountered in preparing the normal teletext magazine, such as the need to synchronize subtitles with the program video.

Authors Dr. R.W. King (left) and A. C. Downton, posing with their experimental subtitling facilities at the University of Southampton, England.

Experimental broadcast

It was not until 1978 that subtitles were first broadcast experimentally over the teletext system; since fall 1980, the British broadcasters have provided a pilot service for the hearing impaired.

During this 2-year period, however, substantial research was undertaken to determine how teletext subtitles could best serve the hearing impaired,

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both directly by the BBC and the Independent Broadcasting Authority (IBA), and by a research project funded by the IBA and the Independent Television Companies Association (ITCA), carried out within the department of electronics at the University of Southampton, England. Most of this research work was devoted to the problems of subtitling prepared programs, and consequently such programs have formed a large part of the subtitled broadcasts.

Nevertheless, a number of notable live programs have been subtitled and broadcast on an experimental basis. The particular problems of live subtitling will be discussed later.

Display options

The teletext insertion facility provides a number of options to the subtitler: six colors in addition to black and white for the text and background; single- or double-height text characters; flashing characters; and positioning of the subtitle almost anywhere on the screen. Only one character font is available in the current teletext system.

An initial objective of subtitlers in Britain was therefore, to explore the display facilities available and to establish those that were most acceptable to hearing-impaired viewers.

With the support of the Ceefax staff, including a subtitle editor funded for two years by the Royal National Institute for the Deaf, the BBC has subtitled and broadcast a wide range of prepared programs. A variety of subtitling techniques have been used in these programs, and the subtitling practices have been refined and developed partly as a result of the responses of the hearing-impaired audience, which has been able to receive the broadcasts.

Guidelines

The work at Southampton University funded by IBA/ITCA had the initial objective of investigating the display format requirements for an average hearing-impaired viewer. The subtitling guidelines published as a result of this study were based on the results of organized demonstrations of experimental videotapes, with open subtitles, at a number of clubs for hearing-impaired people, together with considerable work with individuals.[2] The display recommendations and editing guidelines are too lengthy and complex to be presented in full, but a summary follows:

- The most comfortably read subtitles are in white double-height mixed case characters left-justified within a black box, as shown in the example in Figure 1.
- Uppercase characters can be used for emphasis within a subtitle or to indicate the source of an external sound, such as a radio or telephone voice.
- Rhythmic sound effects such as the ring of a telephone bell can be presented by flashing a short subtitle ("RING RING") in an appropriate part of the picture.
- Different colors can be used to identify individual speakers within a scene or within the program as a whole.

Figure 1. A typical teletext subtitle.

[2]R.G. Baker, "Guidelines for Subtitling of Television Programmes," a research report from Southampton University for Independent Television (United Kingdom). (Available from Engineering Information Service, IBA, Crawley Court, Winchester, England).

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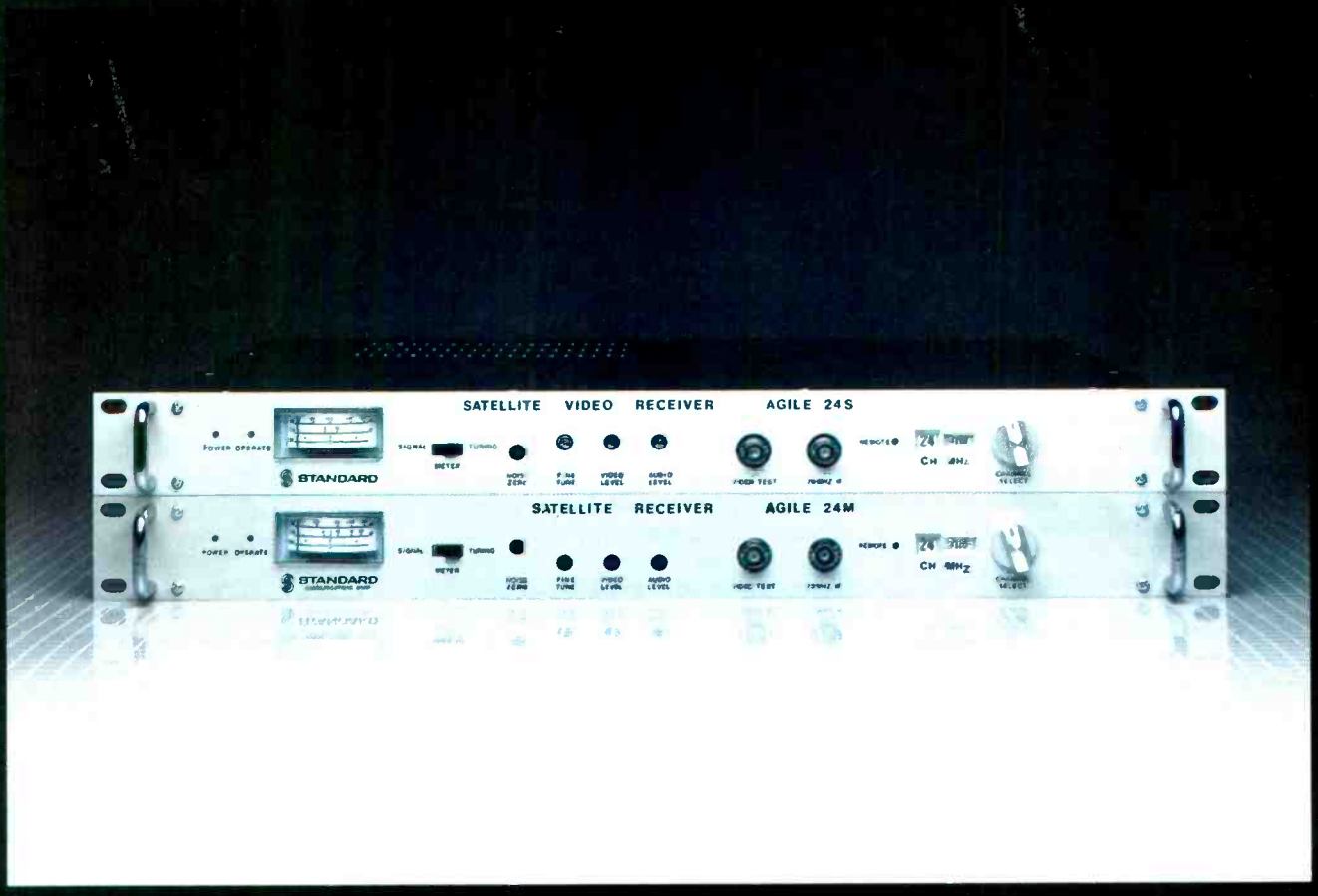

Too many words

Within that display framework, the subtitle editor is faced with presenting the program script in a manner acceptable to the hearing-impaired audience. Despite their obvious desire to have everything subtitled, the hearing impaired found that verbatim subtitles contained too much text to read comfortably if the program was to be viewed as well.

Two alternatives, commentary subtitling and script editing, produced an unequivocal response from the hearing-impaired audiences in favor of the latter approach. The degree of editing required depends on the type of program; a fast-talking drama serial requires much more reduction than a nature documentary, for example.

Subtitle reading is a complex task in divided attention, from picture to subtitle, in which the rate of text presentation is not under the reader's control. The research has shown that 2-line subtitles are a satisfactory compromise between displaying sufficient text and allowing enough unobscured picture, and that such subtitles should be left on the screen for about six seconds. This represents an average word rate of 120 words a minute. The script needs to be edited down to this rate in most programs.

Best format

Efficient subtitle reading can be aided by formatting the subtitles in particular ways. For example, a 2-line subtitle should contain lines of approximately equal length, provided that the split between the lines can be at a linguistically sensible place, such as at the end of a clause or phrase. Similar rules apply, but more stringently, when a single sentence carries over into a second subtitle.

The practice recommended by the Southampton University/IBA subtitling guidelines is to end the first part with three dots and to start the following subtitle with two dots to indicate the continuation. Finally, the use of simpler sentence structure, such as the conversion of a passive sentence into an active one, has been found to aid subtitle reading.

The process of subtitle preparation can be broken up into a number of tasks. First, the program is viewed in conjunction with its script, and the script is edited to the required word rate and divided into subtitles. These are then entered by means of an appropriate keyboard and colored, formatted and positioned using teletext control codes. The subtitles are stored on a floppy disc. Program time codes for each subtitle can be inserted either during initial subtitle entry, or later when the subtitles are reviewed together with the program videotape. The final stage of subtitle preparation is to review the subtitled program as a whole and make any necessary corrections to the subtitle file.

Slow process

This preparation process is a time-consuming one that involves a complex interaction between the subtitler and his machine. With currently available equipment, designed specifically for creating teletext magazine pages rather than subtitling, the process is rather cumbersome because the background boxing, double-height and other control codes all have to be entered with each line of subtitle and the subtitle formatted and positioned by hand. The time-code fixing and final correction runs are not entirely straightforward, either.

The result is that up to 30 hours are required to produce one hour of subtitled program. Both British broadcasting authorities have addressed themselves to the problems of reducing this time penalty by developing specific subtitle preparation equipment.

At the BBC, equipment for subtitling foreign films was used as the basis of development of a teletext subtitle preparation system[3]. The foreign film subtitling system consists of two components, both based upon the same computer. A subtitle preparation unit is used to type and format the text subtitles and record them on a floppy disc; a replay unit then recovers the subtitles, synchronizes them with the output of an appropriate telecine machine or videotape recorder, and converts them into high-quality proportionally spaced film subtitles using white characters with black edging, or in a black box.

Teletext subtitles

For teletext subtitles, the film subtitle preparation unit is no longer used; but, the subtitles are still replayed through the replay system described previously, which performs various buffering and formatting functions using a special computer program. This replay computer is connected between the film subtitle replay unit and the Ceefax transmission computer[4]. Using the experience gained with the feature film subtitle preparation system, a separate set of equipment dedicated to the preparation of subtitles from videotape cassettes has been designed and put into service since the end of 1979. The result has been to produce relatively rapidly a prototype teletext subtitling system that has enabled a substantial number of programs to be captioned during the past two or three years.

More recent work at Southampton University, funded through a Science and Engineering Research Council research studentship, has examined the subtitle preparation tasks in detail with a view to ultimately sharing them between the subtitler and the computer in an optimum way. By this means, the overall preparation time will be reduced and the subtitler's linguistic and artistic skills will be used more effectively, while the machine will perform the mundane job of inserting formatting control codes. This will help the subtitler to conform to the presentation guidelines described earlier. A prototype of such a machine is now being used by Independent Television's Oracle Teletext service to speed up the initial entry of subtitles.

Because prepared subtitles typically require 20 to 30 hours' preparation for each hour of program material, alternative techniques are necessary for live program subtitling. The need to provide a subtitle service for the Royal Wedding in July 1981 was a major impetus, and two different experimental live subtitling systems were used on the air by the BBC and Independent Television.

BBC1 and BBC2 carried the same pictures, but subtitles were transmitted as open captions over BBC2, so that deaf people without access to a teletext receiver could benefit from them. The subtitles on Independent Television, which has only one TV channel at present, were transmitted by teletext.

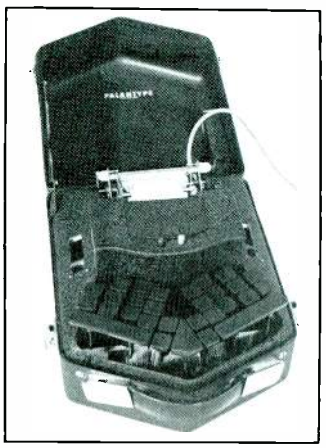

Figure 2. The Palantype machine.

Palantype shorthand

One way of providing simultaneous live subtitles is to make use of the output of a shorthand machine that can be operated at verbatim speed. The machine used in law courts in England for this task is the Palantype machine (see Figure 2), which is conceptually similar to the American

[3]W.R. Hawkins, *et al.*, "The Electronic Sub-Titling of Foreign Feature Films," IBC, 1976, pp. 68-70.

[4]C.B.B. Wood, *et al.*, "Subtitles on the Ceefax Service," IBC, 1978, pp. 304-307.

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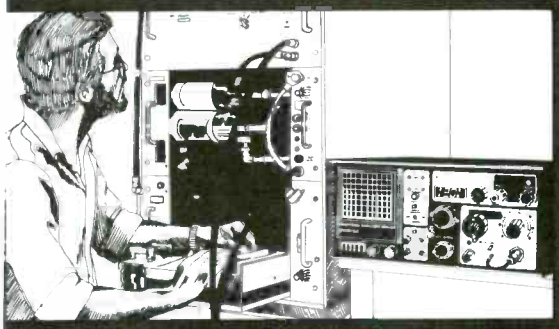

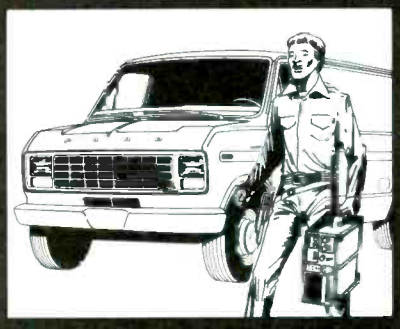

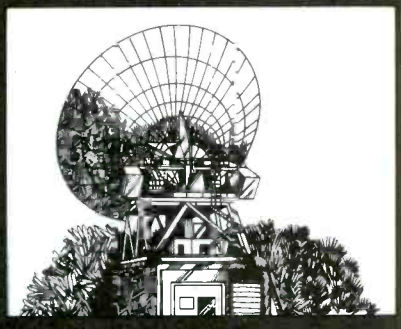

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stenograph machine. Groups of keys on this machine are depressed simultaneously, similar to than chords on a piano, and each group represents a syllable or word of English.

The output from the machine normally appears on a roll of paper (see Figure 3) as a pseudo-phonetic code.

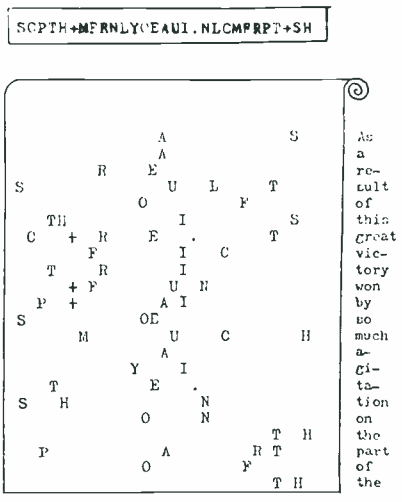

Figure 3. An example of Palantype output with its English equivalent.

Because this code cannot be easily understood without training, for subtitling purposes it is fed into a computer that attempts to reconstitute the original English.

Two techniques have been developed for performing this translation. The first, based on a large dictionary look-up procedure, was originally developed at the National Physical Laboratory for automatic transcription in verbatim reporting. Subsequently, the technique has been further developed at Leicester Polytechnic, in the English midlands, and the BBC[5].

An alternative system, developed at Southampton University as a portable aid for the hearing impaired, involved the use of a restricted dictionary of common words supplemented by phonetic transliteration algorithms[6].

Confusing errors

In the portable aid for the hearing impaired, the transcription appears within one or two seconds of the utterance, one word at a time on a TV screen. This type of display would be distracting in subtitling, however, where the viewer must divide his time between text and picture, so the Palantype text is built up into complete subtitles before being displayed.

The disadvantage of this approach is that the subtitles are significantly delayed compared with the accompanying video, because the subtitle cannot be transmitted until the last word of it has been spoken and transcribed. Ideally one would wish to transmit the subtitle in synchronism with the start of the speech that it represents.

A further problem occurs because the Palantypists who perform the initial transcription sometimes make keying errors. These generally result in a failure to match incoming chords to the appropriate dictionary entry, with the result that a garbled phonetic version of the word is produced rather than the correct orthography. Because the subtitle is transmitted immediately, there is obviously no opportunity to correct these keying errors.

A final difficulty is that the system produces verbatim subtitles. With many live programs, such as the news, speech rates can consistently exceed 180 words a minute; subtitles presented at this speed require enormous concentration on the part of the user.

[5]W.R. Hawkins and L.A. Thomas, "The Economic Preparation of Teletext Subtitles," IBC, 1980, pp. 89-92.

[6]A.C. Downton and A.F. Newell, "An Assessment of Palantype Transcription as an Aid for the Deaf," Int. J. Man-Machine Studies, 1979, v. 11, pp. 667-680.

Figure 4. Palantype subtitling of the Royal Wedding by the BBC.

Nevertheless, although the subtitles produced by this method are less than ideal, they do represent a major breakthrough in subtitling for the hearing impaired, and were enthusiastically received by hearing-impaired viewers of the Royal Wedding (see Figure 4). Current research at the BBC and Southampton University is investigating ways of reducing or eliminating the drawbacks of Palantype transcription.

Summary subtitling

Independent television's coverage of the Royal Wedding provided an opportunity for the first trial of an alternative live subtitling technique based upon a conventional QWERTY typewriter keyboard. The system used was developed by Southampton University, principally to speed up the preparation of prepared subtitles, by partially automating the process of initial entry of subtitles into the teletext computer. The subtitles can alternately be inserted directly into the transmitted teletext data signal to provide summary subtitling of live programs.

The novel feature of the equipment is that, based upon the guidelines on display format developed earlier, subtitles are automatically formatted so that the subtitler need concern himself only with the textual content of the subtitle. Breakpoints between lines in the subtitle are chosen using a weighting function that takes into account not only geometrical parameters and punctuation, but also a limited linguistic analysis of the input text.

When the same technique has been used in prepared subtitling, less than 10% of subtitles have required subsequent editing by hand. The system allows relatively polished live subtitles to be presented in normal English, albeit at speeds one-third to one-half slower than the ideal 120 words a minute. Figures 5 and 6 show the system in use and an example of a subtitle produced by the system during the Royal Wedding.

International caption exchange

A further initiative on subtitling during the International Year of the Disabled has been the investigation of possible caption exchanges between Britain, the United States and other caption-producing nations.

An *ad hoc* study group of members of the National Captioning Institute (NCI), the BBC, Southampton University and the IBA has investigated not only possible data transfer media (a technique to use spare data capacity on the time code channel of the program videotape is currently being examined), but also the degree of subtitle data *translation* that will be required to allow for difficult display parameters and captioning styles between Line 21 and teletext.

Caption exchange would significantly increase the number of subtitled programs available in Britain and for other countries using teletext; equipment to support caption data transfer is likely to be required and will need to be developed.

Figure 5. The Southampton University subtitle preparation system can speed up preparation of prepared subtitles or provide summary live subtitles.

Labor intensive

Although the subtitling potential of teletext has been known for several years, the introduction and expansion of teletext as a magazine information service has been the first priority. Development of subtitling techniques has nevertheless proceeded meanwhile, and new subtitling equipment currently under development will also benefit from the rapidly accumulating experience of the needs of subtitlers.

TV subtitling is labor intensive and, therefore, relatively expensive. Although the cost of subtitling represents only a small proportion of the total TV program budget, it nevertheless requires a substantial investment of capital and technical development.

In Britain subtitling has not, so far, had the advantage of the substantial government funding that enabled the National Captioning Institute to be set up in the United States; nevertheless it is estimated that 10% of the population of Britain is sufficiently impaired in hearing to benefit from subtitled television. It can be argued strongly that these people have just as much right to subtitles accompanying their TV picture as the hearing have to sound.

Figure 6. Summary live subtitle of the Royal Wedding produced by Independent Television/Southampton University.

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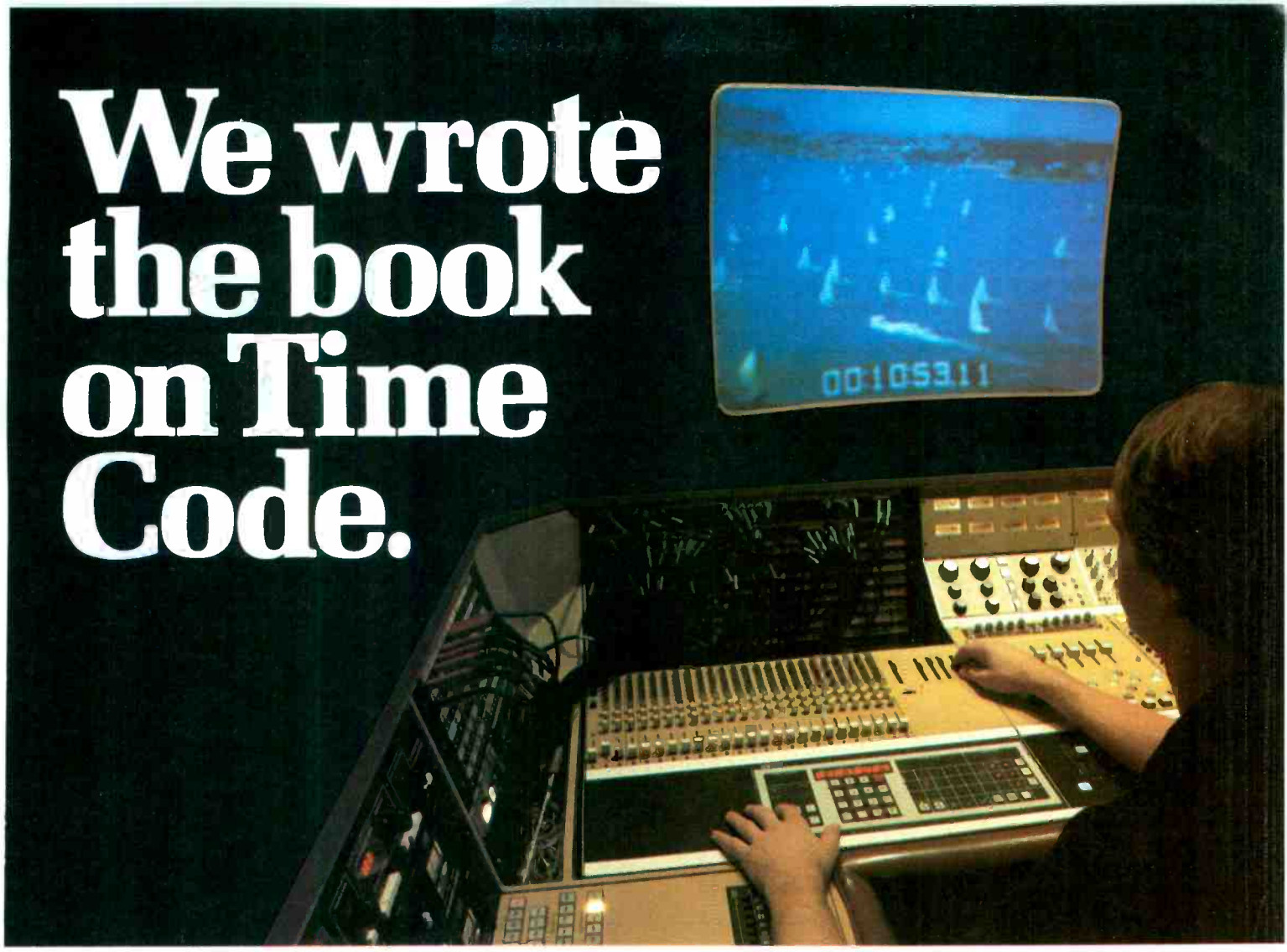

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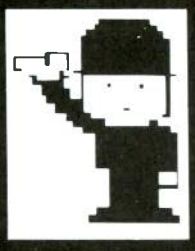


Videotex information can be distributed by normal broadcast services, cable or telephone networks. In some ways, commercial developers have more aggressively pursued this new technology than have broadcasters. However, experience with videotex potential will eventually help broadcasters adopt its use in station services. The author presents an overview of some recent videotex developments.

By Peter Wynne-Davis, British Telecom's Prestel Service

In the 1970s, Britain saw the growth of color television from a minority interest to general acceptability, the first hesitant steps toward free use of electronic news gathering (ENG), and lengthy discussions on the subject of an independent fourth TV channel to compete with the BBC and the Independent Broadcasting Authority (IBA).

However, the dark horse in the technological race from the 1970s to the 1980s and beyond will probably be *videotex*, the generic name for a varie-

ty of information services broadcast either by cable or through the public telephone network. Videotex has, in the past two years alone, come straight from research laboratories to public service and on to international usage with predictions for multimillion dollar markets in the next few years.

The first videotex system on the market was British Telecom's *Prestel*. Acclaimed at the time as a world first and now as *the world viewdata service* because of its international usage, the system was invented by a British research engineer, Sam Fedida, in the early 1970s. Fedida's concept was seized by a telecommunications authority wanting to increase its evening and off-peak traffic levels.

Prestel was viewed as a mighty information warehouse that would be consulted by families and businessmen alike. This original premise was a faulty one because the costs of acquiring terminals for domestic usage at more than $2000 each was a severe marketing handicap.

Eventually Prestel executives realized that videotex success in a nascent period depended on the provision of packages of information to specific business groupings—such as travel agents and commodity brokers—who depend on cheap and fast provision of updated and reliable information. Prestel's current store of 200,000 pages of information is now heavily biased towards business, and more than 80% of the 15,000 Prestel users have their terminals installed at places of work.

An overseas visitor is shown the editorial room of the BBC's Ceefax teletext system. Ceefax was developed by the BBC to broadcast pages of information onto domestic TV screens.

World sales

The international potential of Prestel was apparent to British Telecom executives at an early stage. Intensive overseas marketing was undertaken with the result that software from British Telecom and videotex software from GEC Computers of Britain was supplied to West Germany, Italy, Switzerland, Belgium, Hong Kong, the Netherlands and Austria. Prestel software was originally written in the computer language called Babbage. This particular

language works exclusively with GEC computers and, thus, Britain's public videotex marketing has always been a close cooperation between British Telecom and the computer company.

While Prestel was being coaxed from the videotex nursery, other research and development was being done elsewhere. It was not long before cries of jubilation were heard in both France and Canada where *Teletel* and *Telidon* appeared for the first time. Prestel then had competition on the international stage, and rivalry between the parties became intense.

Anyone with any experience of videotex knows how rapidly markets change. Videotex's ability to change data and provide a fast information service was to be turned upon itself, and the international field became even more competitive.

Since 1975 France had vigorously promoted not only its Teletel videotex service, but other forms of new technology such as teletext, mass facsimile and tele-writing. The services formed the *Telematique* program. France's Teletel entered an 18-month trial stage in June 1981. At Velizy in Paris, 2500 volunteer families had access to about 15,000 pages of data from 200 companies.

Another part of the Telematique system is an electronic directory that is undergoing trials in Brittany, and there are long-term plans for a mass usage of the system. However, strong customer reaction was experienced, and the service is now voluntary. There was strong and persistent opposition to the Telematique program from the newspaper world in France, which feared the possible decline of advertising revenue. Political lobbying on this aspect occurred. In Britain, however, Prestel was initially treated with suspicion by the press but never with positive antagonism. But, like Prestel, Teletel foresees the importance of shopping as a key to commercial success.

Many of the Velizy users have been issued with *smart cards* in order to identify themselves to the Teletel computer so that shopping requests can be made. Prestel terminals, on the other hand, have internally stored identities that are sent for interactive purposes to the computer and smart cards are not needed.

Canadian experience

In Canada, developments had continued with the *Telidon* system. Unlike the Europeans, Canadians elected not to develop a cheap domestic system but rather to move toward a complex graphics system capable of reproducing curves and diagrams in ways impossible in Europe. However, the more complex the terminal, the more expensive it is, and Telidon terminals are estimated to cost at least 400% more than their equivalents in Britain.

The first commercial Telidon system appeared in May 1981 with the provision of about 20,000 pages of mainly agricultural data for the farming communities around Manitoba in western Canada. Initially, 25 sets using the Manitoba telephone system were installed in agricultural offices. Although *Project Grassroots* provided a specialist business package similar to Prestel's present policies, *Vista*, a Telidon trial based in Quebec, is directed solely toward the residential market. The information supplied to the 1000 users ranges from simple entertainment listings to domestic packages from Quebec's department stores.

Other Telidon trials are under way in Canada and the United States. However, in September 1981 the Canadian Federal Government announced that it would substantially reduce its Telidon program and transfer financial responsibility to the private sector, a policy that was followed by the Australians. The general policy is that, having set up the technology, the private sector can use its own business acumen for information development. Grants for field trials are scheduled to end in 1983.

International breakthrough

Prestel's first overseas sale was to West Germany. Called Bildschirmtext, the German videotex service has been under trial in Berlin and Düsseldorf since 1980. Administered by the Deutsche Bundespost, the facility is operated much like Prestel and publishes much of the same type of information. However, a major videotex development can be justifiably claimed by the Germans—the development of software *(Gateway)*, in association with a British company, to allow interaction through a public videotex system with a private computer.

Gateway enables more interactive facilities to be undertaken and also gets around the problems of real time and personal transactions. Both the Deutsche Bank and the small, aggressive Verbraucherbank offer a full banking service through Gateway, with the options of looking up bank balances and even conducting real time foreign exchange transactions.

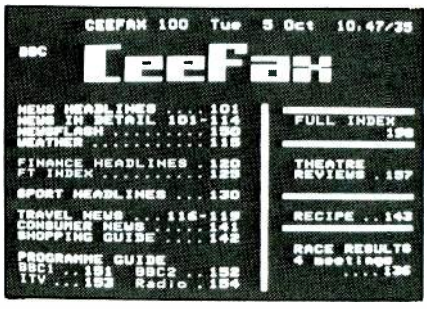
Gateway, developed as a result of German interstate law and an inherent reluctance to input data onto a computer maintained centrally, has the power to alter videotex in a variety of ways. Ready to exploit the potential of this private computer linkup, Prestel launched its own Gateway services in March 1982.

European developments

Elsewhere in Europe, videotex activity is widespread. Austria launched its own Prestel-based service in March 1981 with 300 users accessing 50,000 pages of information. Several videotex trials are under way in Belgium, with the principal one centered on the BTM facility in Antwerp. Also, the Belgian Telecom authority is now moving toward public service.

The Danish Telecommunications Authority is planning a field trial of its native *Teledata* service starting early this year, using about 200 terminals. Developed by the Danish company,

A journalist uses Prestel, the British system that went into full public service in September 1979.



This index page of the BBC's Ceefax service tells the viewer which page to select for specific types of information.

An advertising page from the Independent Broadcasting Authority's Oracle service.

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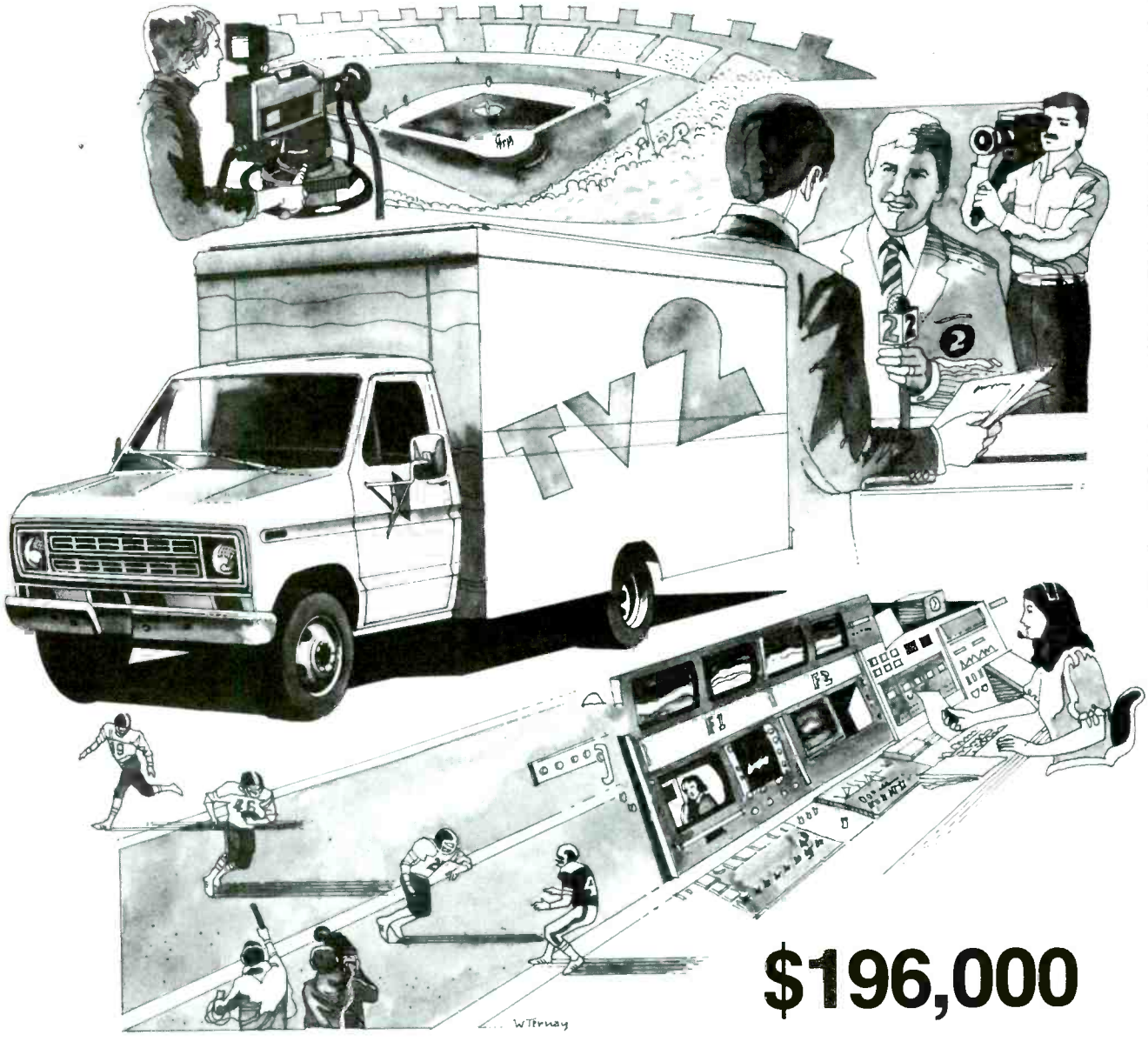

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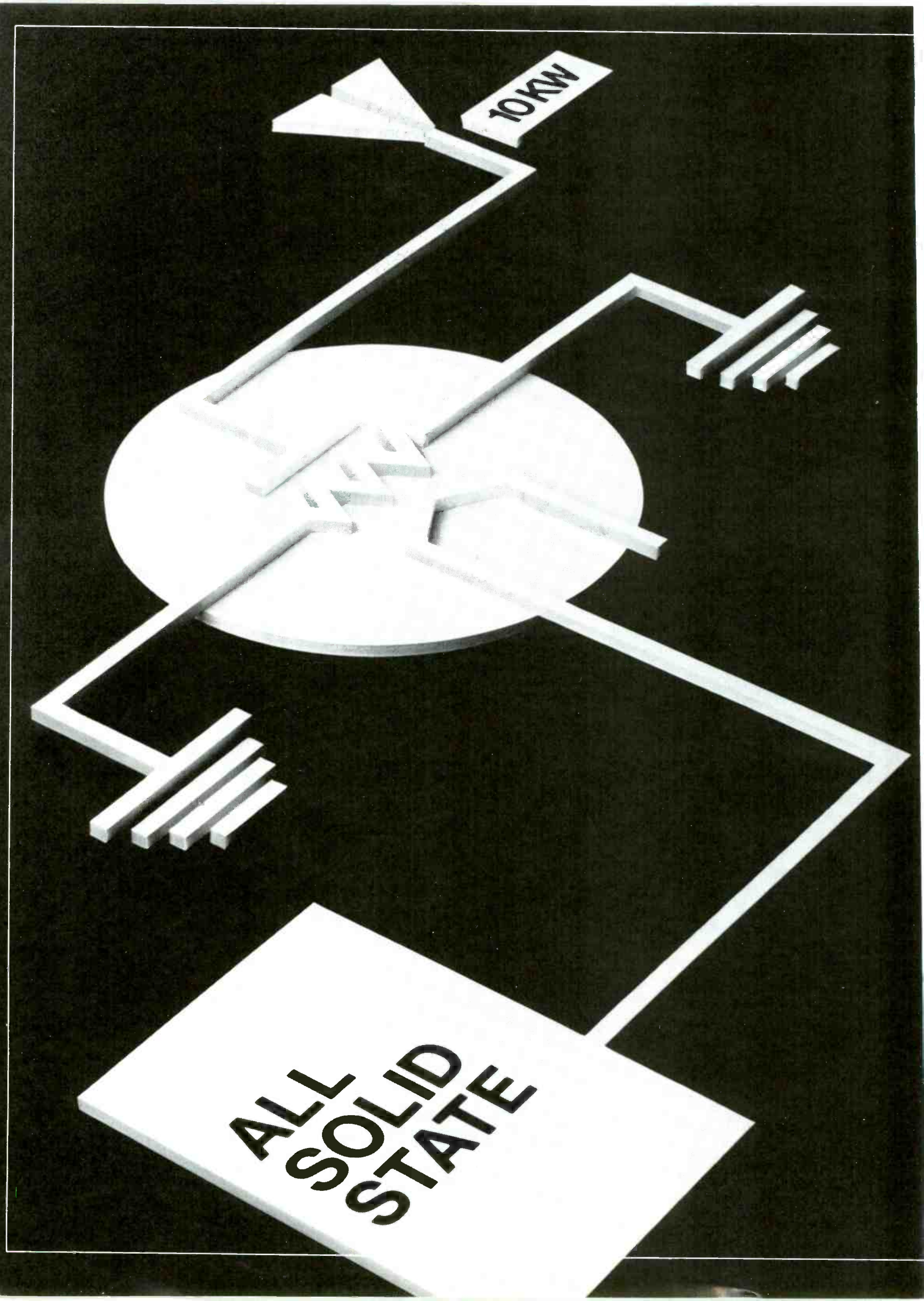
10KW
ALL
SOLID
STATE

ELCOM/BAUER FM RADIO TRANSMISSION

The Simplicity and Stability of Grounded Grid and One Tube Design: The Best of Both Worlds in a New, 10,000 Watt FM Transmitter.

In a power range from 3kW to 10kW, the broadcast engineer can now have the reliability, efficiency and low maintenance that are inherent in a one tube transmitter design. Combine with this the operational benefits of a grounded grid configuration power amplifier stage that requires no neutralization and you have the best of both engineering worlds.

Add to This a New Exciter, Solid-State IPA and Exclusive Broadband, Low-Loss Ferrite Combining

The new 690A Exciter is the heart of all Elcom/Bauer FM transmitters. Its advanced solid-state engineering delivers great frequency stability while assuring you an exceptionally clean signal for further amplification.

Our solid-state IPA consists of four power amplifier modules (2 amplifiers per module) when combined produce 1,000 watts of drive power, with plenty of power in reserve. All of these modules are identical and loss of one of the four driver amplifier modules will not result in an off-air condition. All modules are broadbanded and require no individual tuning over the entire 88-108 MHz FM band. The modular design gives you back-up capability for more reliability in addition to an overall reduction of transmitter tuning requirements.

The exclusive Elcom/Bauer ferrite combiner is also broadband to take full advantage of the new solid-state IPA.

Easy Access and Spacious Cabinets for Engineering Maintenance

Every component in an Elcom/Bauer transmitter is readily accessible; full-length, non-interlocked front doors and side panels, which may be removed if necessary, are provided along with interlocked rear doors. High voltage grounding switches and grounded shorting sticks are provided. In addition to roominess and ease for the engineer, every safety precaution has been re-examined and no compromises made in assurance of operator safety.

Extensive Features That Guarantee Performance/ Reliability

All important operating parameters are metered including operating elapsed time and AC line voltage. Solid-state rectification is used exclusively in all power supplies that are conservatively rated and easily accessible. Rugged variable inductors of solid brass (silver plated) are used to provide simple, stable tuning adjustments.

Automatic recycling restarts the transmitter should a momentary fault occur. A tally light memory keeps the appropriate fault indicator lamp lit until it is reset locally.

Interfacing to remote control or ATS systems is simple with all of the standard functions accessible via terminal strips. Interface for telemetry control equipment is standard, too.

Every transmitter also includes VSWR protection, automatic power output control, AFC status indication, solid-state timing diode logic and relays, tuning controls with counter indicators, multimeter readout on secondary operating parameters and front panel circuit breakers and fusing.

The Quality You Can Depend On– Anywhere in the World.

Your broadcasting requirements need the simplicity and stability of grounded grid and one tube design – the best of both engineering worlds in a new FM transmitter. And, you should investigate the advantages of flexibility and cost-savings that come with the exclusive Elcom/Bauer ferrite combining. A comprehensive two-year warranty and in-depth engineering, available on a 24 hour basis, are your further guarantee that Elcom/Bauer can and will respond to the most stringent requirements for your facility.

A customer list is available upon request. We invite your technical evaluation of new FM transmitters that broadcast professionals are calling: "The Heritage Of The Future."

THE HERITAGE OF THE FUTURE

Elcom/Bauer Broadcast Products
6199 Warehouse Way
Sacramento, California 95826
Tel: (916) 381-3750 Telex: 377-331

Circle (81) on Reply Card

Christian Rovsing, the facility is compatible with Prestel but incorporates a key-word search method for selecting pages.

Across the sea in Finland, several of the country's 60 telephone companies are conducting videotex trials, but the largest is *Telset*. Run by a private company for mainly business users, the service is not visualized as having domestic appeal for some years. Turku and Tampere have similar systems, and others are on the horizon.

Italy and Switzerland both bought test services from Prestel and both are currently under trial. A singular peculiarity of the Swiss trial version is that the computer's database is bilingual, and users can choose which language to read after the system's initial welcome page. For the full service, three languages will be incorporated as well as Gateway facilities for access to private computer banks.

In the Netherlands, *Viditel*, another Prestel overseas sale, is due to have about 100,000 users by 1985 and currently has data supplied by more than 400 companies.

France's only overseas sale, to Brazil, is currently under development for a Teletel field trial.

United States' potential

The United States is seen as the cherry on the cake of international videotex marketing. But, because cable television proliferates in the United States, unlike in Europe, videotex has hitherto been confined to various limited applications and trials. However, in Coral Gables, FL, more than 100,000 pages of general information are available to 160 residential users in a trial called *Viewtron*, and a larger test service is scheduled for Miami in 1983.

Telidon systems appear in Washington and Los Angeles in trials run by the Alternate Media Centre with WETA and the Times Mirror Company. Britain's marketing efforts are being jointly channeled with that of teletext through a government sponsored company, BVT. The company has already made several teletext sales, including one to the Taft organization.

Common standard

Much of the international concern stems not from computer efficiency or information availability but from a complex argument over standards. The desperate need for an internationally accepted standard for terminal construction has been a major part of the larger videotex operators' efforts. Because of the projections for future markets, the struggles have been particularly bitter and drawn out.

In a rare example of European cooperation, Britain, France and West Germany, and the other European telecom operators, agreed in May 1981 on a common standard for alphamosaic display. This standard, which will make its debut with the launch of the full Bildschirmtext service in 1983, will ensure that Prestel, Teletel and Bildschirmtext will be compatible to the new standard.

At present, Teletel terminals cannot access Prestel and Bildschirmtext, and vice versa. The maelstrom over standards has now moved from a European theater of war to the United States, where discussions concerning alphageometric display, on which Telidon is based, continue.

Perhaps supplies of private videotex services point the way to the future potential of the concept. Rediffusion, one of Britain's leading computer firms, has already supplied 120 Prestel-based systems throughout the world at a cost of more than $29 million. The power of videotex and its adaptability cannot be denied, and there is little doubt that in 10 years' time videotex will be as commonplace as color television is now.

SHOK-STOP, The case that covers the Indy 500 and never fails to qualify.

The Indianapolis 500. It's been called the ultimate test of man and machine.

And since Indy cars get pushed to their limits and beyond on the track, they get babied all the way to the track.

Shok-Stop babies sensitive broadcast equipment all the way to the track.

Our unique equipment case design incorporates "concertina" folds which absorb shock energy by "giving" slightly during impact.

And the outer material is a tough but resilient polyethylene that returns to its original shape to await the next jolt.

Inside, cushiony foam adds yet another layer of protection. With 98 "blank foam" cases and hundreds of custom patterns, we can transport virtually any piece of broadcast equipment with snug assurance.

What's more, only Shok-Stop hardware can easily be repaired on location. Because something as important as the Indy 500 shouldn't hinge on a hinge. You can depend on us from start to finish.

So call Thermodyne today. Thermodyne International, Ltd. 20850 S. Alameda, Long Beach, CA 90810. (213) 603-1976

THERMODYNE INTERNATIONAL LTD

Superiority in every case.

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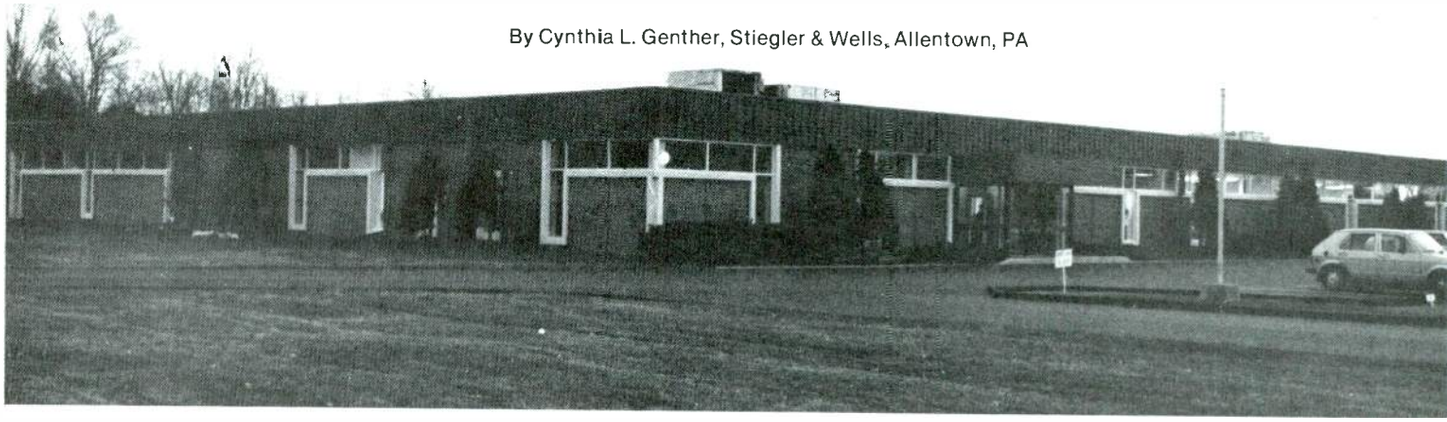
Plant tour: Acrodyne's new facilities

By Cynthia L. Genther, Stiegler & Wells, Allentown, PA



Acrodyne Industries, originally founded in 1968 for the engineering and manufacture of RF components for military applications, later diversified into the broadcast industry. Recently Acrodyne has become a major worldwide supplier of TV transmitters, translators and accessory equipment.

On April 1, 1981, Acrodyne, a division of Whittaker Corporation, moved into a 30,000-square-foot facility in Blue Bell, PA. The new complex, centrally located on a 10-acre tract in an industrial center, houses all the engineering, manufacturing, administrative and marketing functions for the company.

Editor's Note:

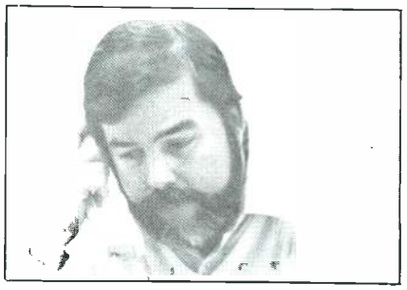
Last year we began a department of *journalistic plant tours* to let you see some of the staff and facilities of companies manufacturing equipment for broadcasters. We included response numbers and our readers voted for us to continue such coverage

This article, prepared by Acrodyne and its agency, lets you *walk through* the company's new facilities in a series of pictures and captions. **BE** visited Acrodyne just before the company moved, so this is also our first view inside the new plant.

This information is provided as a service to **BE** readers who may or may not be able to take an actual plant tour. We plan to *tour* other facilities as time and space permit. If you would like to see a particular organization included, write and let us know.

Marshall C. Smith,
president

Nathaniel (Nat) S. Ostroff,
vice president, engineering



Daniel (Dan) Traynor,
vice president, manufacturing

John D. Parke,
vice president, marketing

Willard (Will) Remphrey,
controller

Now your ENG units can afford the same "line" microphones bought by every major network!

You can pay as much as $1,500 or more to get a good long-reach line microphone. Or, you can put the new Audio-Technica AT815 in every production unit for under $230 each, or the phantom-powered AT815R for under $300 each.

What you'll hear is performance closely rivalling our more expensive brethren. So close, in fact, that every major network has tried and bought our line microphones. And you'll get some advantages which can be very important in the field.

For instance, the phantom-powered AT815R can interface with supply voltages from 9 to 52 volts without adapters or extra circuits. So you don't have to rebuild present equipment to put it on the air. We also have a neat 2-battery 9V power supply you can use. When one battery is in use, the other is on standby. For your peace of mind.

Our internal-battery AT815 uses a standard AA "penlite" cell available everywhere. And in intermittent use, a premium battery should last about 4,000 hours. That's over a year even if used eight hours every day! Just one less thing to worry about when time is short.

The AT815 and AT815R weigh barely over 9 ounces, to make them easy to "fishpole" or hand hold. And each comes with a foam windscreen which slips on in a second. Our optional shock mount can be added as well. And the AT815R has a bass roll-off switch if needed to control rumble.

Both models are designed to take the rough-and-tumble life of an ENG unit or remote film crew, and keep delivering excellent sound. With the narrow directivity which makes line microphones so useful in suppressing noise and "reaching out" beyond normal mike range.

If you thought line microphones were out of reach of your budget, ask your Audio-Technica sound specialist to show you the AT815 or AT815R. We think you'll agree that the networks are onto something great!

AT815
Line + Gradient Microphone.
Under $230.
Optional shock mount extra.

AT8410a Shock Mount. Under $40.

AT8501 9V Dual Battery Power Supply. Under $100.

AT815R Phantom-Powered Line + Gradient Microphone. Under $300.

Circle (86) on Reply Card

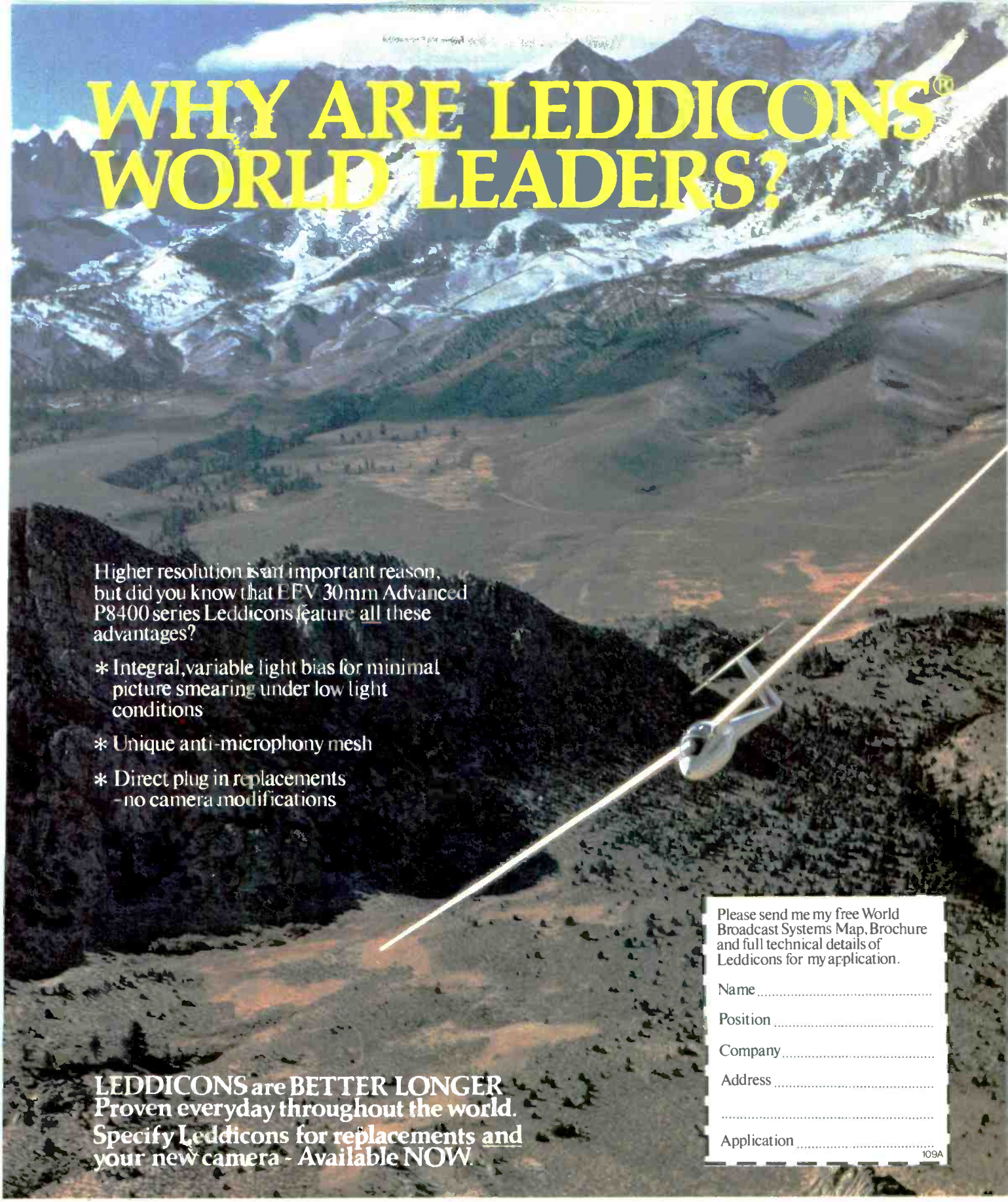
audio-technica®

AUDIO-TECHNICA U.S., INC., 1221 Commerce Dr., Stow, OH 44224 216/686-2600

Marketing department
The domestic and international marketing divisions use telex and computer assistance for the network of Acrodyne sales representatives. Marketing coordination of sales, production, delivery and field installation of transmitters also assists the customer with timely, on-air reliability.

Purchasing department
The purchasing department at Acrodyne has the critical and complex assignment of coordinating the functions of vendor interviews, dissemination and evaluation. This department is also responsible for distribution of supplier data, engineering consultations, negotiations and order placement. Purchasing expediting and vendor rating assures the ready availability of materials to satisfy production scheduling and field service requirements.

Electronic engineering laboratory
The electronic engineering laboratory and offices are the center of activity for new product development as well as production and field engineering. A staff of engineers and technicians directed by the electronic engineering manager continuously engage in circuit and system development at both video and RF frequencies. The staff also is responsible for component evaluation and product improvement. Field and customer service operations are also directed by the electronic engineering manager.



EEV, INC.
7 Westchester Plaza, Elmsford, NY10523, Tel: 914-592-6050, Telex: 646180
In Canada : EEV Canada Ltd., 67 Westmore Drive, Rexdale, Ontario M9V 3Y6, 416-745-9494, Telex 06-989363
In Europe : English Electric Valve Co. Ltd., Chelmsford, Essex CM1 2QU, England, Tel. 0245 61777, Telex 851-99103

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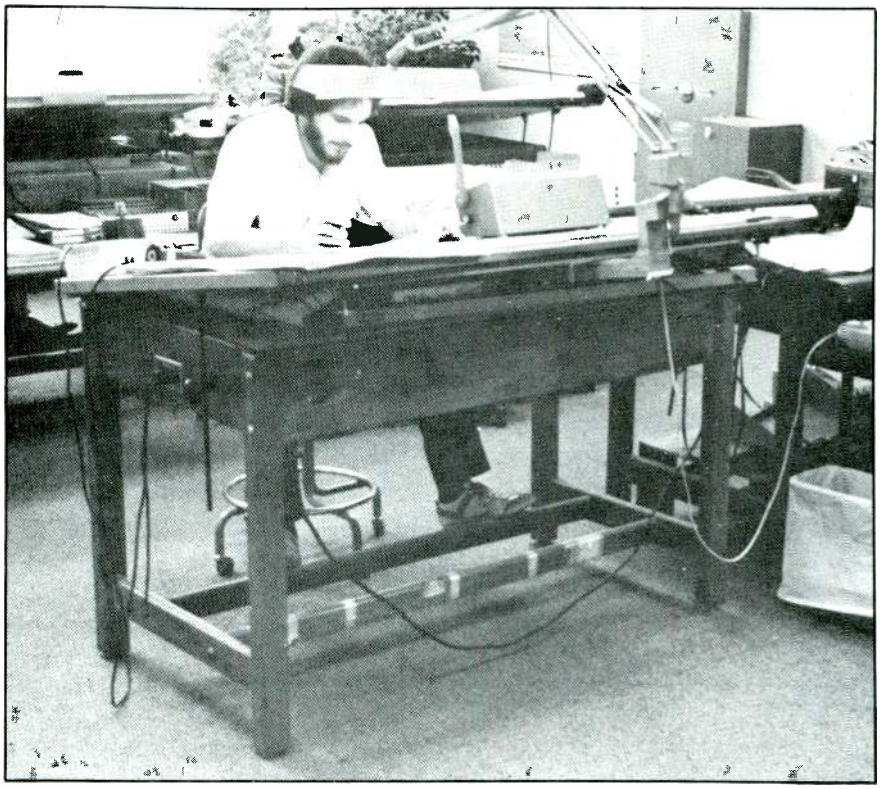
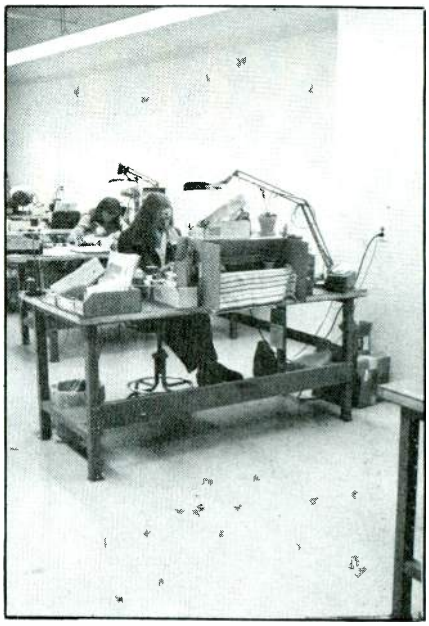


Mechanical engineering

The mechanical engineering office provides all new product design drawings as well as product configuration control documentation. Drawings for all Acrodyne products are maintained in an up-to-date basis through an effective ECN program. Instruction manuals are prepared in the mechanical engineering office from the latest product revision data. The team consists of a senior mechanical engineering manager and a staff of designers and draftsmen.



Module assembly

Each piece of equipment is a system comprised of many electronic modules. Every module in a system is built and assembled in a separate module assembly room. Here, components are soldered onto PC boards, in accordance with engineering schematics. The boards are then encased to form the individual modules. Assembled modules are quality controlled, tagged and serialized before proceeding to the module test lab.

A Message of Major Importance for Broadcast Management

Vital Industries has instituted a cost-saving manufacturer-financing program - applicable to any Vital equipment purchase.

In accordance with our longterm commitment to more responsive television industry service, equipment purchases are being directly financed by Vital Industries itself **at 10% interest.**

Recognizing the barriers raised by prohibitively high interest rates, this financing program is offered well below prime — to permit prompt acquisition, without delay, of the advanced programming and operational systems so essential to productivity and profitability.

This bottom-line economy adds to the special advantage Vital offers TV management: **a complete line of switching, video effects and station automation equipment, available from one single source** — 25 sophisticated system options, totally line compatible. Including production and post-production mixers and switchers, plus our exclusive digital video manipulation system, the versatile Squeezoom®. All are state-of-the-art products of Vital's innovative technology; and all are now available with Vital 10% financing.

This low-interest opportunity is made possible by Vital Industries' unique financial strengths, solidly established by nearly two decade's stable performance and continuing growth. Now the largest U.S. independently-owned manufacturer of TV switching, effects and distribution systems, Vital can draw on corporate resources available from few other suppliers.

For full program details, contact our Finance Department:

(800) 874-7875 Toll Free

VITAL INDUSTRIES, INC.

3700 N.E. 53rd Street
Gainesville, Florida 32601, USA

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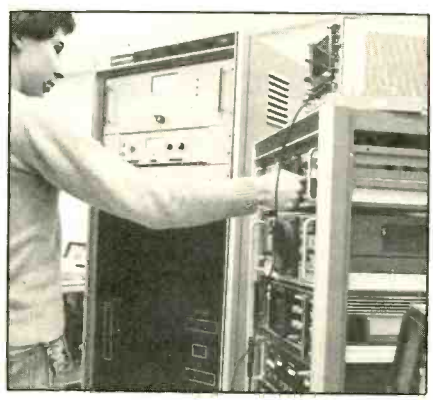
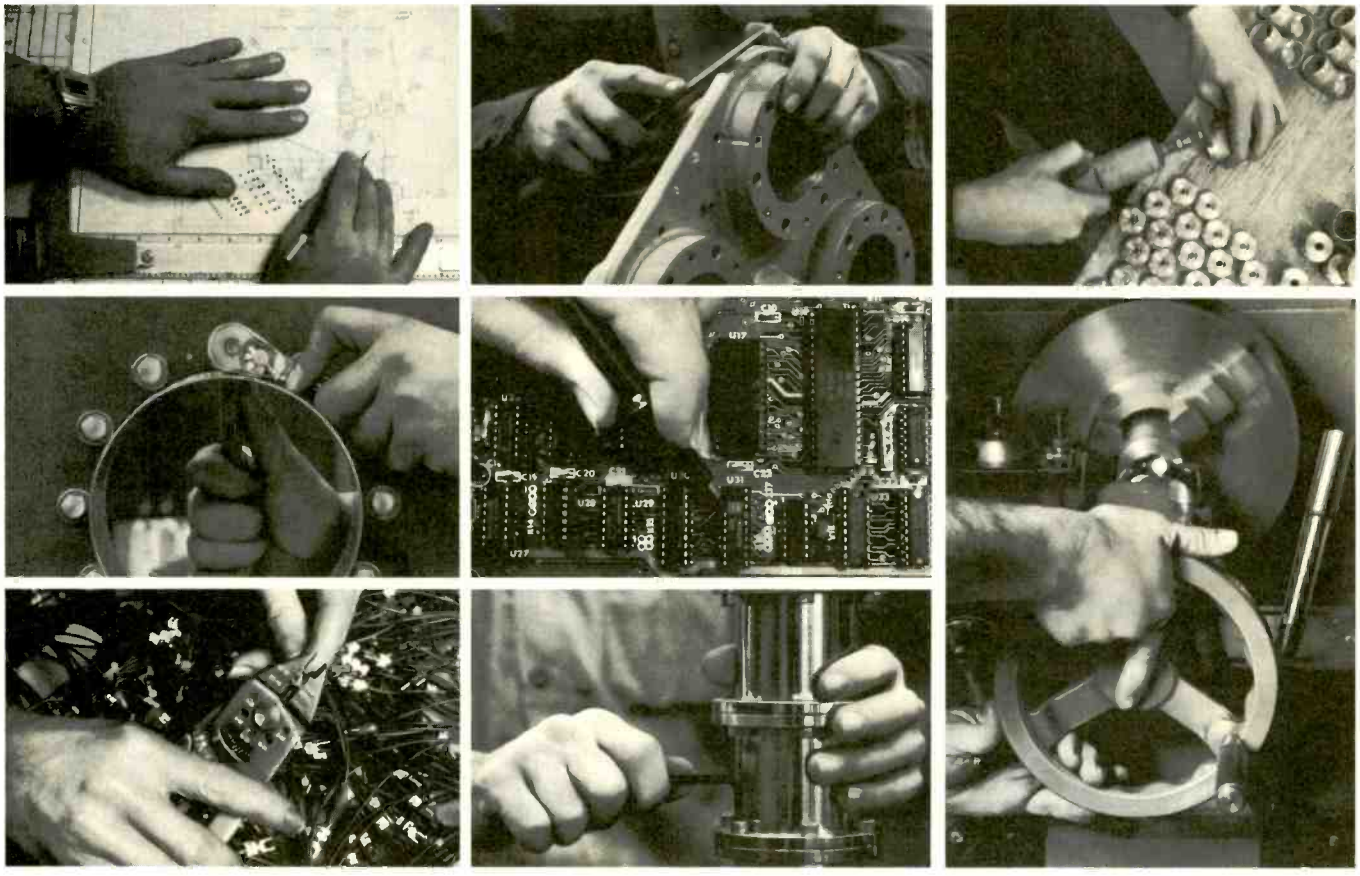
Module test lab
Modules are tested to pre-determined specifications using the latest in electronic test equipment. Quality control test data is kept on file for all modules. By testing in this manner, when modules are assembled as a translator, the system meets all published specifications.

Chassis assembly
Pre-assembled and pre-wired harnesses are manufactured on jigs generated from production control drawings. The harnesses are placed into chassis on which pretested modules have been mounted. This completed subsystem is then ready for testing.



Low power test lab
This 100W solid-state transmitter is being tested in the Acrodyne low power test lab. The test technician is using the latest in video gear. The department also has the capability of testing multiple units at once. All units are life-tested for a minimum of 100 hours before shipment.

UHF Systems?
You're in capable hands with Comark.



At Comark we manufacture more of the components that make up a total UHF TV transmission system than any other name in the business. Experienced technicians with skillful hands measure, fit, connect, test, check and re-check. But that's only part of the reason you should be looking at Comark.

We are in the forefront in creative engineering and practical implementation. We pioneered the concept of maximum transmitter plant efficiency. From initial planning, to total service, our hands-on policy assures you that we live up to our word and workmanship. And because we're in charge we're able to bring our products to you more economically.

Whether you're looking for a turn-key system, or a transmitter or just components, you place yourself in capable hands the moment you contact Comark. Call us at (413) 569-5939 or write: Comark Communications Inc., PO Box 267, Southwick, Mass., 01077. Telex: 955 329.

COMARK

MAKING UHF BETTER, SOONER

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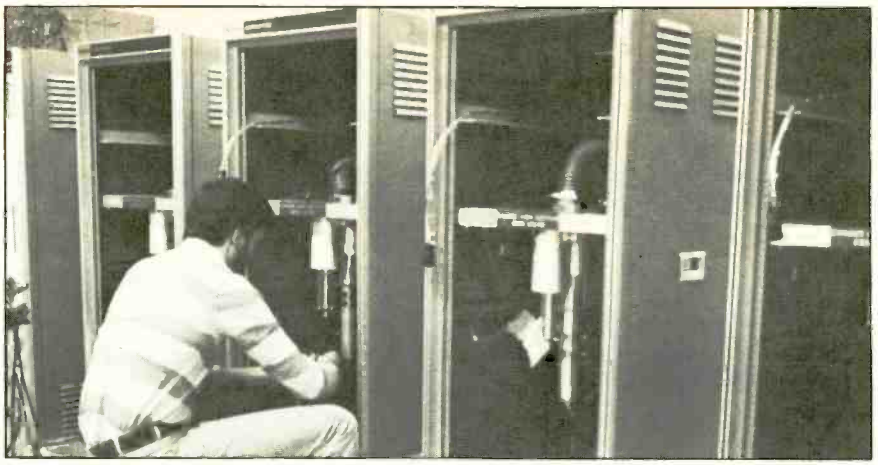
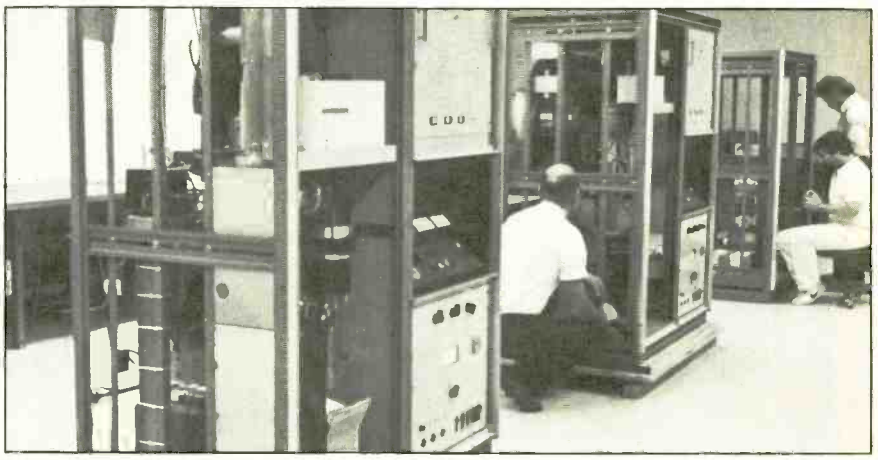
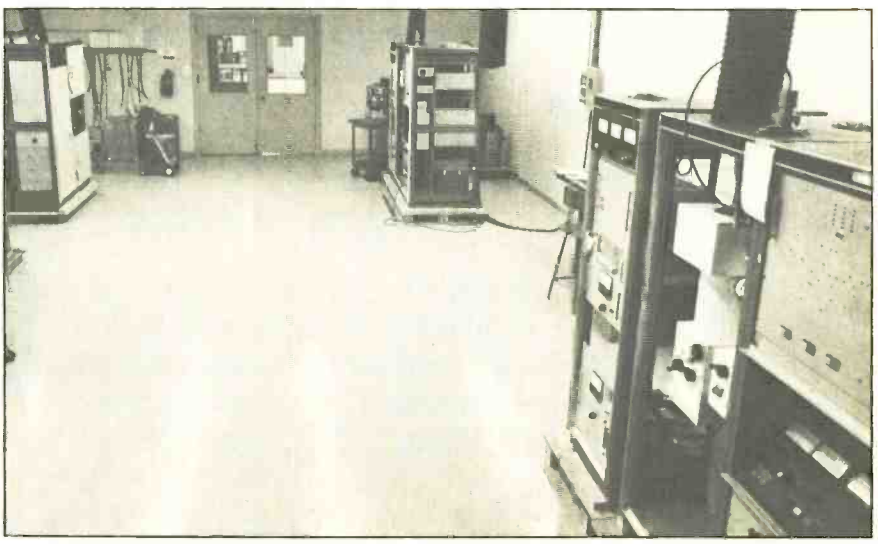


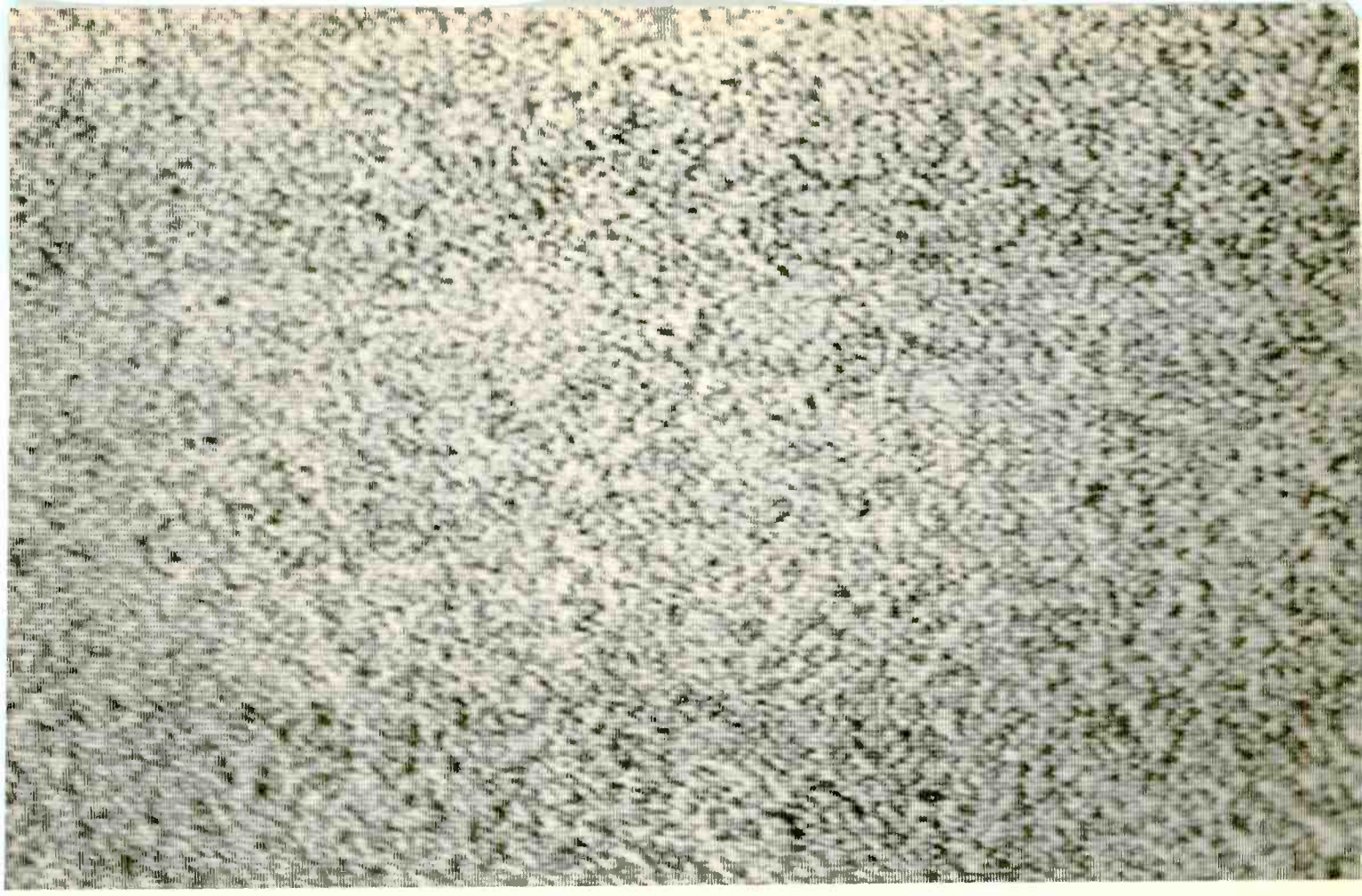
System assembly
All cabinetry work for units from 1 to 500W are assembled in this area. The modules, chassis and power supplies are put together as a system and sent to the system test lab.



High power assembly
The high power amplifiers are built and then tested with their particular driver units in the high power test area. This facility has the capability of building equipment rated up to 25kW.



High power test lab
This test lab has the capability of testing 4 high power units at once in a separate soundproof area. The room has its own heat ducting system and a 50Hz generator for testing international units. All high power units are life-tested for 50 hours before shipment.



The next time your air monitor goes dead, tell your audience about your bargain low-power television equipment

The high cost of low price equipment

No broadcast equipment is a bargain when it's off the air. So EMCEE® Broadcast Products builds its translators, LPTV transmitters and other hardware without cutting corners or costs. Frankly, that often means prices that appear higher. But it also means the proven higher reliability that EMCEE hardware has provided since 1960.

Oldies but goodies

This higher reliability is no blue-sky claim, either. Many EMCEE HRV-1 1 watt translators are still doing a full broadcast day's work eighteen years after installation. EMCEE HTU-100 100 watt translators are still going strong after seventeen years on site. And the list goes on. Because through three generations of low-power television equipment, value and reliability have always come before cost.

Lasting value

This value and reliability comes from higher rated components that loaf along at operating values. From human engineered front panel metering for immediate status of operating parameters. And from innovations such as the industry's first use of pre-correction to improve linearity and extend final tube life. And the industry's only remote interrogator. A complete translator/transmitter status monitor that reduces the number of trips and hours necessary to keep isolated installations operating efficiently.

Valuable support

But technology alone isn't the source of EMCEE reliability. It comes from the Applications and Field Engineering Departments that supply design, installation and total turnkey services without additional charges. It comes from the expertise of our tower crew. And it comes from our special inventory of emergency hardware and a 24-hour number that can help you solve small problems before they become bigger ones.

A fourth generation of reliability

The next generation of EMCEE low-power television equipment is now in the breadboard stage. Like the three previous generations, it won't be the least expensive hardware available.

Which leaves you with two choices. Pay the price of reliability when you buy. Or when your air monitor goes dead.

It's not just how it works. But how long it works.

EMCEE®

BROADCAST PRODUCTS

a division of
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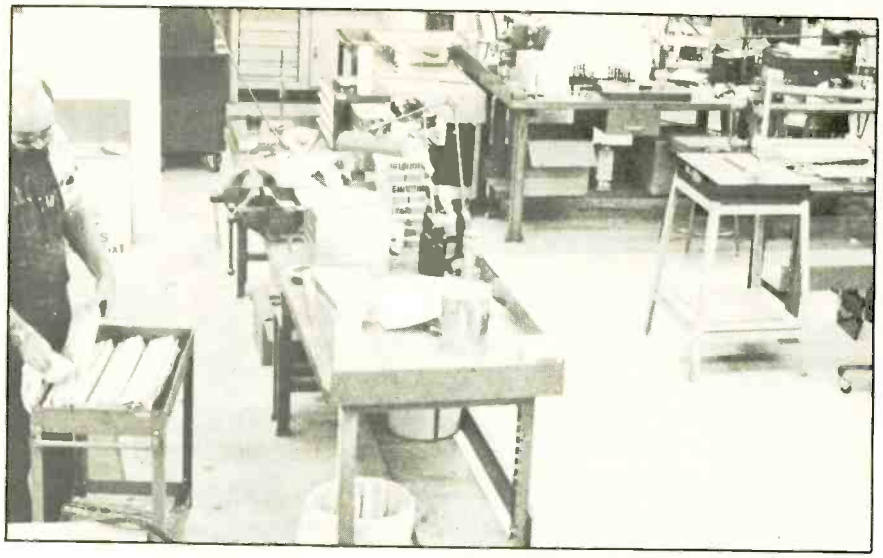
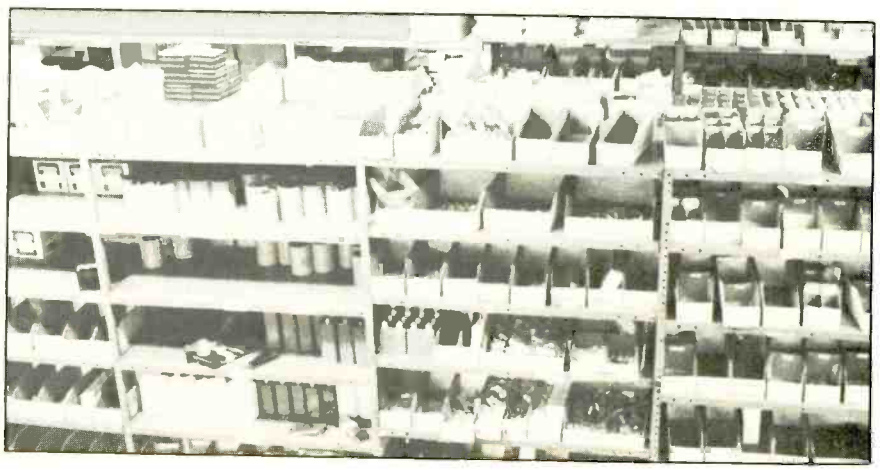


Machine shop

Acrodyne maintains a modern machine and sheet metal shop complete with computer controlled machinery. All Acrodyne sheet metal requirements are fulfilled by this shop.



Stockroom

Acrodyne has the capability of building almost every one of its products completely from the stockroom. The expensive cavity and tubes used in high power equipment are also stocked here. A closely watched minimum/maximum availability of every part is kept to ensure quick delivery to customers.

Acrodyne philosophy

In times like these when everyone is selling high volume, off-the-shelf equipment, Acrodyne stands firm in its commitment to supply quality, customized products built for reliable operation and easy service. Acrodyne continues to pursue improved TV communications.

NATPE-'82 conference replay

By David Hodes

- **March 11-16, 1982**
- **Las Vegas Hilton**
- **4500 attendees**
- **243 exhibitors**

The 18th Annual Convention of the National Association of Program Executives drew 4500 attendees and more than 243 exhibitors. Programmer booths and hospitality suites filled the Las Vegas Hilton, and key panel discussions were set in the nearby Sahara hotel.

On March 13, a panel discussion featuring FCC commissioners Mimi Dawson and Henry Rivera focused on regulatory actions for new industry technologies. Issues included airwave deregulation, LPTV and DBS. Rivera claimed that technologies such as DBS and LPTV will help eliminate government regulations as soon as they are accepted into a fair and equitable marketplace.

One topic of the convention was the Prime Time Access Rule (PTAR). In the panel discussion, Dawson said that PTAR would not be in front of the committee in the short term.

At the end of his speech on March 15, FCC Chairman Mark Fowler said, "While PTAR is not on a head-on collision course with the first amendment, it is a rule...that the government should not make if we believe in a marketplace orientation."

Even though programmers took issue with Fowler's position on PTAR, many cable entrepreneurs were pleased about the FCC's *hands off* posture on new technologies.

On March 14, the programming awards ceremony was held at the Aladdin Hotel grand ballroom, with a post-awards reception following at the MGM grand ballroom. Celebrities Gary Collins, Chef Tell Erhardt, Lorne Greene, Michael Landon and Sarah Purcell presented awards for programs in entertainment, public affairs, specials, public affair series, sports, children and magazine formats. One of the president awards presented by NATPE's Stephen Currie went to the QUBE system's show, *Magic Touch*, delivered by Warner Amex. This marked the first time such an award went to cable TV, and further acknowledged the presence of new technologies in current programming efforts.

The Iris Award of the Year went to veteran Hollywood star Lucille Ball.

Field report: 409 and TRACE editing software

By Arthur Schneider, A.C.E., post-production consultant, Agoura, CA

For users of computer-assisted editing systems, two software programs are available to assist videotape editors in preparing a clean edit list to be used during an automatic computer-assisted assembly.

The first program is known as 409, an edit list cleanup program. The second is called TRACE, a multigeneration tracing program. Both programs are designed to work with DEC PDP-11 or LSI-11 computers. This software works well on CMX and Mach One editing systems and should work well on other systems using the PDP-11 or LSI-11 series computers.

Each program requires at least 8k of 16-bit memory, a high-speed reader/punch or floppy discette, and a teletype or Decwriter. A CRT terminal and line printer are optional output devices.

The latest 409 version handles up to 6-digit alphanumeric reel numbers, simplifying reel assignments for systems capable of using this feature.

The 409 and TRACE operate with SMPTE time code and may be used with drop frame or non-drop frame time code. Also available are optional versions that may be used at the 24-frame film rate or the 25-frame PAL rate. The latest software release provides for storage of up to 32 individual files on one side of a single-or double-density disc. Each file is displayed in ASCII so that the user will see each file title exactly as it is stored in the edit list.

With the minimum 8k of memory, the system will handle between 200 and 300 edits. For each 4k of added memory, an additional 200 to 300 edits may be handled. Many current systems are using between 20k and 28k of memory, which allows the processing of up to 1600 edits at one time in a 28k system.

The use of the 409 program allows the editor to be less aware of the

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Editor's Note:

The field report is an exclusive **BE** feature for broadcasters. Each will be prepared by the staff of a broadcast station, production facility or consulting firm. The intent is to have the equipment tested on-site. The author is at liberty to discuss his research with industry leaders and to visit other broadcasters and/or the manufacturer to track down pertinent facts.

In each field report, the author will discuss the full applicability of the equipment to broadcasting, including personal opinions on good features and serious limitation – if any.

In essence, these field reports are prepared *by* the industry and *for* the industry. Manufacturer's support will be limited to providing loan equipment and to aiding the author if support is requested in some area.

It is the responsibility of **Broadcast Engineering** to publish the results of any piece tested, whether positive or negative. No report should be considered an endorsement by **Broadcast Engineering** for or against a product.

mechanics of editing and allows him to be more concerned with the aesthetics, because any redundancy or other list management problems are efficiently taken care of by the 409 program.

The 409 program reads edit lists (EDLs) from paper tape or floppy discettes and generates a "clean list" in a CMX format. The most common functions of this program are to eliminate over-recordings, reorder events in a manner most efficient for an automatic assembly, and join two or more continuous edits into a single event, reducing the number of separate events in a list.

The 409 program also allows the user to modify an existing EDL by adding or deleting events or in other ways changing the inputted list. After the cleaning process has been completed, the results may be stored on punched paper tape, floppy discettes and hard copy printouts. All output mediums contain a list of cleaned events starting with consecutive event numbers on the left of the display and a second set of event numbers that refer to old event numbers as they appeared in the list before cleaning. The cleaned list notes if events are missing and also identifies discontinuities in record times.

The editor may call for an automatic list clean, which processes the list using all the components of list clean, or ask for selected functions that may be used to generate an edit list for a specific purpose.

Some of the individual functions are join events, clean events and split inserts. Also, group events are possible to rearrange edits to maximize the number of audio/video edits. The user may also ask for a separate video only or audio only list for special purposes such as the conforming of sound tracks.

The second of these two programs, TRACE, gives added flexibility to the videotape editing process by allowing the user to "rough cut" a videotape, then use this first cut as a source tape, creating a new version on another videotape along with a new series of edits that represent a modified second version.

This process of using subsequent generation tapes and edit lists to refine a program may be repeated up to 10 times or generations without rebuilding all edits each time a change is required. It is a great time saver. The TRACE program stores the various edit lists from each version and then computes all the edits back to the original source tapes. TRACE is an ideal tool for film-style editing, which is becoming more popular due to its flexibility.

TRACE and 409 are somewhat interactive because they work together to generate efficient auto assembly lists for videotape editing. Both of these programs have been in use for several years now and most editors involved in any type of time code editing think that these two programs prevent human errors and simplify the post-production process.

In 1980, the Academy of Television Arts and Sciences awarded David Bargen an Emmy Citation for the development of these two programs.

Both of these software programs are available to the industry from Interactive Systems Company of Boulder, CO, and were designed and written by David Bargen. For more information about these products, write: ISC, 2425 6th St., Boulder, CO 80302.

AM stereo: The technical story

By Dennis Ciapura, group vice president, telecommunications, Greater Media, East Brunswick, NJ

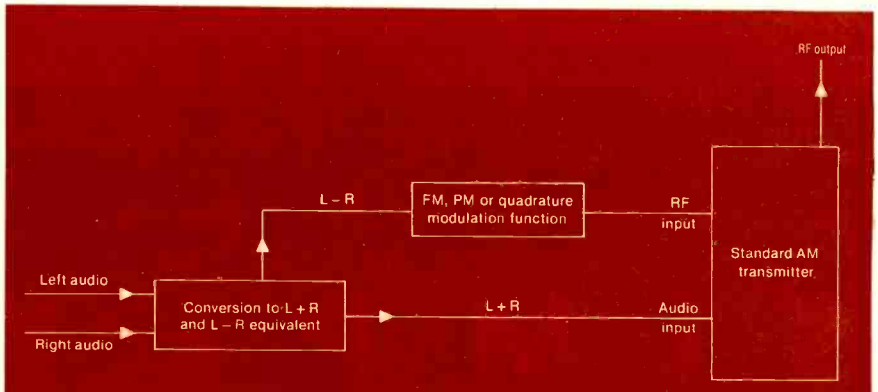


Figure 1. The basic stereo generation approach of the five systems presently proposed

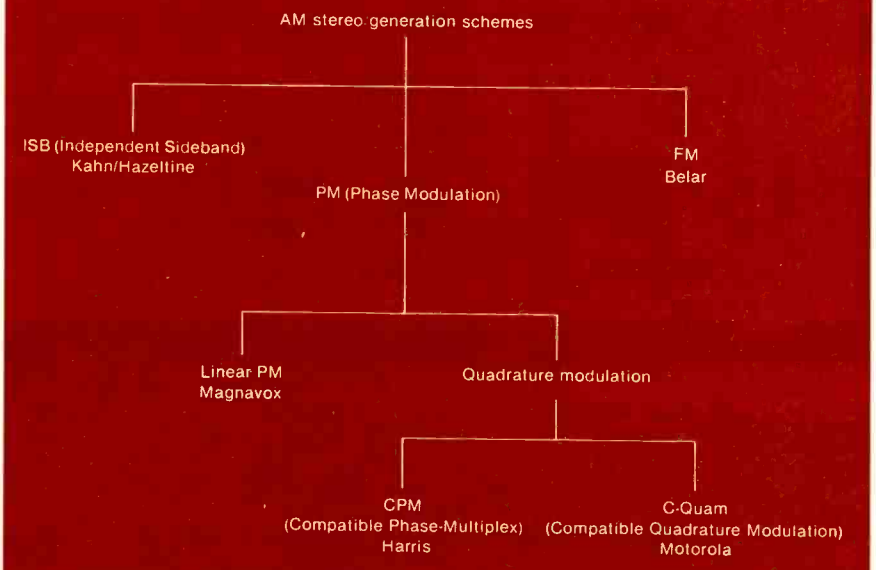


Figure 2. The AM stereo family tree

The battle to prove technical supremacy in the AM stereo arena has been as frustrating for broadcasters as it has been exciting. Replete with accusations of deception and pages of conflicting documentation, the struggle has left many engineers confused and suspicious. The more vociferous proponents have raised so many serious questions about competing systems that one cannot help but be a little skeptical about the claims of *all* of the proponents. After all, they all cannot be the best.

For the broadcaster, in the end, it will be a combination of receiver popularity and individual technical assessment of system capabilities that will determine which AM stereo transmission system is employed. It is too early to forecast the receiver marketplace, but a review of how each of the five proposed systems works is a good place to begin the technical assessment.

Audio channels

All of the systems are similar to each other (and FM stereo) in that the left and right audio channels are converted into L + R and L – R equivalents for transmission. This is a natural outgrowth of the requirement that a normal mono receiver be able to detect a mono amplitude modulated carrier that is the summation of the left and right channels. Figure 1 is a simplified block diagram that illustrates the general scheme employed by all five of the systems proposed thus far.

The systems differ in the way in which the FM or PM of the carrier is accomplished. Do not be deceived into thinking that these systems are as similar in their performance characteristics as they are in their block diagrams, because there are important differences. We will look at some of those differences later, but for now let's continue our analysis of how they generate the stereo information, because that background is key to understanding the performance variations.

Stereo generation

Figure 2 breaks the five proposed systems down by the method of stereo generation. Although all of the systems employ some sort of phase modulation, the Kahn system is unique in its independent sideband approach, which results in the left channel being carried on the lower sideband and the right on the upper one. This is the one that allows stereo reception with two mono receivers – one tuned a little low and the other a little high. The Belar approach is to frequency modulate the carrier with the stereo information, while Magnavox, Harris and Motorola phase modulate the carrier. The Harris and Motorola methods are similar in that they are modified quadrature modulation schemes, not unlike the method

Continued on page 132

Commissioner Abbott Washburn's dissenting statement

I dissent to the majority's decision which denies the request of the AM broadcasting and manufacturing industry for authorization of a single AM stereo system. My fellow commissioners have, instead, stepped aside and turned the destiny of this service over to the marketplace.

I differ with them in assessing the consequences of multiple systems being offered to the public versus a single, nationwide system. The competing systems are technically incompatible. This means that in a given geographical area you might have two or three different stations broadcasting in AM stereo but using different systems, so the listener would have to have multiple radio sets in order to receive them. Or the consumer might find upon moving to another city that the radio set purchased to receive AM stereo will not receive the AM stereo signal in the new location. Or a motorist, traveling the highway, might find that he or she can receive AM stereo in one community but not in the next.

Will the public accept these inconveniences and added costs when they can already receive a universal FM stereo signal that is at least as good as AM stereo would be? The majority is betting that consumers *will* do so and that, furthermore, by eventually preferring one system over another, *they* will make the choice that the commission is today eschewing.

I submit that this type of marketplace referendum is not the way to make an informed choice, if indeed it results in a choice at all. (The sad possibility of no service coming into being is recognized in paragraph 55 of the Order.) The data before us shows that the performance characteristics of the five systems are so close that consumers of AM stereo will be able to detect little if any difference among the systems. The difference among broadcast signals caused by different station powers and antennas, different distances and propagation paths between stations and consumers, different types of program material, different signal processing practices (such as signal compression for "louder" perceived sound level but lesser fidelity), and other aspects of signal and receiver quality will thoroughly mask system differences as perceived by consumers. In actuality, therefore, whichever system or systems evolve will be based not on true consumer preference resulting from comparison of the five systems, but rather on the size of promotion and merchandising expenditures and like factors.

It is a proper function of government to lay down the guidelines for a single system that will result in AM stereo in every home at the lowest cost consistent with technical excellence and quality reception. I remain convinced that the commission *can* choose with confidence a system which will meet the needs of broadcasters, manufacturers and the public. To do so risks making the "wrong" choice. But with the five systems running a close race in their technical quality, that risk is minimal. And I continue to believe that it is in the public interest for the commission to choose a single system. The risk in selecting a single system pales in comparison to the consequences of compelling multiple systems to fight it out in the marketplace. Specifically, the authorization of a single system will prevent needless delays and avoid the significant waste of resources by broadcasters, manufacturers and consumers associated with marketplace determination. In addition, the benefits that would result from price and performance improvements due to competition within a single system, as well as from vigorous competition between AM and FM stereo services, would begin flowing to the public immediately.

Selection of a single standard has been our practice for more than 50 years. For example: monochrome and color TV, FM stereo, telephone and other communications systems were all designed to a standard selected by the FCC. The data and analysis we need to set a standard in AM stereo are before us. I dissent to the majority's unwillingness to make the choice that would have assured a national standard.

FCC update

Continued from page 6

that time permitted only to rebroadcast simultaneously the programming of a full-service station, would be allowed to originate programming to an unlimited degree. On March 4, 1982, the commission authorized the low power TV service, subject to the following rules.

Technical standards

Secondary status Low power stations have secondary spectrum priority to full-service stations. They may not cause interference to or receive interference from full-service stations. They must correct any interference caused to full-service stations and must yield to facilities changes or new full-service stations that create an interfering condition. This rule also applies to land mobile stations sharing UHF frequencies with broadcast uses. Between cable systems and low power stations, a "first in time, first in right" policy applies where there is interference at the cable headend or the output channel of a cable system using a converter; in other instances of cable/low power interference, the cable operator is responsible to correct the interference.

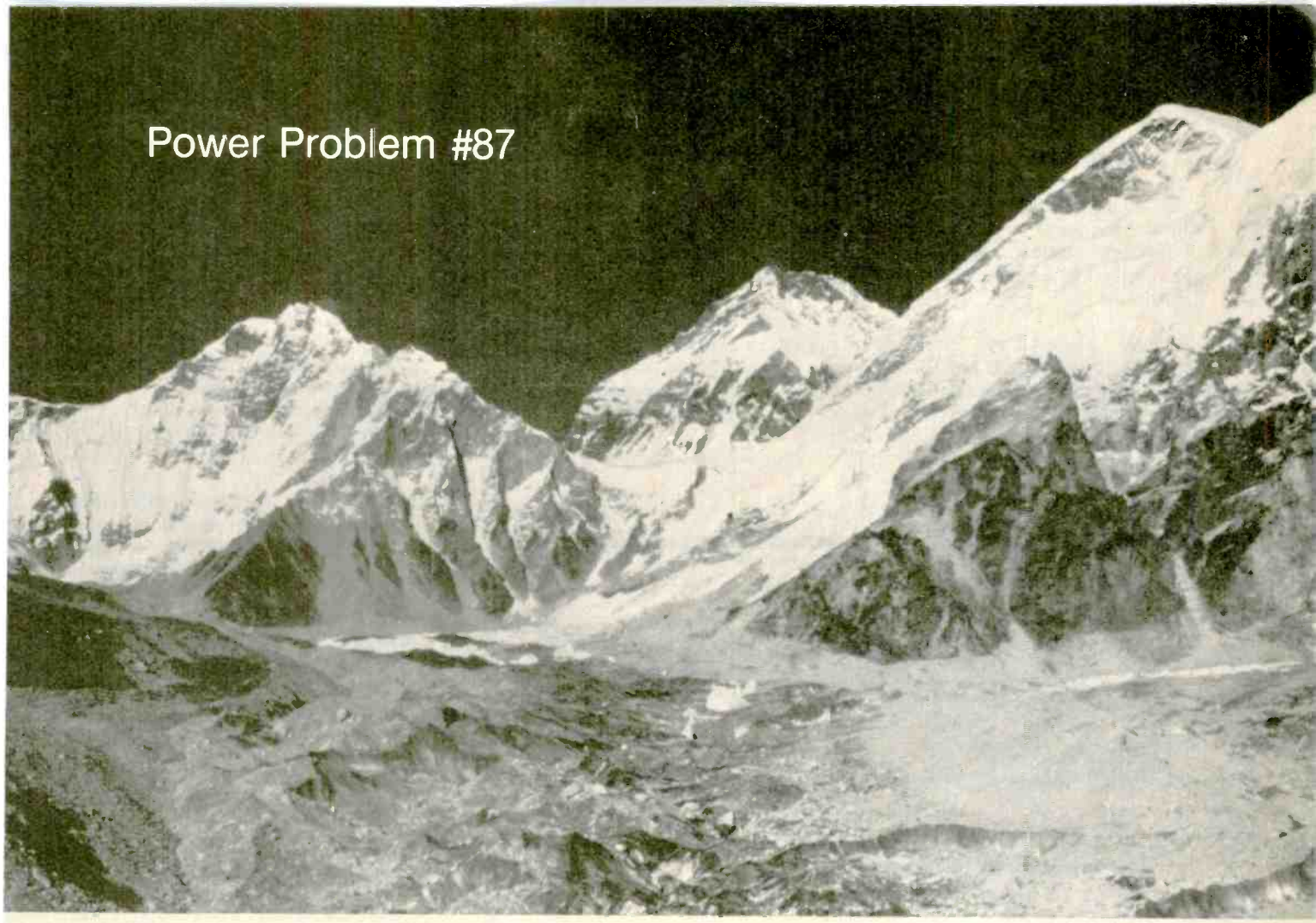
Channel selection Low power stations may operate on any available VHF or UHF channel, provided that they do not cause objectionable interference to full-service stations, other translators or low power stations, or land mobile stations that share frequencies with broadcast uses. Low power channels are to be allocated on a demand basis. There is no table of allotments. No channels are reserved solely for non-commercial use; rather, applicants select a channel and provide an engineering showing on the application that the proposed facility will not cause objectionable interference. The potential for such interference is predicted using desired-to-undesired (D/U) frequency ratios set out in the report and order. D/U ratios are used to determine where the protected contours fall for full-service, land mobile and low power stations and translators, and they establish the measure by which the overlap of the contours of low power and other stations is prohibited. The D/U ratios establish a 4- to 7-mile protected contour for low power stations, although the signal may carry beyond that contour where no other signals interfere with it.

Power limits Low power stations and translators will be limited to 10W VHF and 1000W UHF. VHF stations operating on channels in the TV Table of Assignments may use 100W. 1000W UHF low power stations within 250 miles of the Canadian border and 199 (UHF) or 250 (VHF) miles of the Mexican border must be coordinated with the governments of those countries.

Program content rules

Origination Low power stations will be *permitted* to originate programming to an unlimited degree but will not be *required* to originate any programming. Program origination includes any transmission other than simultaneous rebroadcast from a full-service station.

Statutory rules The statutory prohibitions on the broadcast of obscene material, lotteries, plugola, payola and licensee-conducted contests apply to the low power service. The Fairness Doctrine and rules mandating access for political candidates and victims of personal attacks will apply in a sliding scale, to the extent that the low power station's origination capability permits. The copyright laws apply to low power stations. This means that consent from the copyright holder must be obtained for program rebroadcast and commercial substitution.



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*Karl Maret, M.D., Mt. Everest Project Coordinator

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Commission regulations Low power stations will be subject to a minimum of program content regulations. There is no ascertainment requirement. There are no prescribed amounts of non-entertainment programming or local programming and no limits on commercialization. There are no minimum hours of operation required.

Station management An operator must be in continuous attendance during all local originations; microwave transmissions must be observed on a conventional receiver for 10 continuous minutes each day. The statutory exemption from the operator-in-attendance requirement for translators whose primary function is rebroadcast continues in force.

Subscription service Low power stations may provide subscription (pay) programming, subject to no complement-of-four restriction (this rule prohibits STV in markets where there are fewer than four other free stations) or required minimum hours of free programming. Decoders may not be sold to subscribers, however, but may be leased only.

Mandatory carriage Cable systems will not be required to carry the signal of low power stations, but may do so if they choose, on the basis of private negotiation.

Ownership restrictions

There will be no restrictions placed upon multiple ownership of low power stations, as shown by the following:

- Any number of low power stations may be owned in common.
- Current broadcast licensees, cable operators and newspaper publishers may own low power stations.
- The three national commercial networks may own low power stations.

Comparative procedures and criteria

When two or more applications are mutually exclusive, or when a challenge to the basic qualifications of an applicant cannot be resolved by staff action, the subject applications will be designated for a comparative hearing. The hearings will be largely conducted on paper, with a right for prehearing discovery or oral testimony only when the administrative law judge deems this to be necessary. The comparative criteria will be diversification of control of the media of mass communications and more than 50% minority ownership.

For more information, contact the FCC Consumer Assistance Office, 1-202-632-7000.

Excerpted from FCC Report No. 16871 re. Docket No. 78253.

News

Continued from page 8

heat. Because of heat reduction, the size of the cooling device needed for dissipating on-board heat is smaller and less complicated.

The device consists of a series of concave electrodes that recover electrons of varying velocities just before they have spent their energy. The collector sorts out electrons by velocity and slows them to prevent them from streaming back into the tube.

The device can, after some modification, be applied to any microwave power transmitting device to improve its efficiency. At least five manufacturers are now building devices similar to this for installation in military equipment. In Japan and Great Britain, similar devices, based on US technology, are already widely used with UHF TV transmitters.

Kosmahl has been associated with the Lewis Center for approximately 20 years. He holds 10 US patents, six foreign patents, and has three patents

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pending. In 1980, he received NASA's highest monetary award, $15,000, for his work in developing the multistage depressed collector.

Home video coalition retains Ferris

Former FCC Chairman Charles D. Ferris and former Sen. Marlow Cook (R-KY) have been retained as counsel for the Home Recording Rights Coalition.

Ferris will act as the coalition's chief coordinator and spokesman. The coalition is asking Congress for legislation to clarify the current copyright law in a manner that would clearly exempt consumers from copyright infringement when they record TV programs for private, non-commercial use.

A ruling by the Ninth Circuit Court of Appeals in October 1981 held that the use of home videocassette recorders for taping broadcasts was an infringement of copyright. It also held that the making, selling or advertising of home video equipment that could be used for taping broadcasts contributed to this infringement and should be subject to damages.

The movie industry, which brought the suit, is seeking the payment of a royalty *tax* on the sale of all home video recorders and blank videotape.

The Home Recording Rights Coalition opposes the imposition of such a tax, on the grounds that it would be unfair to consumers, harmful to small business, and is not justified by the law or the economics of the recording industry, which already rewards copyright holders through the mechanisms of a free market.

The coalition is seeking passage of legislation in the House and the Senate that would exempt non-commercial home users from the copyright laws. House bills introduced by Reps. Stan Parris (R-VA) and Thomas S. Foley (D-WA) have been co-sponsored by more than 70 other members of Congress. A Senate bill introduced by Sens. Dennis DeConcini (D-WA) and Alfonse D'Amato (R-NY) has 12 co-sponsors.

The coalition includes distributors, manufacturers, retailers and users of home video equipment.

Ferris was chairman of the FCC from 1977 through 1981. He is now a senior partner in the Washington office of the Boston law firm, Mintz, Levin, Cohn, Ferris, Glovsky and Popeo.

Cook, a republican senator from Kentucky from 1968 to 1974, is a partner with the law firm, Cook, Purcell, Hansen and Henderson.

business

Broadcast Engineering makes top 25

Broadcast Engineering has been rated one of the top 25 trade magazines for 1981 in terms of advertising volume growth. The survey results were reported in the March 1982 issue of *Industrial Marketing* magazine. According to their figures, **Broadcast Engineering** ranked 16th in terms of total page growth with an increase of 154 pages from 1980. **BE** also ranked 18th in terms of percentage growth with an increase of 17.3%.

Broadcast Engineering was the only magazine in the radio, TV and teleproduction industry to make the list. 1981 was a record year for **BE** with total ad volume reaching 1110 pages.

Elcom/Bauer expands facilities

Elcom/Bauer has announced the addition of office and production space to the 2-year-old firm's existing facility. This move adds approximately 33% more room for increased business activity. A data processing system was also added.

Phoenix Computer Systems enters broadcast market

Phoenix Computer Systems recently announced its entry into the broadcast TV market with the introduction of the Graphics Broadcasting Terminal.

Combining the company's successful Raster 640, a high resolution, raster-scan color graphics terminal, with the Phoenix NTSC encoder, the Graphics Broadcasting Terminal provides the broadcaster with pixel-addressable graphics for a variety of applications.

MSOs buy ATC antennas

Antenna Technology Corporation has been awarded contracts from several MSOs for its multibeam antenna, the Simulsat. Installations scheduled for next month include: Jefferson City, MO (TCI), Corpus Christi, TX (TCI), Vacaville, CA (GE CableVision), St. Louis, MO (Sammons Communications), and Compton, CA (CATV-West/Heritage).

Simulsat has been proven to be a successful solution to cable operators' need for multisatellite reception. Field testing on the antenna by cable operators has established Simulsat as a viable alternative to the typical antenna farm.

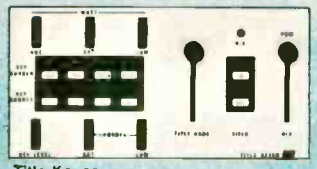
Harris markets AM stereo system

Harris Corporation has begun selling its AM stereo broadcasting system to the nation's 4650 AM radio stations, and is licensing manufacturers of home radios to use its stereo receiving technology.

The company expects to begin delivering equipment in July 1982 and estimates that AM stations will eventually invest $100 million in stereo transmission.

The FCC's recent vote allows AM stations to broadcast in stereo for the first time. However, the FCC declined to select one of the five incompatible transmission systems contending for approval as the industry's technical standard. Commissioners left that decision to the marketplace.

Harris has decided to enter the market aggressively, despite its belief that the FCC should have decided the issue. The company will mount a campaign to convince broadcasters and the public that its stereo system is the best.



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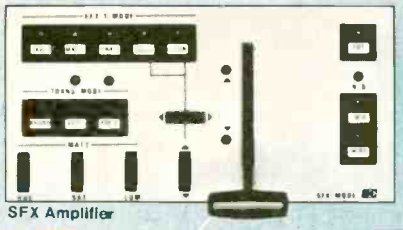
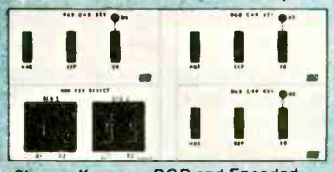
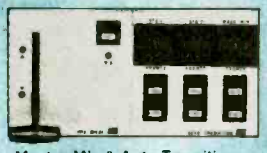


SFX Amplifier



Chroma Keyers...RGB and Encoded



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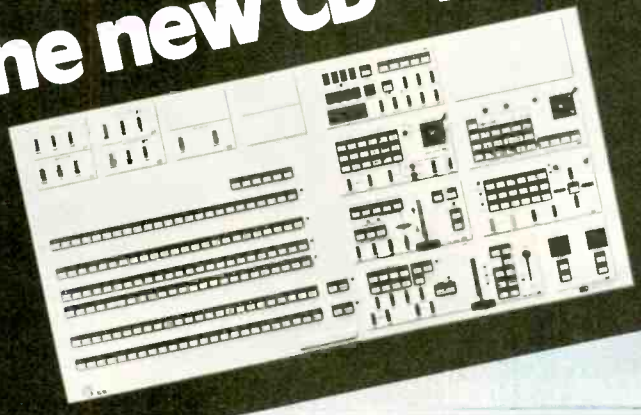

CD-480 Model 4
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CD-480 Model 10 (2 SFX, 10 buses)

CD-480...the most powerful and modular production switcher available today.

The 480's proven superior performance, reliability and flexibility has evolved from these powerful video production modules.

That's why you can customize a 480 to your specific production requirements...within your budget. And because of the 480's modular design we can deliver the largest model within 90-120 days.

Design your own switcher starting with any one of 9 basic models, and selectively equip it with a wide range of powerful 480 modules and accessories.

No other manufacturer can offer you that flexibility ...and every 480 is equipped with the unbeatable video power of the CD-480 SFX Processor System that includes the SFX Amplifier, Key and Wipe Modules.

The 480 family includes switchers with 4 buses to 10 buses...even a model you can upgrade from 1 SFX and 5 buses to a Model 8 or 9 with 2 SFX Amplifiers and 8 or 9 buses. And the 480 continues to evolve which means you can always add the latest 480 production accessories.

That's why over 300 users call the 480 the most powerful and flexible new generation switcher available today.

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Circle (109) on Reply Card

Continued from page 124

used to transmit two chroma signals on a single carrier.

A closer look

Now that we have organized the systems by function in a general way, let's take a more detailed look at each one individually, starting with the Kahn system, which is unique. Figure 3 shows a block diagram of the proposed encode and decode circuitry. First introduced more than 20 years ago and extensively air-tested, the Kahn/Hazeltine ISB (Independent Sideband system), feeds its L+R output from the matrix into the transmitter's audio input to provide the required mono envelope modulation. A 45° phase lag is introduced, which, relative to the 45° degree lead in the L-R channel, spaces the L+R and L-R outputs of the matrix by a total of 90°. After summing and squaring, the second-order L-R components phase modulate a local oscillator, which in turn drives a frequency multiplier chain and translator. The translator allows the station's transmitter oscillator to maintain carrier frequency control as usual. The second-order phase modulation generated by the phase-shifted audio feeding the frequency doublers and difference circuit serves to enhance the separation performance.

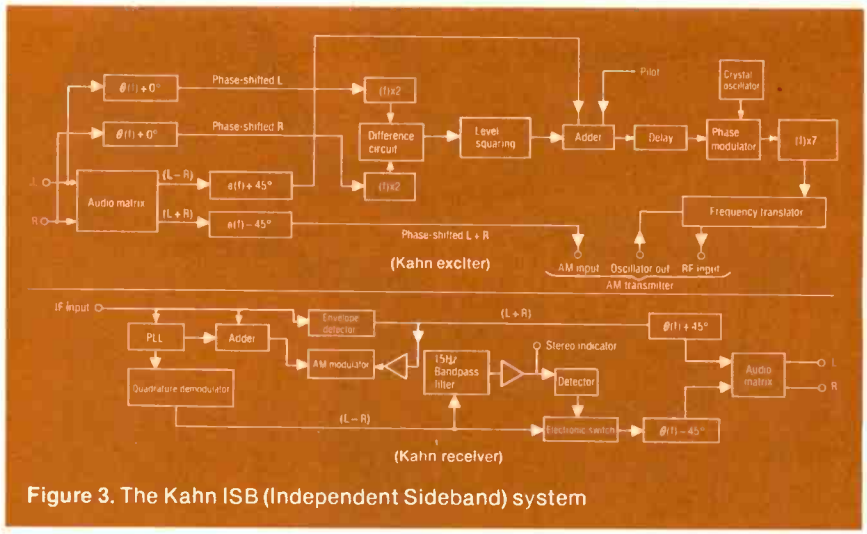


Figure 3. The Kahn ISB (Independent Sideband) system

Reception is rather straightforward and consists of conventional envelope detection of the L+R, while carrier recovery and quadrature detection provides the L-R signal needed to

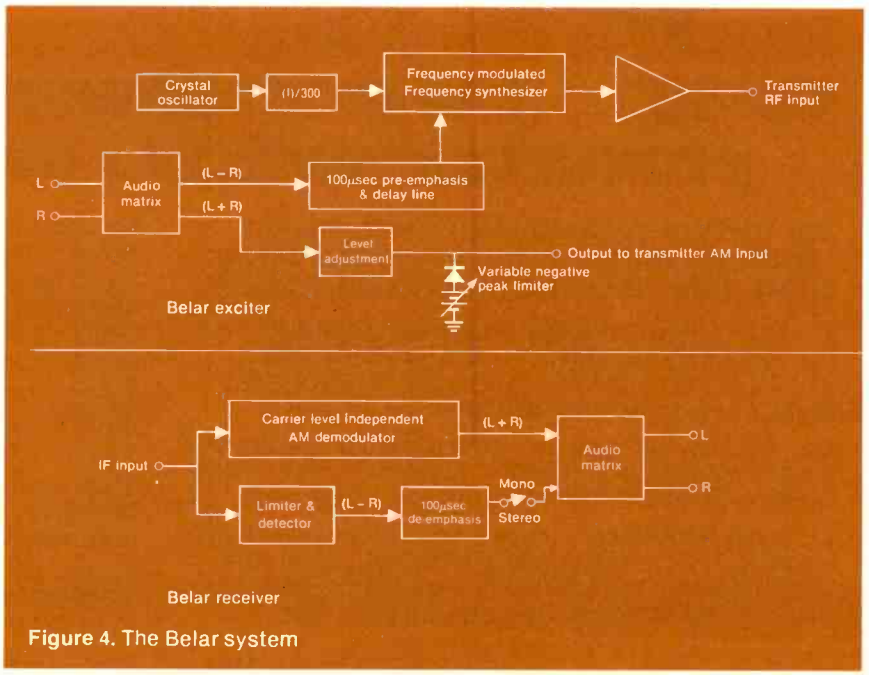


Figure 4. The Belar system

complete decoding of the stereo channels in the matrix. Synchronous detection is also possible, if desired. Overall, the system looks rather complex and is one of the more expensive schemes to implement*, but it really works. Over the years Leonard Kahn has been able to successfully defend his system from aggressive detractors, and it has been improved along the way. The present form of the system features better stereo separation and a pilot lamp that was not part of the original proposal several years ago.

The Belar AM/FM system is one of the easier ones to understand and is one of the less expensive ones to implement. It starts with the ubiquitous audio matrix (see Figure 4), which produces an L + R to AM the transmitter and an L – R that FMs the transmitter by ± 1.25kHz. The L – R path is pre-emphasized by 100μsec to improve the L – R channel signal-to-noise ratio, and a variable delay is incorporated to match the L + R delay through the transmitter's modulator. The negative peak limiter is required to prevent the FM detector in the receiver from generating a pop when the instantaneous signal-to-noise ratio of the carrier approaches unity as the carrier power approaches zero on the negative swing. Bear in mind that even a very high power transmitter will only be delivering a few dozen watts to the antenna at – 95% modulation; at that instant the RF carrier that the receiver has to work with is not much above the noise. You will see this same kind of negative limiter in some of the other AM stereo exciters as well, and in the case of Motorola, in its receivers.

The Belar receiver is almost a statement of the obvious, as you can see from diagram on page 132. Although the pilot injection and recovery points are not shown, a pilot will be included (as in all five systems), and a 10Hz frequency is contemplated.

Figure 5 illustrates the Magnavox AM/PM system operation. In this case the L + R feeds the transmitter audio input as usual, while the L – R phase modulates the synthesizer output. This is mixed with the local oscillator output, which has been FMed by the 5Hz pilot tone by ± 20Hz (at carrier frequency). Once again we find the negative modulation limiter, which serves the same purpose here that it did in the Belar exciter.

The Magnavox receiver is also simple and readily understandable from the block diagram. L + R is recovered by conventional envelope detection, delay compensated and sent to the audio matrix. The PM signal is detected, leveled and sent along to the matrix to combine with the L + R to decode the left and right audio channels. The 5Hz FM component is detected and employed to illuminate the stereo indicator lamp.

It was the Magnavox system that the FCC selected in its first abortive attempt to settle on a nationwide standard from among the five proposed systems in the spring of 1980.

Harris calls its offering the Variable Compatible Phase-Multiplex System,

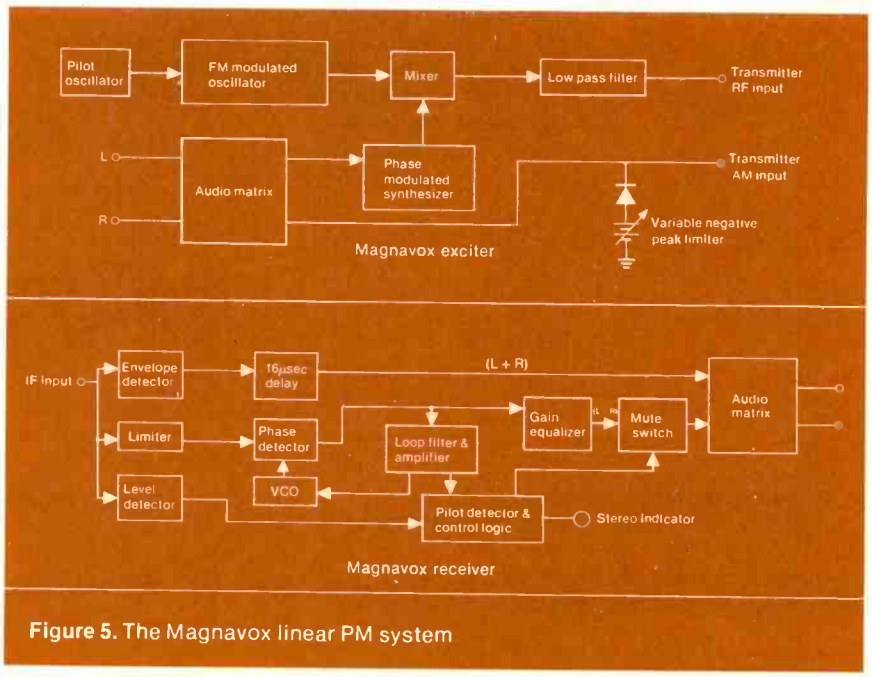


Figure 5. The Magnavox linear PM system

*As reported in our April issue, Kahn claims a breakthrough in design that is supposed to make the proposed circuitry less expensive, maybe the cheapest of the five proponents.

or V-CPM. Simple in concept, the Harris system amplitude modulates two RF carriers separated by 30 to 90° phase difference. The left channel modulates one of the signals, while the right channel modulates the other. Figure 6 shows in simplified form how the system works. As you can see, the two low level carriers are added to produce the V-CPM signal. Through envelope detection the V-CPM sum is reduced to an AM component, L+R, for application to the transmitter audio input. A clipper circuit strips AM information to recover PM components, which are applied to the transmitter RF input. The complete composite signal looks like a normal mono one with respect to the L+R components. It is interesting to note that the output of the adder is the complete V-CPM signal, which could be fed directly to a high power linear amplifier if desired. Harris boasts of excellent bandwidth conservation with this method.

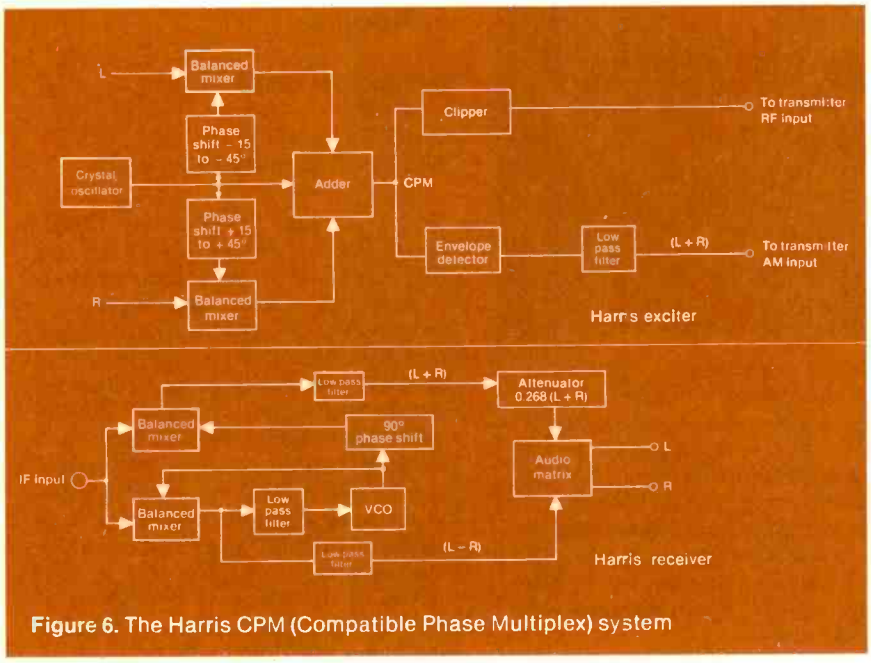


Figure 6. The Harris CPM (Compatible Phase Multiplex) system

Although V-CPM is really a quadrature modulation scheme, varying the phase difference of the carriers from 30 to 90° prevents the generation of distortion in mono reception. The pilot tone is varied from 55 to 96Hz to enable the receiver circuitry to track this varying phase difference and provide normal stereo decoding. Although this means that the L−R frequency response can only extend down to about 200Hz, Harris points out that these long audio wavelengths make a negligible contribution to perceived stereo separation. One of the big advantages of the system is the ability to maintain stereo separation out of 15kHz, and it is these higher audio frequencies that are most directional. The Harris V-CPM system does not require a negative modulation limiter in its exciter or receiver to prevent pops. So, like the Kahn system, there is no modulation distortion compromise to deal with.

The Harris receiver reverses the transmission encoding by generating unmodulated IF with the phase-locked loop to quadrature detecting the L−R stereo difference information. After attenuating the L+R to match the L−R, both are fed to an audio matrix to recover the left and right audio channels. This is one of the more costly systems to implement.

The Motorola C-Quam (Compatible Quadrature Modulation) version of AM stereo will be recognized as a rather straightforward quad-mod scheme, except that a limiter strips off the AM to remove the incompatible sidebands that would cause IM distortion in a mono envelope detector. The L+R output of the matrix amplitude modulates the transmitter as usual, but the exciter RF output actually contains both L+R and L−R components. The C-Quam signal is actually generated by the transmitter itself as it amplitude modulates the phase moduated RF carrier with the L+R input (see Figure 7).

In the receiver, a gated envelope detector recovers the L+R, while a quadrature detection arrangement employing synchronous detectors yields the L−R stereo signal. The system modulates the in-phase and quadrature components by the cosine of the modulation angle during

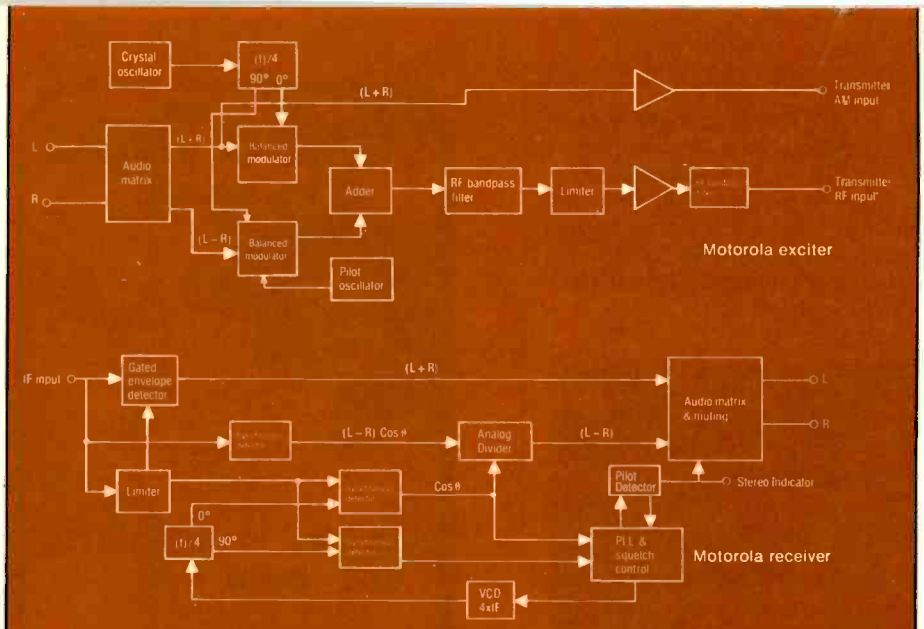


Figure 7. The Motorola C-Quam (Compatible Quadrature Modulation) system

transmission; thus, distortion in mono is prevented while the noise advantages of full quadrature operation are retained.

The Motorola C-Quam system exhibits good modulation noise characteristics up to the point where loss of carrier power during peak negative modulation generates a noise burst. As mentioned earlier, the Motorola receivers would probably employ a negative limiter if the exciters do not. Like some of the other systems, 95% seems to be the practical limit for negative peaks, but because the C-Quam system's angular phase modulation increases as instantaneous carrier level decreases, Motorola claims better depth of modulation than Magnavox and Belar. In any case, this is an area of considerable controversy among the proponents.

The differences

Although there are many similarities, there are also considerable differences between the five systems. And, because each proponent has geared his data to highlight his system's strengths, it is difficult for many broadcasters to sort it all out. As it stands, the best that we can do is to try to understand how each system works and consider what the proponents have said about each other.

Motorola has produced data showing that its system exhibits considerably less modulation noise than Belar, Harris and Magnavox, under certain conditions, such as left- or right-only modulation. It also shows Motorola *and* Harris to excel with left = right inputs, but the data give no figures for Kahn/Hazeltine. We would expect these results, considering the modified quadrature modulation schemes employed.

Harris has shown that its system has the smallest occupied bandwidth and is thus least effected by system aberrations. The FCC's Appendix E to its Report and Order reads like a glowing recommendation of the Harris system. It points out numerous advantages of the linear system and uses the Harris approach in comparison with the other systems to illustrate some of their weaknesses.

Kahn claims that the Belar, Magnavox and Motorola systems must clip negative modulation by 95% or less to prevent objectional noise bursts. Whether the clipper is in the receiver or exciter is irrelevant; 0.5dB of clipping means either distortion generation or a reduction in modulation to avoid it.

Although the proponents of the less costly Belar and Magnavox systems stress the importance of low cost implementation to encourage receiver proliferation, Kahn points to the importance of stable stereo imaging and robust performance under sky-wave conditions. Kahn/Hazeltine supports its claim with more than 20,000 hours of field testing at broadcast stations.

The charges and counter-charges go on and on, and one quickly realizes how nice it would have been to have had some uniform, independent testing, even though the marketplace approach was adopted. Many of the tests performed by NAMSRC (National AM Stereophonic Radio Committee) and "independent" consultants had proponent "observers" along to help, and we all know that is not the way to do things.

In any event, we'll do our best to keep you informed and hope to accumulate our own field test data as things move along.

station-to-station

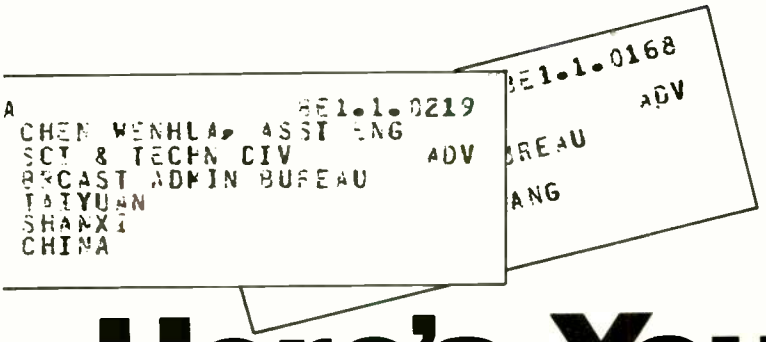
RM 529 vertical output modification

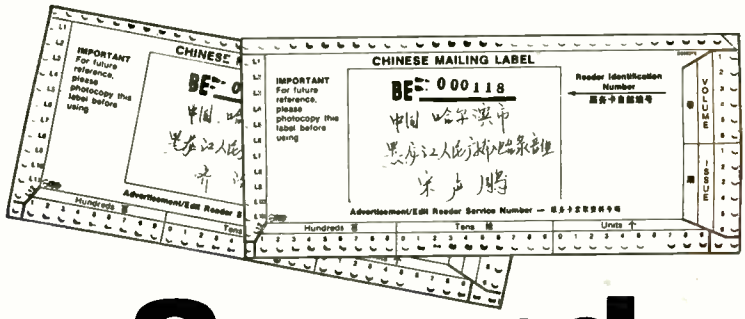
By Edgar Lee Howard
Supervisor
Special Projects
WOSU-TV, Columbus, OH

With reference to the article, "Transistors Solve Tube Problems for the 529," on page 74 of the December 1978 issue of **BE**, I have determined that changing the value of the newly added zener base bias diode from 27V to 12V (1N4742) allows Q_{164} and Q_{264} to operate nearer the V_{ce} and dissipation of the original tube design. This prevents thermal runaway and latch-up conditions from occurring to the output stages, while preserving the original dynamic range and linearity of the display.

Also, with reference to RM 529 scopes from serial number 10670 and up, the modification in the original article will not work properly without additional work, because the operating points of the entire vertical amplifier have been changed from those indicated on the schematics. Symptoms include trace compression and lack of dynamic range at the top and bottom of the graticule display.

For those who wish to take a chance, the original modification can be made to work by a careful altering of the value of R_{123} to reprogram the current source Q_{124} so that the feedback pairs, Q_{144} - Q_{154} and Q_{244} - Q_{254} are operating .in the center of their dynamic range, with the vertical position knob in the center of its range and the dc balance set for *equal* dc voltages at Q_{154} and Q_{254} collectors. The existing R_{123} is usually paralleled with a selected resistor to do this.





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calendar

May 20-21

A 2-day seminar, *Satellite Technology for Managers and Executives*, will provide managers in the telephone, TV, radio and data communications industries with the specific technical background necessary for broad business decisions. It is also relevant for engineers who are new to communications satellite systems planning.

Subjects of the conference include: satellites and spacecraft; radio frequency links; and modulation, multiplexing and multiple access.

For registration and fee information, contact: Phillips Publishing, 7315 Wisconsin Ave., Suite 1200N, Bethesda, MD 20814.

June 28-30

Videotex '82, a 3-day conference and exhibition to be held in New York at the Hilton Hotel, promises to provide the impetus for major US corporations to become actively involved in the rapidly developing electronic publishing industry. The conference will be an international showcase for an industry developed from the convergence of the computer, the telephone line and the home TV set or home computer.

Exhibitors from around the world include AT&T, IBM, Nippon Telephone and Telegraph, Britain's Prestel, France's Intelmatique and Canada's Telidon. They will display the many new systems and services now coming into the US marketplace.

More than 100 speakers at the conference will address the following key questions about the new technology:

- How to make money out of the new technology.
- Who will use videotex and what information will they want?
- How best to enter the videotex marketplace.
- What are the implications for advertising?
- How will videotex and teletext affect traditional forms of communication (print and television)?
- What will be the role of cable in the new information technology?

For more information on registration, contact one of the following: Julie Wang, Manning, Selvage & Lee, 1-212-599-1000; or Peter Shaw, Online Conferences Ltd., UK phone, 011-44-9274-28211.

Aug. 16-20

Short courses titled *Microcomputers and Broadcast Automation* and *Broadcast Antennas* will be held at the department of electrical engineering and electrical technology, Bradley University, Peoria, IL.

The microprocessor course will be devoted to microprocessor fundamentals. Sessions will enable participants to understand microcomputer concepts common to a variety of equipment and instrumentations in the broadcast field. Part of the course will feature technical staff from the broadcast industry who will cover current practice and future trends in broadcast automation and computer applications.

The antenna course will cover topics in the design, construction, analysis and proof-of-performance of broadcast antennas. Basic antenna and transmission line theory will be covered.

For registration information, contact the College of Continuing Education, Bradley University, Peoria, IL 61625.

people

New Media Graphics Corporation of Cambridge, MA, has announced the appointment of **Arthur J. Franke** to the position of vice president, sales. His responsibilities include all domestic and foreign sales.

Carl Peterson has rejoined IGM Communications and has been assigned to the sales department's new audio products division.

The appointment of **Robert T. Krzyzkowski** as director, Alascom services and new business development, has been announced by RCA American Communications. Krzyzkowski will continue to work closely with his counterparts at Alascom in handling business matters relating to RCA Americom's satellite services. Added responsibilities will include the close evaluation of new business opportunities involving RCA Americom's satellite communications network, with initial emphasis on direct broadcast satellite services.

Microdyne Corporation recently announced the promotion of **Earl Currier** to the position of sales manager. Currier has been with Microdyne for three years and was promoted from his position as sales engineer.

Shure Brothers has announced the appointment of **M. Travis Ludwig** to the position of technical coordinator, distributor microphone products. His responsibilities include field research, product development, market planning and product sales training.

Melvin K. Miller has joined Video West as an account executive for corporate video and pay cable.

Charles Felder has been promoted to vice president, sales, Sony Broadcast Products Company. Felder has been the regional manager of Sony Broadcast's southern region for the past two years. He joined Sony in 1977 as a sales engineer in the southeast region.

Comark Communications has announced that **Nathaniel Ostroff** has joined them as a member of the board of directors and as an operating vice president. Ostroff will be responsible for the design and manufacture of products for Comark's expanding high power UHF transmitter lines.

Chris Ware has been appointed a sales engineer and assigned to head the new Dallas office of Studer Revox America. Ware will assume primary responsibility for sales and service of Studer professional products in Texas, New Mexico, Oklahoma, Arkansas and Louisiana.

Owen F. Ulmer recently joined Philadelphia Resins Corporation as manager of broadcast sales for the Phillystran rope division. In that capacity, he will be responsible for worldwide sales of electrically transparent Phillystran high-performance tower guys and insulating sections.

Atlantic Research Corporation has announced the appointment of **William F. Pohts** as a consulting engineer with the department. Pohts has an extensive background as a consulting engineer specializing in planning, design and maintenance of industrial and broadcast television, 2-way radio and associated electronic systems.

new products

Projection system

The *Great American Market* Scene Machine, which incorporates a 2kW quartz lamp, is a modular projection system designed for professional use. Interchangeable parts allow the unit to project still and moving effects from one basic unit.

Circle (175) on Reply Card

Digital preview unit

The *Sony* DDU-1510 digital preview unit, in combination with the Sony digital mastering system (PCM-1610, PCM-1600 or PCM-100 professional processor and BVU-200B recorder), provides a precise preview signal and program signal. These features allow the cutting lathe to accurately control pitch and depth during the lacquer-cutting process.

Circle (176) on Reply Card

Audiotape cartridge

The *Fidelipac* Master Cart II NAB type AA audiotape cartridge permits properly adjusted cartridge machines to precisely control the tape path, providing repeatable stereo phase and performance. The upper and lower tape guide limiting device allows the cartridge to be used in older machines.

Circle (177) on Reply Card

Video animation system

The VAS III video animation system from *Lyon Lamb* incorporates advances in VHS formats for testing animation, special effects, puppets and pixilation. It may also be used as a production tool for shooting storyboards and animatics.

Circle (178) on Reply Card

Modular consoles

The Production/On-Air series modular consoles from *Quantum Audio Labs* feature input capabilities from 8, 14, 20 and 28 mainframes. The consoles feature total modular construction.

Circle (179) on Reply Card

Electronic word processor

National Video's Data-Prompter features high contrast, character-generated output; multiple input capability; remote variable speed control; and storage of material on mini-digital cassettes.

Circle (180) on Reply Card

Audio recorder

The *Ampex* ATR-800 can be easily converted from one to two to four channels. A built-in cue amplifier permits monitoring of a single channel or multiple channels of tape while it is being edited or cued.

Circle (181) on Reply Card

Tower trailer

Aluma Tower Company's steel trailer transports and erects any Aluma aluminum or steel tower. It is used for mobile demonstration work, civil defense and remote signal testing.

Circle (182) on Reply Card

Broadcast cartridge

3M ScotchCart radio broadcast cartridge permits reel-to-reel quality from a radio cartridge. The NAB-compatible cartridge maintains constant tension for head-to-tape contact without using pressure pads.

Circle (183) on Reply Card

WWV receiver

The TF-3 from *True Time Instruments* is furnished with three manually selectable receiving frequencies of 5, 10 and 15MHz (others available) for reception of worldwide time data broadcast by international authorities.

Circle (184) on Reply Card

Audio test equipment

Three options are available for the *Sound Technology* 1500A audio test system. The model VP-150 video printer replicates the CRT display in hard copy form. The Option 007 one-third octave spectrum analyzer performs spectral noise analysis and flutter measurements. The TR-150 test record contains high quality tests for phono cartridge analysis.

Circle (185) on Reply Card

4-system color monitor

The *JVC* TM-14PSN color TV monitor functions in the NTSC, PAL, SECAM and modified NTSC systems. The monitor automatically selects the proper system under normal signal conditions, or the system may be chosen manually.

Circle (186) on Reply Card

Microwave repeater checker

Anritsu America's microwave repeater checker contains a power meter, frequency counter and signal generator.

Circle (187) on Reply Card

Microphone

The PZM-6S microphone from *Crown International* offers extended bass response and smooth high end response.

Circle (188) on Reply Card

Audio program monitors

World Video's AMP-1 and AMP-2 audio program monitors are designed to rack-mount in only 3½ inches of rack space. The single input AMP-1 may be ordered with balanced or unbalanced inputs, and the AMP-2 may be ordered in the same way with switchable dual inputs.

Circle (189) on Reply Card

CX encoder/decoder

The *UREI* 1181, designed for phonograph record and videodisc mastering, allows real time monitoring for preview during mixdown, without waiting for a test lacquer; separate encoding of preview and program channels; and decoded monitoring during mastering.

Circle (190) on Reply Card

Load terminations

Six new load terminations from *Phelps Dodge Communications Company* offer ratings up to 300W. Each has a maximum VSWR of 1.1:1, 25-960MHz.

Circle (191) on Reply Card

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7/20/'82 Tuesday

9:00 a.m.	**Welcome**—John H. Battison and Dale K. Ouzts, General Manager, WOSU
9:15 a.m.	**"Transmitter Plant Maintenance,"** Henry R. Kaiser, P.E.
9:45 a.m.	**"What's My Operating Frequency?",** Royce O. Woodward, Woodward Measurements Laboratory
10:15 a.m.	**"Inspection Requirements,"** James P. Stevens, Engineer-in-Charge FCC, Cincinnati, Ohio
11:00 a.m.	**"FCC Matters,"** Irby Tallant, Engineer-in-Charge, FCC, Detroit, MI
11:30 a.m.	**"The Engineer's Legal Responsibility,"** Daniel Toohey, Dow Lohnes & Albertson
12:00 noon	Lunch—Speaker, John A. Cunningham, Cleveland Institute of Electronics
1:45 p.m.	**Audio Symposium,** Moderator, Larry Reynolds, Manager of Radio Engineering, WOSU
	"Broadcast Microphones," Greg Silsby, Electro Voice
	"Broadcast Studio Design," Richard Shumeyer, Capitol City Communications
	"Audio Processing," Dr. Eric Stoll, President, MSI, and Eric Small, Director of Engineering, MSI
	"Telephone Interfacing," Mark Durenberger, Consultant
7:30 p.m.	**Joint SBE,** Chapter 52/Engineering Conference Meeting
	Audio Demonstration, Ed Thompson, WOSU
	Audio Panel: Dr. Eric Stoll
	Eric Small
	Mark Durenberger
	Greg Silsbury
	Richard Shumeyer

All papers and meetings will be held in the Fawcett Center for Tomorrow auditorium.
All exhibits will be in the FCFT Exhibit Rooms.

7/21/'82 Wednesday

8:45 a.m.	**"Checking FM and TV Antennas,"** Don Markley, Consulting Engr.
9:30 a.m.	**"The Composite FM Signal,"** Jeff Mendenhall, Broadcast Electronics
10:30 a.m.	**"Fundamentals of Directional Antennas,"** Carl E. Smith, President, Sm th Electronics
11:15 a.m.	**"Satellite Audio Distribution Problems,"** Richard Cassidy, Vice-President of Engineering, NPR
12:00 noon	Lunch—Speaker, Bill Rhodes, Editor of **Broadcast Engineering**
1:30 p.m.	**"Rebuilding RF Power Tubes,"** John Sullivan, Econoco Tubes
2:10 p.m.	**"Bandwidth in AM Broadcast Antennas,"** John Cunningham, CIE
2:50 p.m.	**"Designing and Using Tee Network Filters,"** Roy Christen, CIE
3:45 p.m.	**"Continuing FCC Developments,"** John Reiser, FCC
4:15 p.m.	**FCC and Industry Panel:** Moderator, John Battison
	Wally Johnson
	John Reiser
	Jim Stevens
	Irby Tallant
	Carl Smith
	Dan Toohey
	Don Markley
7:00 p.m.	Banquet—Speaker, Dr. John D. Kraus, Professor Emeritus, OSU
	"Waves & Antennas—a lecture Demonstration"

7/22/'82 Thursday

	Television Symposium—Moderator, Tom Lahr, Operations Supervisor WOSU-TV
8:30 a.m.	**"Inserting Local Commercials In Satellite Programs,"** Paul Breneman, Engineering Supervisor, QUBE
9:05 a.m.	**"Correcting, Timing and Phasing Problems,"** Lee Howard, Special Projects Supervisor, WOSU-TV
9:50 a.m.	**"Uses of Fibre Optics in Television Broadcasting,"** Chad Witawicz, Artel Communications Co.
10:35 a.m.	**"Digital TV Developments,"** John D. Lowry, Chairman, DVS
11:20 a.m.	**'Developments in Digital TVR's,"** Frazer Morrison, Ampex
12:00 noon	Lunch—Speaker, Wallace Johnson, Director of ABES
	"Problems Facing the Broadcast Engineer in the future"
1:45 p.m.	**"Broadbanding Directional Antennas,"** Dick Snyder, Harris Broadcast Products
2:30 p.m.	**"Networking Local Satellite Stations,"** Hugh Paul, Broadcast Consultant
3:15 p.m.	**"Circularly Polarized UHF Candalabra Installation,"** William Orr, Vice President, Engineering, WBNS-TV Columbus

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England
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Telex: 895-2387

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TRAINING

ELECTRONICS DEGREE by correspondence. Earn A.S.E.T., then B.S.E.T. Free catalog. Grantham College of Engineering, 2550 South La Cienega, Los Angeles, California 90034. 1-82-tfn

FCC GENERAL RADIOTELEPHONE operators license through cassette recorded lessons at home plus one week seminar in Boston, Washington, Detroit or Philadelphia. Our twentieth year teaching FCC license courses. Bob Johnson Radio License Preparation, 1201 Ninth, Manhattan Beach, Calif. 90266, Telephone (213) 379-4461. 8-81-tfn

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ONE STOP FOR ALL YOUR PROFESSIONAL AUDIO REQUIREMENTS. Bottom line oriented. F.T.C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32506. 7-71-tf

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VIF INTERNATIONAL will remanufacture your Ampex or Scully (Ashland/Bodine) direct drive capstan motor for $200. Average turn around time—2-3 weeks. for details write **P.O. Box 1555, Mtn. View, CA 94042, or phone (408) 739-9740.** 1-82-eom

TRANSMITTER TUBES REPROCESSED—Save 40 to 50%. 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS CO., 3233 Conti St. N.O., La. 70119. (504) 822-9222. 6-79-tfn

BROADCAST CRYSTALS for AM, FM and TV transmitters, frequency change, repair or replacement of oven types, also vacuum types where needed. High quality products and better delivery. Don't be without a spare crystal. Over 30 years in this business. Eidson Electronic Co., Box 3751, Temple, Texas 76501. Phone (817) 773-3901. 4-82-eom

MISCELLANEOUS FOR SALE

VIDEO T-SHIRTS. TV DESIGNED, preshrunk T-Shirts. Our four designs are; "ENG" and Reg. Chart, "GLITCH", "RESOLUTION" and chart, and "VIDEO PEOPLE DO IT IN SYNC". $8.50 each and $2 handling. Send check and size to: AaRLO ENTERPRISES, 109 MINNA ST., SUITE 254, SAN FRANCISCO, CA 94105. 8-81-tfn

RAZOR BLADES, Single Edge. RALTEC, 25884B Highland, Cleveland, OH 44143. 12-81-12t

EQUIPMENT FOR SALE

FOR SALE: AMPEX 1200 B, (2) IVC 870's, IVC 2000 TBC, 8 input CDL Audio Mixer. Call Media Group Television, (309) 764-6411 or 764-3219. Ask for Curt or Chuck. 5-82-1t

EQUIPMENT FOR SALE (CONT.)

COMPLETE AUTOGRAM AUTOMATION SYSTEM, $4000 value, make offer. You must see to appreciate. Scully 255 automation reproducer, stereo 2-trak 7.5 ips, Automated/Control Design Kartel 2400R random access with record capability. Best reasonable offer will be accepted on all three items. David Green Broadcast Consultants Corp., Box 590, Leesburg, VA 22075, 703-777-8660. 4-82-2t

USED TV TRANSMITTER BARGAINS: GE-transmitter package on Ch. 8, 35kw excellent condition, serving as operating standby now, with TY53B1 antenna and 3⅛" transmission line; GE-transmitter 30kw (low UHF Ch. 14-34), operating with good useable klystrons; RCA-1kw Ch. 40, complete & operating; RCA-10kw Ch. 42, excellent condition; RCA 30kw Ch. 57, fine transmitter; RCA 1kw from Ch. 14 up. What do you need? Visual 55kw transmitter on Ch. 47, ready to go! Most of the above can be retuned! (4) Varian 30kw Klystrons 4KM100LF good life remaining (Ch. 34-52). 6⅛" and 3⅛" transmission line with fittings and hangers. Call Ray LaRue, Quality Media Corp. (800) 241-7878. In GA (404) 324-1271. 5-82-1t

REMOTE PRODUCTION CRUISER: Beautiful Crown Chassis, carpeted, full AC, camera platform on roof, 1600 mi. on diesel & drive train, good tires and brakes, includes (3) GE PE-350 Cameras, working well, 10:1 & 2-18:1 Lenses, motorized reels & TV-81 cables, Grass Valley Sync & line gear, new color prog. monitors, 12X6 prod sw'r w/effects, 8X2 GE Audio, well designed & professionally built. Options available if preferred. $150,000. Call Ray LaRue, Quality Media Corp. (800) 241-7878. In GA (404) 324-1271. 5-82-1t

VTR's RCA TR-70, Full Cavec, SS REC AMPS, DOC, (3) RCA TR-60 Record only Units 1000 hrs. total time each. Ampex 1200B Amtec, Colortec, Auto Chroma, Vel Comp, RCO, DOC; Ampex VR 3000 with metering and charger; IVC 870. Call Ray LaRue, Quality Media Corp. (800) 241-7878. In GA (404) 324-1271. 5-82-1t

COLOR CAMERAS—NEW: SPECIAL PURCHASE! Brand new Thomson CSF MC-301, 3 Tube Saticon Cameras with 14:1 Fujinon F1.7 Lens, 1.5" Viewfinder, AC supply $9,000.00. Studio Accessories Available. Call Ray LaRue, Quality Media Corp. (800) 241-7878. In GA call (404) 324-1271. 5-82-1t

COLOR CAMERAS—USED: GE Film Chain with Eastman 285 Projectors, Multiplexer, RCA TP-7, BEI Auto Light Controls, Cohu Encoder, CBS Enhancer, excellent condition; (1) Norelco LDH-1, RCU, 50' Cable; (1) GE PE-350; (3) GE TE 201 Good Operating Condition; Ikegami HL-33, HL-35, Hitachi FP1020/JVC 2600 Battery Belts Charger-AC Supply, 100 hrs. total; Toshiba/GBC CTC-7X, Minicam, plumbs. Call Ray LaRue, Quality Media Corp. (800) 241-7878. In GA (404) 324-1271. 5-82-1t

USED VIDEO EQUIPMENT: ITE studio tripods, 529 Techtronics waveform monitor, Agenieux 15-1 zoom lens fits IVC 7000, IVC #200 camera with lens. Best offer. (415) 388-0838. 5-82-1t

BNC CONNECTORS, UG-1094/U—79¢, UG-88/U—$1.35, UG-260/U—$1.35, UG-914/U—$1.40, UG-255/U—$1.90, UG-273/U—$1.40. Call or write for our FREE catalog. CZ Labs, 55 Railroad Ave., Garnerville, NY 10923, (914) 947-1554. 5-82-3t

IVC 7000P CAMERA with tubes, mini-control unit, auto iris, two 200 foot cables, one 100 foot. Angenieux 15 two 1 zoom lens, body support brace. Never used on mobile. Call Bob Canady at (515) 255-2122. 5-82-6t

CHYRON IV CHARACTER GENERATOR: Top condition, complete with colorizer, encoder and sync generator. Will consider lease with option to buy. (213) 361-4017. 5-82-1t

REMOTE VIDEO VAN: 1977 Ford High Cub Van, low mileage, very plush, 2 air conditioners, isolated power, removeable tracks, can be set up in many configurations, can accommodate cameras, Tape, etc. Also monitors and test equipment available. (213) 361-4017. 5-82-1t

FOR SALE: ONE AUTOMATED BROADCAST 2501G Tone Generator and three IGM 504-D Sensors, all $1,575.00 or Sensors only $380.00 each. Electronica Fernández, P.O. Box R, Hato Rey, Puerto Rico 00919-3934. 5-82-1t

SONY ¾" EDITING SYSTEM with Convergence controller, 2850, 2800, $5500; CVS 504 TBC $1995; Sony VO 1800 ¾" recorders $495; Two IVC 500A cameras $4500; Sony SLO 340 Betamax $725; Tandberg 10X reel-reel $475; Mole-Richardson mike stand and boom $1500; Gibralta tripod, dolly, head—new $775. Frank Didik (212) 843-6839. 5-82-2t

EQUIPMENT FOR SALE (CONT.)

USED BROADCAST TELEVISION EQUIPMENT. Hundreds of pieces wanted and for sale. Please call System Associates to receive our free flyer of equipment listings. (213) 641-2042. 1-82-6t

TUBES, HIGH POWER, SPECIAL PURPOSE WANTED: 304TL, 4CX1000A, 4-1000A's, 5CX1500, etc. Also some receiving types, 53, 7F7, 7N7, 6HU8, etc. DCO, 10 Schuyler Ave., No. Arlington, N.J. 07032, (201) 998-4246, (800) 526-1270. 3-82-3t

MICROWAVE ASSOC. MA12G system with 4' dishes. Some wave guide. $13,000. Call Randy Johnson. (904) 356-6077. 4-82-2t

420 FT. SELF-SUPPORTING GALVANIZED TOWER still standing in desert climate, excellent condition—as is, where is (Las Vegas, Nevada). Best Offer. **LISTEC KRESTEL CAMERA CRANE,** like new, w/field tires. 1 year old, used in studio. $17,500 or best offer. **ISI 821 MASTER CONTROL SWITCHER.** 20 X 2 (PST, PGM) w/auto transition, keyer, clock, AFV plus 6 input breakaway/over/under audio system. Make Offer. Contact: General Manager, KVBC TV, P.O. Box 44169, Las Vegas, Nevada 89116. (702) 649-0500. 4-82-2t

WANTED TO BUY

WANTED: Pre-1928 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, CA 92054, (714) 722-6162. 3-76-tf

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 2-79-tfn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (in Georgia call 404-324-1271). 6-79-tfn

WANTED: USED RECORDING EQUIPMENT of all ages and varieties. Mics, outboard, etc. Dan Alexander, (415) 441-8936. 1-82-6t

WANTED: SOFTWARE FOR CPM mini computer for radio sales, logs, & billing. Ron T. Smith, 547 Mission Vineyard, San Juan, Bautista, CA 95045. 5-82-1t

WANTED: STATION LIBRARIE'S OF MUSIC, 16" ET's, 12" Transcriptions, 45's, 78's, LP's. Boyd Robeson, 2425 W. Maple, Wichita, KS 67213, (316) 942-3673, 722-7765. 5-82-tfn

INSTANT CASH FOR BROADCAST EQUIPMENT: Urgently Need Good Used: Transmitters, AM-FM-TV, Film Chains, Audio Consoles, Audio-Video Recorders, Microwave; Towers; WX Radar; Color Studio Equipment. Ray LaRue or Bill Kitchen, Quality Media Corp. (800) 241-7878. In GA (404) 324-1271. 5-82-1t

$500 REWARD FOR UHF TRANSMITTERS: For information which leads to our purchase of any UHF TV Transmitter. Call Ray LaRue or Bill Kitchen (800) 241-7878. In GA (404) 324-1271. 5-82-1t

HELP WANTED

TV/RADIO MAINTENANCE ENGINEER: Looking for a relaxed atmosphere? Paid health, dental, life ins. and retirement plan + 14 paid holidays a year? This might not sound possible to you, but it is! We can also boast of current up-to-date equipment at our television production facility and FM radio station. First phone-min. 3 yrs. current broadcast maintenance experience. Filing deadline 5/21/82. Contact: Personnel Services, SAN DIEGO COMMUNITY COLLEGE DISTRICT, 3375 Camino Del Rio South, Rm. 330, San Diego, CA 92108, (714) 230-2110. Equal Opportunity Employer. 5-82-1t

RADIO—SR, AUDIO TECH: For public radio facility. 2 yrs. tech training incl. digital & microprocessor theory & 2 yrs. on-air mixing & equipment maintenance. Familiarity w/all state-of-the-art techniques essential. FCC 1st class or general license req. Send resume to P.O. Box 1168, Phila., PA 19105. EEO M/F. 5-82-1t

ENGINEERS, TV Systems Engineers, Electronic Technicians, Technical Supervisors, Maintenance. Immediate openings. Experienced. Full time. Full benefits, plus Pension. Excellent salary plus commissions. Send resume to Technical Operations, Inc., P.O. Box 840, New Hyde Park, N.Y. 11040, or call Personnel Mgr. (516) 352-2238. 9-80-tfn

HELP WANTED (CONT.)

TO AN ENTERPRISING E. E.

We are audio products producers located in the Northeast and are looking for an Electronic Engineer with a demonstrable track record in the design of components for the professional user and an entrepreneur at heart. Initially, this position entails the design of audio products and systems but will phase into company management, leading to control and ownership.

Compensation includes salary, profit sharing, and stock bonuses. If you are an aggressive, talented designer, unafraid of work and challenges and are looking for a future under your own control, you should answer this ad. Please give sufficient detail on education, work experience accomplishment and objectives to permit us to go to the next step, a personal interview. Reply 565, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212.

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AND TECHNICAL SALES
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We specialize in the placement of TECHNICAL ENGINEERS with TV and Radio Stations, Groups, Networks, Satellite Programmers, Production Facilities, Corporate and Industrial TV, Mfrs and CATV. All levels and positions: Director, Chief, Asst. Chief, Studio Supervisor, Maintenance and Technical. (Our service does not include operational or program personnel). All locations nationwide. Employers pay all fees - Confidential, Professional. Over $4,000,000.00 in Salaried Positions Placed; we also place Technical Sales People. Employee and Employer inquiries Invited.

Phone/Resume - ALAN KORNISH
(717) 287-9635

Key Systems
106 New Bridge Center-Kingston, Pa. 18704

TELEVISION HELP WANTED—TECHNICAL: $40,000 + FIRST YEAR GUARANTEED. Our company has grown so quickly in the past 5 years, we are in desperate need of a very special person who knows broadcast equipment intimately and has aggressive sales ability. We are diversifying into other areas and need someone to take over the equipment sales division. Responsibilities include sales of new and used broadcast equipment and further development of equipment sales division as business demands. We are a first rate company and believe in paying top dollar for the right person. Call Bill Kitchen, Quality Media Corp., (800) 241-7878. 9-80-TFN

TV TRANSMITTER ENGINEER—CBS television station affiliate seeks a "hands-on" maintenance pro to take on full supervisory responsibilities. Position demands an individual with strong background in the operation and maintenance of high powered UHF transmitters. 3-5 years experience is minimum, FCC general class license is essential, digital training desirable, company offers an excellent salary plus benefits package. Send resume or call Chief Engineer KPWR-TV, 2831 Eye Street, Bakersfield, California 93301, (805) 327-7511. 5-82-1t

RANK PRECISION INDUSTRIES, BASED AT WEST NYACK, N.Y., require experienced customer service engineers who have experience in some of the following areas. 1. T.V. broadcasting equipment; 2. Video oriented equipment; 3. Precision servo systems; 4. Microprocessors; 5. Telecine; 6. Film to tape transfer (high quality); 7. Film analyzer type equipment. A position with a future which will attract high caliber engineers only. Competitive salary, car, medical and pension benefits plus training in the United Kingdom are all part of the position offered to the right person. Contact: By phone—Mona Miles (914) 353-1914. Or send resume to: Rank Precision Industries, 260 North Route 303, West Nyack, NY 10994. 5-82-1t

Manager Technical Support

KNBC News Operation

NBC is currently offering a superior opportunity for the individual who wants to blend their strong engineering capabilities with their ability to manage people. This position exists at NBC's Burbank, California broadcasting facility.

Your technical expertise will be fully utilized as you are consulted on all major engineering projects and lend support to tape editing, maintenance, and field operations at both the local & network level. To meet the demands of this job you will need a solid background in RF and microwave communications, FCC licensing, and purchasing. Previous supervisory or management experience is highly desirable.

If a key role in a rapidly expanding news operation is the challenge you seek, please send your resume or letter of interest to:

NBC Employment Department (BE)
3000 W. Alameda Avenue
Burbank, CA 91523

NATIONAL BROADCASTING COMPANY
We are an equal opportunity employer M/F/H

MAJOR MARKET CHIEF ENGINEER

REQUIREMENTS:

Administrative capability, especially ability to organize, plan, control and interface with other departments.

First Class or General Telephone License a prerequisite. 10 years broadcasting, 5 years experience with FM including high quality audio, RF and digital preferred.

Responsible for design, installation and maintenance of studios, transmitters and microwave.

Innovative individuals meeting the above requirements and who are ready for professional growth with a Bonneville International O & O in Chicago should contact:

Mr. Chet Redpath
WCLR Radio
8833 Gross Point Road
Skokie, Illinois 60077

AN EQUAL OPPORTUNITY EMPLOYER

HELP WANTED (CONT.)

RADIO – HELP WANTED TECHNICAL
FM/AM Chief with First or General License and two years experience in AM directionals, FM Stereo, automation and proofs. 50 KW state of art equipment growing FM #1 rated country station. 5 KW AM rock. Salary $15,000-$18,000 starting. Send resume to Engineering WNWN/WTVB 6123 South Westnedge Avenue, Kalamazoo (Portage) Michigan 49002. Over 80 lakes in scenic area. EQE. 5-82-1t

CHIEF ENGINEER: PRODUCTION CENTER serving broadcast and nonbroadcast clients. Responsible for 10w FM transmitter, all engineering design, maintenance and technical personnel. Digital experience required. Prior experience in production support and management of technical facility and personnel desired. First phone or equivalent. Bill Lewis, Wright State University, 102 TV Center, Dayton, Ohio 45435. 5-82-1t

CHIEF ENGINEER – MEDIUM MARKET OHIO AM station wants individual with technical expertise in RF and audio. Good ear a must. Current assistant wanting to move up would be ideal. EEO employer. Reply with resume and particulars to Dept. 566, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 5-82-1t

TV MAINTENANCE ENGINEER: Major multiple system cable TV operator seeks maintenance engineer for four cable television studios in eastern Massachusetts. Must maintain and repair television production equipment, including ¾" VCR's, ENG camera equipment, video switchers, audio systems, etc. Experience a must. Competitive salary and excellent benefits. Send detailed resume and salary history in confidence to: Dan Donohue, Colony Communications, P.O. Box 969, Providence, RI 02901. 401-277-7116. An Equal Opportunity Employer. 5-82-1t

BROADCAST ENGINEERS/ TECHNICIANS

MCI/Quantel, world's leading supplier of digital video equipment and Emmy award winner for technology, has several outstanding career opportunities for engineers and technicians.

Immediate openings exist for a technical services engineer to be based in the New York metropolitan area, and test engineers, installation engineers, and technicians to be based at corporate headquarters in Palo Alto, California. Some travel required.

Your background ideally would include experience with digital video systems, but a background in computers/peripherals may suffice.

We offer an excellent starting salary, good benefits package, and plenty of room for advancement. Plus the prestige of being associated with the top company in an exciting industry.

Send your resume now to MCI/Quantel, Broadcast Group, PO Box 50810, Palo Alto, CA 94303. Or call Marsha Verse at (415) 856-6226. An equal opportunity employer.

MCI/QUANTEL
The digital video people

Design Engineering Service/Test Engineers

Excellent career opportuities are immediately available with fast growing Broadcast Electronics. You will find state of the art design tasks exceptionally challenging and the working environment in a 70,000 square foot headquarters complex pleasant and stimulating. Excellent company benefits, including Profit Sharing Plan.

Section Manager RF Products

Lead a creative group of RF Design Engineers through the development of a new line of innovative RF broadcast products. Position requires a strong background in design of RF power amplifiers or in AM or FM transmitting equipment along with skills in supervisory and project management. BSEE with 3-5 years' expenence.

Section Manager Audio Products

We need an experienced audio engineer with some project management experience to head up development team to design audio tape cartridge machines and audio control consoles. Individual should have BSEE.

Radio Automation Service Engineer

If you enjoy working with program automation equipment and have a technical background with a good command of digital electronics, you could be the person for this challenging position. The overwhelming success of our "Control 16" Program Control System has resulted in an opening for a Customer Service Engineer.

Transmitter Test Technician

Must possess experience or skill to test, align and troubleshoot RF amplifiers or broadcast transmitters up to 30KW power output.

Also, Challenging Opportunities For Design Engineers

We are seeking talented designers for the RF, audio, microprocessor hardware and mechanical engineering sections. Applicants should have BSEE or BSME degree with one to three years' experience.

Candidates are invited to send resume, in strict confidence, to Personnel Department.

An Equal Opportunity Employer

BE BROADCAST ELECTRONICS INC.
4100 NORTH 24TH STREET, P.O. BOX 3606
QUINCY, IL 62305, PHONE (217) 224-9600

HELP WANTED (CONT.)

A NEW CAREER IN FUTURE TECHNOLOGY GROUP W SATELLITE COMMUNICATIONS

The technological leader in satellite communications is offering excellent career opportunities to broadcast maintenance engineers. As a diversified satellite communications company, openings are available for maintenance engineers experienced in studio installation, studio maintenance, ENG/EFP maintenance, and satellite earth station maintenance. GWSC offers an excellent compensation and benefits program. Begin your career in the future, now, by sending your resume including salary history in confidence to:

Group W. Satellite
Comunications
41 Harbor Plaza Drive
P.O. Box 10210
Stamford, CT 06904

Attn: Bill Johnson
Mngr. Tech. Opns.

M/F – GWSC is an equal opportunity employer.

HELP WANTED (CONT.)

NEEDED: QUALIFIED BROADCAST ENGINEER experienced in installation and maintenance of sophisticated studio equipment. Please send resume to: Jim Borgioli, Chief Engineer, Kartes Video Communications, 10 E. 106th, Indianapolis, Indiana 46280. 5-82-2t

TELEVISION ENGINEER: Immediate opening for qualified engineer. Excellent benefits, good location. Salary commensurate. Send resume to: David Wiswell, Chief Engineer, WGVC-TV, c/o Personnel Office, Grand Valley State Colleges, Allendale, Michigan 49401. GVSC is an EEO/Affirmative Action Employer. 5-82-1t

CHIEF ENGINEER FOR WMOT 50kw public FM station: Must maintain high quality NPR Station, STL, RPU, transmitter, and remote recording equipment. Construction experience, music recording ability, computer knowledge helpful. Ability to work with faculty, staff, and students essential. Applicants must file: 1. Application for Employment (available by writing Personnel Office, 216 Cope Building, Middle Tennessee State University, Murfreesboro, TN 37132, or by calling (615) 898-2929); 2. A resume including personal, educational, and professional background. Submit application materials by May 15, 1982, to Personnel Office. For more information contact John High, WMOT station manager, (615) 898-2800. MTSU IS AN EQUAL OPPORTUNITY EMPLOYER. 5-82-1t

HANDS-ON CHIEF – proficient in areas of: FR, Digital, Ampex Quad, RCA Telecine, BVU, Vidifont. New facility in beautiful Salisbury, Maryland. Salary commensurate with experience. Send resume to Box 321, in Salisbury, Maryland 21801. AF, EOE/MF. 5-82-3t

TELEVISION MAINTENANCE ENGINEERS – Repair and maintenance of various television equipment, including RCA and Ikegami chain and Ampex VTR's. Requirements: First Class FCC license, three to five years applicable experience and an educational background to assure ability to operate and maintain television equipment. Apply to: Director of Finance, WYES-TV/Channel 12, Box 24026. New Orleans, LA 70184. NO CALLS! WYES-TV IS AN EQUAL OPPORTUNITY EMPLOYER. 5-82-4t

MAINTENANCE ENGINEER – Videotape post production company in beautiful Pacific Northwest has immediate opening. Good pay and benefits. Contact Mike at (206) 623-5934. 4-82-2t

HELP WANTED (CONT.)

CHIEF ENGINEER, LONG ISLAND AM-FM: Excellent opportunity to grow and learn. Good salary. Resort living. Resume to Barry Grant, WRCN, P.O. Box 666, Riverhead, NY 11901 or call (516) 727-1570. 4-82-2t

CHIEF ENGINEER AND MAINTENANCE ENGINEER. Major East Coast post production facility. Experience on SONY 1" and QUANTEL desirable. Send resume and salary history. Dept. 563, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 5-82-1t

MAINTENANCE ENGINEERS: For one of L.A.'s largest and fastest growing post-production companys. We're now ready to expand with studios, earth station, etc. and offer excellent salary, benefits, exciting growth potential and more. If you're interested and qualified (experience with Rank telecine, CMX, type "C" VTR and/or DVE) send resume to: Dept. 564, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 5-82-2t

TELEVISION TRANSMITTER ENGINEERS – Assume total resonsibility for the transmitter facility during assigned shift. Closely monitor and maintain quality control of received and transmitted video and audio signal to assure compliance with FCC Rules and Regulations. Requirements: First Class FCC license, three to five years applicable experience and an educational background to assure ability to operate and maintain television transmitter. Apply to: Director of Finance, WYES-TV/Channel 12, Box 24026. New Orleans, LA 70184. NO CALLS! WYES-TV IS AN EQUAL OPPORTUNITY EMPLOYER. 5-82-4t

SYSTEM DESIGN ENGINEER – CCTV. Must be able to specify, design, supervise installation and de-bug top quality industrial CCTV systems. Experience required. SYSTEM ENGINEER – AUDIO VISUAL and PROFESSIONAL AUDIO. Hands on experience with audio/visual equipment a must. Digital knowledge helpful but not required. Responsibilities include complete job oversee and client interface. Both positions provide paid health, life insurance, vacation, etc. Please call collect 201-288-6130, Stylist Systems, Teterboro, N.J. 9-81-tfn

POSITION WANTED

BROADCAST ENGINEERING GRADUATE with FCC license seeks entry level position. Joe Donato, Box 20113, Phila., PA (215) 389-4367. 5-82-2t

Twentieth Century-Fox Video, the leading producer of home video entertainment products, has challenging positions for the following Engineering professionals.

ELECTRONICS ENGINEER

You'll be responsible for assisting in the designing, prototype constructing, testing and measuring of video and digital circuitry. You must have circuit layout, breadboard and electronic chassis assembly experience, and familiarity with common electronic laboratory test equipment. Engineering degree preferred.

STUDIO ENGINEER

Working in a production house environment, you'll be installing and maintaining video and audio equipment, including 1" and 2" video tape machines, digital video effects, cameras and computer tape editing equipment. Should possess good working knowledge of digital electronics and the ability to troubleshoot to components level on state-of-the-art production and post production equipment essential. A related degree and 2-3 years' experience preferred.

We offer an excellent salary and benefits package, including a comprehensive dental program. Both positions offer a truly unique opportunity to join a dynamic, fast-growing organization that provides significant challenges and career growth. For prompt consideration, please submit your resume to:

Glenn P. Middlekauff,
Recruiter, Human Resources
TWENTIETH CENTURY-FOX VIDEO
23629 Industrial Park Drive
Farmington Hills, MI 48024
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INTERNATIONAL OPPORTUNITY AUDIO VISUAL

The King Faisal Specialist Hospital and Research Centre in Riyadh, Saudi Arabia has current openings in its Audio Visual Department. The AV Department is responsible for the educational and television needs of the employees and dependents of the 250 bed acute care referral facility.

The following positions are available:

- **CHIEF TV ENGINEER:** BSEE, 8 yrs. related experience (2 as supervisor) in the design and maintenance of CCTV systems and other AV equipment.
- **TV ENGINEER:** BSEE, 5 yrs. experience in maintenance and repair of TV or Video Systems. Must be familiar with TV cameras, monitor systems, video tape recorders and cable.
- **TV TECHNICIAN:** AA Electronics or 2 yrs. trade school or military equivalent plus 5 yrs relevant experience – TV and video systems. (Single Status)

Benefit pckage includes attractive salary, 30 day annual leave, free transportation, furnished lodging, free medical care, bonus pay and bonus leave. Two year contract.

For further information, please send resume to: Kathleen Langan, Personnel Consultant, Hospital Corporation of America-International Division, P.O. Box 550, Nashville, TN 37202.

HCA International Division

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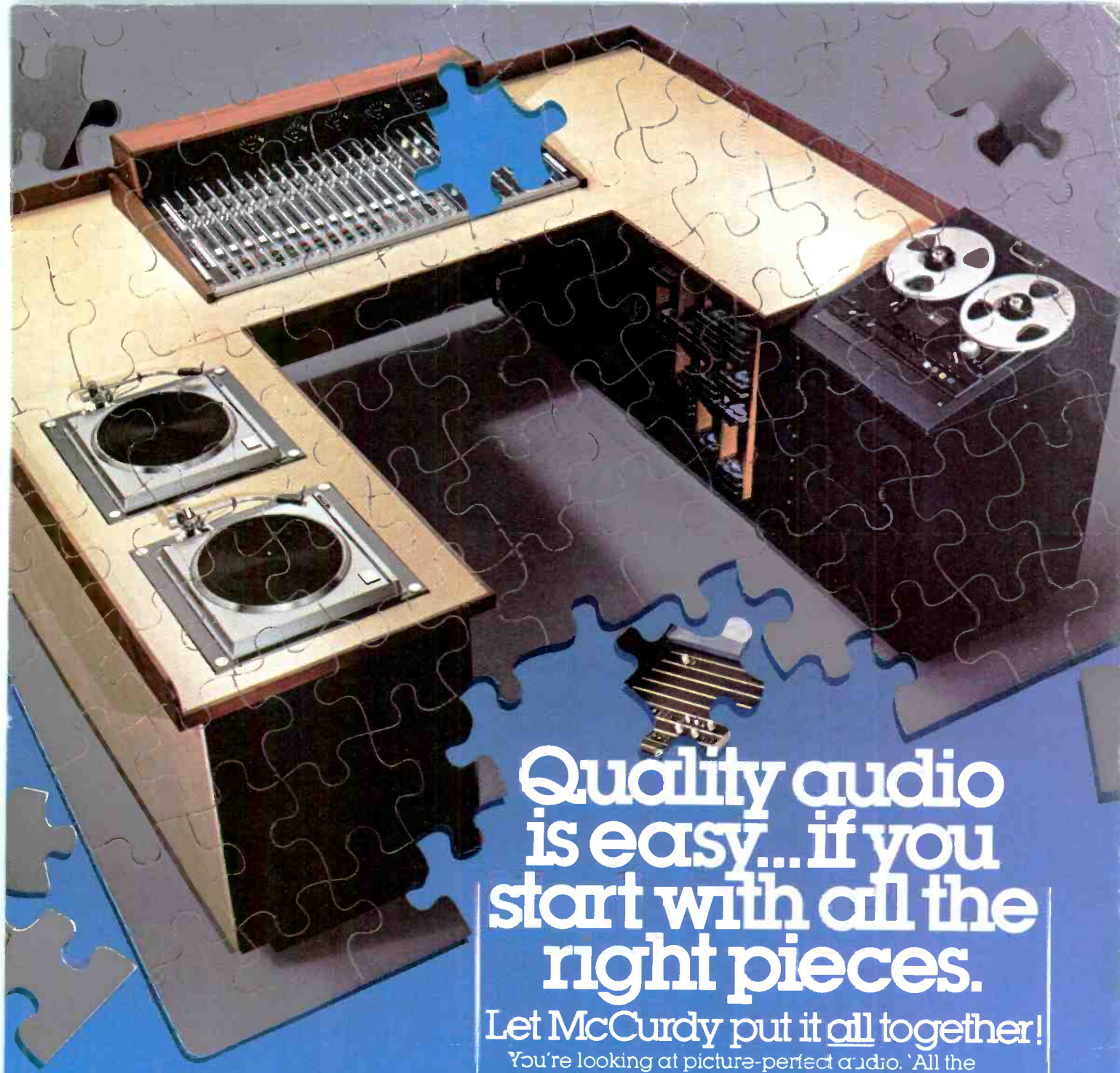

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