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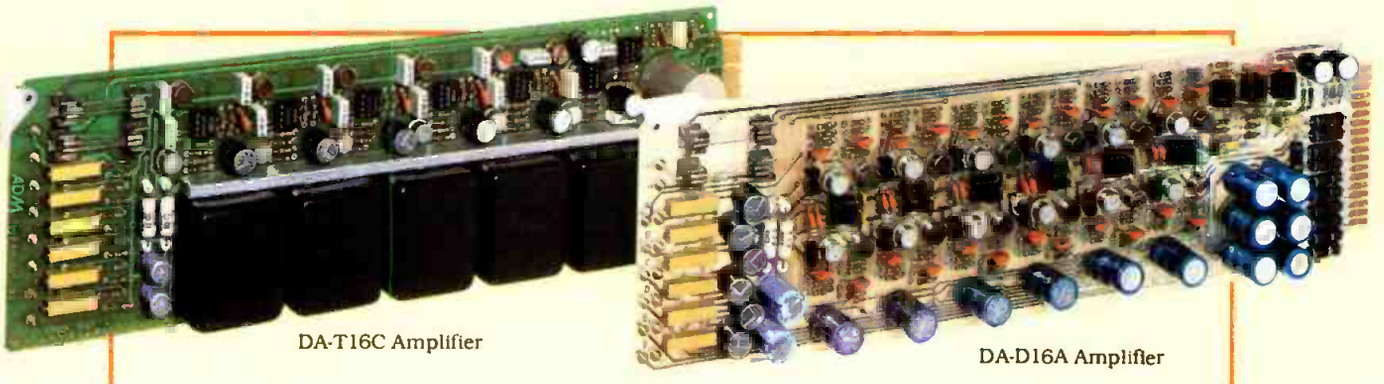

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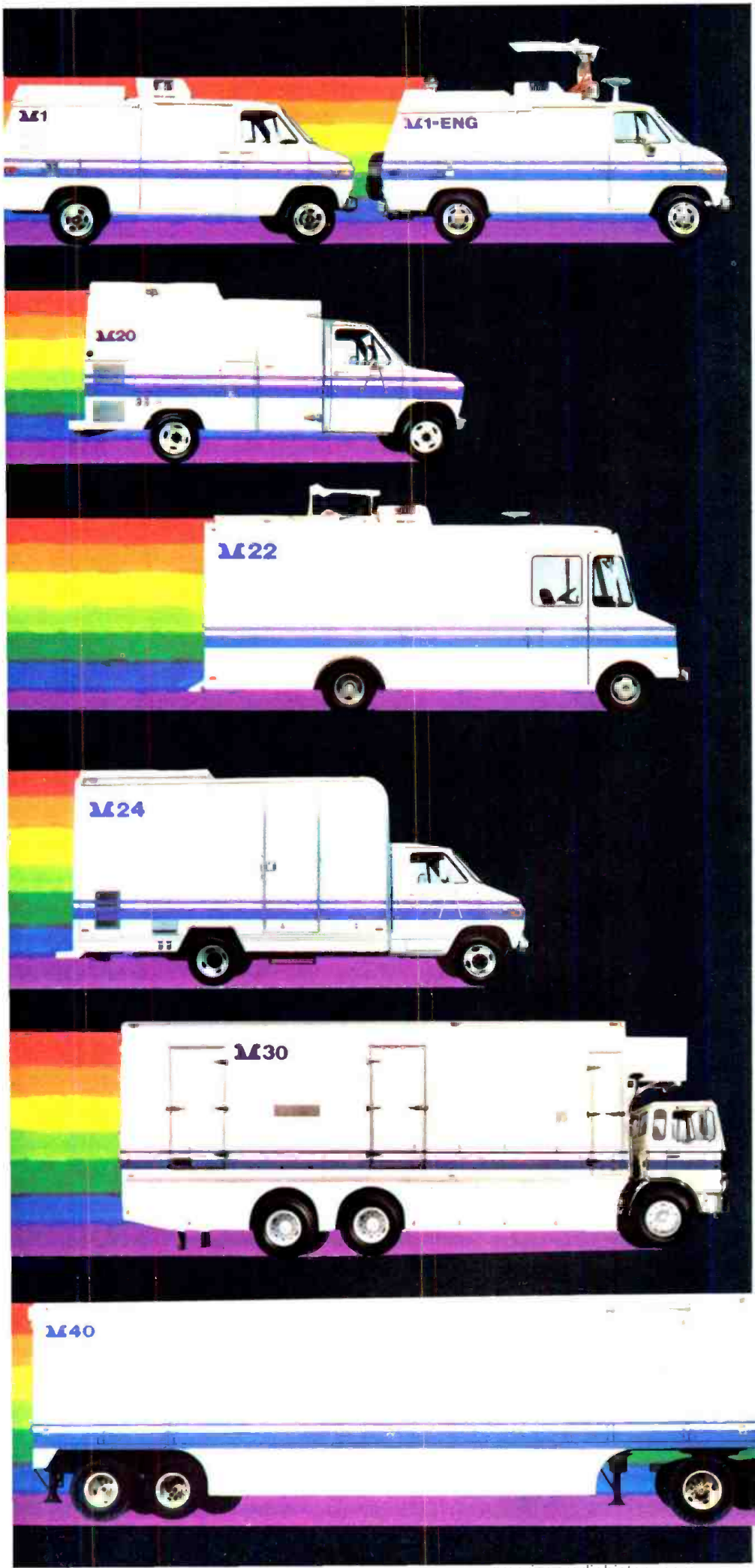

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BROADCAST engineering

The journal of broadcast technology

February 1984 • Volume 26 • No. 2

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THE COVER this month is an illustration by Lisa Bell, a graphic designer for Design Services, Turner Broadcasting System, Atlanta. The art depicts the varied and timely news coverage of the Cable News Network (CNN). A description of the approach used for creating graphics at CNN begins on page 21.

Coming events

March 27-28
LPTV West, Anaheim, CA

March 27-30
Audio Engineering Society (AES), Paris, France

April 8-12
NPR Annual Conference, Arlington, VA

April 29-May 2
NAB 62nd Annual Convention, Las Vegas, NV

May 3-6
ITVA, Las Vegas, NV

May 12-15
Audio Engineering Society (AES), Anaheim, CA

May 20-23
Broadcast Financial Management Association (BFMA) 24th Annual Conference, New York, NY

May 30-June 2
American Women in Radio and Television 33rd Annual Convention, Chicago, IL

June 3-6
National Cable Television Association (NCTA) Annual Convention, Las Vegas, NV

NEXT MONTH:
- Monitors for radio and television
  - —Audio monitor update
  - —Video monitor update
- NAB-'84 report
- LPTV industry review

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.

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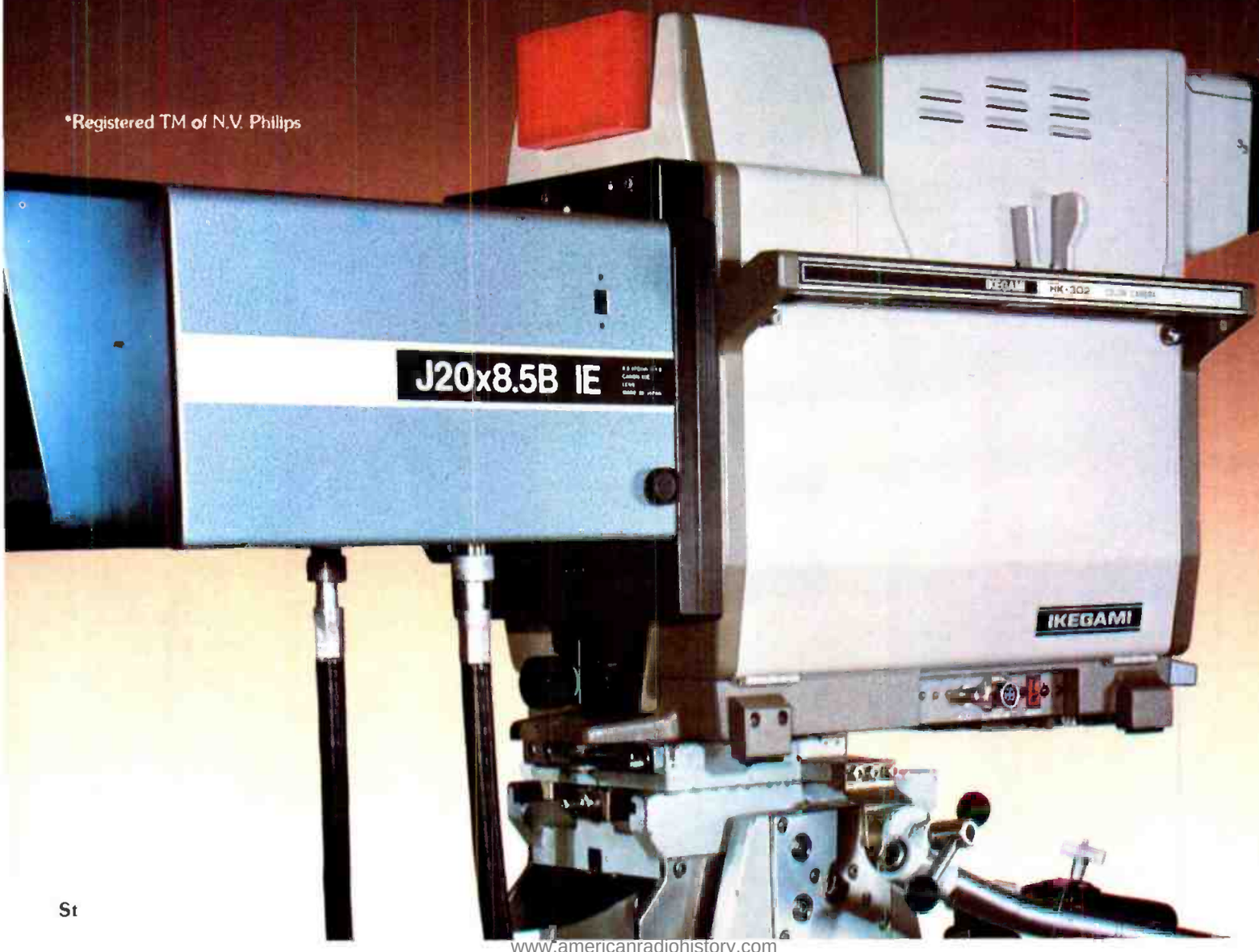

St

Harris receives type acceptance

The FCC has granted type acceptance to the Harris STX-1A AM stereo exciter, following extensive testing by the commission in its laboratory. Tests included not only the customary engineering measurements, but also subjective listening evaluations under program conditions. Type acceptance of the STX-1A was called into question last August, when the FCC determined that the original approval given the Harris AM stereo exciter was invalid. The commission said, "The measurement data filed and description of the functioning circuits (included in the original type acceptance process) was not representative of its (the STX-1A's) actual operation during stereophonic broadcasting."

The commission had found excessive monaural receiver distortion when an envelope detector was used for the measurement. Harris suggested a new multitone distortion test (as an alternative to the standard harmonic distortion measurement technique), which the company said was a better approximation of program audio. The FCC instead decided to waive the distortion measurement requirements for the STX-1A, clearing the way for type acceptance. The commission based its decision on subjective listening tests, which showed the Harris system to be of acceptable quality. The STX-1A met all other standard engineering measurements required for type acceptance by the FCC.

Harris has shipped a large number of back orders, and now is filling new orders for the STX-1A. The company has waived all receiver licensing and royalty fees previously required of receiver manufacturers to help accelerate the production of AM stereo receivers.

Chrysler goes with Motorola

Chrysler has joined the Buick Division of General Motors in electing to install single-mode AM stereo receivers keyed to the Motorola AM stereo system.

A Chrysler representative said that the C-QUAM system receivers will be available for portions of the company's 1985 automobile line. The company said it chose the Motorola AM stereo system after extensive internal testing.

The Chrysler announcement followed a decision by Buick to offer Delco radios designed to receive C-QUAM signals as an option in some of its 1984 model vehicles. The Buick decision was based on the much-publicized Delco AM stereo tests, in which three of the competing systems were analyzed on the bench and in the field.

NAB pushes multimode development

The Executive Committee of the National Association of Broadcasters has urged radio receiver manufacturers to develop multimode units, particularly for automobiles. The resolution said that developing radios capable of receiving all AM stereo transmissions would encourage the introduction of AM stereo technology into the consumer marketplace.

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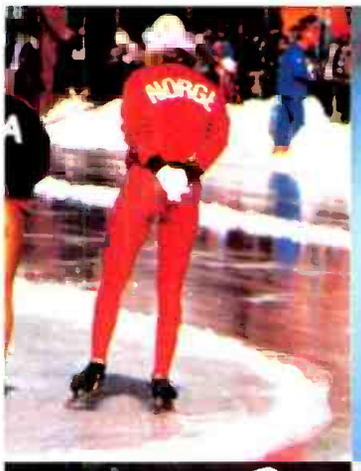

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FCC update

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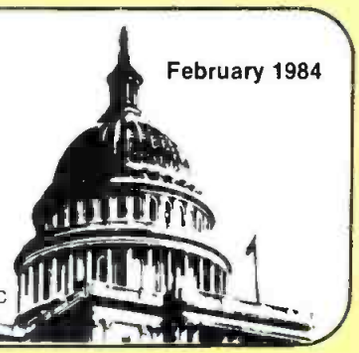
Harry C. Martin, partner, Reddy, Begley & Martin, Washington, DC



Quotas for children's TV voted down

The FCC has decided against adopting mandatory quotas for children's TV programs.

Since 1980, the commission has been considering imposition of rules that would have required TV stations to broadcast specific quantities of programming geared to younger viewers. In a decision issued in December 1983, however, the FCC said such quotas are unnecessary because there has been an overall increase in programming available to children. In this respect, the marketplace has not failed to address the needs of this special group. In addition to traditional broadcast services, the FCC expects that emerging telecommunications services, such as DBS, MDS, SMATV and cable TV networks, will add to current diversity.

In its order, the commission reaffirmed the obligation of all commercial TV stations to serve the special needs of children. Even though specific quantification rules were not adopted, broadcasters still are obligated to be responsive to the needs and interests of all groups in their communities, including children.

Echoing the same theme that has been the basis for other deregulatory actions over the past several years, the agency said there was no value in substituting its judgment for that of licensees in deciding what amounts or types of children's programming was needed, because licensees were in a better position than the government to determine the interests and needs of the children in their audiences. The decision to refrain from establishing quotas also was based in part on free speech concerns.

Major change to be redefined

The FCC has proposed modifications in its rules under which it classifies certain changes in FM and TV facilities, and ownership in AM, FM or TV applications, as *minor* or *major*.

The proposed reclassifications are important because once an application—or an amendment to a pending application—is classified as major, it is subject to a variety of requirements, including cutoff procedures (which invite petitions to deny and conflicting applications), rules requiring local publication and a 30-day holding period before grant. In the case of mutually exclusive applications, the filing of a major amendment after the cutoff date can result in dismissal of the application.

The proposals affect the following types of applications:

- **those involving changes in service area for FM or television of more than 50%.** Such changes, now considered major, would be considered minor under the proposed rules. (AM applications never have been classified as major or minor on the basis of service area changes.)
- **with respect to pending AM, FM or TV applications, a change of 50% or more in ownership.** (This provision would codify existing case law on major ownership changes.)

These rule-change proposals are designed to streamline and speed up the application process. The staff no longer will have to calculate the percentage of change in coverage area shown in applications or amendments, and will have a more definite standard to govern substantial ownership changes.

Changes in LPTV processing proposed

In a Notice of Proposed Rulemaking adopted in December 1983, the commission has proposed the following changes in its processing procedures for LPTV and TV translator applications: modification of the cutoff rules to provide for a *window*, or certain date, for filing applications; elimination of the requirement to file financial information or certifications; and designation of TV translators as a separate, higher priority of service than LPTV for processing purposes.

Under the window procedure, applicants would have a limited period after public notice within which to file complete and sufficient applications. Applications would not be placed on an "A" cutoff list, thereby being made subject to competing applications, as is the current practice. Instead, applicants would have to file during a specified window time period to be considered with any other mutually exclusive application filed during the same window period.

Comments have been invited as to appropriate groupings for a given window period. Groupings by tier, geographic location, market size and channel number have been suggested.

The commission is considering this revision in its processing procedures because of abuses of the present cutoff system. Under current rules, a bona fide applicant may expend substantial time and money to prepare an original application and, after the cutoff date, find that three or four competitors have copied and refiled it in their own names. The commission said that this practice has delayed substantially implementation of the new LPTV service, contrary to the public interest.

In proposing elimination of the financial showings required for LPTV and TV translator applications, the FCC said that the public interest may be better served by enforcing strict construction deadlines for authorized facilities. This mechanism, which requires completion of construction within one year after grant, already is in place. Further, the commission found that financial commitments may not be available in many instances until after construction permits are granted, because of the newness of the LPTV service. In any event, the FCC said, financing used to construct a facility often differs from that originally proposed, thus making pre-grant showings useless exercises in many cases. The FCC also said that eliminating financial requirements for applications may make it easier for minorities and women to enter the new LPTV service.

Finally, the commission invited comments on the issue of whether TV translator proposals should be given priority over LPTV applications in the processing scheme, and, if so, how such a priority system should be implemented. The commission recognizes that the filing of thousands of LPTV applications over the last several years has delayed processing of TV translator applications and has made it difficult to obtain translator authorizations. Consequently, the advent of LPTV has blocked translator service to shadowed areas and to rural and underserved markets.

To change this situation, the FCC is considering several alternatives. One proposal is to give special priority treatment to translator applications proposing to fill in a full-service facility's city-grade, Grade A or Grade B contours. Another option is to permit

Continued on page 127

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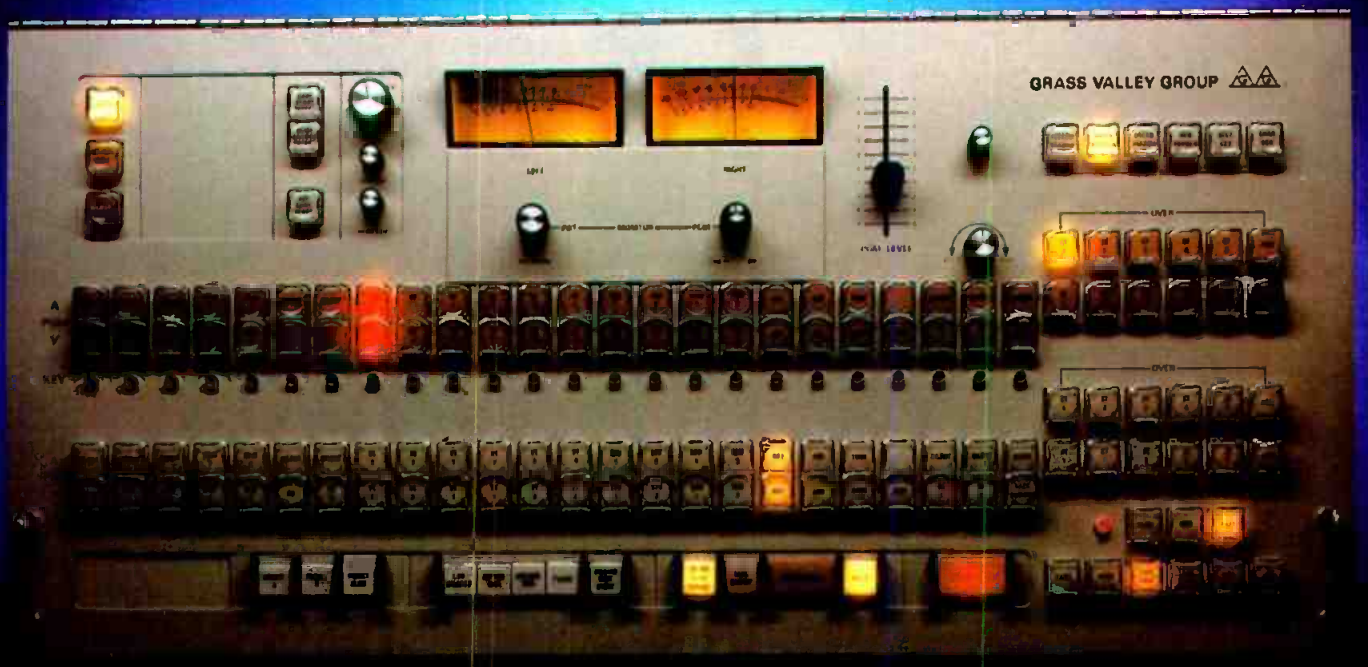

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AM radio: Where do we go from here?

The standard broadcast radio band—the grandfather of the communications industry—is in trouble, and we think the time has come for AM broadcasters to stop complaining about the problem and to start doing something about it.

It is no secret that AM radio has been steadily losing audience shares to the higher quality, and often more aggressive, FM broadcaster. The perception by many in the industry has been that, by and large, technology has deliberately ignored standard broadcasting. Regarding AM transmission systems, this is true to some extent. Regarding receivers, this is true without a doubt.

The AM transmission medium has several built-in problems. First on the list is the fact that the intelligence is transmitted via *amplitude modulation*, which is subject to impulse noise (such as lightning, auto ignition and motors). The second problem is the fact that AM has excellent skywave propagation characteristics at night, allowing good wide area coverage and interesting *distant station reception* reports. But in the world of broadcasting, such benefits mean little when it comes to listeners in the station's primary service area, where advertising sales are made and audience surveys are taken.

Receiver manufacturers have known these problems for decades, and have designed their radios accordingly. The solution to noise and skywave interference from distant adjacent-channel stations was, at one time, to roll off the audio frequency response at approximately 5kHz. This made the receiver simple in design and inexpensive to produce. For a long time, such practices were acceptable, because little programming was available that had high frequency content.

An interesting chain of events then began to unfold. As technology progressed, audio source material became substantially wider in bandwidth and manufacturers of studio and transmitting equipment responded with improvements of their own. AM stations that once rarely transmitted audio frequency components beyond 5kHz suddenly began to see response to 10kHz and higher. This gave excellent reception during daytime periods, but at night the sideband energy from adjacent-channel stations caused severe problems for receivers. The matched system that once had existed, in which AM stations transmitted frequencies up to 5kHz and receivers delivered response up to 5kHz, was disrupted. The sideband energy of 5kHz modulation fits nicely into the standard broadcast 10kHz channel, but spillover results from anything more. Receiver manufacturers addressed this problem by further reducing the audio frequency response capabilities of their radios, down to about 3kHz.

The public became accustomed to low fidelity radio. Listeners did not expect more from AM.

The advent of FM, particularly FM stereo, showed the listening public that something more was available than what they had come to expect. FM was not taken seriously until the mid-1970s when the audience shares and, to a lesser extent, the advertising dollars, began to escape from the AM stations that long had been untouchable. FM, once treated as a stepchild, has grown up and is taking a large part of its parent's share of the pie, as shown in Figure 1 and Figure 2.

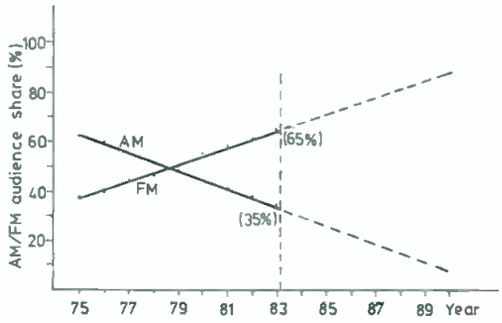

Figure 1. The growth of FM audience vs. AM audience, showing the dramatic shift in listener preference over the last eight years, and projections of what the future may hold.

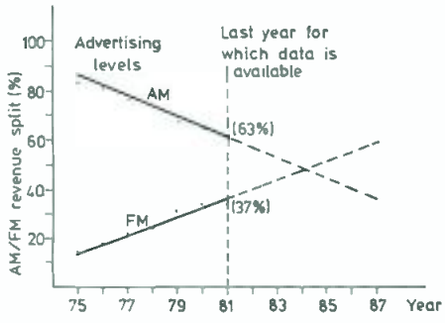

Figure 2. The division of AM vs. FM advertising dollars. If our linear projections are correct, the turning point for the radio industry will come during this year.

AM radio broadcasters have not rolled over and played dead in the face of this competition. Many innovative programming ideas have kept AM stations on top in numerous markets across the country. The lure of FM for music programming is strong, however, and its momentum is hard to stop. If AM is to be saved from a further exodus of music programming, much more work by broadcasters and receiver manufacturers will be needed than we have seen to date.

Toward this end, the National Association of Broadcasters has formed an AM Improvement subcommittee to look into the problem and to suggest solutions. We applaud this effort. The time has come for someone to say something good about the technical end of AM broadcasting, and provide evidence to back it up.

AM broadcasters need a well-planned, concerted effort to improve the technical performance of their transmission systems and, just as important, a coordinated and aggressive move by receiver manufacturers to solve the problems that have plagued AM radio since the beginning. These problems can be solved, in large part, with present technology at a price that the industry, and the public, can afford.

The solution to the AM problem definitely is not another round of loudness wars. New technology has offered the broadcaster more control than ever over the type of signal transmitted, but the new audio processors also have their limits. AM stations cannot expect that placing a new black box ahead of the

Continued on page 128

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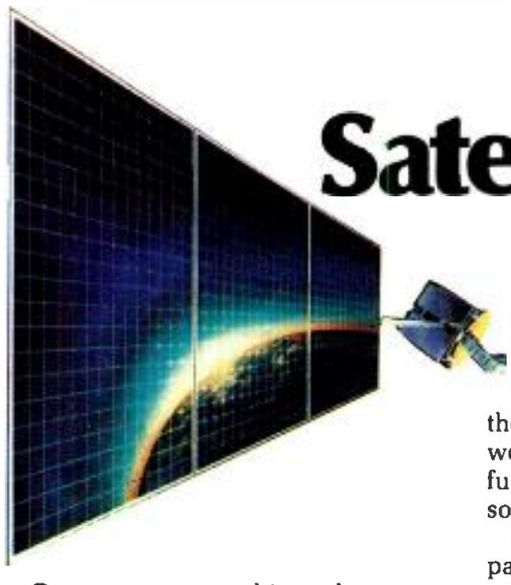


Satellite update

By John Kinik, satellite correspondent

One year, ago, this column examined satellite broadcasting trends expected for 1983, including the commencement of the first Ku-Band direct-to-home type of service, the continued expansion of conventional C-Band services, the implementation of closer satellite spacing for C-Band satellites and the determination of a plan for direct broadcasting satellite (DBS) services in the Western Hemisphere. It is useful to review the developments of the past year with respect to likely developments during this year.

The DBS services plan was established at the Regional Administrative Radio Conference (RARC) held in Geneva last summer, with channel frequencies and satellite orbital positions assigned. These high power DBS satellites will operate in the 12.2-12.7GHz portion of the Ku-Band and are intended to transmit signals directly to homes, with receiving antenna sizes of 1m diameter or less. Note that this is the only category of satellite broadcasting technology that is designated *officially* as DBS technology. In this column, the term *satellite broadcasting* has been used to describe *any* broadcasting-type service via satellite. This was done for two reasons: to use the most correctly descriptive terminology, and to underscore the fact that the existing satellite delivery systems were performing the same function as future DBS satellites would, but with somewhat larger receiving antennas.

Based on the developments of the past year, the most recent C-Band satellites and the new medium power Ku-Band satellites are capable of delivering signals to antennas that are small enough to make the distinction between the future DBS technology and the existing technologies less clear than it has been in the past. By the time the first high power DBS system goes into operation in 1986, the term *DBS* may be well-established, by virtue of the number of signals available by then on a direct-to-home basis. The first of these services, provided by United Satellite Communications Inc. (USCI), went on the air in December 1983, offering five channels of movies, sports and other programming. The USCI service is being test marketed in Indianapolis and the surrounding region, and will be introduced gradually in other regions of the country during the coming year. Initially, the USCI service will face stiff competition from existing C-Band services, because the advantages of a smaller USCI receiving antenna (4-foot diameter) are offset by the greater number of channels available on C-Band satellites and the fact that the larger (8-foot diameter) antenna required for C-Band reception is not an installation problem in non-urban areas. Also, the higher signal level available from the newest C-Band satellites (37dBW EIRP from Galaxy 1) is driving the C-Band antenna size down to the 5- to 6-foot diameter range, making the choice even less clear.

To illustrate the basic capabilities of each of the three delivery technologies and to provide a basis for comparison, Table I presents the essential characteristics of C-Band, medium power Ku-Band and future DBS satellite systems.

The downlink signal strength is expressed in terms of effective isotropic radiated power (EIRP) and is determined by a number of factors, including EIRP limits imposed by international telecommunications regulations and the state-of-the-art capabilities in satellite technology (primarily satellite transmitting power amplifiers of the traveling wave tube (TWT) type). For C-Band satellites, the upper limit has been reached partly because of EIRP limits placed on 4GHz signals by the International Telecommunications Union (ITU) to prevent interference into terrestrial microwave systems all over the world that operate in the 4GHz band shared with C-Band satellites.

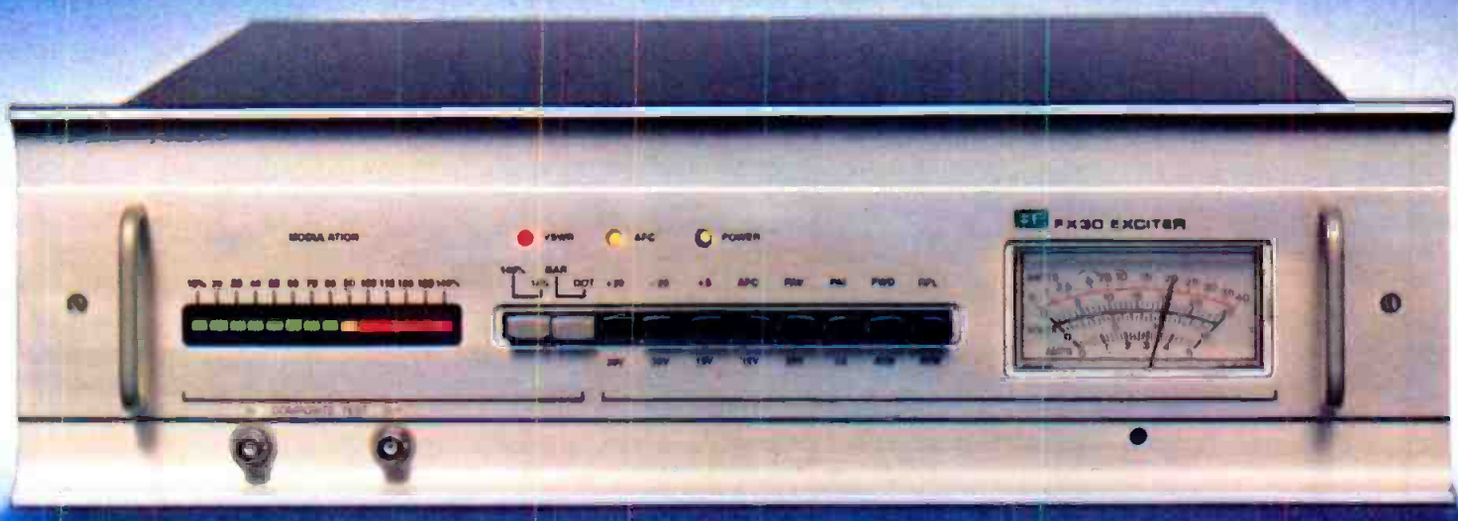
There also are diminishing returns from going much higher in EIRP because of the beamwidth of receiving antennas at C-Band. As shown in Table I, the 1.5m antenna size now possible with the Galaxy satellites is about the lower limit because of the adjacent satellite interference problem at 2° spacing. With 12dB of basic isolation caused by antenna pattern

Continued on page 129

Table I.

	C-Band	Medium power Ku-Band	Future DBS
Frequency range	3.7-4.2GHz	11.7-12.2GHz	12.2-12.7GHz
Typical satellite	Satcom 3R, Galaxy 1	Anik C2, G Star 2	Satellite Television Corporation
Typical EIRP	34-37dBW	47-50dBW	55-60dBW
EIRP coverage	CONUS	East/west beams	4 time zones (4 satellites)
Channels available	More than 30 in 1984	5 (in 1984)	3-4 (in 1986)
Receive antenna size	3m-1.5m	1.5m-1m	0.6m-1m
Adjacent satellite interference isolation	3m-18dB 1.5m-12dB (2°)	1.5m-15dB 1m-12dB (1°)	25dB or more (10°)
Total number of orbit positions	35	70	8

The FM Exciter That Can't Be Copied.



Broadcast Electronics' FX-30 Exciter.

There are imitations, but if you search the world over, you won't find a better exciter than the FX-30

Unmatched Performance.
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Field proven dependability, rugged construction and precision workmanship from the high quality front panel to the shock mounted encapsulated modulated oscillator.

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Quality engineered with thorough attention to detail assures you that every component in the FX-30 is operated conservatively.

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Circle (8) on Reply Card

McMartin plans FM/SCA network

McMartin Industries, Omaha, NE, has announced plans to develop a nationwide FM/SCA communications network to be called Comuni-Quik.

The network will use the new Super S transmission system that McMartin recently invented and that now is operational. The Super S system permits five separate and distinct full-range voice or data services to be transmitted simultaneously over the subchannel spectrum of any FM broadcast station.

Of the five channels available on the network, the company plans to set aside at least three of the channels for subsequent lease to well-established national companies specializing in electronic publishing and education, news services, data transmission, computer downloading and software conversions, paging, electronic mail or background music.

The remaining two subchannels probably will be saved for locally originated services. Examples would be foreground or stereo music, ethnic music, utility load management, electronic sign displays and radio reading services for specialized audiences.

A special feature of the network will be monitoring facilities at the McMartin plant in Omaha. The network is expected to be operational nationally during this year. A second phase of the development calls for the company to expand the Comuni-Quik network internationally to countries in which McMartin FM transmitters and FM/SCA equipment now are in use or are being planned.

Development can double satellite channel capacity

The number of channels on a communications satellite could be doubled using a new amplifying system developed by Dr. Henry G. Kosmahl, an electron physicist at NASA Lewis Research Center, Cleveland, OH. The new system—termed a dynamic velocity taper (DVT)—actually is a relatively minor technical modification of an existing space amplifier.

Kosmahl explained what happens technically when the dynamic velocity taper is used:

"A stream of electrons is directed from an amplifier. Over a certain length they interact with a radio wave. In the process, a part of the energy of the electron is transferred to the wave. The wave carries the signal or communication—voice or whatever. Since the electrons become slower as they proceed, we put a weak wave and strong electron beam at the beginning. We end up with a strong wave and a weak electron beam."

Kosmahl said that the dynamic transfer of power from the electrons to the radio wave in synchronization is the key feature of the development. A major side benefit is that additional power results from the constant resynchronization.

Hughes Aircraft's Electron Dynamics Division already is using data furnished by Lewis to test the new device and is reporting early success, including obtaining 30% more power just by rearranging the "hard limiter" characteristics.

Kosmahl has applied for a patent on the DVT. It will be owned by NASA, but will be available to industry.

ABC forms committee for Summer Olympics

A World Broadcasters RF Committee for the 1984 Los Angeles Summer Olympic Games has been established by ABC-TV, the host broadcaster. The committee will coordinate all radio frequency activity for US radio and TV stations planning news coverage of the games and the many world broadcasters planning radio and TV broadcasts of the events.

ABC-TV, under a special waiver and temporary authorization from the FCC, has been assigned the UHF TV spectrum from 482-488MHz to handle the many requests for operational communications channels. World and US broadcasters requiring communications channels will be assigned dedicated frequencies in this spectrum for their use during the games. Microwave requests will be considered on a case-by-case basis so that existing Los Angeles area ICR and STL links and related Olympic microwave operations are ensured protection.

Any organization planning activity in the Los Angeles area for the games that require the use of RF equipment must coordinate their requirements through the committee. Information should be sent in writing no later than March 1 to Michael LoCollo, chairman, World Broadcasters RF Committee, ABC-TV, 1313 N. Vine St., Hollywood, CA 90028.

Tektronix opens service center in China

Tektronix, Beaverton, OR, has established a product service facility in Beijing, China. The Tektronix China Service Center will be operated cooperatively with the Chinese Academy of Sciences. the official sponsor and operations management for the venture. The service center will be located at the Institute of Computing Technology in Beijing. Tektronix's immediate goal is to provide high quality product service.

TTS to build and operate shortwave broadcast station

Telecommunications Transmission Systems (TTS) of Salt Lake City has announced that it will build and operate a shortwave broadcast station. The station, which will be located in the western United States, will be a commercial venture funded by TTS and other partners.

According to TTS president Raymond C. Rask, the goal is to have the station on the air by some time in 1985.

Students invent compact, inexpensive satellite dish

Remote areas of the country now may have access to good TV reception, thanks to three Syracuse University (Syracuse, NY) engineering students who have designed an inexpensive ground station satellite dish.

Joseph Blade, Jared Goodfriend and Peter Lord designed a satellite ground antenna called STGA I. which won third place in a national student design competition sponsored by the General Electric Company's Plastic Operations and Plastic Design Forum magazine.

Made of GE's industrial plastics, the satellite measures two feet in diameter and easily can be mounted on a roof. The students, all seniors in the L.C. Smith College of Engineering, shared a cash award of $3000.

UPI inaugurates own satellite uplink

United Press International has announced the transfer of its satellite uplink from Glenwood, NJ, to its communications center in Dallas, making it the first major US wire service to have ownership and full control of its own uplink services.

National and international news now feeds into the UPI Dallas Technical Center and is beamed directly up to the Westar 3 satellite for distribution to UPI subscribers. Formerly, the news feed traveled from Dallas to the New Jersey uplink by land lines and microwave, which UPI identified as a costly and unreliable link between breaking news and subscribers. In addition to adding reliability, UPI expects the new uplink to increase the volume of data that can be moved through the system.

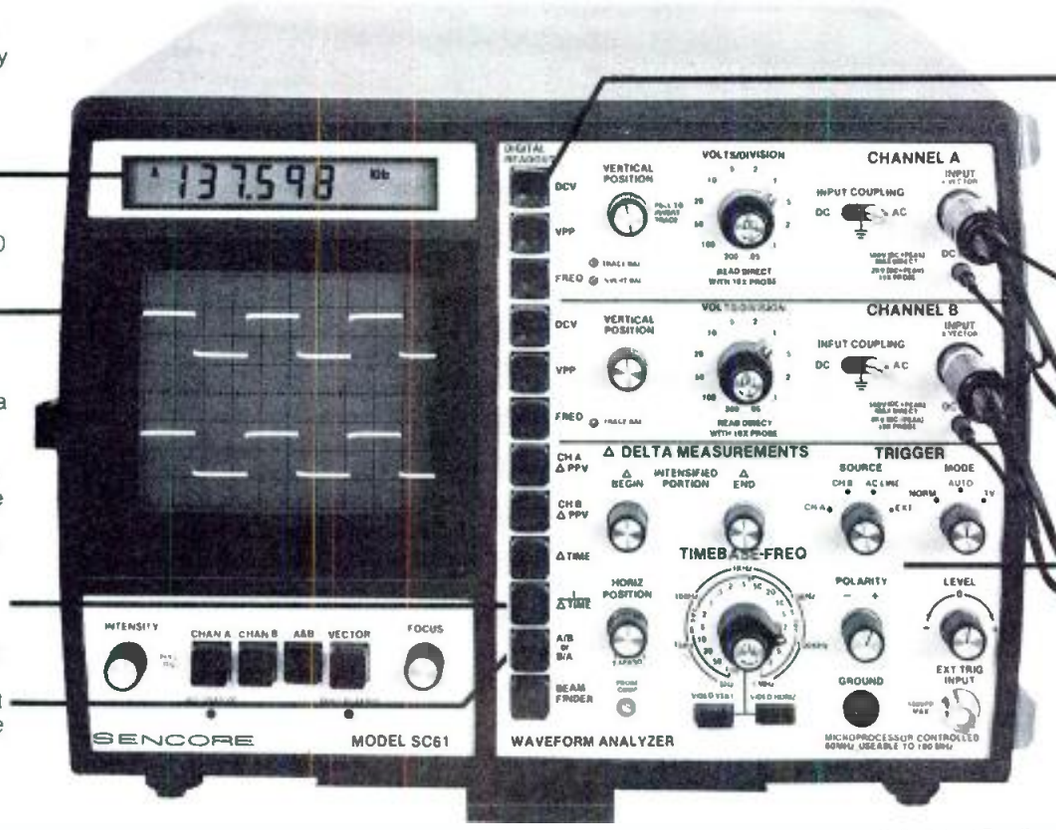
Double Your Troubleshooting and Testing Productivity . . . Or Your Money Back!

Six-digit readout: Automatically tracks every CRT test. We call it digital autotracking. It's patent pending.

Bright dual-trace CRT: 60 MHz (– 3 dB); 100 MHz (– 12 dB).

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

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



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

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

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

U.S. Patent Pending
Financing Available

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

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

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

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

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

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

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

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

Double your productivity. When we say the SC61 will double your productivity, we're being conservative. We've seen cases of three, four, even ten time increases in productivity with this first-of-its-kind, automated oscilloscope. Every situation is different, however, so try the SC61 and judge for yourself. Here's our offer.

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Circle (9) for information
Circle (10) for demonstration

feedback

Photo credit

Credit for the photo on page 58, October 1983 (in the article, "Ku-Band Milestone Reached"), should have been given to Microdyne Corporation, manufacturers of the earth station system provided by VideoStar Connections.

BE staff

Correction

Readers of the December 1983 *BE* article, "Time Base Correction: An Equipment Survey" (page 112), may have discovered some missing information. Unfortunately, there are no built-in diagnostics in publishing as are found in some TBC and frame synchronizer equipment. Reader Service Numbers did not appear in the article. Table I includes those numbers for readers wanting more information on products in the article. Also, several manufacturers were not included in the original article. Those companies and their products are included here.

FOR-A Corporation. For capstan-servoed or non-servoed VTRs, digital encoding of analog signal components in the FA-410 TBC increase the S/N ratio of luminance and chrominance with improved signal stability. A 16H correction window, blackburst outputs, preset proc-amp functions and dropout compensation are standard. Models are available for NTSC and PAL. In the PAL version, the FA-430, digital TBC functions are enhanced with image processing capabilities, including noise reduction detail enhancement, color correction and gamma correction.

Circle (375) on Reply Card

Hotronic. Feedback of 3.58MHz is available from the AD51 TBC and frame synchronizer to allow correction of direct or heterodyne VTRs. Synchronization of outside video sources to station sync also is possible. A 1-bit/board design is provided, and all memory boards are interchangeable. More than one frame of memory is included in the $4xf_{sc}$, 8-bit system, which is completely remote-controllable and offers adjustable vertical blanking.

Circle (376) on Reply Card

Nova Systems. The Nova 500 corrects all ¾-inch and ½-inch non-segmented VTRs that accept sync and derived subcarrier inputs. Digital processing reinserts sync and burst in accordance with RS-170A, even if reference sync-subcarrier phasing is not correct. With 32 lines of storage, the system is an 8-bit, $4xf_{sc}$ design.

Circle (377) on Reply Card

Table I.

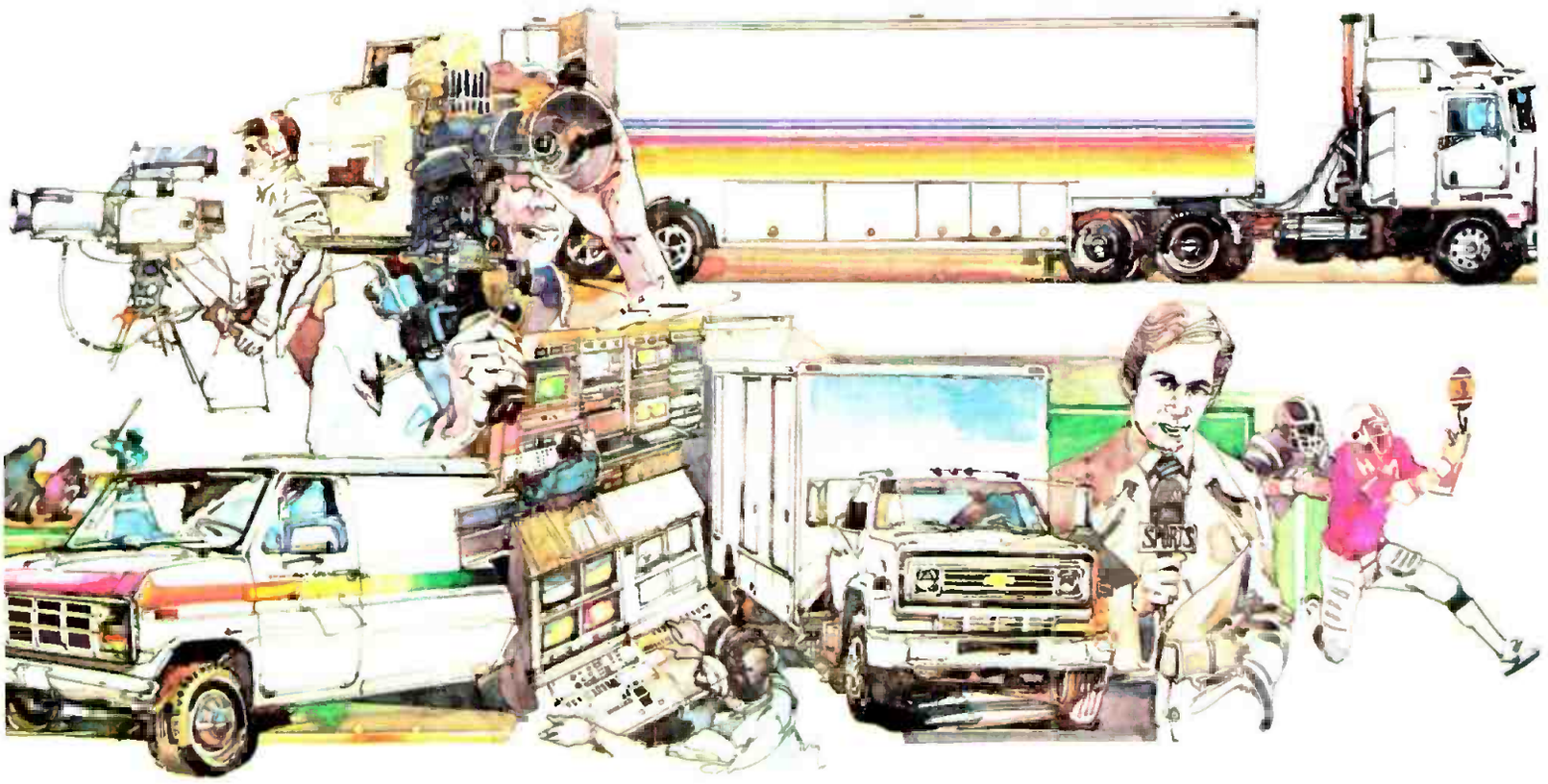
ADDA	(378)
Ampex	(379)
Apert-Herzog	(380)
Digital Video Systems	(381)
FOR-A Corporation	(382)
Fortel	(383)
Gunnerfield Ltd.	(384)
Harris	(385)
Hotronic	(386)
MCI/Quantel	(387)
Merlin Engineering	(388)
Microtime	(389)
NEC	(390)
Nova Systems	(391)
QuesTech Ltd.	(392)
RCA Broadcast	(393)
REGIS/BLT	(394)
Sony Broadcast	(395)
Thomson-CSF Broadcast	(396)

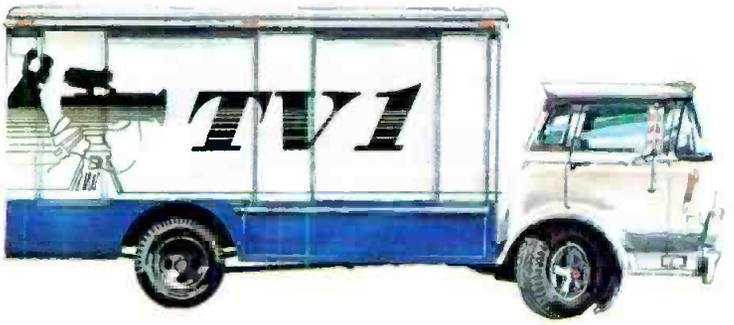
BE staff

Correction

In reference to TASCAM on page 34 of the 1983 **Spec Book** and page 96 of the November 1983 *BE*, the spec listing

MOBILE TELEVISION UNITS





If your future plans include a mini-van, a full scale production truck, or something in between, we can develop your ideas into a complete television vehicle.

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FULL LINE OF ALL HITACHI BROADCAST EQUIPMENT

headed by model 32 should read: series 30, with 2-, 4- and 8-track models. The column headed by 58 should read: series 40, with 2-, 4- and 8-track models. The column headed by 52 should read: series 50, with 2-and 8-track models available.

***BE** staff*

Correction

Because of computer coding and printout, some errors appeared in the September 1983 ***Buyers' Guide.*** *The following is the correct data:*

- ***Headphones with announcer's microphone.*** *The list for Swintek should appear in red ink and should reference the company's ad on page 112.*
- ***Microphones, wireless.*** *Swintek should have been listed in red ink, with a reference to its ad on page 112.*
- *The following listings for Audio + Design Recording should have appeared in red ink, with a reference to the company's ad on page 165:*

Amplifiers, AF and AGC
Amplifiers, AF Compressing
Amplifiers, AF General Purpose
Amplifiers, AF Peak Limiting, AM & FM
Amplifiers, De-esser
Amplifiers, Distribution Audio
Equalizers, Audio Emphasis
Filters, Audio
Filters, Variable and Fixed Tuned
Preamplifiers, Audio
Preamplifiers, Limiter-Compressor
Preamplifiers, Microphone
Sound Systems, Automatic Level Control
Time Code Readers

- *Tektronix should have been listed in black ink in the following product areas:*

Amplifiers, Operational
Amplifiers, Processing Video
Analyzers, RF Network
Analyzers, Sideband
Analyzers, Video
Attenuators, Fixed
Attenuators, Impedance Matching
Attenuators, Microwave
Attenuators, RF
Automation, Video Testing
Calibration Services, Instrument
Color Correction Equipment
Computer Software
Delay Measuring Sets, Envelope
Demodulators, Video
Detectors, RF
Differential Phase/Gain Measuring Sets
Display Units, Digital
Dividers, Power
Filters, Noise
Frame Synchronizer
Generators, Burst
Generators, Cross-pulse
Generators, FM/SCA
Generators, Signal Marker
Generators, Signal Pulse
Generators, Signal RF
Generators, Staircase
Generators, Subcarrier
Generators, Sync Pulse
Generators, Video Carrier
Generators, Video Signal Test Pattern
Generators, Video Sweep
Generators, VITS Inserter
Modulators
Monitors, RF Level
Monitors, Video Color
Monitors, VTR and TBC
Oscilloscope Cameras
Probes, Oscilloscope
Synchronizers, Digital Video Frame
Test Equipment, Monitor & Meter, Audio
Test Equipment, Monitor & Meter, Video
Test Equipment, RF
Voltmeters, ac
Voltmeters, dc
Waveform/Vector Monitors

***BE** staff*

Guidelines for proper documentation

*An editorial, "It's Greek to Me" (**BE** May 1983), prompted a response from Dr. Hans Springer, Schule fuer Rundfunktechnik, Nuernberg, West Germany. Agreeing with the editorial, Springer said that many problems of instruction manuals for broadcast*

Continued on page 130

Above all...

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Over 70% of Howe Audio customers are repeat customers. They know we provide them with reliable, quality products. Here are just four of the stations that have purchased more than one Howe Audio console.

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WNNC,
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Dave Lingafelt, C. E.
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KQEU
Olympia, Washington
Dale Zabriskie, C. E.
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Howe Audio has been making quality audio consoles for the past 6 years, supplying broadcasters world-wide with quality products at affordable prices. Quality in the form of VCA Control, unparalleled specs, 22 stereo inputs, 2 stereo outputs, one mono output, a spare parts kit, and many other features on each Howe Audio console.

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When you see "JBL" on a speaker, sound system or our newly acquired partner UREI Electronic Products, you're looking at a great deal more than a company logo. You're looking at the synergy of science and sound. At the marriage of advanced scientific research and innovative application.

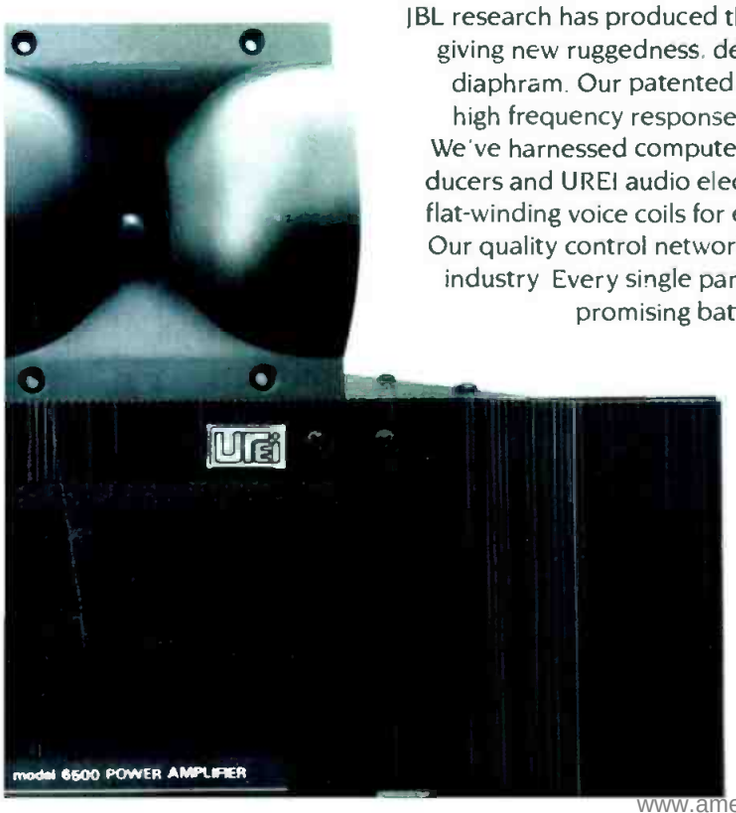
The science of sound and JBL have always been synonymous. Tools from laser holography to the computer to robotics are helping JBL bring new clarity, richness and authority to sound.

JBL research has produced the first perfected use of pure titanium in the audio industry, giving new ruggedness, dependability, and sound integrity to the compression driver diaphram. Our patented "diamond surround" diaphram has dramatically extended high frequency response.

We've harnessed computer science to make major advances in the design of JBL transducers and UREI audio electronics. And microprocessor-directed mechanical arms are flat-winding voice coils for even greater material density and efficiency.

Our quality control network remains the most comprehensive, most demanding in the industry. Every single part, component, and system is put through a rigorous, uncompromising battery of tests and inspections. At the end of each production phase, every product is graphed and compared against its exacting design goals. Finally, products move to Quality Assurance where they are life-cycle tested to insure pro-rugged dependability.

At JBL, we are committed to sound and the sciences that bring it to life. Because we know the caliber of our performance plays an integral part in yours.



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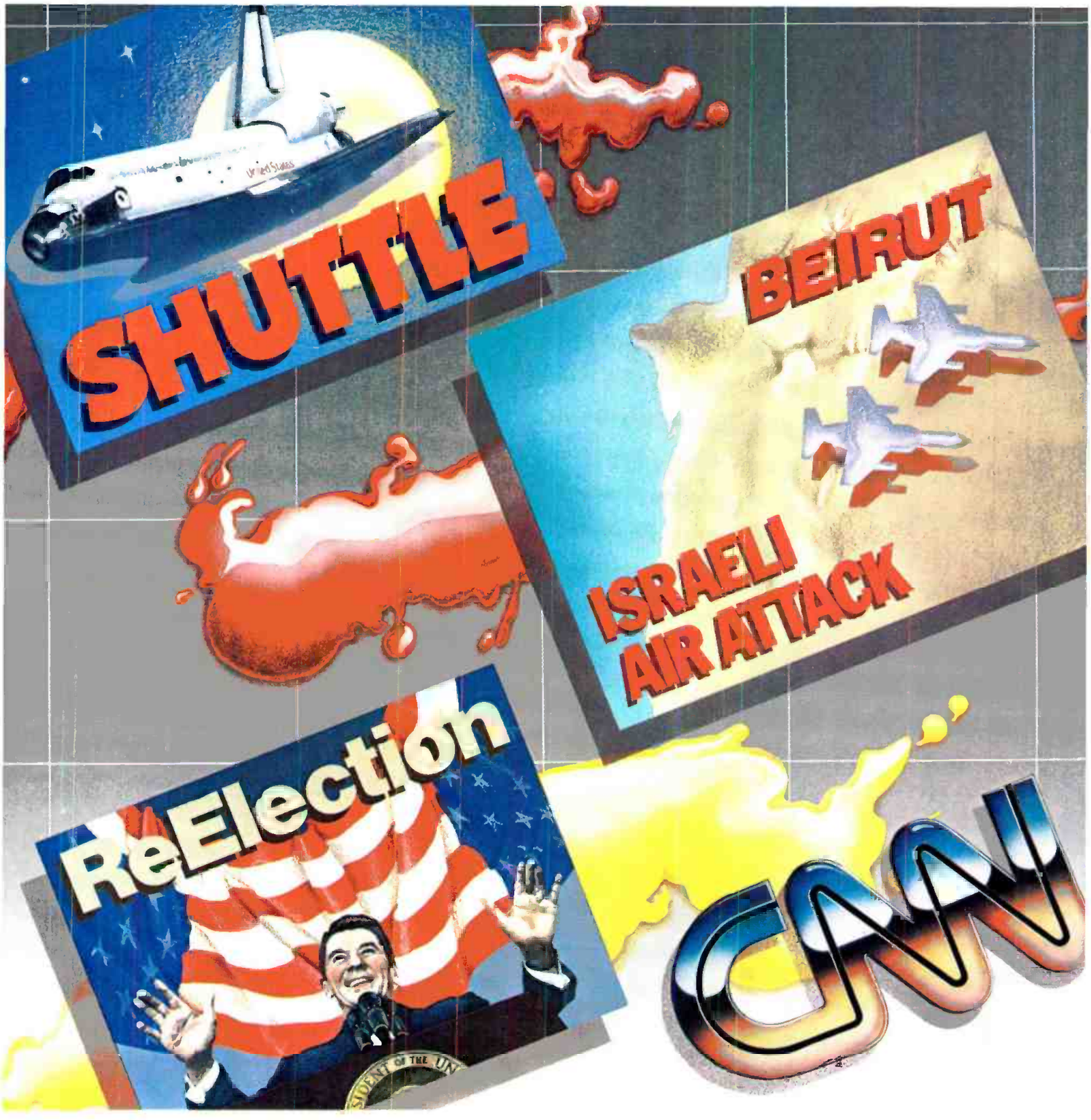
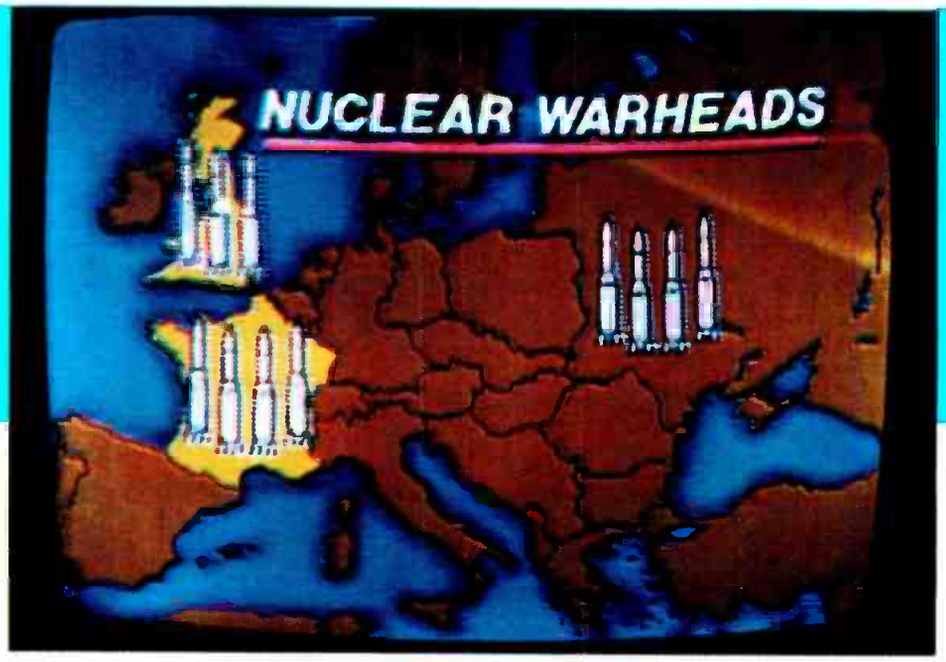
JBL/harman international



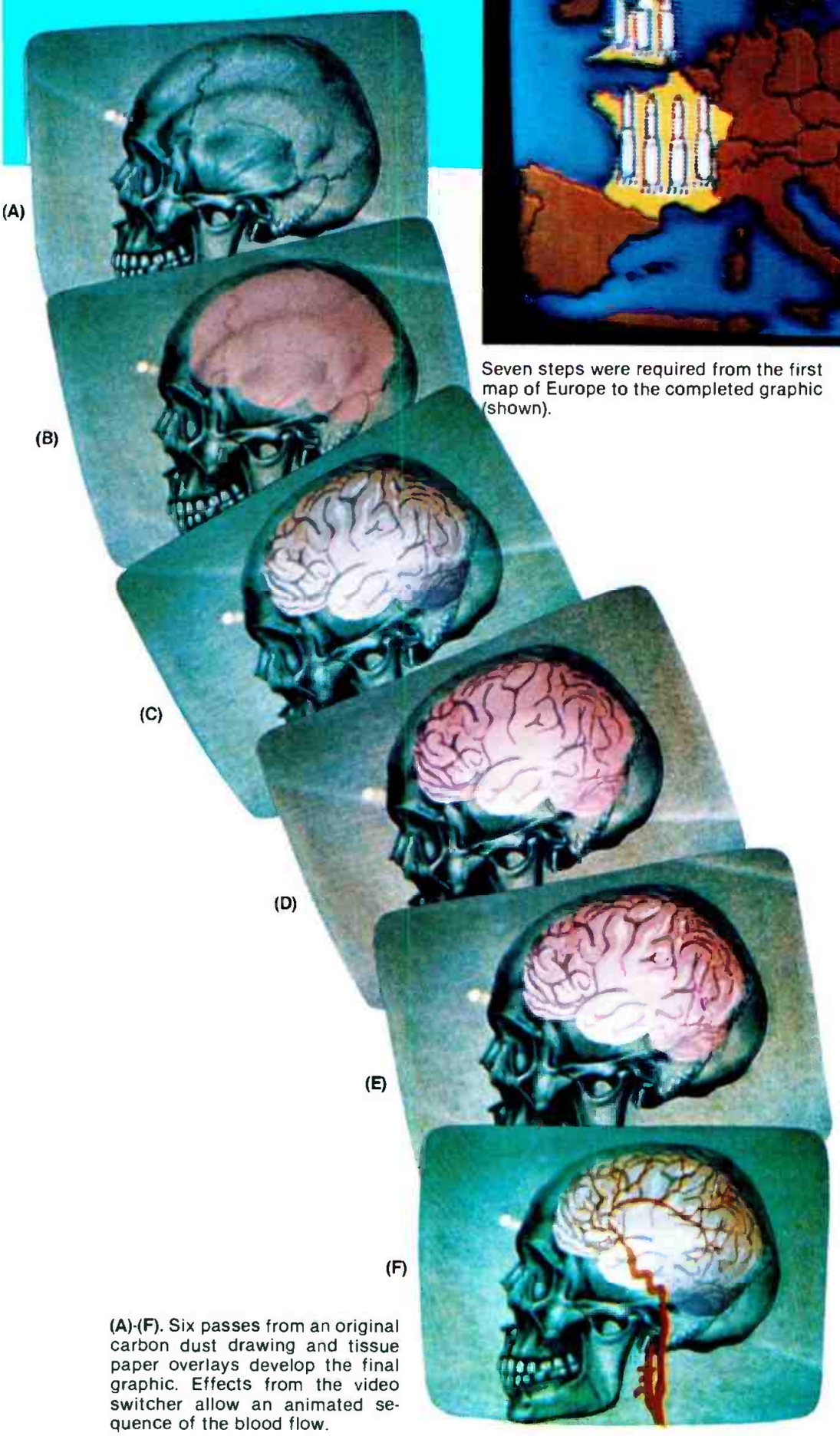
By Bebe F. McClain, president, B.F. McClain Productions, Asheville, NC

How CNN creates graphics

This report, which resulted from a tour of the CNN operation, examines how the ADDA electronic still-store, the ESP-750, has been adapted to satisfy high volume graphics requirements.



Seven steps were required from the first map of Europe to the completed graphic (shown).



(A)-(F). Six passes from an original carbon dust drawing and tissue paper overlays develop the final graphic. Effects from the video switcher allow an animated sequence of the blood flow.

Graphic artists at Cable News Network (CNN) have discovered how flexible the ADDA ESP-750 still-store can be. In the past, the ESP-750 had been considered an optical slide chain replacement. Now artists at other TV stations also are learning how to "cut and paste" graphics electronically, with higher productivity and greater variation.

CNN's setup

Turner Broadcasting, located at WTBS in Atlanta, includes the CNN cable news service and the Headline Service. Of the two, the larger operation is the news service, with 20 graphic artists working in shifts to produce support graphics for 22 hours of news programming daily, which comprises approximately 20 new graphics per hour or 440 complete graphic items per day.

The CNN newsroom is open. As cameras face the news talent, they also see many CNN production staff members in a large open space behind the anchor desks. One-third of this area belongs to graphic arts. (See Figure 1.)

Equipment in the graphics department includes two copy stands with JVC KY-2700 cameras and a production console. Color and monochrome monitors, test equipment, two GVG 1600 switchers, a Thomson-CSF character generator and two operations panels for the still-store systems fill the equipment racks. These two control panels in the master control area and three additional panels elsewhere in the building access five main-frame computers. Each computer may select any of six disk drives, each having a capacity of 750 full frames of video. This comprises the four ADDA systems. A fifth still-store

Continued on page 26

FINALLY, CASSETTE MACHINES FOR PROFESSIONALS WHO'D RATHER SWITCH THAN FIGHT.

At TASCAM, we know how exasperating the hi-fi deck can be in any professional environment. The audio quality doesn't approach that of the machines with which it attempts to interface. The biggest hassle is balancing the entire juggling act with transformers and cables that allow the deck to be imposed into the system in the first place.

Well, the fighting's finally over. Whether your needs are for broadcast, recording studio, or multi-image applications, production, on-air, or sound reinforcement systems, TASCAM's professional 122-B and 133-B Cassette Recorder/Reproducers have got your balancing act wired. Out of the box, ready to go, no modifications. With the flick of a switch, each machine offers full compatibility with both high level +4 dBm, XLR balanced and line level unbalanced systems.

Both machines are built to take the most punishing production/dubbing demands. Each delivers professional audio quality far superior to either hi-fi or cart decks. And each offers the features you expect, helping to improve both the precision and ease of your work.

Why fight the system, when there's a truly professional answer to your stereo or stereo-plus-cue cassette machine needs. TASCAM's 122-B or 133-B. See your TASCAM dealer or write TASCAM Production Products, 7733 Montebello, CA 90640, (213) 726-0303.

TASCAM
TEAC Production Products

Circle (14) on Reply Card

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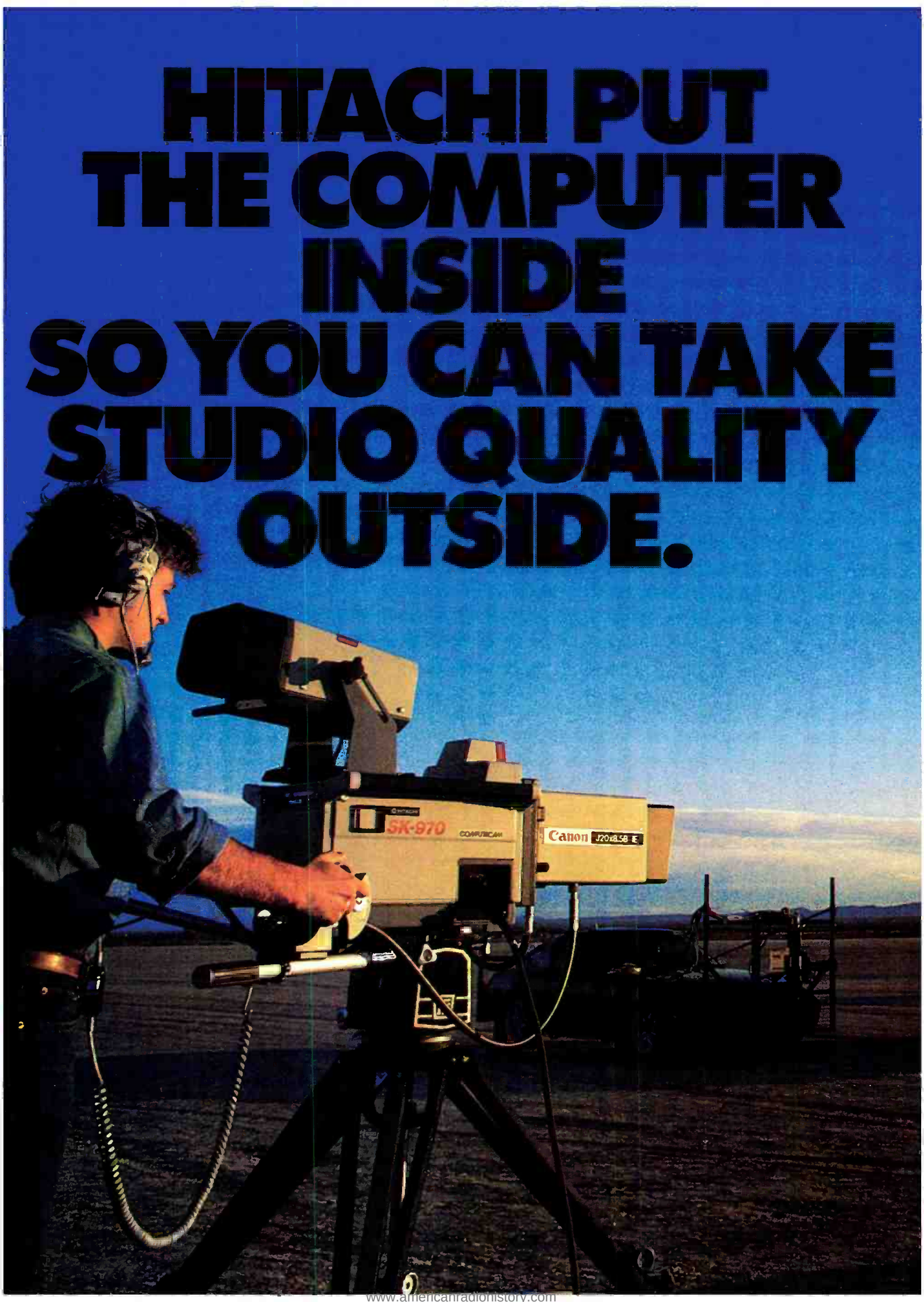

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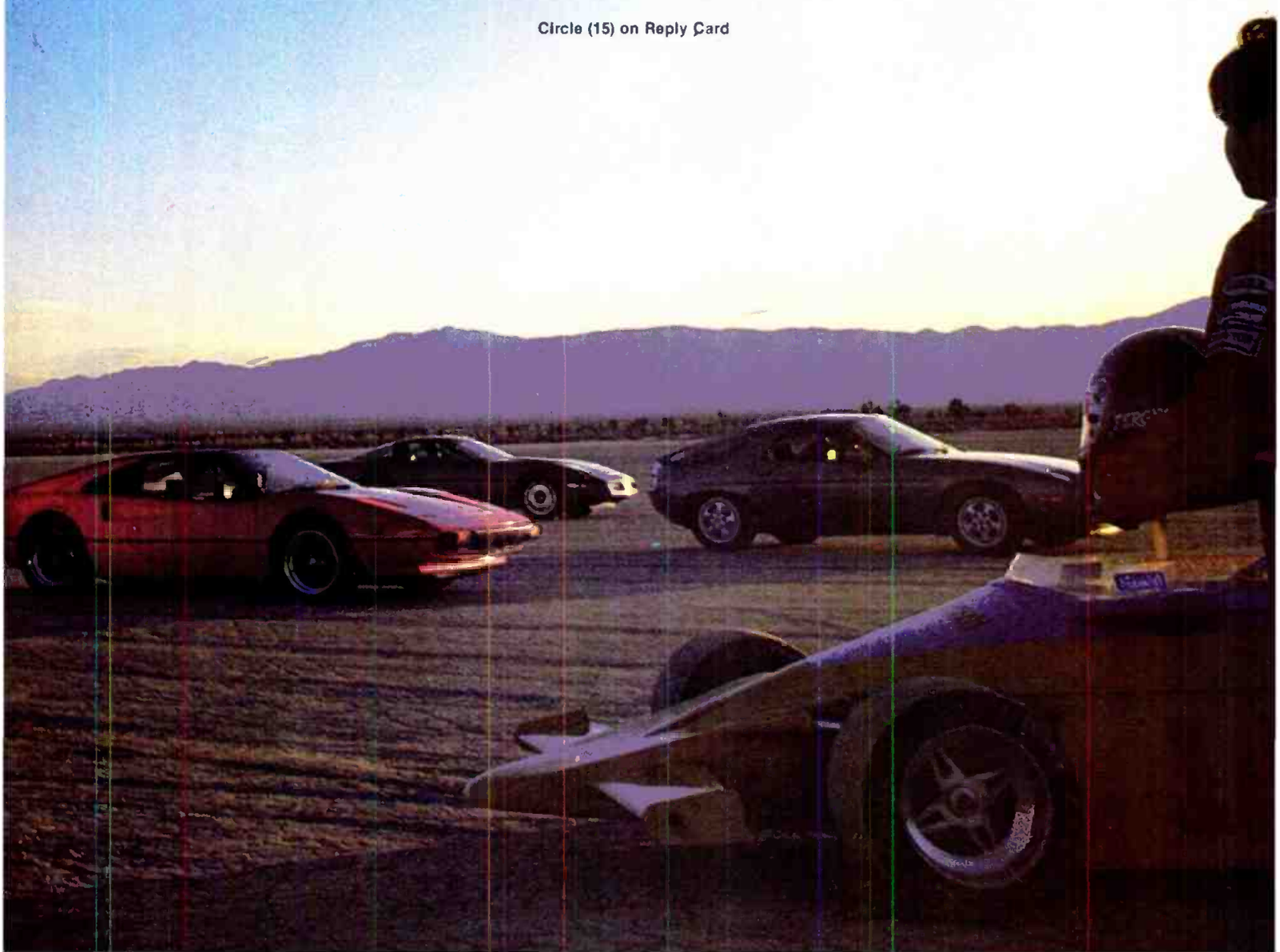


Continued from page 22

is planned to handle the storage load. (See Figure 2.)

The multiple-disk system provides storage for 4200 graphics on a "permanent" basis, while 300 additional frames are changed daily. Three times daily, stills are deleted to accommodate newly created ones, according to news production requirements.

A computer terminal, located in the graphic arts area, accesses a BASYS News Fury computer used by CNN copywriters. An artist, building graphics to complement a story, can read the story copy on the terminal screen. Print-outs, kept beside the terminal, give the planned story rundown for each hour. A run-down sheet lists the story, indicates audio source and states what graphics are needed. A top-story list shows the 14 major stories and all graphics made that day. Each story uses at least three graphics, and these are changed hourly. The artist can punch up a system ID number to view previously used graphics before creating new ones.

A need for graphics

When CNN's 24-hour news service was in the planning stage, graphics were expected to play a key role. Without them, producers faced the

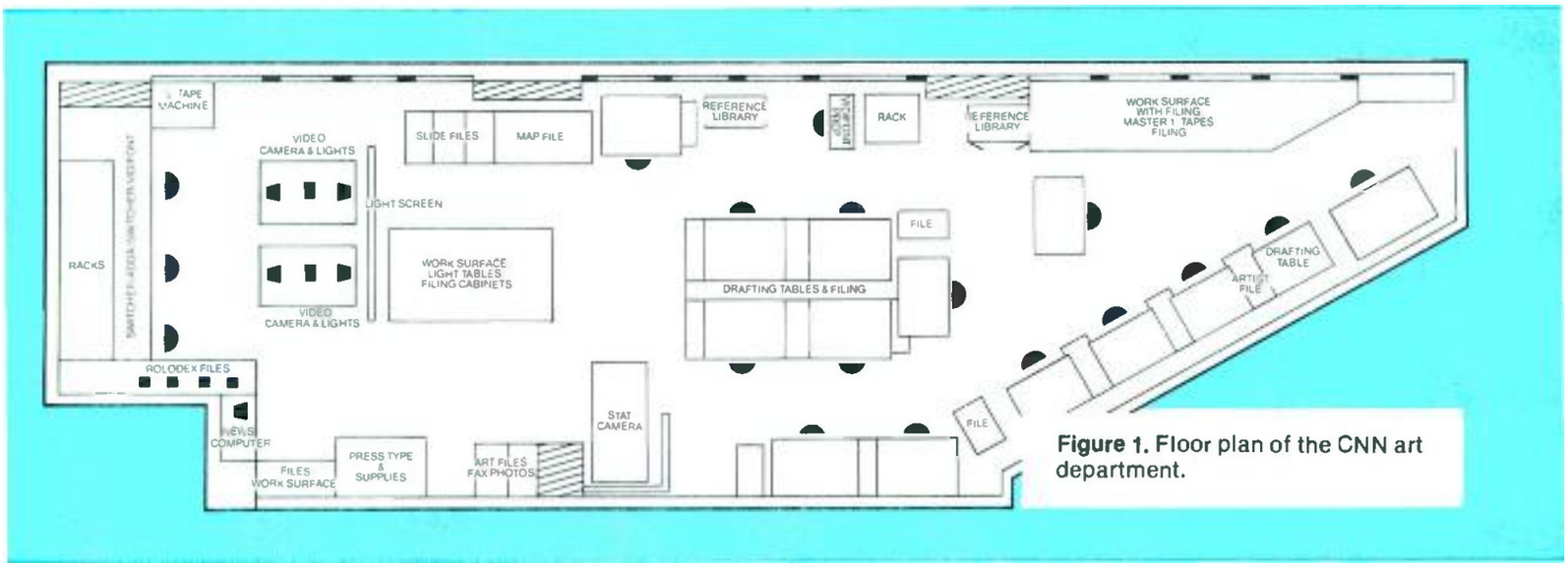
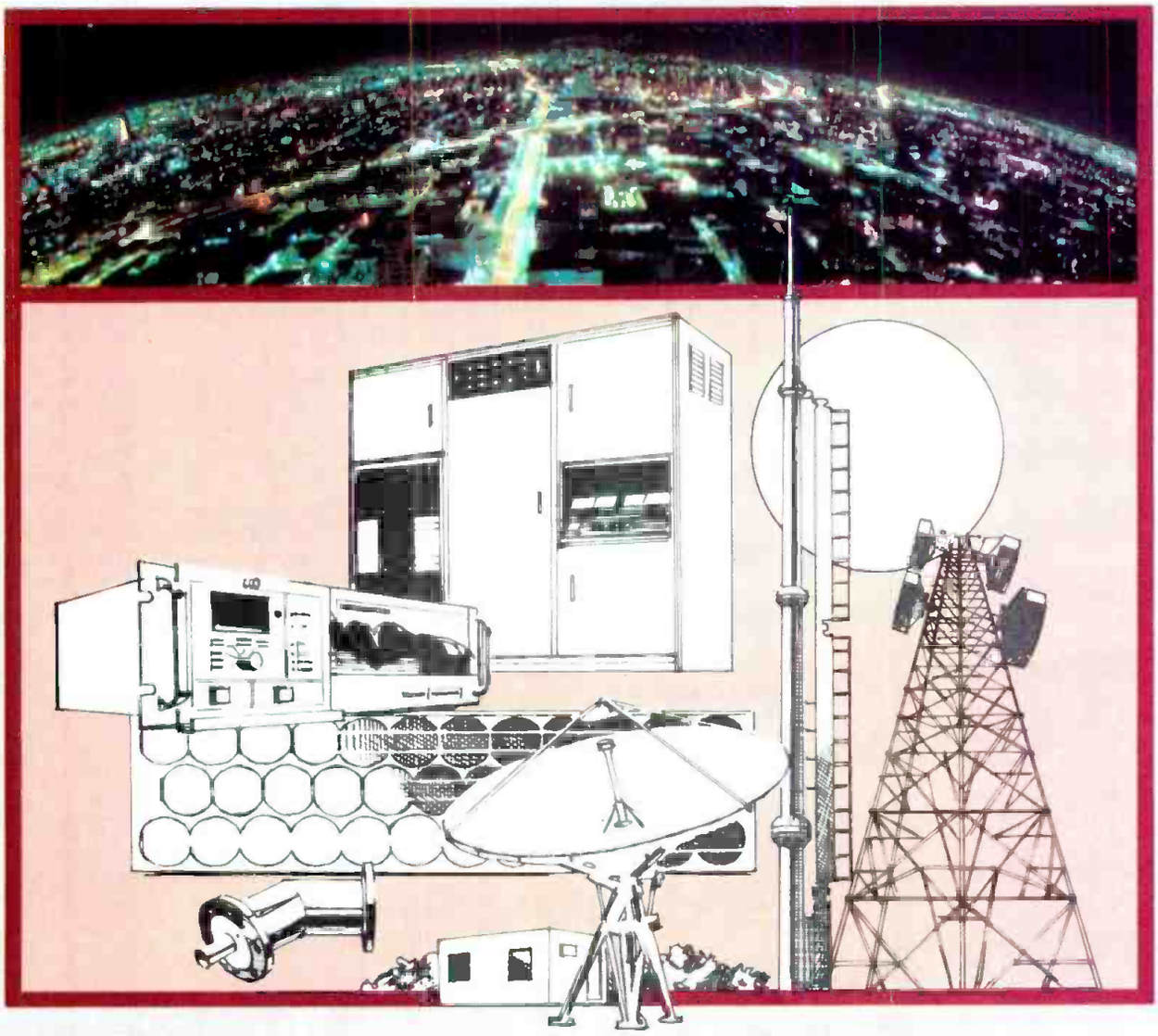


Figure 1. Floor plan of the CNN art department.

The Signal of Reliability



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The Signal of Reliability

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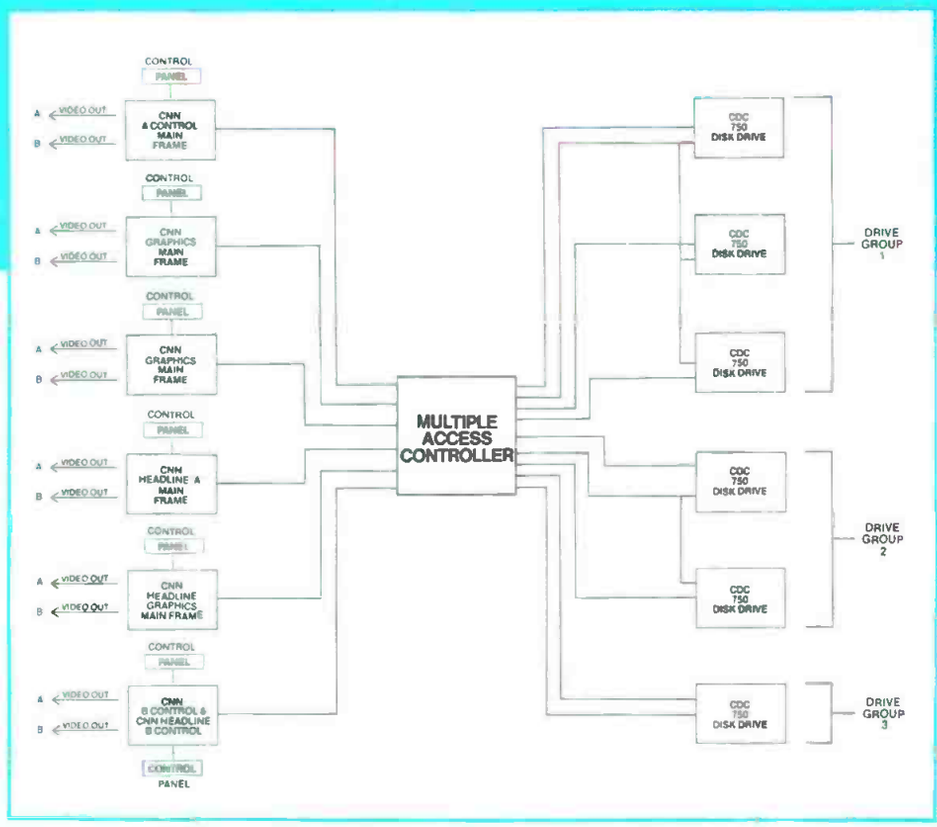
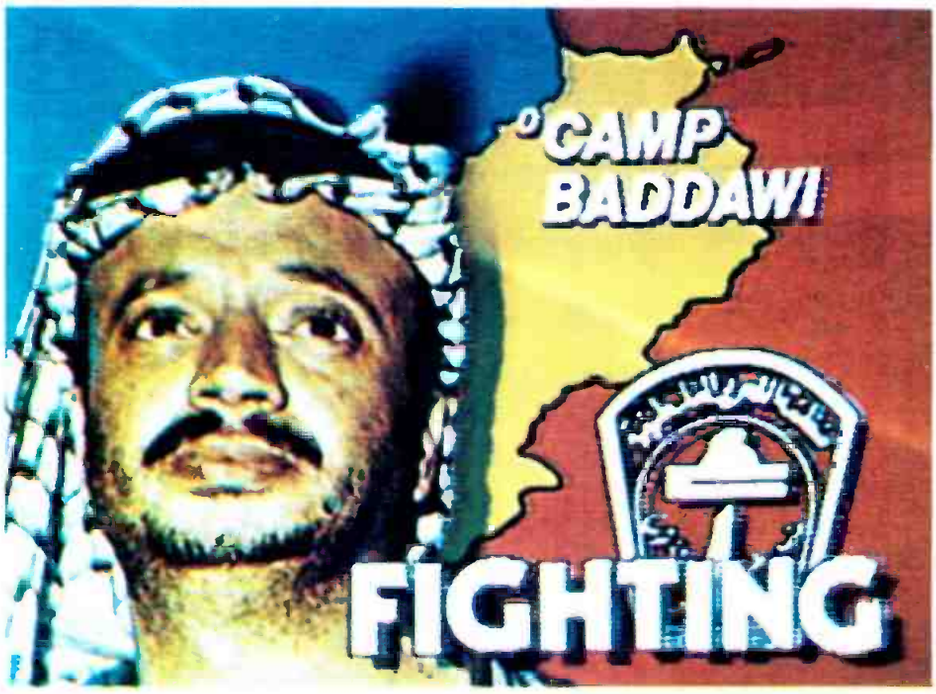


Figure 2. Block diagram of the ADDA equipment and controlling computers.



This complete graphic showing Yasser Arafat took seven passes.

prospect of relying primarily on *talking heads* for segments with no outside footage.

Ann Williams, CNN art director, estimated that, without the still-store production tool, she would need a staff of 50 and about three hours lead time for each story. With the still-store, her 20-person staff provides all the graphics needed 22 hours a day, often with only a few moments notice.

Each hour of the news service is considered a new show, with a new producer and a new story run-down. Top news items carry over hour to hour, but are rewritten, and new graphics are incorporated. The producers specify where graphics are desired, especially for feature stories and special *packages*. For fast-breaking stories, the producer or director may call directly to the graphics control area via intercom to request additional items for the news program.

Method of production

The CNN artists—all trained graphic designers, illustrators or fine arts graduates—work to combine press type, drawings, maps, photos, magazine cutouts and slides into videographics. Their main resources include:

- a *swipe file* of wire photos, magazine articles and other flat artwork, arranged alphabetically by subject and name;
- a *slide file* containing photos of people, corporate or government agency logos and team logos for sports; and
- a *map file* containing hundreds of maps, each on individual art boards.

Enlargement, reduction or reversal of visuals are made on a photostat camera in the center of the graphics area. Materials for a graphic are taken to a video copy stand, where its camera ties into the still-store system. When background artwork is positioned under the video camera, and after adjustments are completed, one full frame of video is placed in the ESP-750 frame buffer memory in analog form.

A second piece of art or type then is placed under the camera. With the ADDA system feeding the stored video into a video switcher in *Key* or *Wipe* mode, the artist sees the second image superimposed over the first, allowing visual adjustments. When the image is correct, the *Freeze* button places the new composite in memory.

Additional elements can be placed under the camera one at a time. Camera zoom position and height above the artwork is variable to change element size before layering.

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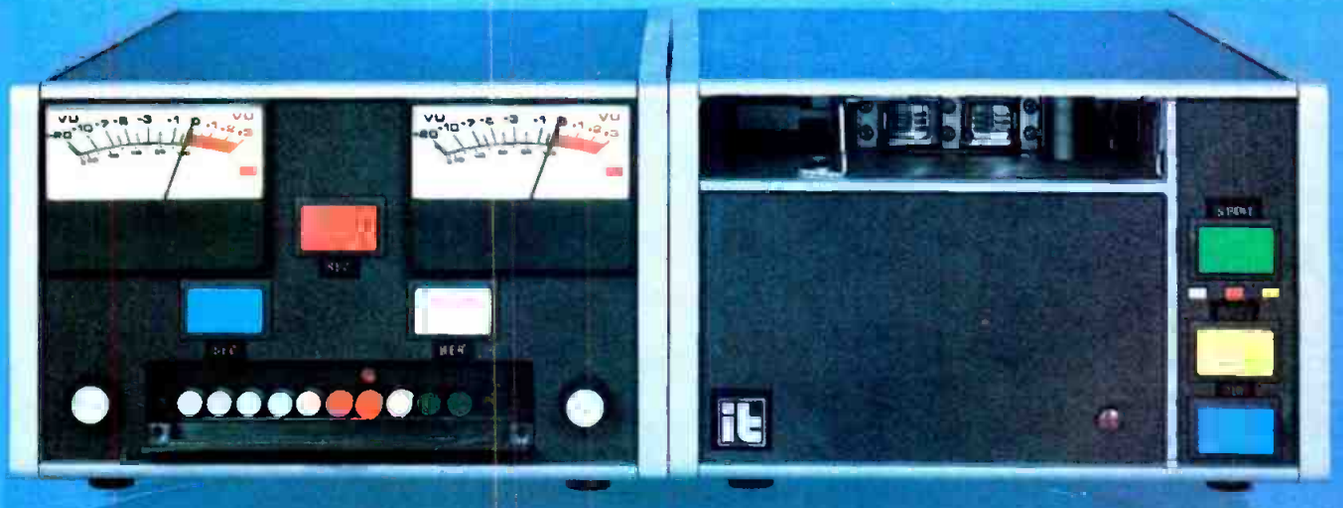

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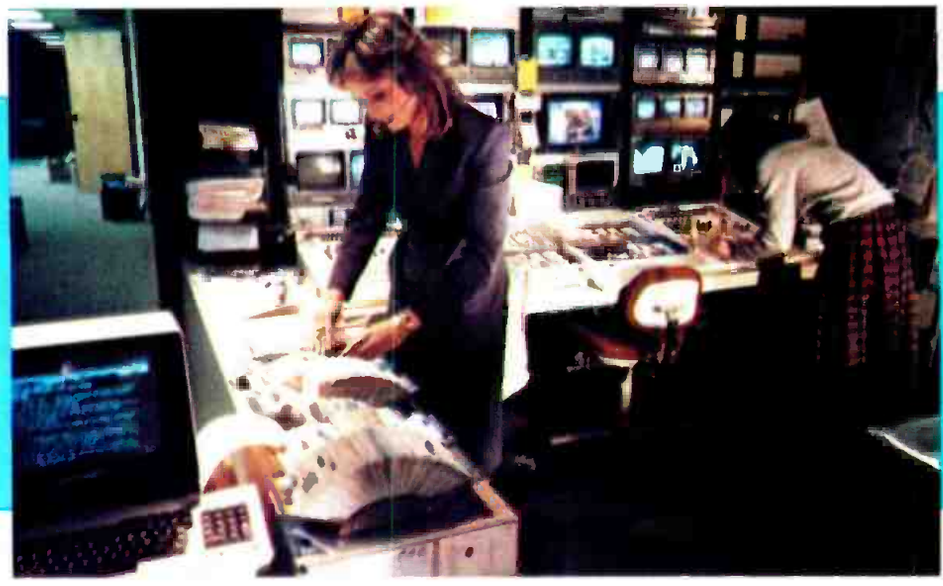

Ann Williams, CNN art director, uses the Rolodex file to locate graphics ID numbers stored in the ADDA system. The terminal, at lower left, ties to the BASYS News Fury automated news system, allowing the art department to check each news story for appropriate illustrations.

Vidifont titles may be put into the system during any pass with another element, thereby incorporating two elements in one pass.

When all elements are frozen in analog form, the artist presses the *Store and enter* control. At that time, the information is converted from analog to digital form and recorded on the hard disk memory. In ADDA's system, composite, rather than component, signals are used to reduce encoding and decoding that tends to degrade signals after needed multiple generations.

A typical news graphic done by CNN, a photo of Yasser Arafat, although made in a few minutes, took seven passes. The recording sequence of passes included the following:

- a map;
- a shadow of Arafat;
- Arafat's photograph;
- a shadow of the PLO logo;
- the PLO logo;
- a shadow of "FIGHTING" (press type); and
- "FIGHTING" and the words "Camp Baddami" (Vidifont).

Shadow effects are used to give CNN graphics a 3-D look. Williams has found that using electronics gives the depth of dimension she desires in a fraction of the time of mechanical methods. Overlapping artwork, creating shadows and showing a third edge are methods CNN artists use frequently for a stand-up look.

Production

The first step in all graphics production is to capture the background. Then, to create a shadow, a piece of artwork is laid under the camera. With the switcher set for a reverse key, the artwork becomes a *black* box. To make the box transparent, the artist fades up the background on a second bus, positioning the fader bar between the two switcher buses. The effect, a transparent drop shadow, is frozen in the buffer storage. Then the artwork that causes the shadow is positioned, slightly offset from the shadow, and is recorded into the composite.

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Circle (20) on Reply Card

Williams and Jon Teschner, ADDA representative, check over a graphic stored in the library.

Fat, exaggerated shadows may be hand-drawn and placed beneath artwork. The result is a dimensional look, as though turned up to expose a third side.

Most color, not already part of the artwork, is added electronically. To add color, black-and-white art is placed under the camera and the switcher is set for a box wipe containing the area to be colored. The color is keyed in and frozen. Additional areas can be boxed in and colored in turn.

Airbrushing, an effect of one color fading into another, adds color and depth to type. Starting at the bottom, part of the title is boxed in and colored, using a soft edge effect. The box is moved so that a new edge overlaps the first, and another color is applied to that portion of the title, also with a soft edge. Usually, three colors are used.

When the identity of a piece of art must be camouflaged, posterization effects may be used. Posterizing, or digitizing, on the still-store is accomplished by removing a board from the system. Additional distortion is possible by colorizing the electronic image.

For almost every hourly CNN segment, basic maps are stored and used repeatedly by electronically highlighting portions. Once an area is highlighted, additional layers of elements are added. Outlining is done last.

Single frames from videotape also can be incorporated into the graphics. A U-matic VTR is installed beside the ADDA production console for that purpose. The artist can grab one frame from a tape to use as the base, or as a layer, in a composite graphic.

Highly detailed artwork often is used at CNN for health-related stories. Margaret Barnwell, formerly a medical illustrator, creates carbon dust illustrations of body organs and full-color cell animation drawings on acetate. With an accurate drawing as a base, Barnwell can modify or highlight areas with additional detail on layers of tissue paper. Networks of veins on individual tissues are added to the base drawing on sequential

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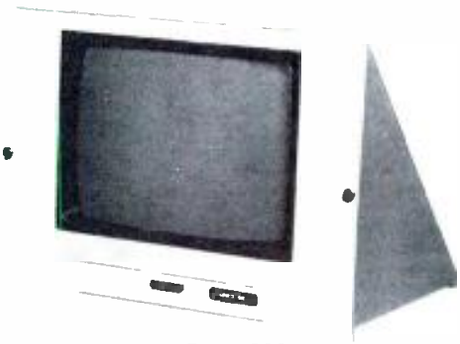

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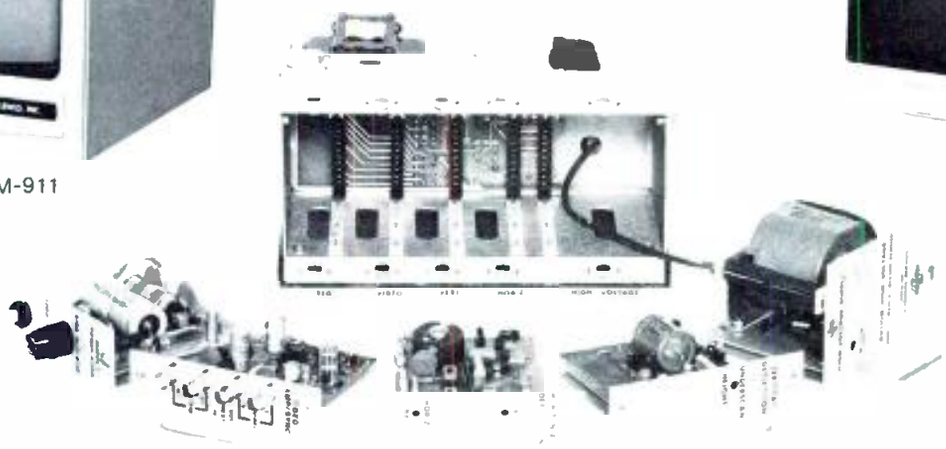
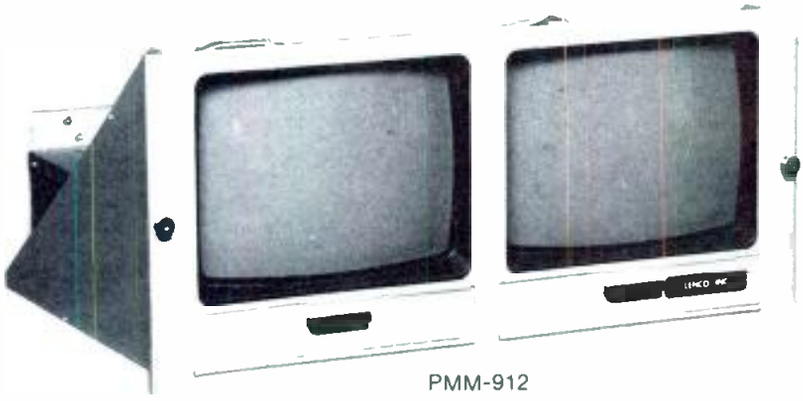


Modules



PMM-912

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Margaret Barnwell, former medical illustrator, prepares artwork for a special story on the brain.

A new, affordable still-store

By Chuck Aronson and Ron Long, ADDA Corporation

Eight years ago, early video still-storage devices were regarded primarily as engineering tools to replace slide chains. Electronic stills could be as immediate as the news stories they illustrated without the continued cost and handling problems associated with slides. Besides cutting costs, saving time and reducing labor, there were other benefits. For example, a TV news director would not need to worry about important slides appearing during the newscast with thumbprints, upside-down, backward, dusty or crooked. Sequences of stills could be edited easily, and the digital technology image quality was identical at each viewing.

Two frame buffers allowed either a dual-channel mode, in which the two outputs operated independently, or a preview/on-air mode, in which a still could be previewed before being passed to the *on-air* output through an internal 2x1 digital vertical interval switcher. All this led to the acceptance of the still-store as a cost-effective and easy-to-use product, but the system basically was still that of a slide chain.

With the introduction of ADDA's ESP-C series in 1981, the still-store found a new role as a graphics production tool, complementing its role as a storage device. With an integral video synchronizer, the two frame buffer outputs can be mixed (in an external switcher) with new images from a copy stand camera and stored again. Transparency of electronics allows as many as 20 successive mix/overlay operations to be performed in creating images with depth and perspective. The accompanying article about graphics at CNN explains how this is done.

Until now, high purchase prices have kept still-store use primarily in the domain of the networks and larger TV stations, even though recent developments in Winchester disk drive technology have resulted in lower cost for storage media. However, ADDA Corporation has introduced the ESP II low cost/compact still-store with digital switching effects, for those with smaller budgets. With new technology and advanced packaging techniques, the cost has been reduced by more than 35%, resulting in a 1-drive system with a capacity of 400 stills at less than $34,000.

The new system has two video channels and digital switching effects with one or two disk drives of various types and capacities, fitting rack space that has been reduced by 30%. While retaining multigeneration transparency, ease of operation and graphics capability, digital switching effects have been included.

Picture quality, of utmost importance to the broadcaster, is based on the same 8-bit, $4xf_{sc}$ sampling scheme as in the ESP-C series. The disk drive data format, compatible with the ESP-C series, allows disk packs to be passed between either type of system or directly shared in a dual-port drive configuration with two systems accessing a common disk drive. Owners of ESP-C systems can add auxiliary ESP II units with complete interchangeability of their data base of stills.

The ESP II mainframe enclosure, requiring 7 inches of rack space, contains three plug-in board assemblies. Two assemblies are freeze-frame synchronizers, while the third contains gen-lock, disk drive control, system control and digital switching effects circuitry. The system can function as two independent freeze-frame synchronizers with a third separate output for the digital switching effects.

The digital switching effects allow a variety of transitions from one still to the next. In addition to vertical interval *(cut)* switching, transitions such as horizontal, vertical or corner wipes; fade or dissolve; and push on, push off or pull off effects may be selected with transition times of 16, 24, 32 and 48 frames. Push and pull functions, which move the stills horizontally on and off the screen, are not found on production switchers. Modifier controls—reverse and midstop—allow transitions in the reverse direction or temporarily halted in the middle.

Sequences of stills are created such that the on-air operator need only press the "next" button for the next still to be switched on-air from preview and the subsequent still to be called to preview. The switching effects may be programmed into the sequence list. Independent synchronizer channels allow effects between two stills, two live pictures or one of each.

Proc-amp controls for the two video channels and system timing adjustments are found on the engineering remote control panel. This unit, only 1¾ inches high, is powered from the mainframe.

Operational control and switching effects are accomplished from a production remote control panel. The production remote, requiring only 3½ inches of rack space, uses dedicated push-buttons for all key system commands. Moreover, the new production remote control is compatible with existing ESP-C systems.

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—Corinne Sousoulas, Art Director Motion Picture Laboratories (Memphis post production house)

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—Dan Sokol, Vice President, Engineering Video Post & Transfer (Dallas post production house)

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Ann Walker, CNN assistant art director, composes a title on the Thomson-CSF Vidifont keyboard.

Teschner checks one of the six disk drives used to store CNN graphics.

video passes. With the switcher, she can electronically wipe red color up the drawing, making it appear as though blood is flowing.

System education

Williams said that an artist requires about a month to become fully trained to produce graphics with the ESP-750 systems at CNN. Through ADDA's training program, supervised by Jon Teschner, formerly a member of the CNN art group, that amount of time can be reduced considerably. Teschner travels for ADDA Corporation, conducting training sessions for system users.

One CNN artist adapted easily to the electronic method of producing graphics. Having been exposed to computer technology, she was not intimidated by electronic systems. Another, however, had to overcome a basic fear of electronic equipment before mastering the system. She had to learn that the control panels and systems would not blow up if the wrong button was pushed. Both now believe they use their skills as designers far more than just their drawing skills. There is more time for creativity, because the time-consuming aspects of drawing, coloring, cutting and pasting have been reduced, if not removed.

Generally, the learning process is a step-by-step procedure, starting with a proficient use of the copy stand video camera. Then the artist learns the control panel of the ESP-750. Finally, the artist masters video switcher effects. Beyond the hardware, the learning experience never stops. The artists at CNN continue to share new ideas, discoveries and techniques with one another.

Artist as technician

With no union at CNN, the artists actually operate the video equipment. They also may act as camera operators, technical directors and still-store operators. Editors often call from an edit suite to have an artist feed graphics directly to the suite. The artists also switch graphics as they go on the air.

The age of disposable art

At the end of my visit, I sat at the ADDA operator control station with the lead artist and went through the *Pack review* mode. The artist viewed hundreds of graphics as they appeared for a second each on the screen. Dozens were earmarked for deletion, an operation that occurs three times daily.

One artist said that the system challenges her imagination to produce the volume of graphics required. With the ADDA ESP-750, the drudgery and much of the stress usually associated with such a production load is eliminated. In Williams' opinion, "The switcher is the scissors and the still-store is the glue that holds the layers together," for an approach that keeps the news visually exciting at CNN.

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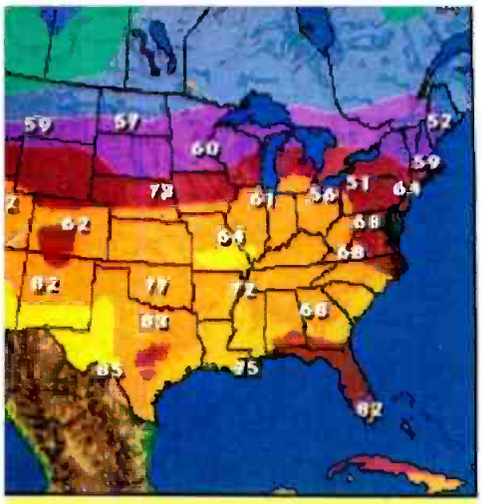

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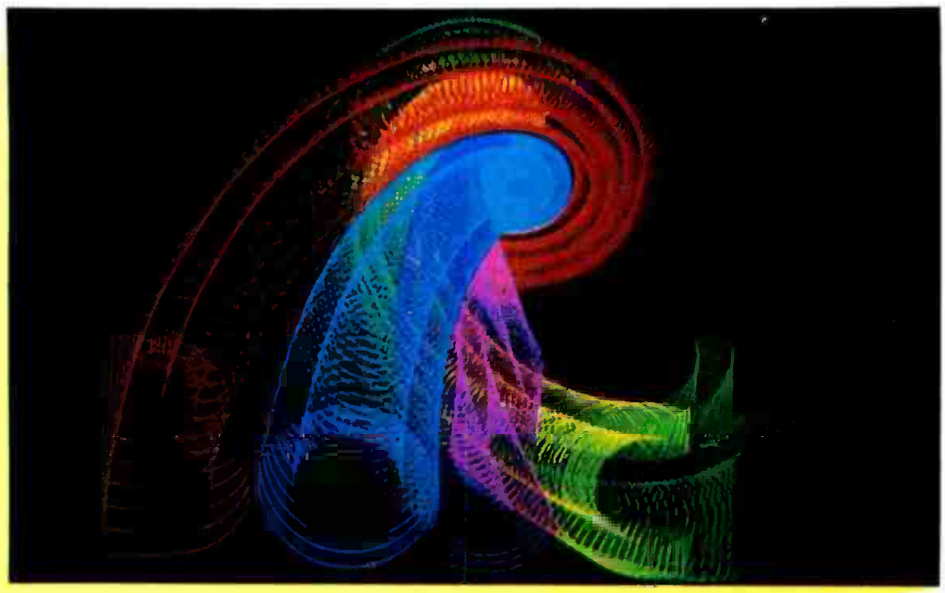


Bosch-Fernseh FGS-4000

Electronic videographics systems:

An update

Photo: Jerry Blank

Digital Graphics Leonardo (CAT-1600)

By Carl Bentz, television editor

Computer Graphics Images

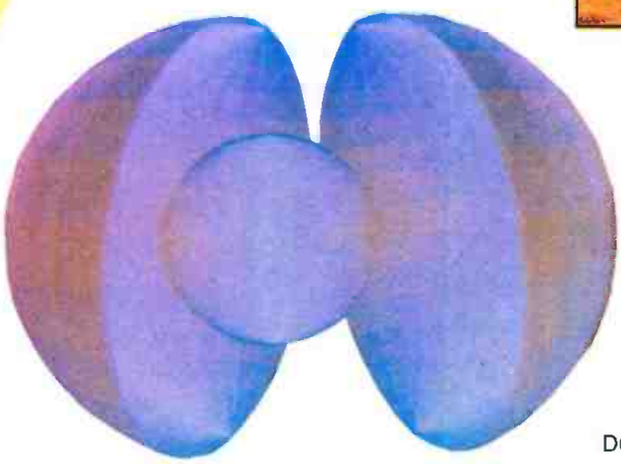


Photo: Keith Thomson

Dubner Computer CBG-2

Television is a visual medium. Keeping it visual requires a good deal of time for a news staff and art department. An ENG/EFP operation or a satellite-relayed news service may add valuable segments of recorded visual material, but sometimes just the right graphic must be created. Electronic videographics equipment, as a tool for the art department, helps get required visuals.

A TV station's plans for using visual material must include techniques for generating those materials. In the case of CNN (see "How CNN Creates Graphics" on page 21), the large volume of material dealing with international topics has led to an electronic still-store version of cut-and-paste artwork that works well. Other facilities, however, prefer the results of the artist at the board, with brush in hand. For such applications, electronic graphics generator systems provide flexible means of creating the right "slide" to chroma-key into the news show, a catchy visual for the station

Continued on page 42

THE CHOICE FOR '84

	Number of Channels	Number of Inputs	Electronic Switching and Attenuation	Distortion (THD)	Signal/Noise Ratio	LIST PRICE
RADIO SYSTEMS ESA-10	10	30	YES	.03	-80	$8,950
Auditronics 212	10	20	YES	.1	-78	$12.389
Pacific Recorders BMX-10	10	20	NO	.025	-75	$13,250

Specifications per manufacturers' brochures.
Consoles priced comparably equipped.

COMPARE VALUE.

For thousands of dollars less than its closest competitor, the ESA-10 from Radio Systems delivers superb sound and complete operator control of every audio function. In 1984, high performance in a broadcast console is finally available at the right price.

COMPARE PERFORMANCE.

Electronic Step Attenuation is the name for flawless audio control.

Inputs are switched by CMOS circuitry and attenuated by digitally encoded commands as they enter the console. Then the signal is routed directly to output stages. This shortened path results in super-low distortion, ultra-low noise and excellent RFI immunity.

COMPARE FEATURES.

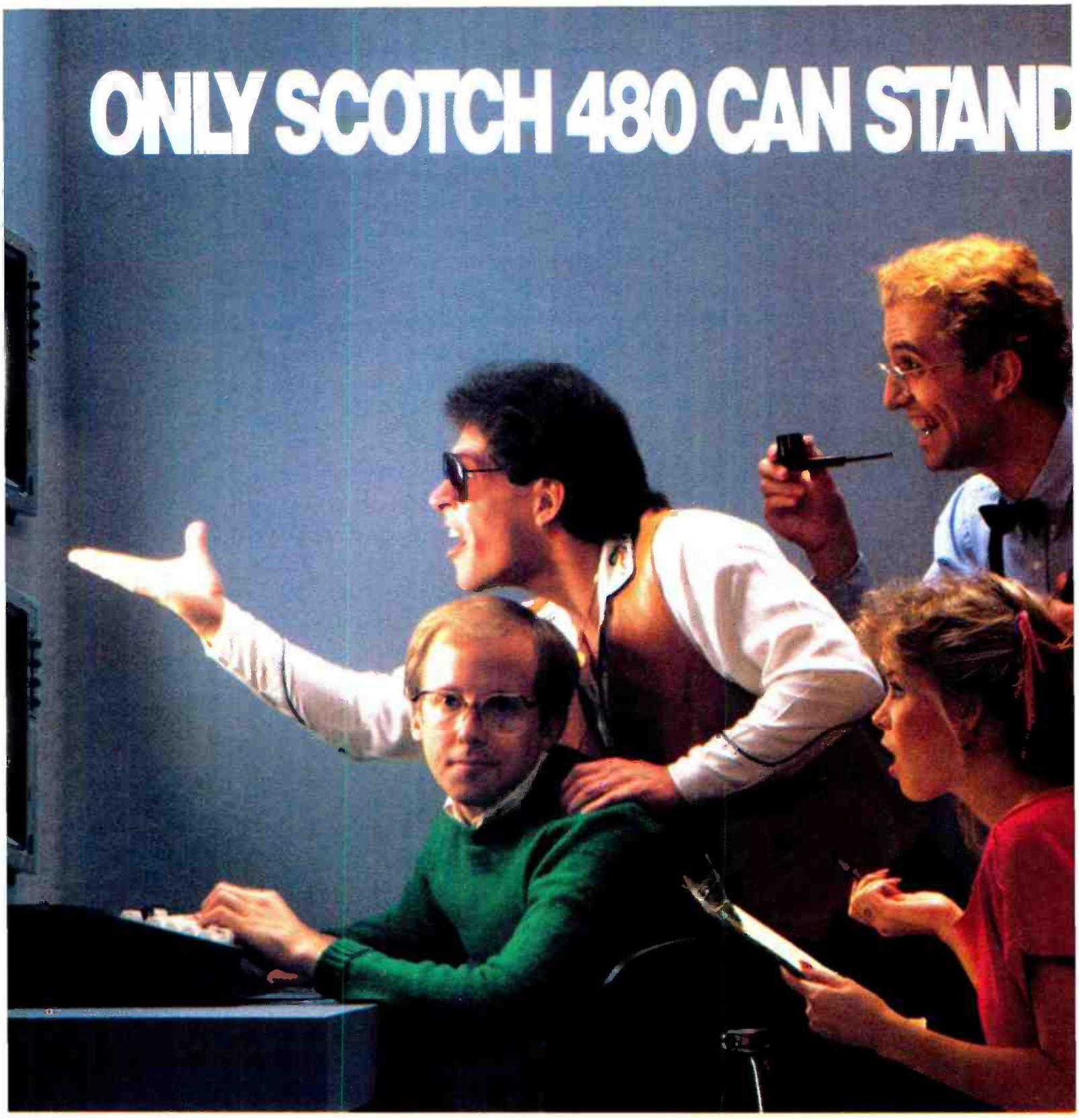
Standard features include: 30 inputs/dual output/remote control/clock and timer/test oscillator/set up meter/mono-mixdown/three stereo meters. No other console is so fully equipped.

Call Toll Free 800-523-2133.
In PA (215) 356-4700.

RADIO SYSTEMS

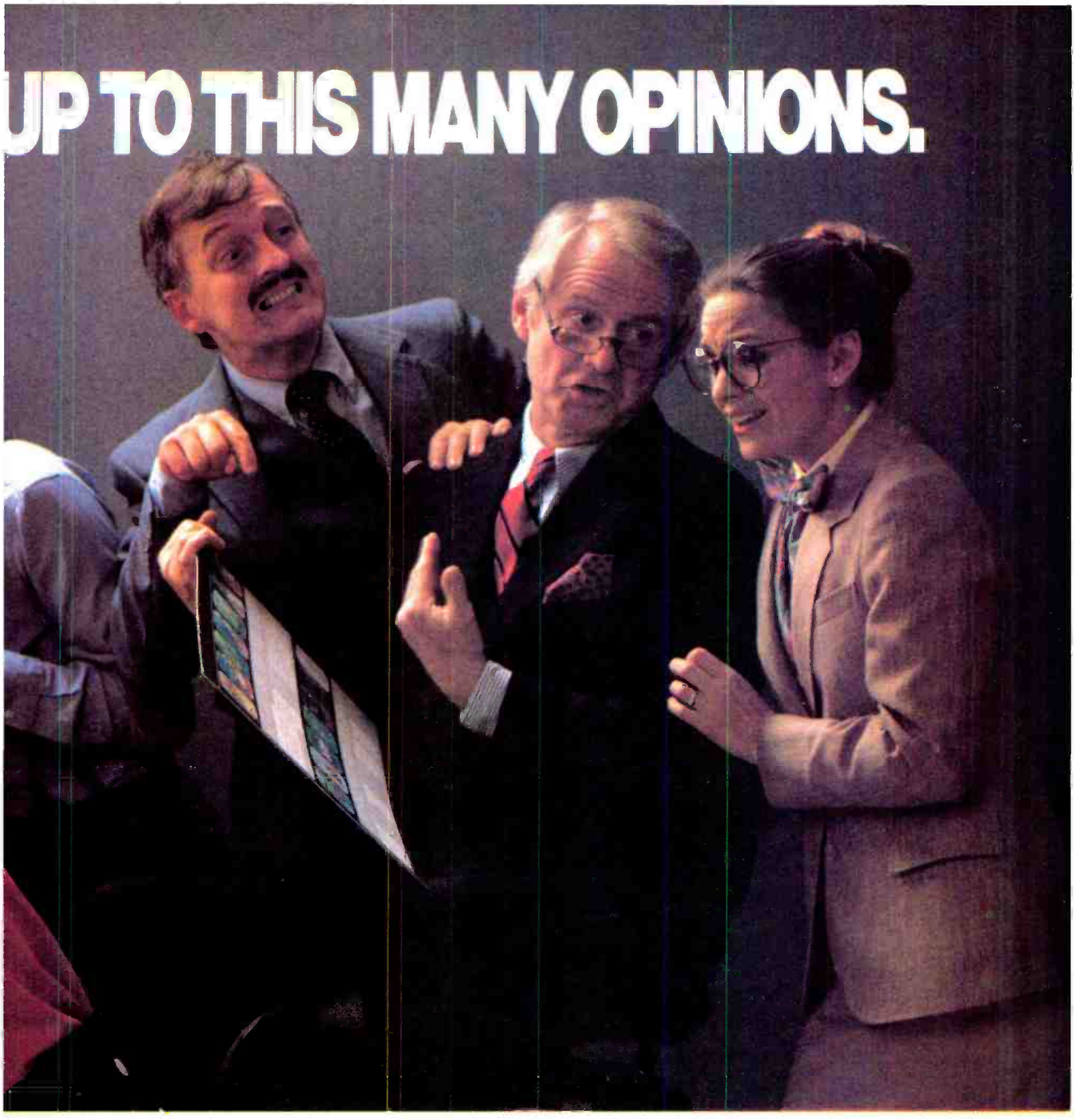
P.O. BOX 356 • EDGEMONT, PENNSYLVANIA 19028

ONLY SCOTCH 480 CAN STAND



Every opinion expressed in an editing session adds up to more starting, stopping and rewinding of the tape. And that can lead to reduced picture quality, unless you've got new Scotch™ 480 one-inch video tape working for you.

An advanced magnetic dispersion, consisting of a totally new oxide, binder and lubrication system on Scotch 480 video tape keeps your productions looking good through the toughest editing sessions. In fact, 3M lab tests have shown 480 video tape capable of delivering *over 1,000 edits from the*



same preroll point, with no significant reduction in playback picture quality.

If your video requirements call for a tape with that kind of durability and image quality, call 1-800-328-1684 (1-800-792-1072 in Minnesota) for more information about Scotch 480. Your productions will look better and so will you.

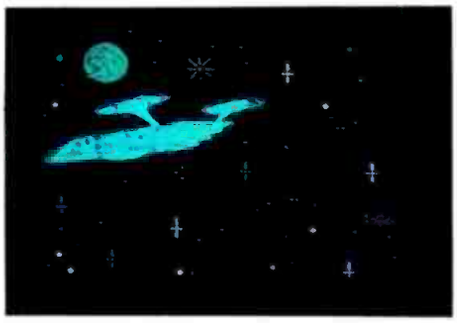
Magnetic Audio/Video Products Division/3M.

SCOTCH 480
1" VIDEO TAPE.
LASER TESTED
FOR CONSISTENCY.

3M hears you...

3M

Continued from page 38



MPB Vista

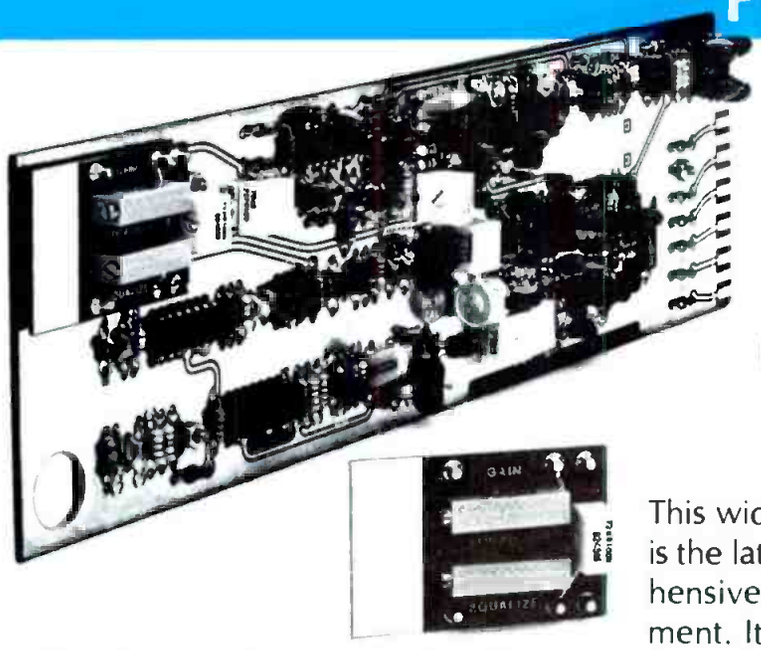
McInnis-Skinner NEWSCAN

Medigraphics Patran-H

Table I.
Guidelines to electronic videographics

Features	Questions
Ease of use	Is the system user-friendly? Can it be operated efficiently by non-technical people?
Menu control	How are the menus arranged? Do they guide the operator? Is the menu displayed on a separate monitor, in color, with all information easily located? Is the menu combined with the picture being generated?
Available colors	How many colors can be used at a time? How many colors and tints are available to use?
Color adjustment	Can colors be mixed? Is the artist limited to a fixed color selection?
Brush shapes	How many different brush shapes are available? Can a special shape be created, if required?
Air brush	Is the air brush technique available for those fine and subtle gradations and shadings?
Image modification	Can the image be altered, edited or modified, allowing a stock image to fit a special purpose?
Edging effects	Are shadows and various edging effects inserted manually? Can edging effects be generated for 3-D illusion automatically?
Image quality	How crisp is the generated visual? Is the focus as sharp as the CRT display will allow? Does the system exceed the typical NTSC TV system?
Anti-aliasing	How good is the resolution? Are algorithms included to smooth out lines and to avoid apparent motion in the picture caused by NTSC characteristics?
Picture expansion	During the generation process, can the picture be expanded to make fine details easier to create?
Display planes	Is the system a multiplane system, allowing a foreground and a background to be handled separately?
Animation capabilities	Can the system be used for real time animation, with dissolves between planes? Is motion within a plane possible? Can cell animation be done?
Video input	Can a camera or other video input be used for image generation? Does the camera digitizing input allow color? Is it limited to black-and-white? Does the system allow a graphics tablet?
Available fonts	How is titling added to the image? Are fonts or typefaces limited? Can fonts be created?
Weathergraphics	Does the system tie directly to a weather service for automatic displays of maps, clouds and numerical data? Is the system essentially limited to weather use? If the station also uses a newsroom computer, are tie-ins between the two possible?
Storage systems	In what format are images stored? Are discs floppy or rigid? What storage capacity of complete images is possible? Are multiple-disc memories allowable as a library function? Can more than one system be tied together?
Operator access stations	Are all operations done through one control panel? Can multiple-control and recall-only display terminals be interfaced?
Geometrics	Can the operator access geometric shapes from the menu to aid in image generation?
Cut-and-paste	Does the system software allow the cut-and-paste technique? Can sections of the image be moved intact?
Basic system	Is the basic system a graphics generator or a character generator with graphics options?

HIGH PERFORMANCE



Video Equalizing Amplifier VEA-662

$265.00

This wideband, six-output amplifier is the latest addition to our comprehensive line of distribution equipment. It features differential input, soft backporch clamping and easily set, continuously variable equalization from zero up to 300 meters (1000 feet) of Belden 8281 or equivalent coaxial cable. Delay trim and common mode hum null controls are also provided. A unique feature of this ultrastable, low power amplifier is a removable sub-module which contains the operational controls for gain and equalization. This allows instant, adjustment-free amplifier substitution.

Here are some prominent **SPECIFICATIONS**

Input

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

Outputs

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

Timing

Delay	25.4 ns (32.7° at 3 58 MHz)
Adjustment range	typically 6° at 3.58 MHz

Power Requirements

Total power dissipation	< 2 W

Performance

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

Equalization

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

Compare price and performance . . . then give us a call.

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

LEITCH

Circle (26) on Reply Card

Leitch Video Limited
10 Dyas Road
Don Mills, Ontario M3B 1V5
Tel.: (416) 445-9640
Telex: 06 986 241

Videographics manufacturers

Use this listing, with Reader Service Numbers, to obtain additional product information.

P. Albrecht Elektronik .....(301)
TX83 videotex system
Alden Electronics .....(302)
Weathergraphics
Aston Electronic Designs Ltd.(303)
Font compose unit for Aston character generators
Aurora Systems .....(304)
AU/100 graphics
New weather software
Beston Electronics .....(305)
Font compose option for Marquee character generators
Bosch-Fernseh .....(306)
FGS-1000 graphics
FGS-4000 graphics
British Videotex & Teletext ..(307)
Teletext graphics
Chyron Corporation .....(308)
RGU camera/font composer
VP-2 generator, Digifex option
ColorGraphics Systems .....(309)
NewStar and Liveline newsroom systems, with graphics and weather
Computer Graphics Lab .....(310)
Images graphics
Tween, Tweep, Scan, BigPaint and Record software for improved graphics and animation

Thomson-CSF Vidifont V

Digital Graphics Systems ...(311)
CAT-1600 series fine arts graphics
Election reporting software
Dubner Computer Systems ..(312)
CBG-2 graphics
ESD weather interface
Election, sports formats
The Fantastic Animation Machine .....(313)
Graphics system
Florida Computer Graphics ..(314)
Graphics system
FOR-A Corporation .....(315)
FVW-300 generator with light pen to draw on screen
GEC-McMichael Ltd. .....(316)
Clock/logo generator
Gresham Lion Ltd. .....(317)
Supervisor 214 graphics
Harris .....(318)
VG Electronics TTS4 teletext graphics
Interand .....(319)
Telestrator 440 graphics
Weather software
Kavouras .....(320)
TADAC C-Band and S-Band radar displays
GOES weather display capability
Logica Ltd. .....(321)
ICON graphics

Continued

One of the world's smallest digital still stores is also one of the largest.

Introducing "Snapshot" from MCI/Quantel. Only 12¼ inches high by 19 inches—including removable cartridge Winchester disk drive!

Snapshot is not only the smallest of MCI/Quantel's DLS 6000 series units—it's one of the smallest digital still stores in the world.

Snapshot lets you capture pictures from live asynchronous feeds, store up to 400 of them with titles, and replay them on demand. You can prepare and edit sequences or stacks of sequences. And you can search by title.

Need more? You can increase Snapshot's storage to 1,600 pictures. Or you can upgrade it to a DLS 6020 with on-air cuts and dissolves. Or upgrade it further to a DLS 6030, the most powerful still store available with production effects that bring an exciting look to your stills.

If that's not enough, you can integrate up to seven Snapshots—or other DLS 6000 series units—as workstations into our Central Lending Library (CLL). Now you can store over 10,000 stills at each workstation and have simultaneous access to 100,000 more from the CLL. Plus unlimited off-line storage on disc cartridges or videotape.

You can even include MCI/Quantel's Paint Box as one of the workstations. So you can create the finest electronic graphics ever seen in television and have them instantly available for on-air use as well as library storage.

So whether you want a small system or a big system, Snapshot is the place to start.

Call your local MCI/Quantel office for more details. Or get in touch with us directly at 415/856-6226. Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303.

MCI/QUANTEL

The digital video people.

MCI/Quantel and "Snapshot" are trademarks of Micro Consultants, Inc.

Circle (28) on Reply Card

MCI/Quantel .....(322)
Paintbox graphics
MPB Technologies .....(323)
Vista graphics systems
McInnis-Skinner & Associates .....(324)
NEWSCAN newsroom system
Zephyr weathergraphics
Election, sports software
Medigraphics .....(325)
Pantran-H graphics
Satellite Broadcast Network .(326)
GOES weathergraphics
Swanlind Ltd. .....(327)
TM108 character generator
Graphics package
Symtec .....(328)
PGS III graphics with Apple hardware
Synsat Communications ....(329)
Stormscan weathergraphics
Weatherpix, weatherwire, radiowire

Via Video System One

3M .....(333)
Camera compose option to D-8800 character generator
Technology Service .....(330)
Series 2000 weather radar displays
Texscan/MSI .....(331)
Zgrass graphics
Thomson-CSF Broadcast ...(332)
Graphics V Vidifont graphics
WSI weather interface
Vidicast, VidiSports software
Unitel .....(334)
Teletext graphics
Scriptel P, Graphtel graphics
Vectrix .....(335)
VBX-TV graphics
Via Video .....(336)
System One graphics
World System Teletext .....(337)
VG Electronics TTS4 teletext graphics

ID, animated sequences for most requirements and even a projected backdrop for a special production. Weather reporting adds another dimension to graphic needs, using radar imaging, photographs from satellites and a host of other meteorological data for the complete picture, often with multiple map presentations and numerical data overlayed.

If you need generated graphics with flexible capabilities, fast access to stored images, editing/retouching of visuals and animated sequences, an electronic videographics system also may be for you. But what should you look for in such a system, before you invest in a major purchase? System cost and image quality are important, but so are a number of other features. A list of some of these features is found in Table I. While looking for a graphics system, check these features and questions to help select the system that best suits your needs.

There are other aspects of various systems that you will want to investigate as well. To get more information, use the manufacturer listing with Reader Service Numbers. The notes with each company indicate the model number and capability of the company's product.

NEW FROM UTAH SCIENTIFIC

A NEW DIMENSION IN MASTER CONTROL SWITCHING

Utah Scientific, the industry's number 1 supplier of routing switchers, has now applied its talents to an allied area—Master Control Switching. Designed for immediate conversion to stereo and / or station automation, Utah Scientific Master Control Switchers are designed to deliver superior performance today while accommodating your future needs as well.

- *Two models: two bus and three bus*
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- *28 direct inputs plus two assignable from panel*
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- *Available with or without station automation system*
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- *Separate 8 x 3 audio only matrix included*
- *Four large LED VU meters*

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Circle (30) on Reply Card

Digital video processor update

By Carl Bentz, television editor

Digital-based video equipment is rapidly replacing traditional analog instruments. This short overview of TBC, still-store, effects and graphics systems provides a guide for locating information on these complex, yet versatile, devices.

Digital concepts in video processing have resulted in many tools for video production. Time base correction and frame synchronization equipment, among the first products to use digital techniques on a large scale, now appear as integral parts of other processing systems. TBCs are essential if VTR, VCR and videodisc playback capabilities are planned in video productions. ENG microwave feeds and satellite-relayed programming require frame synchronizers for live segments used with effects in local news or other shows.

Still-store systems, based on floppy and rigid (Winchester) disk memories, also have evolved from relatively simple production tools to sophisticated devices. What once was a means of holding a still frame of video, a slowly stepping sequence of stills or a slow-motion segment now presents a means of holding hundreds of thousands of individual images. Individual stills or a sequence of animated video may be called from the systems. But although still-store systems are important in themselves, they have become merely an integral part of even more esoteric effects and digital arts systems. Some of these electronic slide projectors or slide libraries include production effects to further enhance their value in production and on-air use.

One area that consistently draws interest at equipment exhibitions is digital video special effects. Methods of dealing with effects and video manipulations seem to rely heavily on high volume solid-state memories and LSI circuitry. These systems, however, also are combined with multiple microprocessors to control frame buffer memories and frame synchronization for their operation. Added to the innovation in processing circuitry is a new technology: the magnetic bubble memory. Although considered too slow for processing activities, bubbles in rugged cassette-type packages form convenient non-volatile storage systems for effects sequence programming of some systems.

Videographic art systems do not yet equal the subtlety of an artist's brush or the detail of pen and ink. But, electronic videographic systems make quick work of logo generation, image retouching, animation, original art and production backgrounds for television and theater. Most systems offer

WHAT STANDS SEVEN INCHES HIGH, CONSUMES ONLY A PINCH OF POWER, COSTS LESS THAN $30,000 AND IS THE PICTURE OF QUALITY?

Why, the revolutionary A42 video slide projector, of course.

A digital slide store doesn't have to be a bulky system loaded down with unnecessary features to justify a hefty price tag. We proved that to you at NAB '83 with our latest generation digital video slide storage system — the A42. This rack-mountable little beauty stands only 7 inches high! It combines the very latest in Winchester disk and digital video processing technology to deliver the highest quality images. And the price is right at $29,900. We've got features galore, including: on-line storage of 100 frames/200 fields (expandable to 300 frames/600 fields), automatic intermixing of field and frames, and an optional high-speed digital streaming tape drive for backup and off-line storage.

The A42. It's your opportunity to get full broadcast quality in the world's smallest slide store system. For details, call (415) 571-1711, or write to Abekas Video Systems, Inc., 319 Lincoln Centre Drive, Foster City, California 94404.

Abekas

Video Systems, Inc. 319 Lincoln Centre Drive, Foster City, California 94404

Circle (31) on Reply Card

DIGITAL VIDEO EFFECTS SYSTEMS

Equipment for visual image manipulation, aspect alteration, and/or dimensional distortions. Digital techniques are used in the operation. Simpler key, border, wipe, etc., effects may be within the repertoire, but are not listed here.

Manufacturer	**ADDA Corporation**	**Ampex Corporation**	**Digital Services Corporation**	**Grass Valley Group**	**MCI/Quantel**
Model Number	**VIP(1)**	**ADO**	**Digifex(2)**	**DVE-2**	**DPE 5000/Plus**
Video Output Channels	1	4	1	1	5
Image Size Changes:					
Compression (H and V)	Yes	Yes, 100%	Infinite	Infinite	Infinite
Expansion (H and V)	.....	>100%	Yes	Infinite	x4
Rotation Around Axes	X, Y	X, Y, Z	X, Y, Z	X, Y	X, Y, Z
Perspective Changes:					
Along Horizontal	No	True perspective	No	No	Yes
Along Vertical	No	True perspective	No	No	Yes
"Elastic Sheet"	No	No	No	No	Yes
Page Turn	No	Linear plane only	Yes	No	No
Multi-image Freeze	Yes	No	No	Yes	Yes
Image Trail Freeze	.....	No	Yes	Yes	Yes
Image Positioning	Yes	Yes	Yes	Yes	Yes
Picture Splits	Yes	Multichannel	Yes	Yes	Yes
Key Tracking	.....	No	No	Yes	Yes
Mirror Imaging (H and V)	.....	Yes	Yes	Yes	Yes
Push-Pull Wipes	Yes	Multichannel	Yes	Yes	Yes
Posterization	.....	No	Yes	Yes	No
Programmed Sequences	Yes	Yes	Yes	Yes	Yes
Mass Memory Type	.....	Disc	Disc	Disc	Disc
Auto/Manual Transitions	Manual	Either	Either	Either	Either
Reader Service Number	**344**	**345**	**346**	**347**	**348**

(1) Also available from ADDA is the AC20A, providing positional/wipe effects.
(2) A recent introduction by DSC is the FlexiKey effects generator for use with any video switcher. A variety of pre-programmed image manipulations may be used manually or automatically.

Manufacturer	**MCI/Quantel**	**Microtime**	**NEC America**	**Precision Echo**	**QuesTech Ltd.**
Model Number	**Mirage(3)**	**T²E-120**	**E-Flex**	**Squeezer**	**6101P**
Video Output Channels	Multiple	1	1 or 2	1	1
Image Size Changes:					
Compression (H and V)	Yes	No	Yes	1/4, 1/9, 1/16, 1/25	Yes
Expansion (H and V)	Yes	No	Yes	Variable crop only	x2
Rotation Around Axes	X, Y, Z	None	OptiFlex option	None	Through sequence
Perspective Changes:					
Along Horizontal	Yes	No	OptiFlex option	No	.....
Along Vertical	Yes	No	OptiFlex option	No	.....
"Elastic Sheet"	And geometrics	No	Optional	No	No
Page Turn	Yes	No	Optional	No	No
Multi-image Freeze	Yes	No	Yes	No	No
Image Trail Freeze	Yes	No	Yes	No	No
Image Positioning	Yes	No	Yes	Yes	Yes
Picture Splits	Yes	No	Yes	No	.....
Key Tracking	Yes	No	Yes	No	.....
Mirror Imaging (H and V)	Yes	No	No	Yes	Yes
Push-Pull Wipes	Yes	Yes	Yes	No	Possible
Posterization	Yes	No	Yes	No	Yes
Programmed Sequences	Yes	Yes	Yes	No	Yes
Mass Memory Type	Disc	None	Bubble	None	.....
Auto/Manual Transitions	Either	Either	Either	Manual	Yes
Reader Service Number	**349**	**350**	**351**	**352**	**353**

(3) For details on the MCI/Quantel Cypher, contact the manufacturer.

On designing a cassette transport to meet 2″ mastering standards.

As an audio professional, you probably work with several tape formats. But your demands for reliability and performance are always the same.

In designing a transport for the Studer A710 and the Revox B710 MKII cassette decks, our engineers worked with the same principles established for our professional open reel decks. No cost-cutting compromises were permitted. For example, the Studer Revox cassette transport is built on a die-cast aluminum alloy chassis, not on stamped metal. This is the only way to assure precision machining and long term stability.

Four direct drive motors handle your cassettes smoothly and gently. Two quartz-locked, Hall effect capstan motors keep wow-and-flutter down to a conservatively rated 0.05% (DIN weighted). Two additional DC reel motors, both servo regulated and microprocessor controlled, provide constant speed fast winding, automatic start-of-oxide cueing, and motion sensing for positive tape protection.

No sleds allowed. Most other cassette decks use a sled mechanism to insert the heads into the cassette shell. The free play inherent in this design often contributes to azimuth misalignment.

In the Studer Revox design, a die-cast headblock pivots upward on two precision (0.001 mm tolerance) conical bearings and locks into a solid 3-point mount. Because the headblock always locks into exactly the same position, absolute azimuth stability is assured.

One transport, two decks. This remarkable transport can be found in only two tape decks, the Revox B710 MKII and the Studer A710. Features shared by both units include 3 head design, internal 24 hour clock for programmable operation, tape type sensor, Dolby™ B and C noise reduction, plug-in modular PC boards, optional remote control, and adjustable headphone output with ample amplification.

A710: The Studer Version. This deck offers professional line level inputs and outputs, with output levels adjustable from −3 to +14 dBu. It also has calibrated input and output levels, XLR connectors, and a rack mount flange standard.

B710 MKII: The Revox Version. The lower priced B710 MKII has front panel mike inputs, mike/line mixing, and an optional infrared remote control.

For the long run. The Studer A710 and Revox B710 MKII are built for consistent, dependable performance. Hour after hour. Year after year. The kind of performance you expect from the world's most respected name in audio recording.

For more Information on Studer Revox cassette decks, contact: Studer Revox America, 1425 Elm Hill Pike, Nashville, TN 37210, (615) 254-5651.

STUDER REVOX

Studer A710

Revox B710 MKII

Circle (32) on Reply Card

DIGITAL VIDEO EFFECTS SYSTEMS

Manufacturer	Regis-BLT	Toshiba Corporation	Vital Industries
Model Number	AVP 900	DPE-III	SqueeZoom
Video Output Channels	2	4	4
Image Size Changes:			
Compression (H and V)	1/4 through 1/64	0 to 100%	Infinite
Expansion (H and V)	x4, x16	0 to 100%	Infinite
Rotation Around Axes	None	X, Y	X, Y, Z
Perspective Changes:			
Along Horizontal	Yes	No	No
Along Vertical	Yes	No	No
"Elastic Sheet"	No	No	No
Page Turn	No	No	Yes
Multi-image Freeze	Yes	Yes	Yes
Image Trail Freeze	Yes	Yes with decay	Yes
Image Positioning	Yes	Yes	Yes
Picture Splits	Yes	Yes	Yes
Key Tracking	Yes	Yes	Yes
Mirror Imaging (H and V)	Yes	Yes	Yes
Push-Pull Wipes	Yes	Yes	Yes
Posterization	Yes	Yes	Yes
Programmed Sequences	Yes	Yes	Yes
Mass Memory Type	Disc	Bubble	None
Auto/Manual Transitions	Manual	Either	Either
Reader Service Number	**354**	**355**	**356**

higher resolution in detail and color than US NTSC TV is capable of showing on the home receiver. The art systems approach CAD-CAM computers in their capability for generating 3-D objects and manipulating them to allow viewing from various angles and directions. Economics, however, has kept most broadcast facilities from purchasing the more *industrial-type* models.

In every case, equipment transparency has been the designers' aim, with the input signal altered only toward the desired effect or correction. The digital signal format, based on binary-coded information, reduces concerns of noise and non-linearity in analog circuitry. Missing bits in a binary word are sensed and corrected by various means to cover what might appear as *holes* in an image. And, best of all, an international agreement has been reached on the digital video sampling frequency, bringing the future reality of an all-digital TV studio closer into focus.

Information sources

Today, however, we still must work with separate systems that meet our needs. If your station needs to upgrade time base correction equipment, refer to our December 1983 issue, "Time Base Correction: An Equipment Survey" (page 112) and to the *Feedback* column in this issue for equipment information. Also, refer to our September 1983 *Buyers' Guide* for information on TBC and frame synchronizer systems.

Regarding still-stores, several new systems have appeared since our August 1983 "Still-store Update" (page 61). They include the following:

- ADDA's ESP II digital video processor, a low cost, multichannel unit with production effects, compatibility with ESP C systems, in a portable format. For information, circle (340).
- Chroma Digital Systems' Digifex 766 frame-store and synchronizer, which includes full proc-amp functions. Production effects included are compression, mosaic titling, posterization and position control. For information, circle (341).
- Harris Video Systems' IRIS II enhancements—including the ICS composition station and production effects—and the new model 650 4-frame synchronizer, for up to six users simultaneously, with each user terminal including titling capability. For information, circle (342).
- Picture Element Ltd.'s (PEL) Video Sequence Processor (VSP) with record, process and playback of sequences; 2-frame frame-store memory; hardware capable of 64-bit operation; and formats for NTSC, PAL, YIQ, YUV, RGB and HDTV Y/R – Y/B – Y 1125-line systems. For information, circle (343).

Clarifying a note in the August 1983 update ("Still-store Update," page 61) on Abekas Video Systems' A42 still-store, the 7-inch-high portable or rack-mountable package allows creation, editing and replay of up to three 100-image sequences. For information, circle (357).

For information about graphics generators, refer to "Electronic Videographics Systems: An Update" on page 38 of this issue, and to the *Buyers' Guide*.

Unlike other products in this update, the Digivision DRGB-343 digital video converter provides 1024-pixel resolution output in both horizontal and vertical detail. Inputs from NTSC cameras, capstan-servoed VTRs, off-air broadcasts or video laser disc units, as well as RGB video, are converted to the high definition format with color, real time motion compensation. For information circle (358).

Concerning special effects using digital technology, the accompanying tables from the **BE** 1983 *Spec Book* give a perspective of available equipment by showing selected specifications for various systems.

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AM DAs: Doing it right

By Jeffrey Bixby, A.D. Ring & Associates, Washington, DC

The pattern of any AM directional antenna system *(array)* is determined by a number of factors, including the electrical parameters (phase relationship and ratio of current in each tower), the height of each tower and the location of each tower with respect to the other towers (particularly to the reference tower). Electrical parameters are, to a greater or lesser degree, adjustable, and tower height is not always open to question. This discussion focuses on the importance of correctly locating the towers of a directional system during construction and ways to ensure that they are placed correctly.

An array consists of two or more towers arranged in a specific manner on property. Figure 1 shows a typical sketch of a tower layout for a 3-tower array, and the pattern such an array would produce. This is an in-line array, meaning that all the elements (towers) are in line with one another. Notice that the major lobe is centered on the same line as the line of towers, and that the pattern nulls (minima) are positioned symmetrically about the line of towers, protecting co-channel stations A and B at true bearings of 315° and 45°, respectively.

Figure 2 shows the same array, except that it has been rotated by 10°. Notice that the pattern shape is not changed, but the position of the major lobe and the nulls *follow* the line of towers. Also notice that the nulls no longer are *pointed* at the stations to be protected. Figure 3 and Figure 4 show that the position of the nulls can be changed by varying the electrical parameters so that one or the other can be pointed in the required direction, but not both. Also, when this is attempted, the size and shape of the small "back" lobe is changed, as is the shape of the major lobe, especially the radiation on the line of towers.

If we imagine a directional antenna system constructed on a gigantic *lazy Susan* or turntable, we can rotate the pattern without affecting its shape. But, to accomplish the required protections and to have the major lobe(s) oriented in the right direction, there is only one correct position. In most cases, the position of the towers will be specified with respect to a single reference tower. The location of the other towers will be given in the form of a distance and bearing from that reference. Occasionally, a reference point, usually the center of the array, will be used. In any case, it is critical that each tower be in the correct place.

Bearing

The bearing or azimuth of the towers from the reference tower or point almost always will be specified in degrees from true north. The distinction between true and magnetic north is vital. In my experience, failing to make this distinction has caused the greatest number of errors in tower placement. Often, surveyors charged with locating power positions attempt to use a magnetic compass and mathematical calculations to determine true north. Some have even used magnetic north rather than true north, which resulted in considerable error.

The magnetic North Pole is not at the true or geographic North Pole. (In fact, it is in the vicinity of 74° north, 101° west, in the islands of northern Canada.) The difference between magnetic and true bearings is called

Continued on page 58

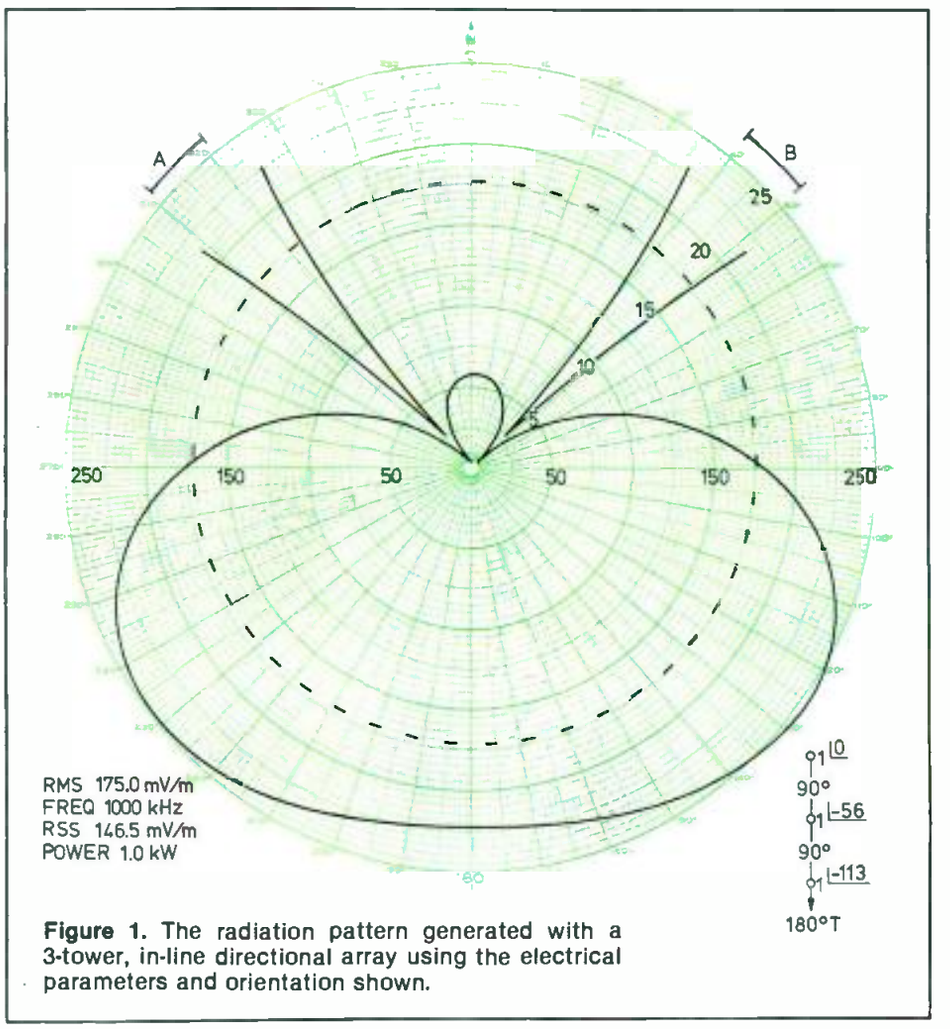

Figure 1. The radiation pattern generated with a 3-tower, in-line directional array using the electrical parameters and orientation shown.

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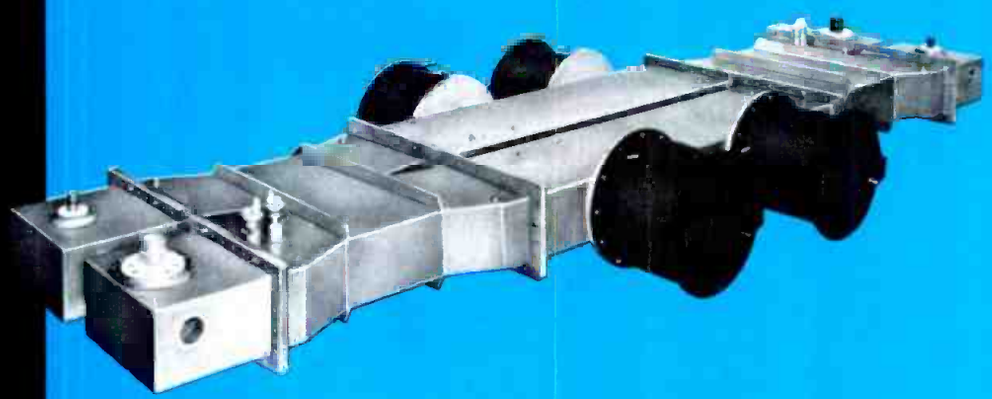

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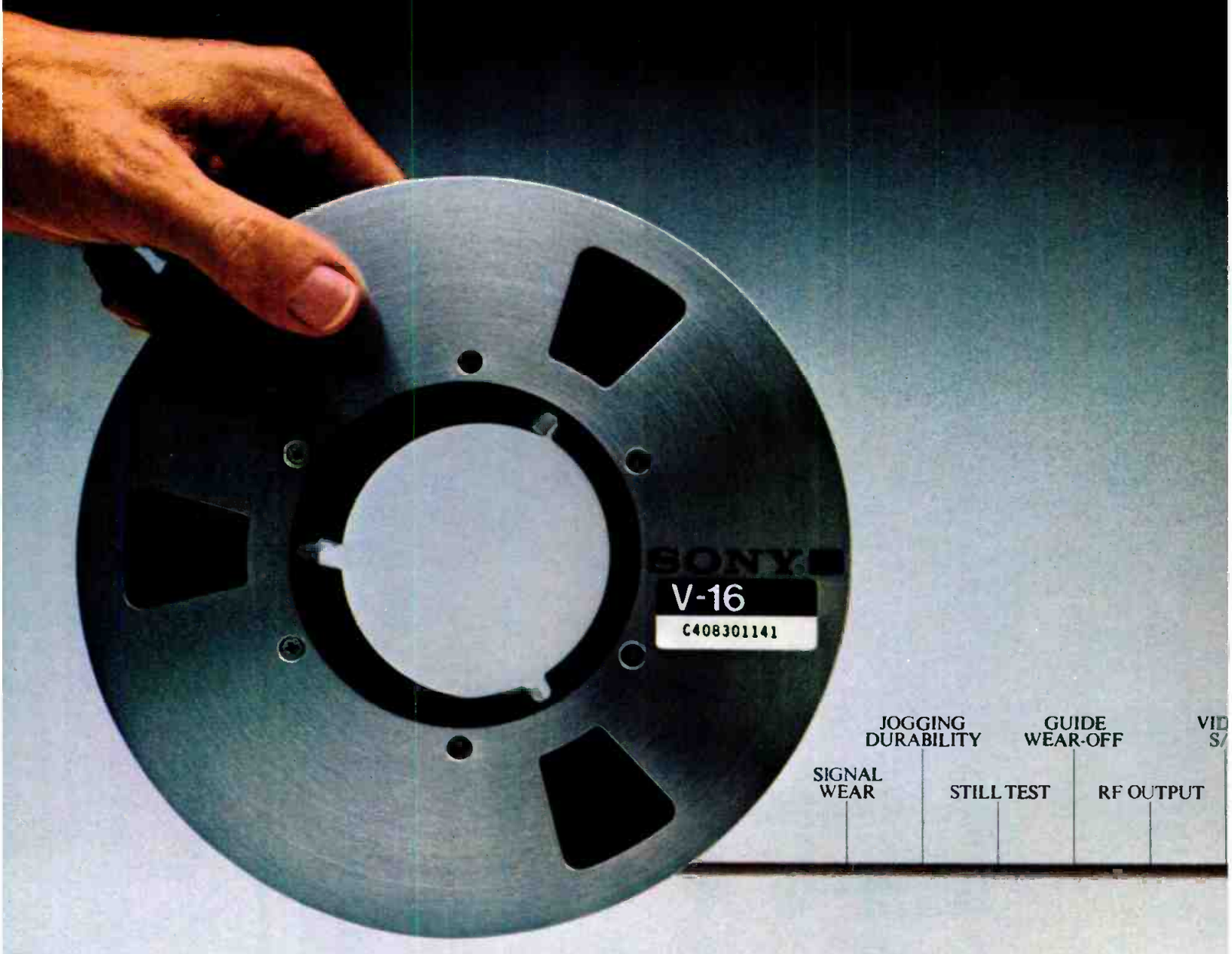

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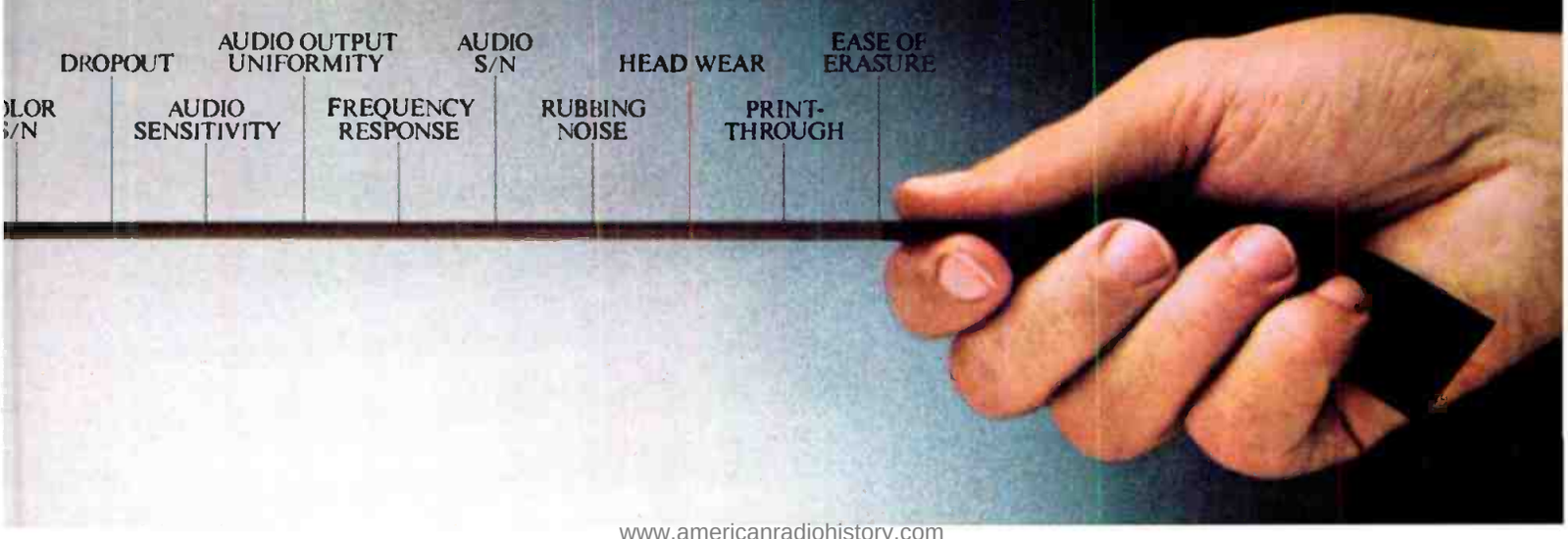

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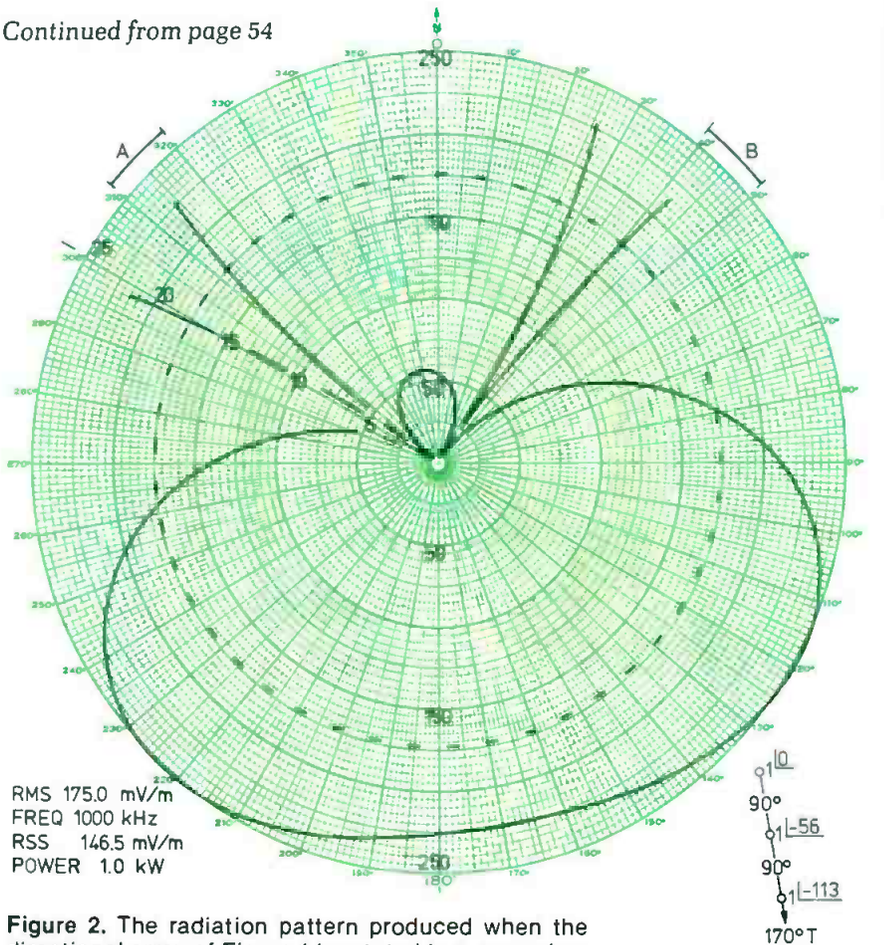

Figure 2. The radiation pattern produced when the directional array of Figure 1 is rotated to a new orientation.

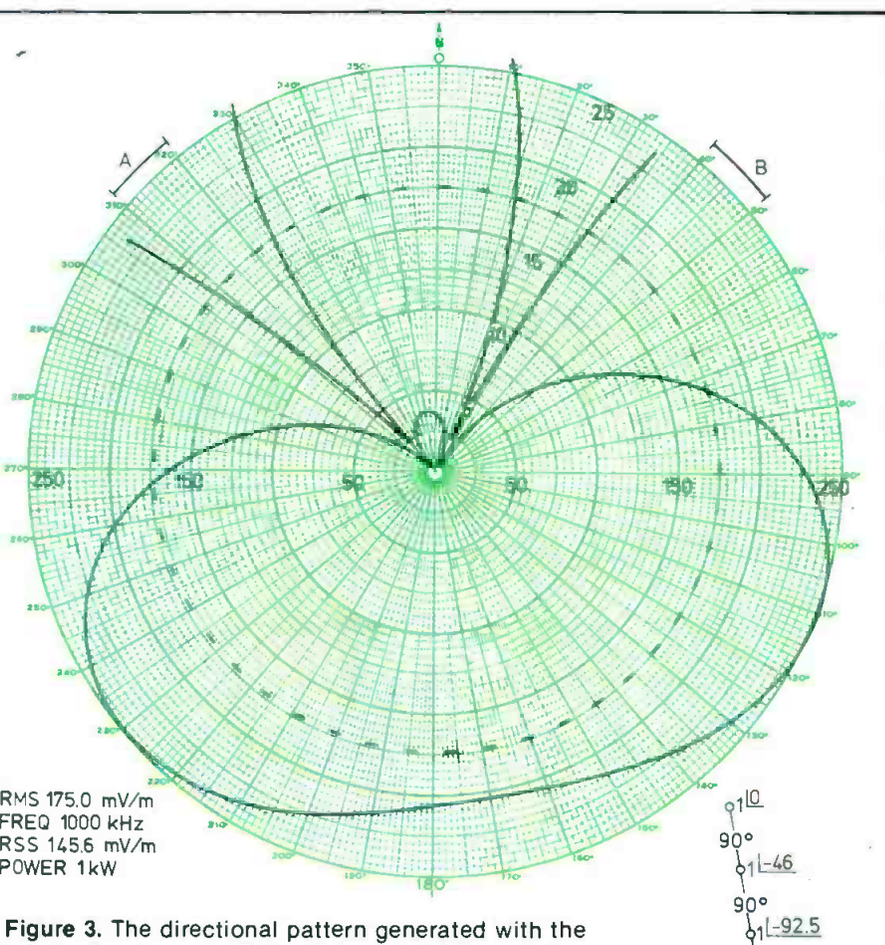

Figure 3. The directional pattern generated with the orientation shown in Figure 2, but with different electrical parameters.

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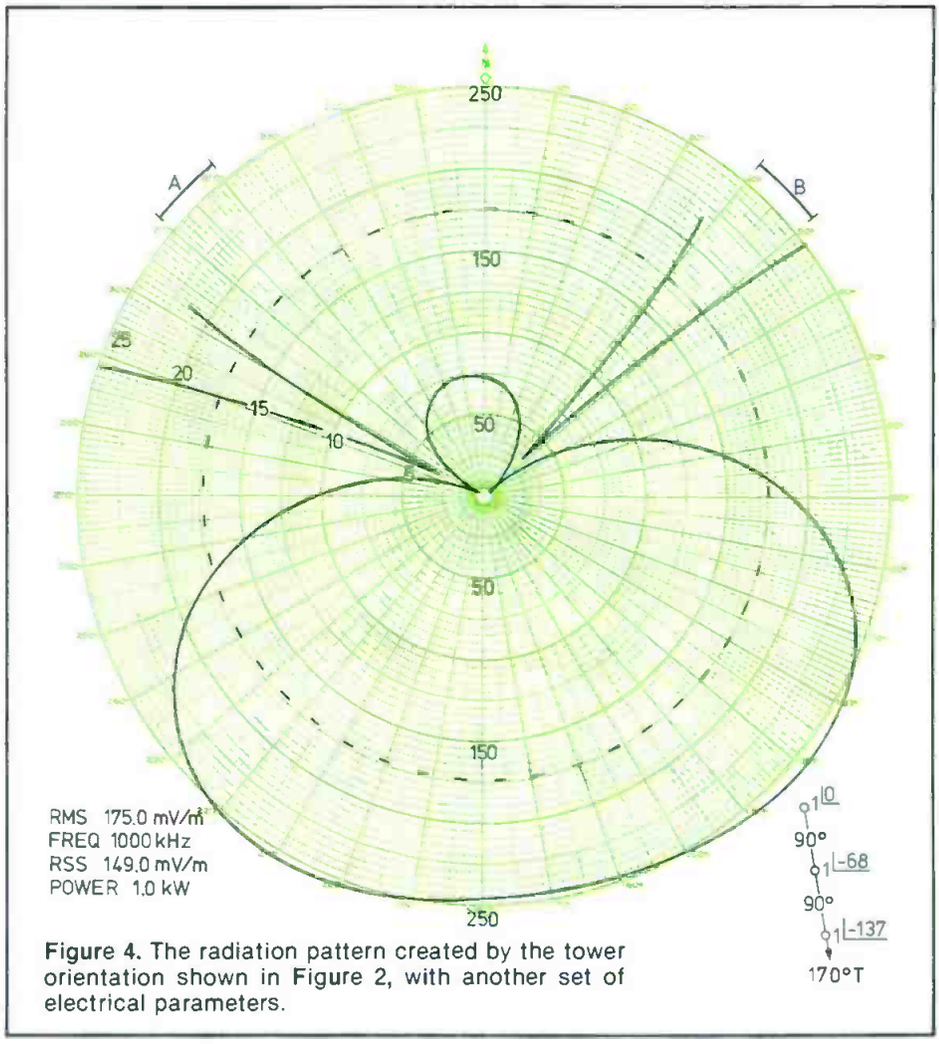

Figure 4. The radiation pattern created by the tower orientation shown in Figure 2, with another set of electrical parameters.

variation or *magnetic declination*. Declination, a term generally used by surveyors, varies for different locations. It is not a constant. The earth's magnetic field is subject to a number of changes in intensity and direction. These changes take place over daily, yearly and long-term (or secular) periods. The secular changes result in a relatively constant increase or decrease in declination over a period of many years.

In addition to declination, the magnetic fields of the earth are subject to local disturbances, some of which may be severe. In many cases, there may be no way to tell that such a disturbance is present, opening the possibility of considerable error. In short, there are a number of potential errors that can defeat the most careful attempt to locate true north.

The direction of true north can be determined accurately and directly by one of two commonly used methods. A detailed discussion of these methods is beyond the scope of this article, but a general description may be useful.

The first and most common method involves observing the polestar (Polaris). Generally accomplished at dusk, a Polaris *shot*, or rather a series of such shots, must be reduced by referring to tables and computations to arrive at true north. This method is well-known, and results accurate to within 0.5' of angle (1/120°) are achieved readily.

The second method involves a solar observation taken at least two hours before or after noon. Accuracy to within 2' of angle (1/30°) is achieved easily. Higher accuracy can be obtained with a series of such shots, given accurate time information obtained easily from WWV. Time signals from WWV are available 24 hours a day by short wave or by calling the National Bureau of Standards (NBS) at 303-499-7111.

Required tables, information and procedures are published annually by the Keuffel and Esser Company in a booklet titled, *Solar Ephemeris*. Of course, major surveying firms should have the required data and expertise to perform either procedure easily and accurately.

Often, surveyors unfamiliar with the degree of accuracy required in this work attempt to locate true north by referring to existing roads, property boundaries or state grid systems. This approach involves nearly as much effort as the celestial methods outlined previously, and because such references frequently are questionable,

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their use is not recommended.

Distance

Although much more readily determined, the distance from the reference point to each tower is no less critical to proper performance of the array than is azimuth. Methods of determining distance range from the standard surveyor's chain to state-of-the-art electronic distance measurement (EDM) equipment. Regardless of the method employed, this distance must be determined accurately.

As unlikely as it may seem, significant distance errors do occur. Recently, I was retained to tune an array that already had been constructed. Preliminary discussions with the principals indicated that the original survey had been done with a magnetic compass. Therefore, I suggested that the array be resurveyed to verify the accuracy of the tower placement. Much to everyone's surprise, the azimuth errors were fairly small. However, the spacing of one of the four towers was some 15 feet short. It was not clear whether this was a case of surveyor error or whether the surveyor was provided with incorrect information, but the error was there.

Cost of errors

In the last few years, I have been, in one way or another, involved with four new arrays, all of which already had been constructed when I arrived on the scene. Two of the four were resurveyed and significant errors were found. In one of these cases, the resurvey was ordered after several days of attempts to tune the array failed. This involved needless and unproductive field expense and, after the error was discovered, several more days were involved in examining alternatives. Finally the decision was made to move three of the four towers. Two of the towers were moved about 10 feet, and the third, some 20 feet. The direct cost of this project ran into five figures.

In the second case mentioned previously, the resurvey was ordered before any attempt to tune the array. Once the error was discovered, however, similar costs were involved in examining alternatives. In this particular case, the flexibility of a parallelogram array made it possible to almost duplicate the standard patterns (day and night) in the construction permit (CP) using the towers in place and different electrical parameters. The differences, while slight, were still sufficient to require that an application to modify the CP be filed. The cost of the application, combined with other costs involved, again put the total cost of this error into five figures.

Suggested procedures

To avoid such problems, it is vital that the station's consulting engineer and the surveyor doing the tower layout be in close contact. The surveyor should determine from the engineer the reference for all bearings (almost always true north) and should use that reference in all his work. Using magnetic bearings, either directly or to establish true north, generally is not suitable, and one of the methods outlined previously should be employed. The surveyor should discuss with the station's consulting engineer the degree of accuracy required. In some simple arrays, ± 1° might be acceptable, while in others, considerably tighter tolerances could be required.

Once the tower locations are determined, the surveyor will stake out the locations on the property. Because there frequently is considerable delay before construction starts, the surveyor should establish a number of permanent check locations so that he can quickly and accurately verify the correct points immediately before construction begins. Survey stakes sometimes are moved or destroyed by accident or vandalism in the interval between the original survey and construction. Therefore, a double check just before construction begins gives extra insurance.

Surveyors are human, and as such, are subject to occasional error despite the best efforts of all concerned. For this reason, the surveyor should carry sufficient insurance or bond to cover damages should an error take place. Major surveying or civil engineering companies typically carry such insurance, and should be happy to provide evidence of coverage on request. The mention of insurance or bond emphasizes to the surveyor the importance of accuracy and, thereby, can make errors less likely.

Editor's note:

Broadcast Engineering, in its 25 years of publication, has been the source for much information on AM directional antenna design and maintenance. Two early articles that examine directional theory for medium frequencies are listed here for those interested in additional information. The articles give theoretical and practical answers to directional system problems. The papers, which ran in 1963, still are applicable and can be found in many public libraries. They are: "The Theory of Directional Antennas," **BE** May 1963, page 24 and "Directional Antenna Phasing," **BE** October 1963, page 26.

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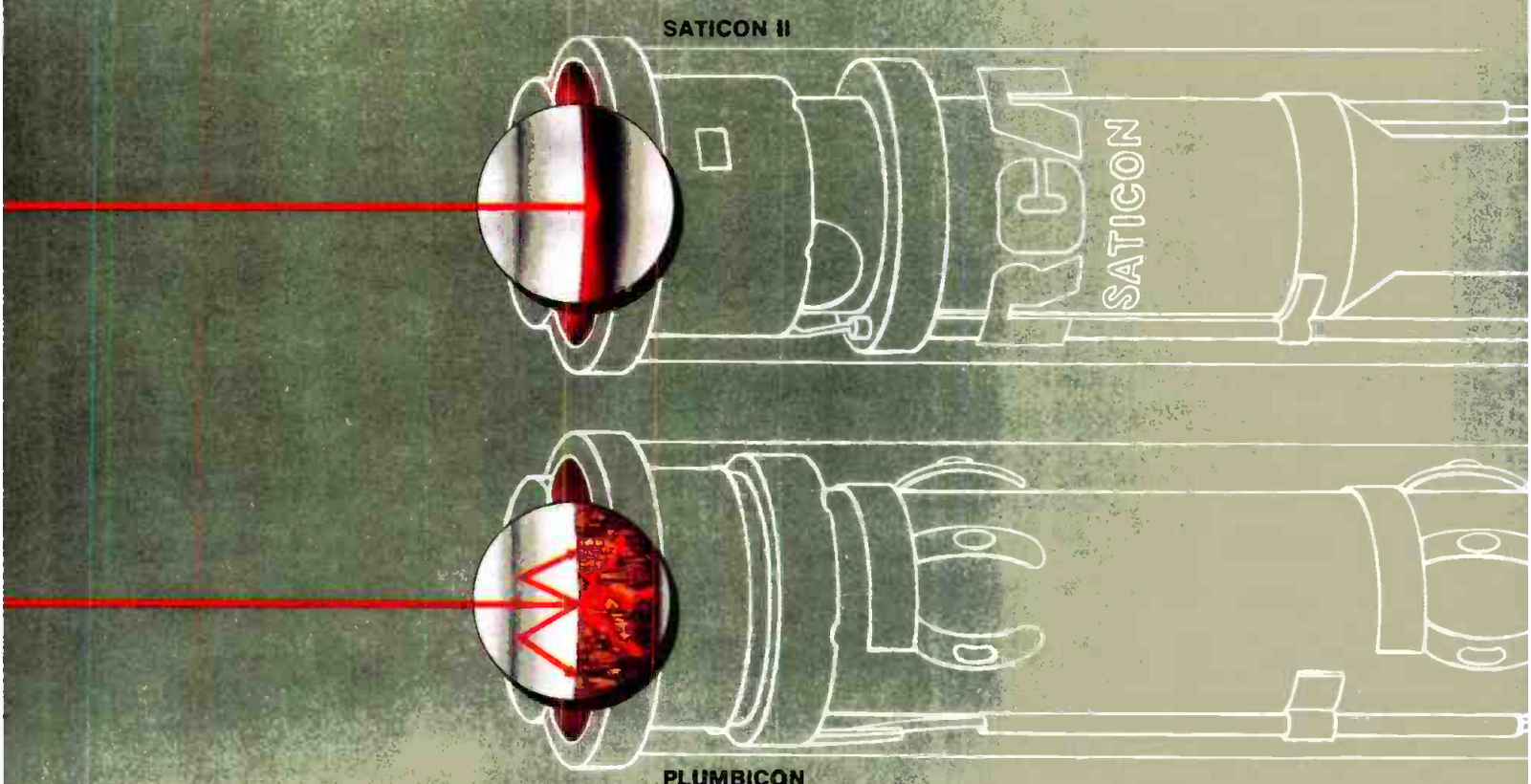

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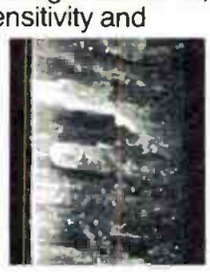

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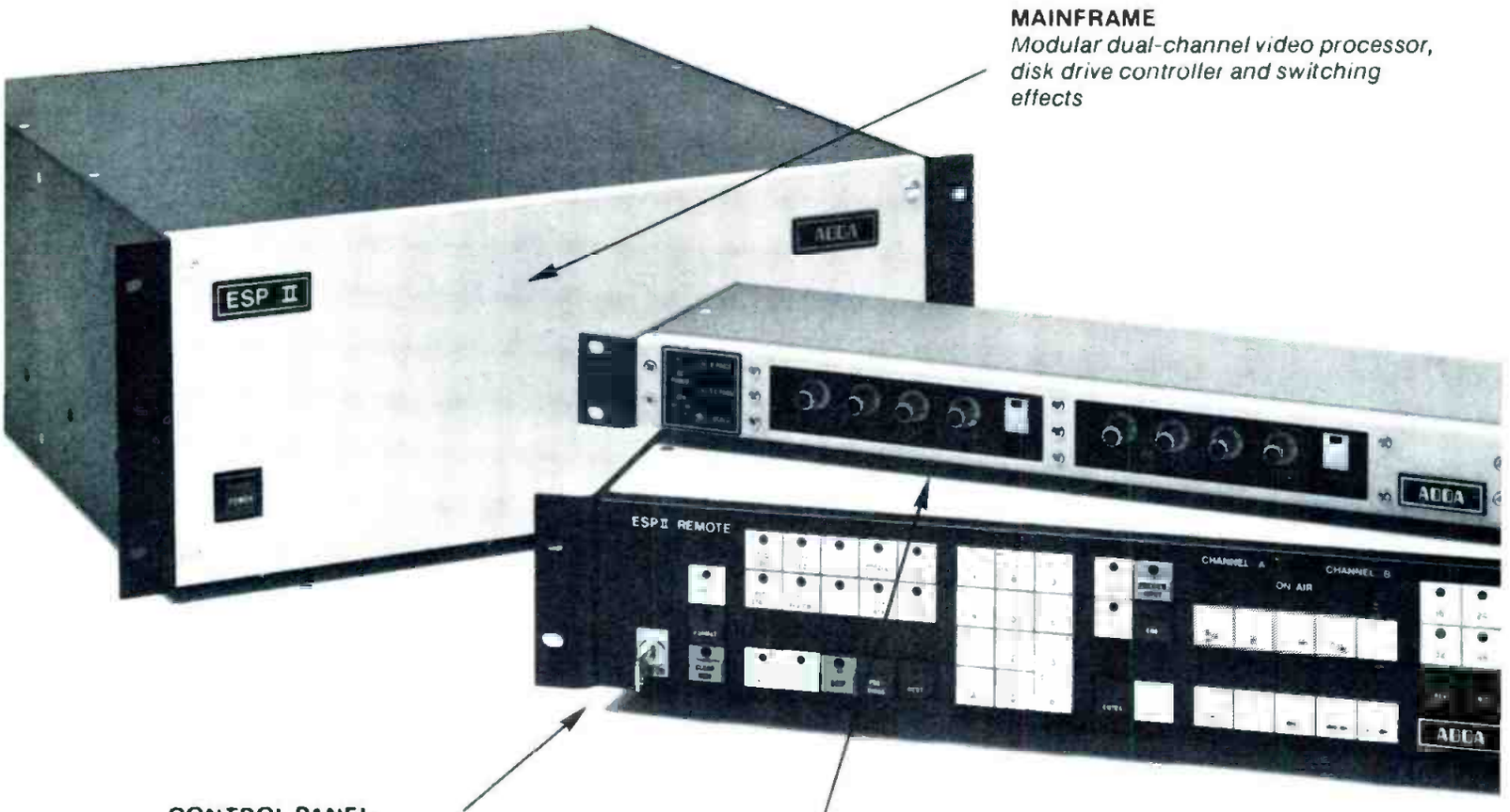

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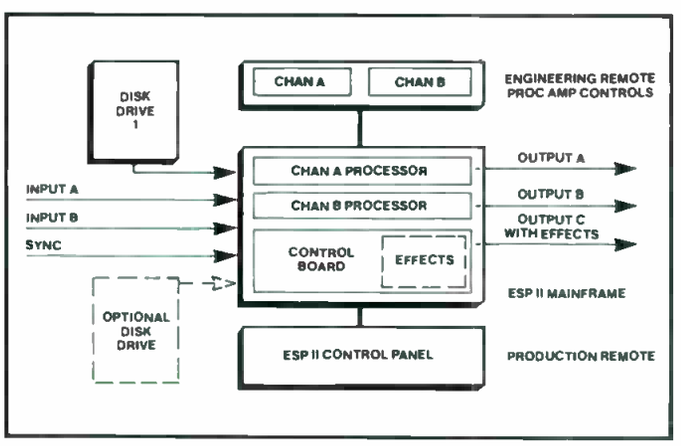

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The status of SCA

By Jerry Whitaker, radio editor

Broadcasters are, generally speaking, a cautious group of business people who look before they leap into a new concept or technology. The opportunities presented to FM broadcasters by deregulation of the subsidiary communications authorization (SCA) channel is no exception. Despite speculations of large financial returns from SCA use, there has been no stampede to subchannel services. This situation may change, however, as financial realities catch up with technical innovations.

Broadcast Engineering conducted a survey late in 1983 of radio and TV station personnel to determine purchasing plans and technical improvement schedules. (See "Research Report: State of the Industry," **BE** December 1983, page 96.) One of the questions included in our survey concerned the use of SCA capabilities by FM stations. The response to that question is shown in Table I. More than one-third of the stations in the Top 50 and Below Top 100 markets said that they currently use their SCA for program or data transmission. Those numbers will change dramatically in the next few years if the response to the next question is any indication. A full 50% of stations in the Top 50 to Top 100 markets said that they planned to become involved in SCA activity to some extent. Stations in the Top 50 markets also showed significant interest in SCA use.

Table I.
BE questionnaire results on SCA activity.

Category \ Market	Top 50 Markets	Top 50 to Top 100 Markets	Below Top 100 Markets
Stations that currently use SCA	35%	15%	36%
Stations that plan to use SCA	44%	50%	23%
Stations that have no current plans to use SCA	21%	35%	41%

The drawback generally cited to full use of the FM baseband above 53kHz is the need to back off main-channel modulation to prevent overmodulation of the total carrier. The back-off requirement may be reduced, however, by future FCC action that would allow modulation exceeding 100% when one or more subcarriers is being transmitted. This proposal is based on field and laboratory tests that show main-channel modulation back-off is unnecessary for bandwidth compliance, if certain conditions are met. (See "Modulation Levels During SCA Transmission" on page 76.)

Another problem that worries some FM broadcasters is the possibility of high frequency *birdies* (beat notes) that can be generated in the demodulator of certain older-design receivers due to intermodulation of portions of the main-channel (stereo) and SCA signals. This problem largely has been overcome through improved receiver design, however, birdies may remain troublesome for years to come with older units still in use. Until audiences upgrade their receivers to newer, quality radios, this situation will persist to some extent.

Another cause of poor SCA performance is improper transmitter tuning and high transmit antenna VSWR. If an FM transmitter generates excessive synchronous AM, subcarrier performance will be compromised. Synchronous AM (also referred to as incidental AM) is caused by one or more narrow bandwidth stages anywhere in the RF chain from the exciter to the power amplifier (PA) tube. For many transmitters, the point of minimum synchronous AM is not coincident with maximum power. Special techniques must be employed in tuneup of a transmitter for greatest bandwidth and lowest synchronous AM.*

New equipment for new expectations

We are seeing now in the field of SCA equipment what occurred a number of years ago with FM stereo generators. Manufacturers have taken a second look at SCA gear with an eye toward top performance. In the past, subcarrier generators were often treated as an afterthought by manufacturers and users. Designs did not change much over the years. Now, however, many of the advances made in stereo generator technology are being applied to SCA equipment.

An example of this trend is the new subcarrier generator system developed by Circuit Research Labs (CRL). The integrated system includes

*See "Multipath Distortion Reduction Through RF Amplifier Optimization" by Edward A. Schober, **Broadcast Engineering**, May 1983.

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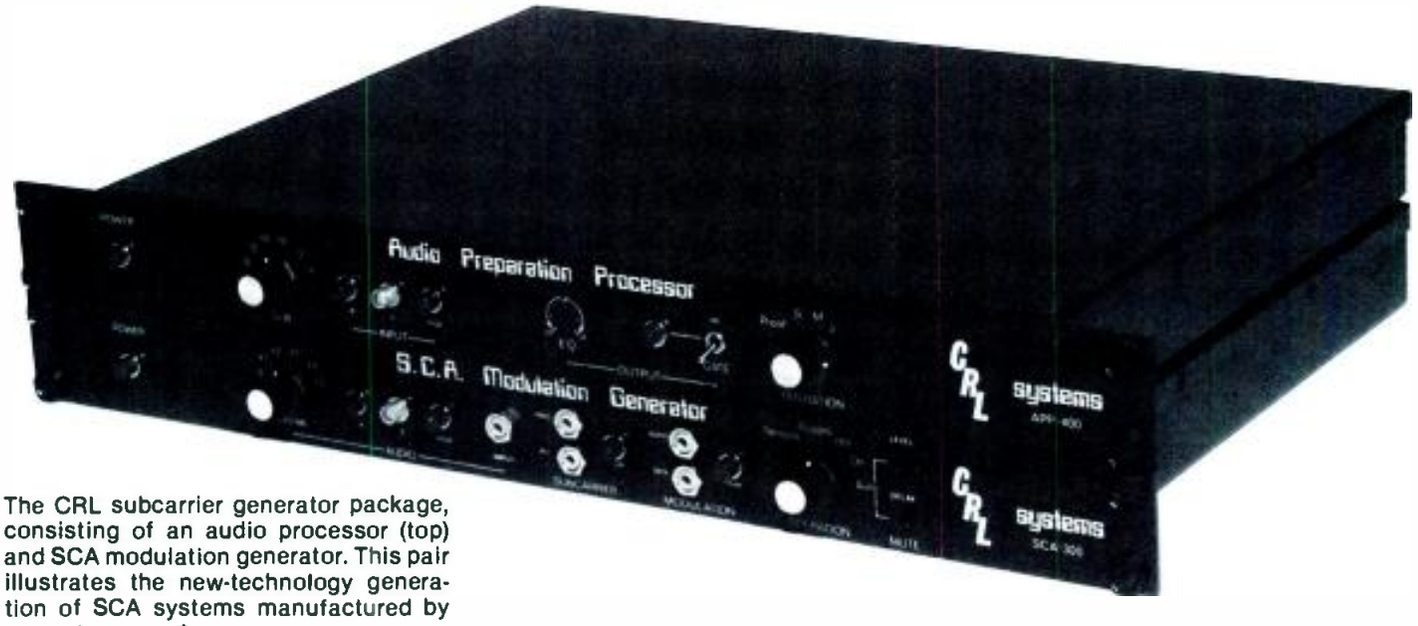


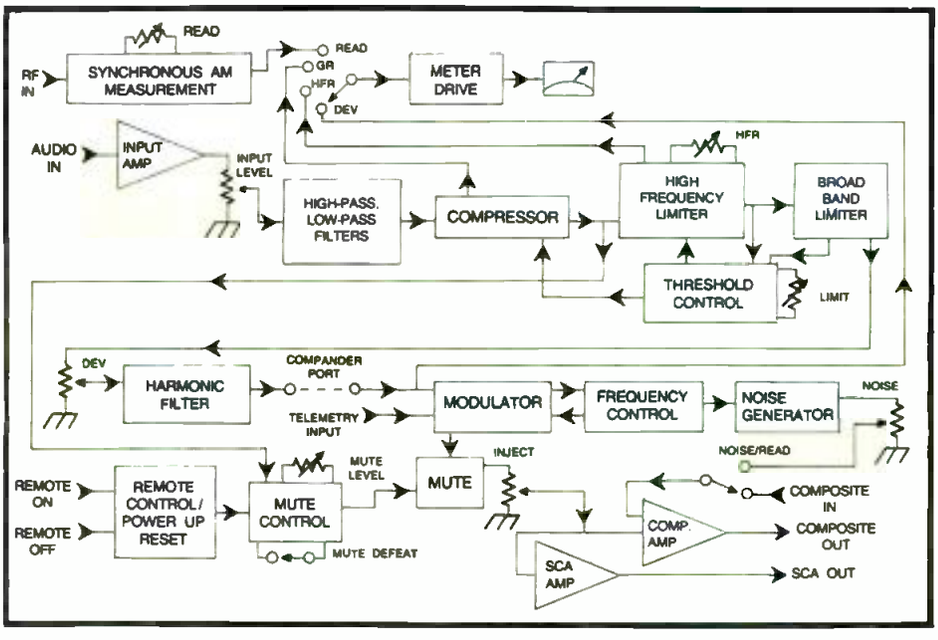
The CRL subcarrier generator package, consisting of an audio processor (top) and SCA modulation generator. This pair illustrates the new-technology generation of SCA systems manufactured by several companies.

audio processing, a low distortion crystal-controlled digital carrier generator, non-overshooting low-pass filters, pre-emphasis and a dc-coupled data input port.

Audio processing consists of a multiband limiter that incorporates a 150μs pre-emphasis curve (others can be selected in the field) and filters to tailor the low and high frequency response of the input audio. CRL's patented, non-overshooting low-pass filter is designed to protect the main-channel signal from SCA interference. Internal jumper plugs on a digital divider chain determine the subcarrier frequency, which can range from 40-115kHz. A digital automatic frequency control (AFC) maintains the subcarrier frequency within tight limits. The SCA carrier is formed by a digital staircase generator circuit.

Another new technology SCA generator is the Modulation Sciences Sidekick, which offers several unique features. The Sidekick, shown in Figure 1, includes a built-in generator and detector for adjustment of minimum incidental AM, an accurate peak-and-hold deviation meter and integral audio processing. A crystal-controlled frequency synthesizer generates any SCA subcarrier desired.

As shown in Figure 1, a composite (stereo) signal can be input to the Sidekick and mixed with the internally generated SCA signal to produce a composite output that is fed into the broadband input of the exciter. This provision satisfies FCC rules that state: "The addition of FM broadcast subcarrier generators...to a type-accepted FM broadcast transmitter is considered a Class 1 permissive change...provided the transmitter exciter is designed for subcarrier operation *without mechanical or electrical alterations to the exciter or other* transmitter circuits."*



Courtesy of Modulation Sciences

Figure 1. Block diagram of the Modulation Sciences Sidekick SCA generator system. The unit features remote-control capability and a compandor port for external processing of the transmitted signal.

A mixing circuit (such as the one provided in the Sidekick) is an important feature, because some exciters do not have provisions for input of baseband SCA feeds, and the previously mentioned rule prohibits user installation of connectors or circuit board changes for this purpose.

New SCA equipment is manufactured by several other companies. Interested readers are referred to the September 1983 *Buyers' Guide* issue of **BE** for a full listing of SCA equipment suppliers and manufacturers.

SCA for data transmission

Tests over two New York City FM radio stations have established the feasibility of wide-area SCA data transmission to small, inexpensive receivers. The development program, conducted by Modulation Sciences, with the cooperation of WBAI and WPAT, has shown that data transmission error rates can be as much as five orders of magnitude higher than standard telephone data lines.

Recent FCC deregulation of the FM broadcaster's SCA channel has generated much interest in single-point and multipoint data transmission arrangements. Technical restrictions on SCA systems also have been relaxed, permitting the subcarrier to be directly modulated in any mode (for example, AM, FM and SSB). The only requirement is that the subchannel signal not exceed the allowed bandwidth or generate excessive cross-talk into the main (stereo) channel.

The Modulation Sciences study of the SCA market shows that it will be economical for organizations that send large amounts of data one way to use subcarriers as the transmission medium. Data flowing in the opposite

*Section 2.1001(h) of the First Report and Order BC No. 82-536, page 24.

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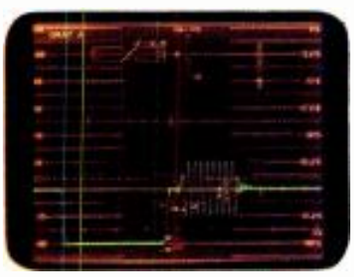

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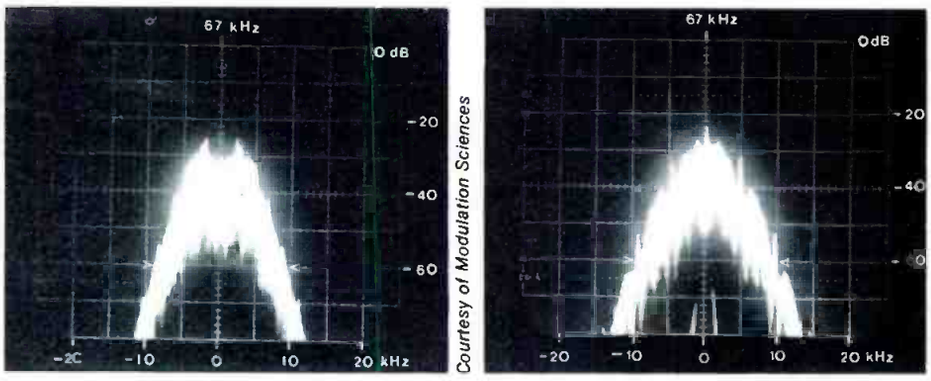

(A) (B)

Shown are off-air spectrum analyzer displays of SCA bandwidth with various types of modulation used in the Modulation Sciences tests. The SCA injection level is 10%. In photos (A) and (B), 0dB is equal to 100% modulation of the main FM carrier. Photo (A) shows the SCA channel modulated with 1200 bits/s audio frequency shift keying (AFSK) data. The occupied bandwidth is 18kHz (to the −60dB points). Photo (B) shows the same subchannel, but with direct carrier modulation at a 4800 bits/s rate. The occupied bandwidth is 20kHz (to the −60dB points). This figure still leaves a 4kHz guard band before the upper edge of the stereo subcarrier channel at 53kHz.

direction, for users requiring some amount of 2-way traffic, can be relayed economically by dial-up telephone circuits, if the back-haul does not exceed 10% of the total information flow.

In recent years, data transmissions have been tried over the SCA channel employing audio frequency shift keying (AFSK). This method, however, requires a good S/N ratio (greater than 20dB) for reliable performance. The practical limit of AFSK, or *indirect data modulation* of the subcarrier, in a 5kHz channel is 2400 bits/s, according to the Modulation Sciences research.

Based on this information, the company has come up with a system that takes a different approach, namely, shifting the frequency of the FM subcarrier directly. The benefits of using this *direct data modulation* technique, according to the study, are that a lower S/N figure (typically 12dB) is required for reliable operation, higher data rates (4800 bits/s) can be accommodated, and decoder circuits are simpler and less expensive to build. If required, data rates of up to 9600 bits/s can be transmitted over a single SCA channel by using special encoding schemes.

The main concern most engineers have regarding high speed data transmissions on their SCA channels is the fear of excessive cross-talk into the L+R and L−R channels. Photos (A) and (B) show that even with a high data rate of 4800 bits/s, no excessive bandwidth problems are encountered.

The New York City tests have shown the following results:

- Error rates are greater than one in 10 million ($1:10^7$), as opposed to the telephone company typical figure of one in 100,000 ($1:10^5$), or lower in some cases.
- Acceptable reception extends 30-40 miles from the transmitting antennas, which are located atop the Empire State Building and the World Trade Center in New York. Both stations involved, WBAI and WBAT, are Class B operations.
- Simple indoor whip antennas

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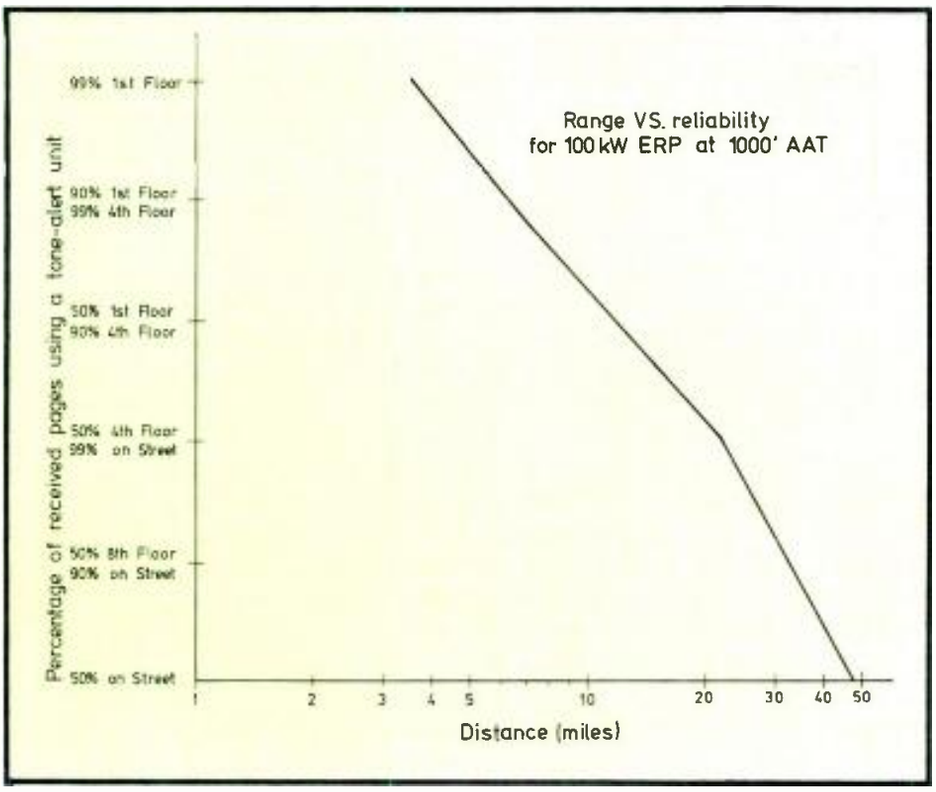

Courtesy of Motorola Communications

Figure 2. This graph plots range vs. reliability data received from the Seattle SCA tests. The transmitter power (ERP) is 100kW and the antenna height is 1000 feet above average terrain. Ten percent injection of the subcarrier is assumed. This chart applies only for tone-alert paging, which gives the greatest coverage range and is the predominant method of paging in use. The paging industry generally considers 90% reliability to be the minimum acceptable for most applications.

The Motorola SCA-1000 Tone Alert radio pager can be set to receive SCA transmissions from any one channel in the FM broadcast band.

Table II.
Maximum power output (ERP) and maximum antenna height above average terrain (HAAT) for various classes of service.

Class	Maximum ERP	Maximum HAAT	De-rated value for 10% SCA injection*
Class B FM	50kW	1500 feet	5kW (when at maximum HAAT)
Class C FM	100kW	2000 feet	10kW (when at maximum HAAT)
35MHz and 43MHz RCC	500W	500 feet	*The de-rating shown in an approximation of the *effective SCA power* resulting from 10% injection of the subcarrier. The listed figures are, in all likelihood, overly optimistic. An accurate determination of the true effective SCA power is the subject of debate at this time.
150MHz RCC	500W	500 feet	
900MHz RCC	1kW	1000 feet	

seem satisfactory in many instances for data reception, at some increase in error rate.

- The analog S/N ratio (which is measured easily) can be used to reliably predict the digital error rate. This fact allows simple and accurate monitoring of the datalink.
- The *grey area* between accurate and inaccurate reception is small. In technical terms, the knee of the error rate is sharp. That is, the data signal tends to be highly accurate, up to a predictable and sharp SNR point.

Potentially, the method of SCA transmission proven in the New York tests could result in two new data channels per FM station, each with an error rate better than typical telephone company data loops. Perhaps the most important factor to the end user is that this type of system can be assembled with existing technology at a price that is, in many applications, less than conventional wired facilities.

The equipment used in the New York City tests included a new data version of the Modulation Sciences Sidekick SCA generator, two modified SCA receivers and an error rate data indicator.

SCA for paging

The new application that most often comes to mind when SCA use is discussed is the personal paging business. Tests on the feasibility of this idea have been conducted in a number of cities by several manufacturers.

One of the programs, sponsored jointly by the National Public Radio (NPR) Ventures Division and Motorola Communications, involved *walk-around* tests in the Seattle area. Reliability determinations were made for reception in various parts of the city, including high-rise office buildings on a tone-only page receiver. Generally speaking, reception inside office buildings was considered less than acceptable in many cases. However, street-level and suburban-area reception was good. (See Figure 2.)

These results are not surprising, given the nature of SCA broadcasting. FM stereo reception is difficult using a small whip antenna inside a large office building because of the steel and concrete construction usually used. It is no surprise, then, that SCA paging would be marginal in those same areas. It is a safe assumption that an area giving poor reception of an FM station (using a portable radio with the whip antenna collapsed) also will give poor SCA paging reception, if transmitted on that station.

The SCA channel has some well-known deficiencies built into it, namely low injection levels (10% typically),

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GAIN REDUCTION: Shows gain of the VCA (0 to −25db). Shows the effect of any control but OUTPUT TRIM and DE-ESSER

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OUTPUT TRIM: Adjusts VCA gain to control or prevent clipping as required. Effect is seen on VCA LEVEL meter. Not an Output Attenuator (Output Attenuator is located on rear of unit).

DE-ESSER OPERATE/DEFEAT: Activates or defeats de-esser control circuitry.

COUPLED/INDEPENDENT: Couples A and B gain and gating circuits for accurate stereo tracking.

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Hugh Ford, *Studio Sound*
November, 1983

"Overall, the 422A/424A should prove to be a system of diverse capabilities, able to tackle the widest variety of material—once the user masters its operation. In addition, its solid construction and excellent service documentation should insure years of reliable operation. Such qualities are typical of timeless designs that tend to retain their value long after the accountants have depreciated them away."

John Monforte, *db Magazine*
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Circle (41) on Reply Card

The Modulation Sciences Sidekick SCA generator is available in data or audio transmission formats.

low modulation levels (6kHz peak deviation) and susceptibility to multipath distortion. These and other factors make personal pager applications difficult to engineer in urban areas. Radio common carriers (RCCs) overcome office-building difficulties by using multiple booster transmitters. FM broadcasters do not have that option, however. RCC systems also are less susceptible to multipath reception problems.

What the SCA lacks in these areas, though, it makes up for in power. Class B and Class C FM stations have available to them much more effective radiated power (ERP) than a single-transmitter RCC could hope for, as shown in Table II.

If SCA paging has a future, and most broadcasters believe it does, perhaps the best end-user field results will come from tone-only units, rather than voice types, which require a substantially better S/N ratio for intelligible operation.

The photo (page 72) shows the new Motorola Communications SCA-1000 Tone Alert personal pager, which uses a common binary digital encoding scheme compatible with existing automatic paging terminals and encoders. The SCA-1000 is capable of receiving subcarrier transmissions anywhere within the 88-108MHz FM broadcast band.

The Motorola tone pager was used in the NPR Seattle tests mentioned previously.

Any station considering use of the SCA channel for whatever purpose should first carefully study the technical considerations and market potential for its idea. Broadcasters cannot expect instant riches from their long-dormant SCA channel.

Gene Swanzy, senior vice president, Mutual Broadcasting System, put the matter into perspective at a recent meeting of broadcasters in Massachusetts. He said that FM stations "can't expect money to shower from the sky with the lease of their FM subchannels, but they can expect a substantial amount of revenue for their station if they are creative and willing to put money and hard work into their SCA business. You must treat SCA as you would any other business, by analyzing your options, researching the market and being wary of overblown claims."

Editor's note:

Those interested in additional information on SCA may contact the National Association of Broadcasters for a publication list and pricing information. Contact NAB Services Department, 1771 N St., NW, Washington, DC 20036-2898.

A detailed look at some of the financial and technical aspects of SCA use also is available from Phillips Publishing. Pricing and delivery information on "Making Money With Subcarriers" can be obtained by writing Phillips Publishing, Suite 1200N, 7315 Wisconsin Ave., Bethesda, MD 20814.

A detailed report from Motorola Communications Division on the conclusions reached from the Seattle tests is available by writing Motorola Paging, 8000 W. Sunrise Blvd., Fort Lauderdale, FL 33322. Ask for the publication, "Subsidiary Communications Authorizations and their Application to Radio Paging."

Information also is available from various SCA equipment manufacturers.

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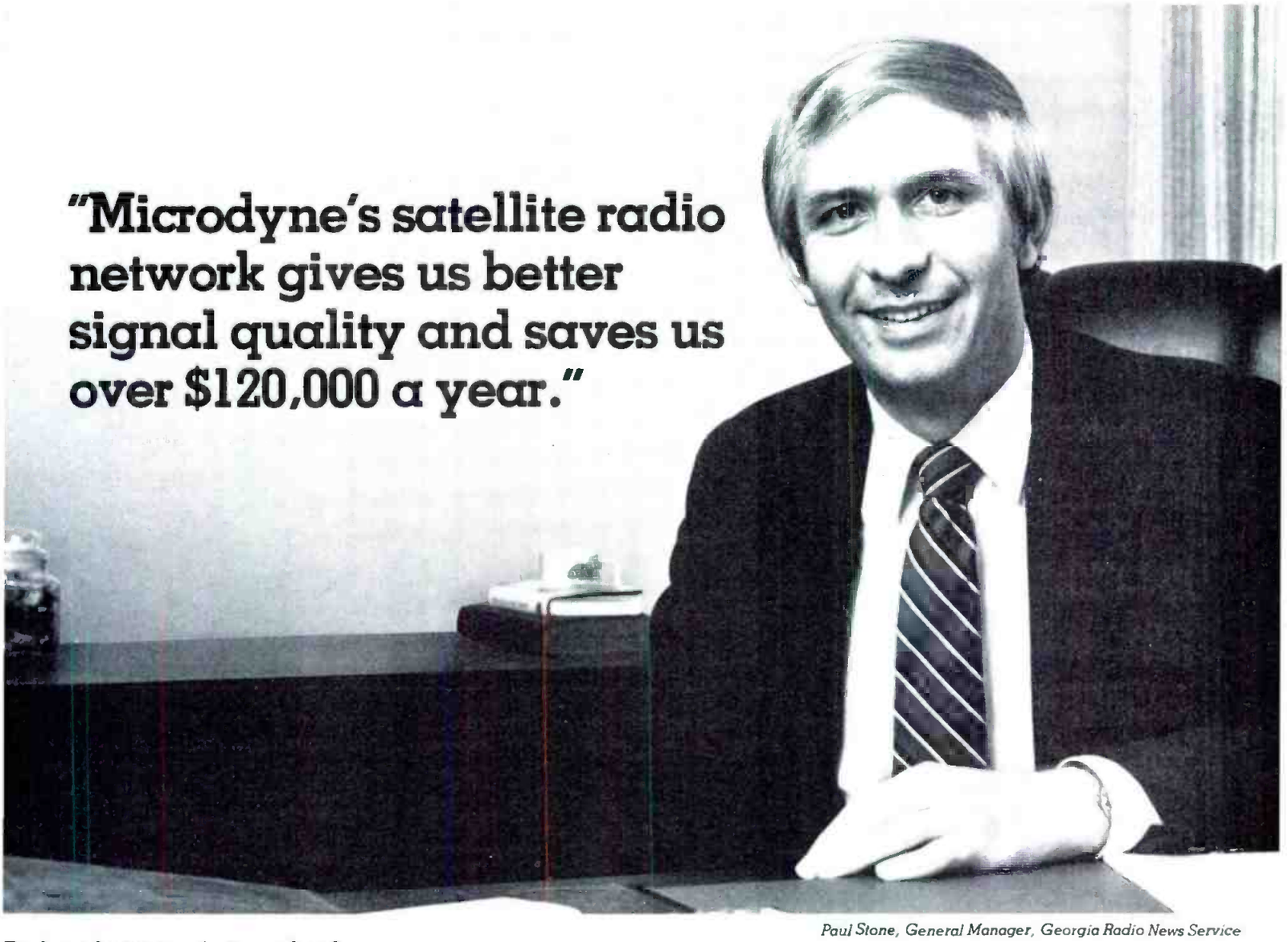

Paul Stone, General Manager, Georgia Radio News Service

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Modulation levels during SCA transmission

By John Hidle, P.E., vice president, Engineering, ABC Radio, New York, NY; Harry Priester, chief engineer, WLS-FM, Chicago, IL; and Alfred Resnick, P.E., chief engineer, WLS-AM, Chicago, IL*

The main drawback many FM stations have seen to use of their SCA channels has been the need to back off main-channel modulation to prevent peaks of frequent recurrence exceeding 100%. Tests conducted by National Public Radio (NPR) and Westinghouse Broadcasting and Cable have shown that stations that add subcarriers at low injection levels above the stereo (L – R) channel need not reduce main-channel modulation to remain within the bandwidth limitations of the FCC rules. A laboratory study performed by Westinghouse and authored by Harrison Klein in November 1982 concluded that a maximum modulation limit of 115% should be permitted when SCA subcarriers are used. The tests, performed at the Broadcast Electronics manufacturing facility in Quincy, IL, showed that the higher limit is technically viable without objectional increases in occupied bandwidth because of the unique spectral characteristics of low deviation subcarriers. The report also concluded that stereophonic or monophonic transmissions without any SCA subcarriers present should continue to be limited to 100% modulation.

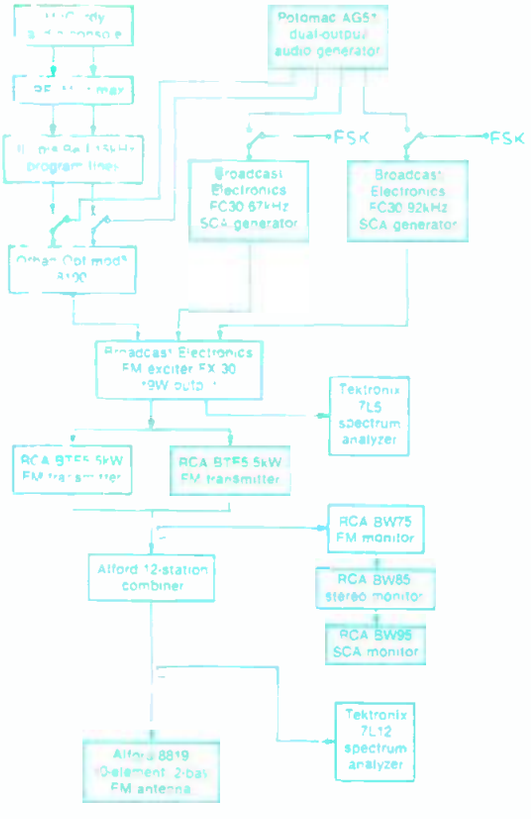


Figure 1. The transmission system at the Hancock Building site used in the ABC Radio tests.

ABC, in a follow-up to the earlier bench tests, examined the same types of parameters as the Westinghouse study, but in actual over-the-air conditions. ABC was granted experimental authority to perform the measurements with modulation limits beyond those allowed in the present FCC rules to gather the necessary data. Assisting in this effort was Harry Priester, WLS-FM, Chicago; Alfred Resnick, WLS-AM, Chicago;* and Klein.

The tests, which closely followed the procedures contained in the Westinghouse engineering report by Klein, were conducted with the cooperation of Klein and other engineers from Group W Radio. The results of the measurements, which approximated those observed under laboratory conditions, have been submitted to the FCC in support of changes proposed in BC Docket 82-536.

Testing procedure

WLS-FM (94.7MHz), the ABC-owned FM station in Chicago, has dual transmitting facilities. One is located at the top of the John Hancock Building and the other at the Sears Tower. The Hancock Building installation, consisting of parallel RCA transmitters and the associated filters, transmission line and multistation Alford antenna, comprised the transmitting facilities for the test. The Sears Tower plant, including the main radiating antenna, its associated transmission line and bandpass filter, was used as the receiving system for the test. The transmitting and receiving antennas both are non-directional in azimuth and are separated by almost one mile. This configuration provides an essentially free-space propagation environment.

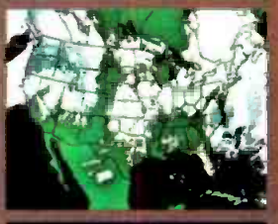
The transmitting system, as shown in Figure 1, consisted of a Broadcast Electronics FX-30 exciter fed by an Orban 8100 stereo generator and two Broadcast Electronics FC-30 SCA generators, one operating at 67kHz and the second operating at 92kHz. Two RCA 5kW transmitters operating in parallel fed the 10-element (2-bay) cavity-backed radiator (CBR) Alford 8819 antenna through a 12-station combiner. Monitoring was provided at each stage of the system, as shown.

Provisions were made for application of either program audio or signal generator inputs to the Orban 8100. The SCA generators were fed with test tones or frequency shift keying (FSK) data signals. No changes were made in tuning the RCA transmitters and all equipment was adjusted for normal program operation, except when measurements were being made pursuant to the experimental authority authorization (modulation levels exceeding those permitted by the present FCC rules).

At the Sears Tower, the received signal was fed through a bandpass filter and directional coupler to a Tektronix 492P spectrum analyzer for display and photography. (See Figure 2.)

For each test spectrum photographed, the pilot level was checked and program audio levels were adjusted to produce the peak modulation specified for stereo content. The SCA injection levels were adjusted while viewing the spectrum baseband. SCA modulation levels were verified by observing the station's carrier when modulated by the particular subcarrier alone. Bessel function first-order sidebands were used for this purpose.

The transmitted radio frequency



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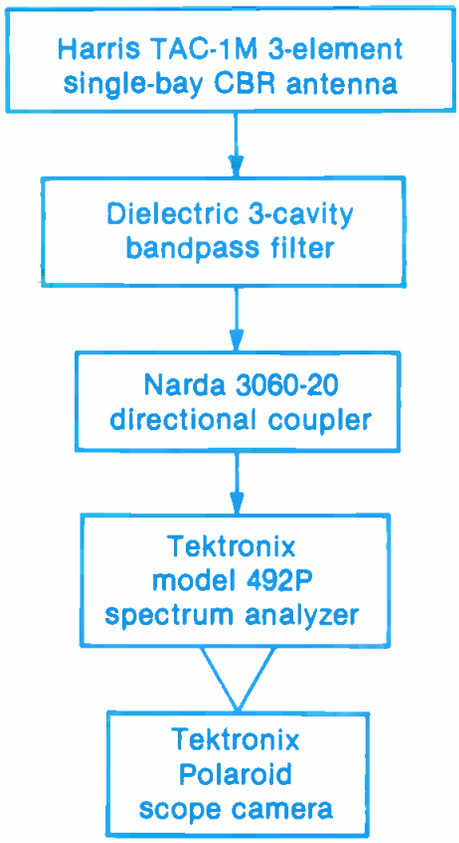


Figure 2. The Sears Tower receiving system used in the SCA experiments.

spectrum at the origination point was observed at a sample port after the Alford combiner, where all of the Hancock station carriers are present. Observation at this stage was to verify first-order sideband levels only.

Combined modulation then was applied to the station carrier. The received signal at the Sears Tower site was observed with the Tektronix spectrum analyzer in a *Max-hold* mode. Program material applied was identical for each spectral photograph. Some tests were conducted while applying 500-baud FSK data to one SCA generator and test tones to the other. As the Westinghouse report noted, no difference in the spectral distribution was observed between cases with fully modulated SCAs and unmodulated SCAs.

Spectrum analyzer photos for single SCA subcarrier operation at the 100% limit and proposed 110% limit are shown in Figures 3(a) and 3(b) for 67kHz systems and in Figures 4(a) and 4(b) for 92kHz systems.

As can be seen in the photographs, large signal strength variations can be observed 200kHz below WLS-FM. This seems to be caused by WKTI in Milwaukee, which operates at

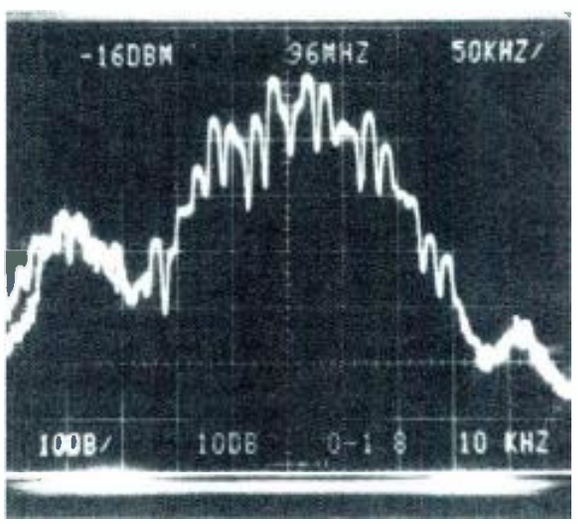


Figure 3(a). Overlay of the RF spectra.

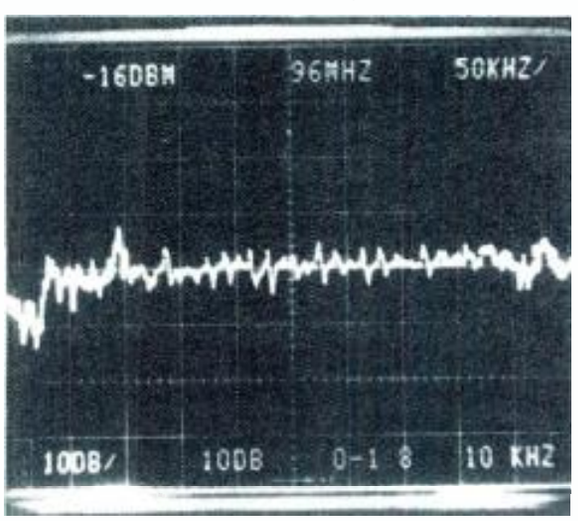
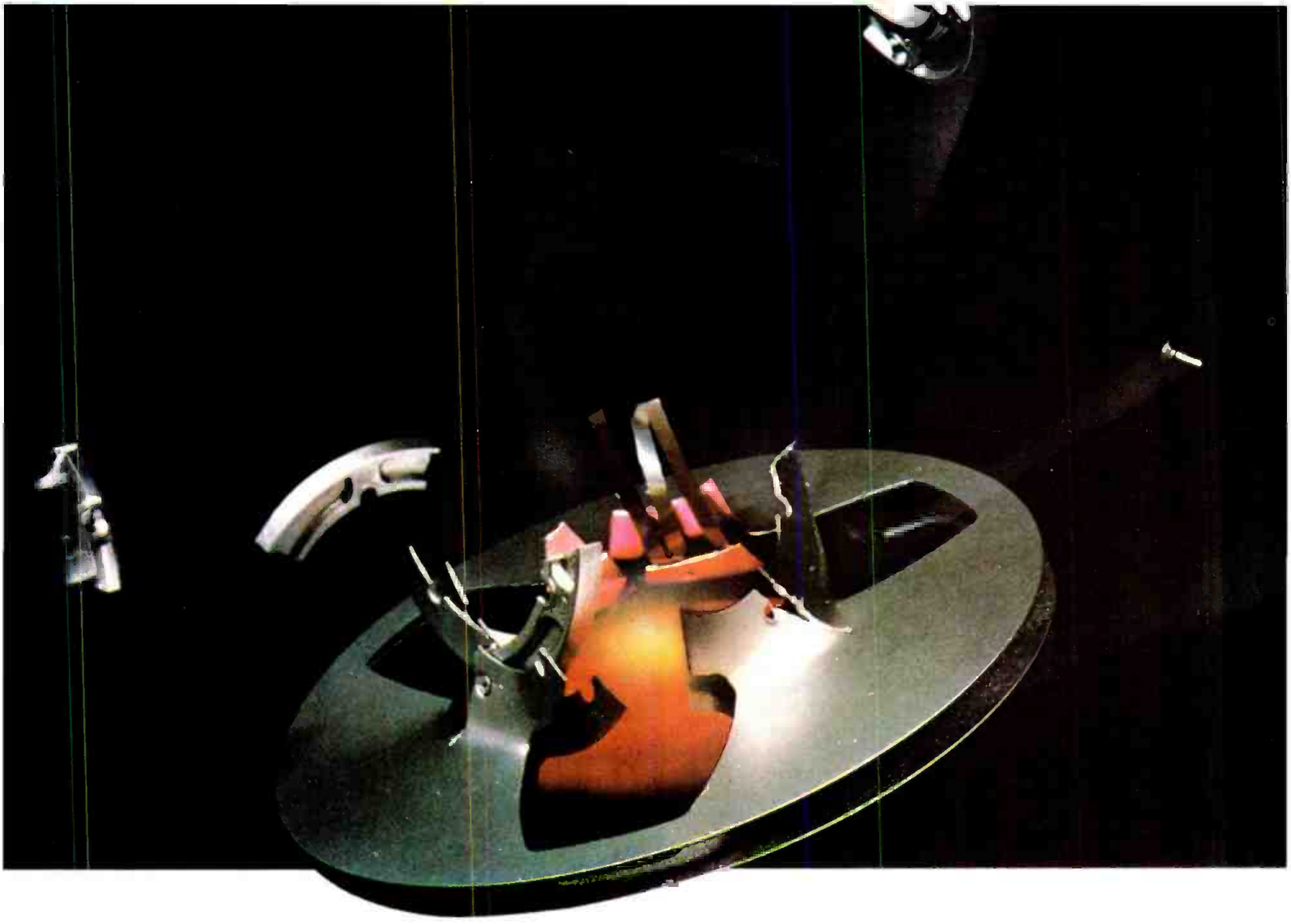


Figure 3(b). Difference in the RF spectra.

Figures 3(a) and 3(b). A pair of processed spectrum analyzer displays from the ABC tests with the two modulation conditions noted below.

Signal #1
91% stereo (15kHz left channel)
\+ 9% pilot
100% total modulation

Signal #2:
92% stereo (15kHz left channel)
9% pilot
\+ 9% 67kHz SCA
110% total modulation



Ramko Research Explodes The Reel To Reel Versus Stereo Tape Cartridge Myth!

FACT: There is now a stereo cartridge system so advanced that you can't tell the original material from the reproduction. A system that performs like a professional reel to reel, yet has all the advantages inherent in the tape cartridge format. The PhaseMaster from RAMKO RESEARCH. The only cart system in the world that allows AM or FM to program in full stereo. Spots, special effects, Beethoven, or hard rock. Consistently, everytime, cart to cart, machine to machine. Not only that, but there are over 300 systems that have been field proven for the last 1½ years. No bugs, no surprises. What you see and read about is what you get.

MYTH: Tape cartridges do not have the mechanical stability nor precise enough guidance systems to produce truly high quality, wide separation, stereo.

FACT: The new PhaseMaster completely eliminates this problem via its exclusive electronic, real time, tape path and phase correction circuitry. No pretesting of carts or adjustments to make. It is so sophisticated and responsive that you can actually bend, twist and move the cart in and out while playing, without any discernable difference between the original source material and that which is being reproduced. In fact, in all of our demonstrations to broadcast managers and engineers, none could tell the difference between an A/B comparison of the record played and that simultaneously reproduced on the PhaseMaster. In addition, this exact reproduction will be repeated on any other PhaseMaster, regardless of head and tape guide alignment (within reason) or cart warpage. No other machine in existence, reel to reel or cart, has this ability.

MYTH: Only reel to reel provides the low noise and distortion, and the wide response demanded by my listeners.

FACT: We are willing to match the PhaseMaster against anything you are currently using or anticipate buying. Judge for yourself or ask for our comparison guide. We believe you'll agree with us (and our competitor's engineers), that RAMKO has indeed advanced the state of tape cartridge technology far beyond what was believed possible.

TO SUM IT UP: If you are stereo formatted and looking for the best, most effective way to program your station, then the PhaseMaster is your answer. Whether it's highbrow or punk rock, you will experience the best of both worlds with all the quality demanded by even your most discerning listeners.

Find out for yourself the whole PhaseMaster story. From its superior mechanics for long term wear and stability, to the totally unique phase correction circuitry and 2 year warranty.

Contact your nearest rep or dealer today, or call RAMKO RESEARCH toll free, (800) 821-2545, for your full color, descriptive brochure. Hurry though, your competition may have already ordered theirs.

RAMKO RESEARCH

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Rancho Cordova, California 95670
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Circle (52) on Reply Card

Figure 4(a). Overlay of the RF spectra.

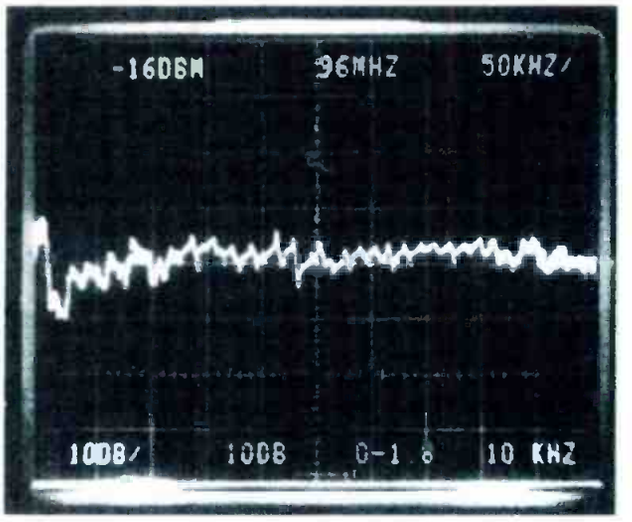


Figure 4(b). Difference in the RF spectra.

Figures 4(a) and 4(b). A pair of processed spectrum analyzer displays from the ABC tests with the two modulation conditions noted below.

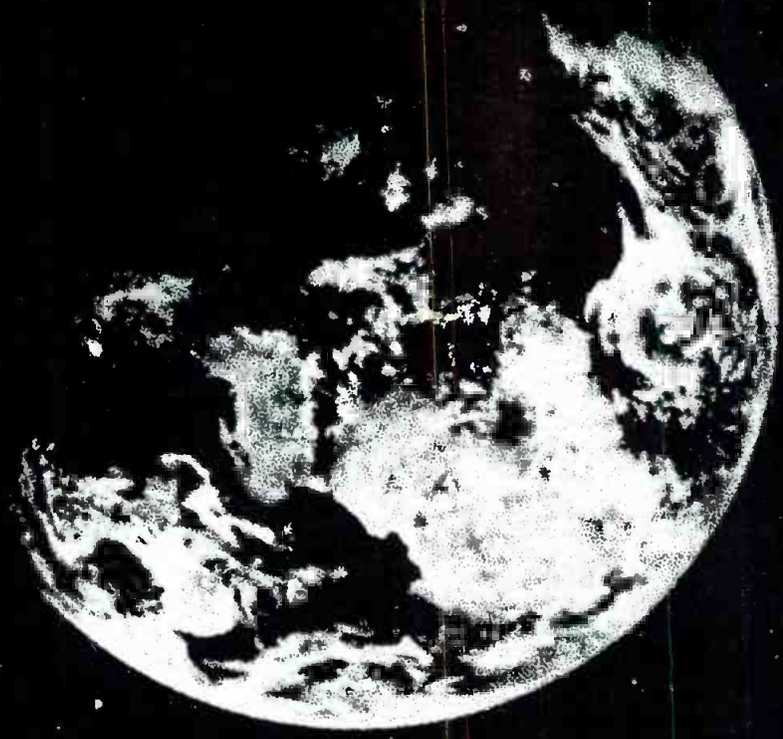
Signal #1:
82% stereo (15kHz left channel)
9% pilot
\+ 9% 92kHz SCA
100% total modulation

Signal #2:
92% stereo (15kHz left channel)
9% pilot
\+ 9% 92kHz SCA
110% total modulation

94.5MHz. A substantial part of the propagation path for this signal is over water and it exhibits propagation anomalies. Using an extremely high receiving antenna (1535 feet) causes reception of the WKTI signal at a far higher level than would be present when using an antenna closer to ground level.

Conclusions

Examining data gathered in these tests yields results substantially agreeing with figures taken under laboratory conditions. Total modulation levels of 119%, when employed during times of SCA subcarrier transmission, produce emissions that easily comply with the occupied bandwidth requirements of Section 73.861 of the commission's rules. Total modulation levels of 119% when employed for stereophonic program material transmission alone, however, produce a spectral distribution that exceeds in amplitude the spectral distribution



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Circle (55) on Reply Card

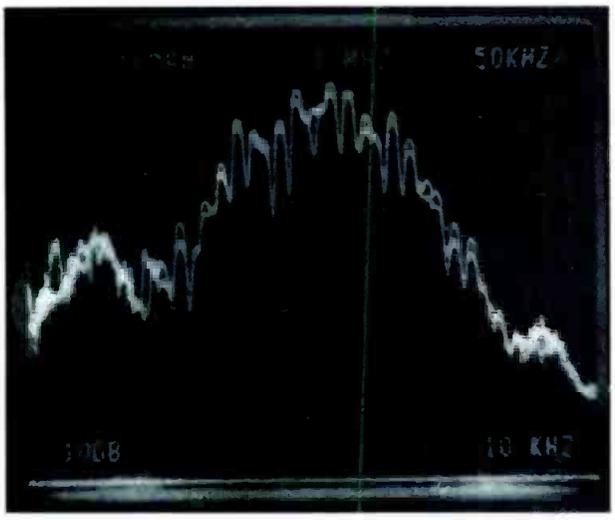

Figure 5(a). Overlay of the RF spectra.

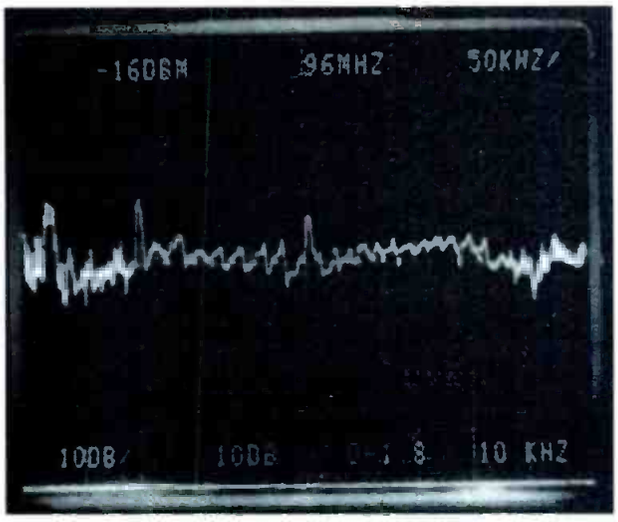

Figure 5(b). Difference in the RF spectra.

produced with 119% total modulation during times when two SCA subcarriers are being transmitted. (See Figures 5(a) and 5(b).

Based on this work and earlier studies, ABC recommends that the commission seriously consider amending the rules to permit total modulation levels above 100% when SCA subcarriers are transmitted. To this end, ABC recommends that the combined peak level for total main-channel modulation including stereo pilot not be reduced when SCA subcarriers are transmitted, provided the carrier modulation by the combined arithmetic sum of all subcarriers below 75kHz does not exceed 10%, and modulation of the carrier by the combined arithmetic sum of all subcarriers above 75kHz does not exceed 10%.

Adoption of this modification of the rules would remove a major roadblock to the increased use of subcarriers in FM broadcasting. |:-)))|

Figures 5(a) and 5(b). A pair of processed spectrum analyzer displays from the ABC tests with the two modulation conditions noted below:

Signal #1:
92% stereo (15kHz left channel)
9% pilot
9% 67kHz SCA
\+ 9% 92kHz SCA
119% total modulation

Signal #2
110% stereo (15kHz left channel)
\+ 9% pilot
119% total modulation

Now . . . remote, automatic control of your entire transmitting facility . . .

Harris 9100 Intelligent Remote Control System

In its various configurations, the Harris 9100 provides intelligent remote control; automatic transmitter control; automatic logging; plant protection through intrusion and fire alarms; and automatic control of tower lights and building temperature. It can even exercise your standby equipment...and operate up to three remote sites from a single location!

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Whether you're AM, FM, TV or Satellite (or any combination), the Harris 9100 Intelligent Remote Control System is designed for you—for your security, efficiency *and* savings. For more information, contact Harris Corporation, Studio Division, P.O. Box 4290, Quincy, Illinois 62305-4290. 217-222-8200.

HARRIS

Circle (57) on Reply Card

The AM stereo challenge:

AM stereo vs. FM stereo

By Dave Obergoenner, chief engineer, KSD-AM/KSD-FM, St. Louis, MO

The question many AM radio station managers are asking themselves is whether AM stereo and improved receiver designs can make AM comparable to FM in audio quality. Based on tests performed at KSD Radio in St. Louis, MO, the answer is *yes*.

KSD-AM last fall became the first AM station in the St. Louis, MO, area to broadcast in stereo. To educate the public (as well as station employees) to the quality offered by high fidelity AM, KSD-AM held a press conference and open house to demonstrate the capabilities of its new Motorola system.

Attendance by the public and local media was good. We set up a number of different listening positions using various AM stereo receivers, speakers and headphones. Component systems costing from $400 to $10,000 were used in the demonstration. The Delco Electronics Division of General Motors lent us two 1984 Buick automobiles equipped with its new AM stereo/FM stereo radios, which should be available as factory-installed options on some 1984 Buicks this month.

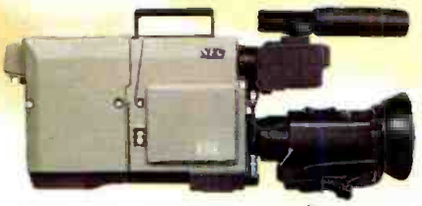
The Delco radio comes with a 25W power amplifier, separate bass and treble controls, a fine-sounding FM section and a high quality dual-bandwidth AM stereo system.

With the battery of top-of-the-line receiving equipment assembled for the open house, the stage was set for a detailed comparison of AM stereo and

KSD-AM's control room, shown during the stereo demonstration tests.

Lou Eads (at right) of Delco Radio demonstrates the company's new AM stereo receiver to a member of the press during the KSD AM stereo/FM stereo comparison.

EVEN THE HAIRIEST SITUATION CAN'T SHAKE UP THE FIRST 3-CHIP CAMERA.



Some gripping news from NEC: the ENG camera has come of age. Our new SP3 packs so many features into 7.3 lbs., it's a small wonder.

With three CCD chips instead of tubes, the SP3 can take all the abuse your crew dishes out, and never needs registering. It produces broadcast quality pictures with over 500 lines of resolution. And better still, you can use it with any format — VHS, Beta,™ or ¾ inch.

To find out more about the SP3, the most newsworthy camera around, call NEC at 1-800-323-6656. In Illinois, call 312 640-3792.

NEC

IMAGINE WHAT WE'LL DO NEXT

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

Circle (58) on Reply Card

The author (at right) demonstrates the performance of the AM stereo system at KSD with members of the local media.

FM stereo. For the tests, KSD-AM and KSD-FM played the same music selections at the same time. Both stations used CRL System-4 audio processors, set to identical parameters. The stereo enhance L – R processing control on the AM stereo limiter was switched off for the tests because it would have given AM an unfair advantage in separation.

Results

Because these were listening tests, the responses varied, depending on the person. The "average" listener thought that AM sounded slightly brighter than FM on some of the receivers, due to peaks in the 6-8kHz region caused by transmitted high frequency equalization. The fast roll-off above 6kHz or 8kHz (depending on the selected receiver bandwidth) of the Delco radio AM section was noticeable to more trained ears, when compared to FM. With the more expensive component systems, in particular the Phase Linear T-5200 AM/FM tuner (which will deliver frequency response exceeding 10kHz), the difference was less noticeable. It was more similar to the difference between two high quality speakers or phono cartridges. The AM S/N figure was greater than 55dB, and stereo separation was good on all radios tested (similiar to FM).

These results were achieved using KSD's daytime non-directional antenna or the nighttime 4-tower directional array. There virtually was no difference between the received quality of the daytime and nighttime signals. The AM and FM transmitting facilities are located approximately 10 miles from the site of the listening tests.

The comparisons left little doubt that high fidelity AM stereo can compete with FM as a quality programming source. A "thank you" is in order to those receiver manufacturers that have had the nerve to venture into the uncharted waters of high fidelity AM stereo. The ball is now in our court, and broadcasters must make their move.

Optimod-FM. The Preeminent Processor.

ADULT	AOR	CHR (Rock)	COUNTRY	BLACK/URBAN CONTEMPORARY	BEAUTIFUL MUSIC
WYNY New York	KMET Los Angeles	WLS Chicago	WMAQ Chicago	WKTU New York	KJOI Los Angeles
KHTZ Los Angeles	KLOS Los Angeles	KIIS Los Angeles	KIKK Houston	WRKS New York	WLAK Chicago
WBZ Boston	WLUP Chicago	WXKS Boston	KSCS Dallas	KUTE Los Angeles	KOST Los Angeles
WCCO Minneapolis	WLLZ Detroit	KIQQ Los Angeles	KILT Houston	WKYS Washington, DC	WJR Detroit
KRTH Los Angeles	WAPP New York	WCAU Philadelphia	WWWW Detroit	KRLY Houston	KMEZ Dallas
WBBM Chicago	WCOZ Boston	KRTH Los Angeles	KSAN San Francisco	KACE Los Angeles	KSFI Salt Lake City
WRAL Raleigh	KMEL San Francisco	WKQX Chicago	KZLA Los Angeles	WGPR Detroit	WEZI Memphis

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ORBAN PROCESSING KEEPS YOU COMPETITIVE

Circle (60) on Reply Card

Field trials:

JVC KY-950 ProCam

By Carl Bentz, television editor

Traditionally, *Field Reports* published in **Broadcast Engineering** have been based on one facility's applications and evaluation of a piece of equipment. Departing from tradition, this article reports findings from engineers at three different types of TV facilities.

When I first saw the JVC KY-950 and KY-900 ProCam cameras, in a pre-introductory demonstration early in 1983, I was impressed. The picture quality that was generated under adverse conditions was much better than what I had expected at a price of about $27,000.* At the same time, I could not help thinking of a previous model, the KY-1900U, which had been considered almost a *throw-away* camera by some broadcasters at its less than $10,000 list price. Unfortunately, many factors that allowed the low cost of the earlier unit also were factors that met resistance from broadcasters.

Because of the picture quality in a poorly lighted conference room, the name ProCam and a 1-button autoregistration feature, I became interested in developing a plan to put a ProCam through its paces. I told David Walton, product manager for JVC, that I would like to place the KY-900 Saticon or the KY-950 Plumbicon into three somewhat diverse, but realistic, service situations – a CATV local origination effort, a commercial TV station and a PBS affiliate. All three selected operations do a significant amount of studio and remote production. He agreed to the arrangement.

CATV setting

Before I delivered the KY-950 to the first test site, I unpacked the camera to make sure that no damage had occurred in shipment. The camera, 14X Fujinon lens and viewfinder arrived housed safely in a suitcase-type transport case. Foam held everything firmly in place, including an ac-adapter/power supply. A separate container held the Anton-Bauer B20 battery and charger. Soon I had mounted the battery and was watching pictures in the viewfinder.

When I delivered the camera to the studios of TeleCable of Overland Park, KS, Steve Paschang, studio engineer, quickly cabled the KY-950 into the video switcher. Gen-locked with color black, a single adjustment was needed for in-phase color bars. Referring to the instruction manual helped locate the appropriate subcarrier adjustment inside the camera.

For the next week, Paschang and his staff used the camera in the studio and with a remote production vehicle. For both applications, the performance was considered adequate. The camera was easy for the non-technical operators to use and seemed to wear well. Auto color balance and registration functioned well.

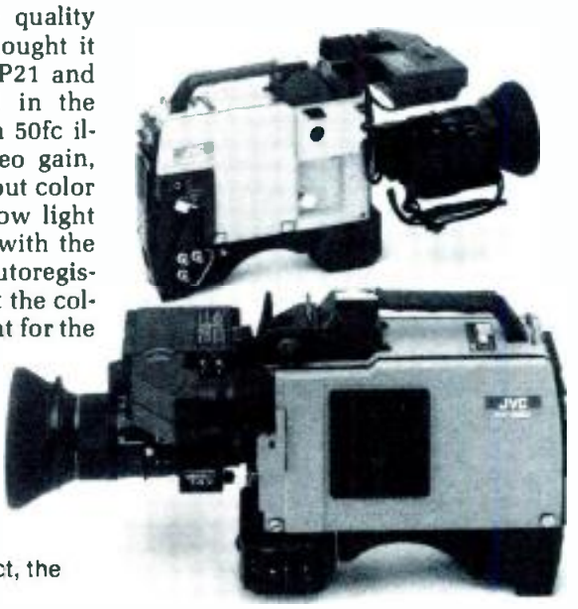
For Paschang, the picture quality seemed acceptable, but he thought it did not match the Hitachi FP21 and FP22 cameras already used in the TeleCable studio. In less than 50fc illumination, with +18dB video gain, noise began to be a problem, but color remained acceptable at the low light level. Paschang was pleased with the compact package and the autoregistration feature, but he thought the color bar switch was inconvenient for the operator.

If new camera purchases were to be considered, Paschang said that the KY-950 would be among his possible choices for an ENG/EFP-type camera.

Commercial station

The second stop for the camera on the Kansas City tour was at KCTV-TV 5, where Joe Snelson, chief engineer, assigned Clifford Lynch, ENG maintenance supervisor, to put the camera through its paces.

After using the camera for more than a week, Lynch said that not only did the camera perform excellently, in adverse lighting, to 60fc, but also noise did not seem to be a problem for him. Low light color remained acceptable. The automatic features, including registration, and good sharp pictures were outstanding qualities of the camera, he said. The 14X lens and its macro qualities were sufficient for most ENG requirements, as was the color balance. Placed only in ENG use, the KY-950 needed no adjustments during the period, but



The KY-950 and its sister product, the KY-900

*Price varies according to lens options and accessories.

Manufacturer's specifications: KY-950 ProCam

Optical system:	3-tube prism (f/1.4) with bias light
Lens mount:	bayonet-mount
ND and color temperature:	turret-type four positions close, 3200°K, 5600°K, 5600°K + 25% ND
Pickup tube:	⅔-inch diode-gun Plumbicon XQ3427
Sensitivity and S/N ratio:	f/4.5, 2000 lux (200fc); 58dB nominal
Sensitivity selection:	normal, +9dB, +18dB
Minimum illumination:	f/1.7 38 lux (3.6fc) (+18dB switch on)
Registration:	0.1%, 0.2%, 0.4%
Horizontal resolution:	600 lines at center (G-CH)
Contour correction:	dual-edged, horizontal and vertical
White balance:	automatic, with 8-bit digital memory, 3200°K preset provided
Black balance:	automatic, with 8-bit digital memory
Black level:	automatic
Encoder:	NTSC (IQ)
Color bar generator:	RS189A split-field bars (switchable to full-field bars)
Synchronizing system:	RS-170A SSG or gen-lock by composite video or blackburst; color framing pulse output
Auto iris:	+50% (one-half f/stop), normal and −50% (one-half f/stop), level selector provided
Output signals:	composite video signal 1Vp-p, 75Ω; test output for black-and-white monitor (R, G, B, −G and encoded output 1Vp-p, 75Ω) mic signal −52dBm, balanced or −20dBs unbalanced (switchable); earphone signal from VTR playback (8Ω)
Power consumption:	12Vdc, 1.95A (without viewfinder and lens)
Weight:	10 pounds (without viewfinder and lens)

Lynch said that the physical layout of the circuitry lended itself to good access for maintenance.

Although Lynch was pleased with the camera and its performance, he said that he could not suggest that the station purchase ProCams. The opinion was based, in this case, not on the product, but on previous experiences and difficulties in obtaining replacement parts. The fast pace of a leading news operation cannot afford to wait around for parts, he said, which has been a common problem for him with JVC products in the past.

PBS environment

John Long, chief engineer, KCPT-TV 19, Kansas City, was the third user of the test camera. Again used for ENG/remote production for more than a week, Long said he thought the camera performed excellently in nearly every way. His main complaint dealt with color fidelity at a lighting level of 25fc. Luminance noise, however, did not become a problem for him at that level.

According to Long, the camera was well-planned for both non-technical operators and engineers. No adjustments were required during his use of the unit, but he took the time to look it over closely. His observations led to conclusions that the physical layout of the camera and the completeness of the instruction manual take the maintenance man into consideration.

At KCPT, the camera performance matched that of Ikegami cameras normally used for remote productions. The lens was adequate and the auto-registration feature was helpful. The operation was sufficient to cause Long to say that he would consider the ProCam in possible future camera purchases.

The ProCam approach

Before introducing the ProCam line, JVC had been considered a consumer and industrial equipment manufacturer. With the new line, however, a different approach was required. Not only does the KY-900 series incorporate prism-optics instead of dichroic mirrors, high grade Plumbicon (XQ3427) or Saticon (H9386D) pickup tubes and highly stable circuitry, but also the company's product support program has changed. JVC, aware of past part supply difficulties for its own products (as well as for other manufacturers), initiated a plan to improve the support of broadcast users. At the New Jersey US headquarters, a separate operation from other product lines includes a board exchange program, a large inventory of replacement parts and an express shipping service to speed parts to their destinations.

Final notes

Based on short trial periods in three TV facilities, the KY-950 camera performs on a level with many of the ENG/EFP cameras currently on the market. The variations among the users' comments are based on their facilities' needs, test environments and investigators' personal opinions.

The accompanying sidebar, selected from the manufacturer's specifications, will allow you to draw your own conclusions.

AES-'83/New York: A landmark in digital

By Bill Rhodes, editorial director

- Oct. 8-12
- New York Hilton
- 202 exhibitors
- 6000 attendees
- 10 technical sessions
- 81 technical papers
- Nine workshops

Traditionally, **BE** has not done an in-depth replay of Audio Engineering Society (AES) conventions. However, rapid advances in digital technology, especially as demonstrated at the 74th AES Convention (AES-'83), have prompted us to provide extensive coverage.

AES-'83 gave unprecedented attention to digital and analog signal processing and to broadcasting. Advances in audio were covered in 10 technical sessions, in specialized workshops with presentations and hands-on equipment operations, and in evening demonstrations of the compact disc technology.

Technical presentations

Technical sessions included the following:

- Digital recording and broadcasting;
- Signal processing: Analog;
- Studio design;
- Sound reinforcement;
- Loudspeakers, transducers and low frequency system alignment;
- Loudspeakers: Network considerations;
- Signal processing: Digital;
- Psychoacoustics;
- Test and measurement; and
- Disc recording and multichannel sound.

The majority of the papers from these presentations will appear in future issues of the *AES Journal*, but the full set of pre-print papers are available from the Audio Engineering Society for a nominal fee.

Workshops

Workshop formats included a combination of presentations, panels of experts to field questions and hands-

George Currie, new head of the Sony Professional Audio Products Division, opened the press conference on the DASH (Digital Audio Stationary Head) format agreed upon by Sony, Studer, Matsushita and MCI/Sony.

AES-'83 awards/fellowships

The Awards Committee, under the chairmanship of Ray Dolby, selected the following persons for special merit:

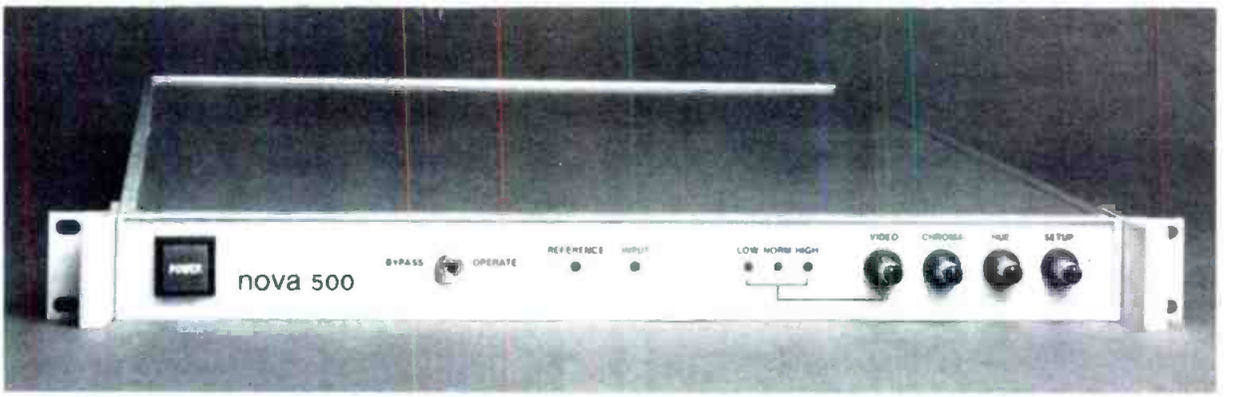
- **Carolyn Davis**—Board of Governors Award for contributions to audio education and for chairmanship of the 66th convention in Los Angeles;
- **Milton Putnam**—Honorary Membership for lifelong contributions to studio design and to the design and production of audio instruments and equipment; and
- **Richard Heyser**—Silver Medal for the development of time delay spectrometry and its use in the study of loudspeaker and room acoustics.

AES Fellowships were presented to the following persons:

- **Dr. Roger Lagadec** of Studer for contributions to digital signal processing and recording;
- **Dr. George C. Maling Jr.** of IBM for contributions to the field of acoustics and to the development of national standards;
- **Dr. Max V. Mathews** of Bell Telephone Labs for pioneering work in the computer generation of musical signals; and
- **Roland J. Zavada** of Eastman Kodak for leadership in the standardization of audio, motion picture and TV systems—much of which has been coordinated through the activities of the SMPTE.

innovative 500

because digital performance doesn't have to cost a lot . . .



The nova 500 Digital Time Base Corrector defines a new industry standard. For the first time, digital performance doesn't have to cost a lot.

The **nova 500** will time base correct all ¾" and ½" non-segmented video tape recorders which accept sync and derived subcarrier inputs. The result, full bandwidth time base corrected signal.

Only one rack unit high (1.75"), the **nova 500** fits into even the most cramped van or equipment rack. A weight of only 10 lbs. enhances portability in field applications.

8 bit 4X subcarrier sampling is employed for maximum picture fidelity. Advanced design memory provides 32 lines of video storage. Proven technology allows operation with less than 50 Watts of power dissipation.

All active components are temperature cycled, burned-in and tested PRIOR to assembly into the **nova 500.** Each system is thoroughly burned-in after test for added reliability. Power supplies operate at no more than 55% of their rated capacity.

You compare! The **nova 500 Digital Time Base Corrector** . . . the best things do come in small packages!

For further information and pricing contact: **nova systems, inc.**
20 tower lane, avon, ct 06001
(203) 677-5252

Circle (63) on Reply Card

For the press announcements on DASH, representatives from MCI/Sony, Matsushita, Sony and Studer answered questions from the press regarding DASH features and applications.

on demonstrations of the latest audio equipment. Scheduled workshops included the following:

- Hands-on digital;
- Recording studio operation;
- Stereo TV mic techniques;
- SMPTE code and synchronizing;
- Console troubleshooting;
- Sound track audio;
- Tape machine maintenance;
- Digital recording; and
- Grounding and shielding.

Exhibits

A stronger focus on digital audio and growing interest in stereophonic/multichannel audio for television have given the audio field a much-needed economic boost, which produced a record turnout of exhibitors and attendees at AES-'83.

New products also abounded, but space does not permit a review. Instead, a listing of equipment exhibitors (page 96), with Reader Service Numbers, is included so that readers may request new product information.

Press meetings

Several events that took place in press meetings and special booth demonstrations are noteworthy.

• **Digital Audio and DASH.** Four major audio forces announced their agreement on a digital audio format called DASH (Digital Audio Stationary Head). The proponents involved were Matsushita Electric Industrial Company Ltd. and Sony Corporation, both of Japan; Willi Studer AG of Switzerland; and MCI (a division of Sony Corporation of America) of the United States.

The new format combines features of the original format jointly promoted by Sony and Studer with new developments from all of the com-

Think of EV as your mike expert.

The RE20. There's a reason it has become a studio standard.

The lack of a consistent "studio sound" is a problem many broadcast engineers wrestle to overcome every day. The simplest and often least expensive way of establishing and maintaining this consistent sound is the use of a professional-quality studio microphone.

The RE20, for example, is uniquely suited to eliminating the sonic variables caused by different mike techniques.

"Single-D" microphones have proximity effect. The RE20 doesn't, and its unique dual-tube Variable-D design not only assures uniform frequency response independent of working distance but also regardless of the talent's position within the cardioid pickup pattern.

The RE20 also eliminates the vocal inconsistencies often heard in post production when studio voice-overs are added to tapes recorded in the field with omnidirectional mikes.

If a consistent "studio sound" is your objective you should consider the Electro-Voice RE20.

Many Electro-Voice Professional Microphone Dealers can arrange a hands-on trial at no cost to you. For more information please contact your EV dealer or write to: Greg Silsby, Market Development Manager/Professional Markets, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107.

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Table I.			
Sampling rate	Tape speed		
	Fast	Medium	Slow
48kHz	76.2cm/s (30ips)	38.1cm/s (15ips)	19.05cm/s (7.5ips)
44.1kHz	70.01cm/s (27.56ips)	35cm/s (13.78ips)	17.5cm/s (6.89ips)

Table II.					
Tape width		¼-inch		½-inch	
Track density		Normal	Double	Normal	Double
Digital tracks		8	16	24	48
Aux. tracks		4	4	4	4
Digital audio channels	Fast	8	16	24	48
	Medium	–	8	–	24
	Slow	2	4	–	–

panies. Representatives from each of the DASH proponents told the press that they hoped their common recording format would be the basis for the universal format required by the audio industry.

The agreement on a new format takes into account recent developments in technology, including the possible use of thin-film heads, a format for low speed recording with increased robustness in signal processing and the recommendation of the AES Standard Committee on Digital Audio for standardization of the 48kHz sampling frequency.

DASH's specifications and features allow it to accommodate a wide variety of future technological improvements (such as thin-film heads) while retaining compatibility. It will be submitted as a proposal for an international specification, and also will be actively promoted among digital audio manufacturers and users as the recommended format for stationary-head digital audio recording.

The DASH format covers a range of applications from 2-channel recorders (19.05cm/s, ¼-inch tape) to 48-channel recorders (76.2cm/s, ½-inch tape), suitable for broadcasters, top studios, small studios or production houses.

The format has three versions—fast, medium and slow—depending on tape speed. The necessary number of tracks to record one channel is one, two and four, for fast, medium and slow versions, respectively.

The tape speed and sampling rates for DASH are shown in Table I.

The track density and channel number for DASH are shown in Table II. Double track density is possible by using state-of-the-art thin-film heads, keeping the compatibility with the normal track density for the initial half number of tracks.

According to those proposing DASH, the future of the format is bright for the following reasons:

- Adaptation of thin-film heads will increase the number of recorders with double track density in the future, providing versatility and tape economy to end users. Tapes recorded at normal track density can be played back on double-density recorders.
- By using a common configuration from 2-channel to 48-channel recorders, manufacturers can take advantage of production and servicing efficiency. Also, with development of LSI, further reductions in size, weight, power consumption and cost will be possible.

- **Digital mixing.** In a bold move, Rupert Neve introduced the industry's first all-digital audio mixing console, the Neve DSP (Digital Signal Processing). With all main-signal processing in digital (PCM) form, the DSP console was designed to launch high quality facilities into the digital audio era. Key applications include broadcasting, recording, mixdown, post-production dubbing, live mixing, theater sound and compact disc mastering.

According to Barry Roche, president, Rupert Neve, the DSP enables broadcasters and recording studios to take full advantage of the digital audio revolution by offering a mixing console system that keeps analog circuitry and conversion to a minimum. All fundamental aspects of recording—for example, gain control, equalization, compression, limiting and time delay—are performed in the

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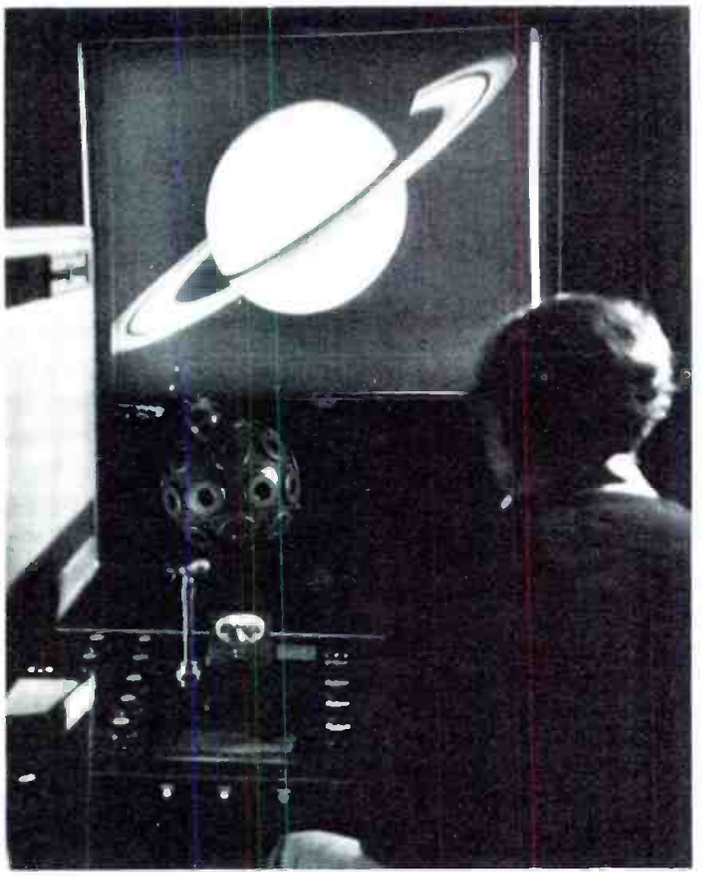
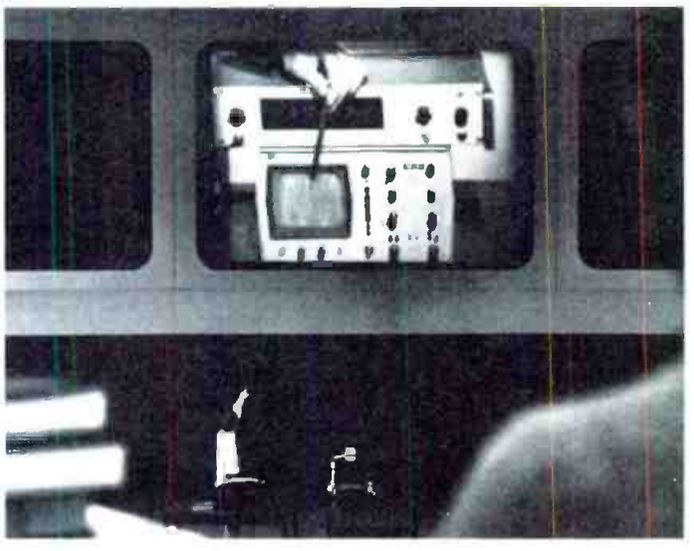


SELL-OUT CROWDS at Fiske Planetarium, Boulder, watched live NASA transmission presented by General Electric projector.



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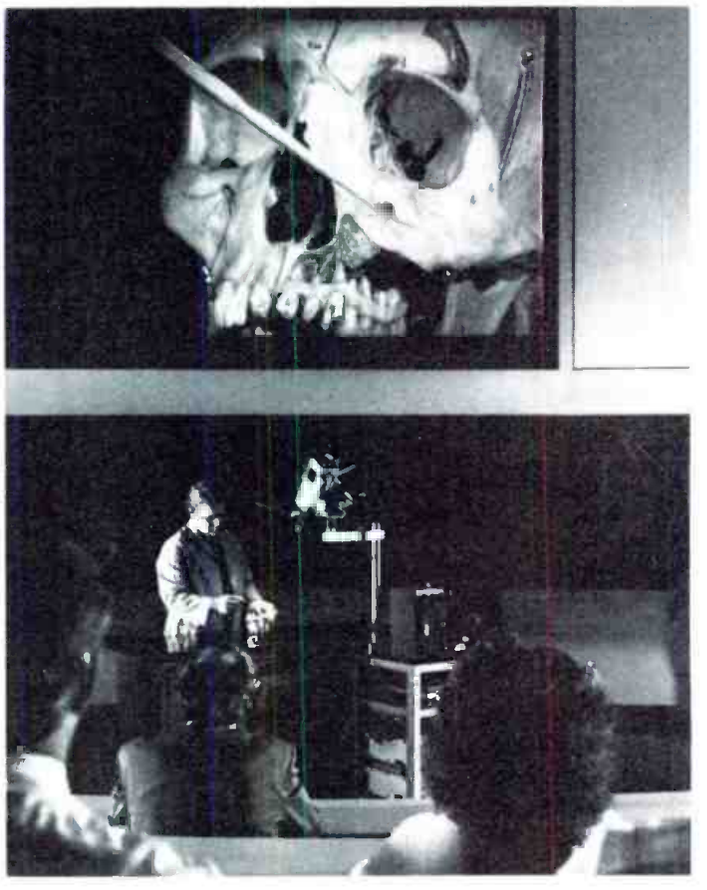

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digital domain. As a result, Roche told the press, digital tape machines can be interfaced with the console without conversion, thus removing the problems of changing formats between digital and analog.

Internally the DSP is capable of using 32-bit words, which eliminates concerns about system overloads. With all audio signals in digital format, audio and control signals are routed together, making the system fully assignable and easily reconfigured to almost any audio balancing requirement. As a result, each sound engineer (or session) can have a personalized floppy disc that can be used to set the console controls to previously assigned positions in seconds.

Although the DSP may seem rather expensive, it becomes more attractive if you consider the complete system cost rather than the cost of the DSP alone. The use of fiber-optics for signal routing and remote controls puts the DSP into a new dimension for installations, as compared to conventionally wired systems.

Dr. Toshi Doi, deputy general manager, Sony Audio Products Group, presented a historical perspective on the DASH format. Doi was the scientist mainly responsible for the development of the compact disc system.

To date, four DSPs have been ordered, with the BBC, CTC Studios, Tape One Studios and the British Museum being the early customers. The first delivery, to the BBC, was scheduled to be installed in a mobile van in time for airing Christmas music from King's College in Cambridge, England.

AES attendees saw only working sections of the DSP, rather than a complete system. However, the **BE** staff saw a prototype of the system in operation at the Neve facilities last

Pick a number from 9 to 52!

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Dr. Martin Jones, group technical director, Neve Electronic Holdings, described to the press the advanced circuitry used in Neve's DSP, the world's first all-digital mixing console.

year following IBC-'83 in Brighton, United Kingdom.

The compact disc

The compact disc (CD), although still in its infancy, is maturing rapidly. Nevertheless, considerable controversy is being generated within the industry as to the quality of the sound being offered in CD players, especially in first-generation players for the consumer market.

Despite that factor (to be expected in the emergence of a new technology), the convention featured much action concerning the CD.

- **Philips** displayed its new CD mastering system and its professional broadcast CD player.
- **Sony** introduced its CD modular system for professionals, the CDS-3000 control unit and the CDP-3000 player(s). A variation of the CDP-5000, the new system is designed for programming CDs in broadcast radio and TV stations and for professional audio production applications. Sony also announced that it is making its CDA-5000 CD quality control analyzer available for quality assurance of CD masters and replicated discs. Also, Sony held a press conference to introduce its new CDP-200 player. A more affordable player than the CDP-101, it also has new index search features for accessing specific music passages. Suggested retail for the CDP-200 is $700.
- **Sansui** demonstrated its CD player, the PC-V1000.
- **dbx** announced that a transcoder is being developed to convert, in the digital domain, its CPDM (Companded Predictive Delta Modulation) to the PCM (Pulse Code Modulation) format necessary for mastering CDs.
- **PolyGram** distributed data describing the design and production of CDs.
- Many major exhibitors used CD players to demonstrate the audio quality of their systems, although the CD players usually were kept behind the scenes.
- During the convention, the National Academy of Recording Arts and Sciences granted the President's Merit Award to **Sony** and **N.V. Philips** for their development of the CD digital audio system. Highlights of this presentation were replayed at Sony's press conference.

Future conferences

The AES announced changes in conference plans at AES-'83. The schedule calls for one convention each year in North America and one elsewhere. There also will be two theme conferences each year, one in the United States and one abroad. The theme conferences will have restricted exhibits.

- The first theme conference will be held May 11-14, 1984, at the Disneyland Hotel in Anaheim, CA. The topic will be "The Recording Arts and Sciences."
- The next full convention will be held March 27-30, 1984, at the Palais de Congres in Paris.
- The next full US convention will be held Oct. 8-11, 1984, at the New York Hilton.

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People in news broadcasting have been using the same lavalier mic for a long time. But our new Shure SM83 is out to change all that. It's just what everyone has been asking for in an omnidirectional condenser microphone.

On-camera talent like the SM83 because its electronics provide for a dip in the mid-range, giving both male and female voices a smoother, more natural sound. And unlike its Japanese counterpart, the SM83 unplugs from the battery pack for easy storage.

Sound engineers appreciate the SM83 because its tailored frequency response requires less equalization. They like its low-frequency rolloff too, which quiets on-air rumbling and mechanical and clothing noise.

Set directors are impressed with the SM83's neat appearance on camera. The cord exits from the side and disappears from view, running down behind a tie, shirt or blouse.

Production assistants enjoy the SM83's mounting versatility. It comes with a single clip that works either vertically or horizontally, a double clip that holds two mics, and a universal mount that can be sewed, pinned or taped to clothing.

Repair technicians love the SM83's easy maintenance. The cartridge is easily accessible by unscrewing the end cap. And cable replacement requires only a screwdriver and tweezers: no soldering is necessary.

Field crews are also big fans of the SM83 because its electronic pack is powered by a standard 9-volt battery or by a mixer's phantom supply.

For more information on the Shure SM83, the little mic with big advantages, call or write Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204. (312) 866-2553.

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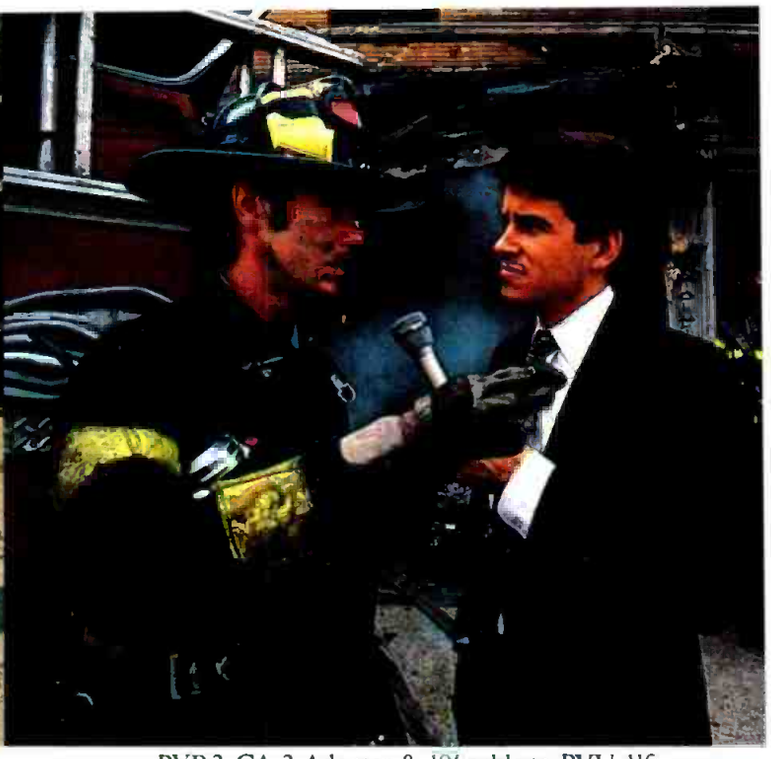
BVP-3 configured as camera/recorder; BVW-3 with BVV-1 Betacam recorder.



BVP-3, CA-3 Adapter & 10′ cable to BVU-110 ¾-inch portable VTR.

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Folk wisdom would have you believe that nothing can be all things to all people.

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And, of course, you can always couple the BVP-3 to a Sony Betacam Recorder and get the absolute ultimate in compact, lightweight,

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Plus, you're getting a camera system that can grow with you. Becoming a camera/recorder one day, a studio camera the next.

In fact, any way you configure it, in performance, flexibility, price, size, you name it, the Sony BVP-3 is a camera worth looking into.

Which is easy enough to arrange. In NY/NJ, call (201) 833-5350; in the Northeast/Mid-Atlantic (201) 833-5375; in the Midwest (312) 773-6046; in the Southeast (404) 451-7671; in the Southwest (214) 659-3600; in the West (213) 841-8711.

SONY Broadcast

*U.S. list price (includes camera head with tubes and viewfinder).

Corporate profile:

TEAC

By Carl Bentz, television editor

Artwork on buttons worn by TEAC workers stresses the corporation's concepts. The design of the "C" is a reminder that people are the basis of success.

The QCD buttons, worn by workers, and QCD signs, which hang over the assembly lines at TEAC's Toyooka factory, are more than symbols of an employee incentive promotional program. *Quality*, *Cost* and *Delivery* are concepts that have driven the TEAC Corporation since the introduction of its first product more than 28 years ago. The QCD idea, although not visually stressed at the Mitaka headquarters or the Murayama factory, is present in the atmosphere of all three facilities located in Tokyo.

TEAC means much more than just the original company name—Tokyo Electro-Acoustic Company. TEAC also stands for Technology, Excellence, Ability and Creativity, a translation also reflected in the corporation's policy statement from Katsuma Tani, president and founder of TEAC: "We respect sincerity, value originality and manufacture superior products to meet the needs of the world."

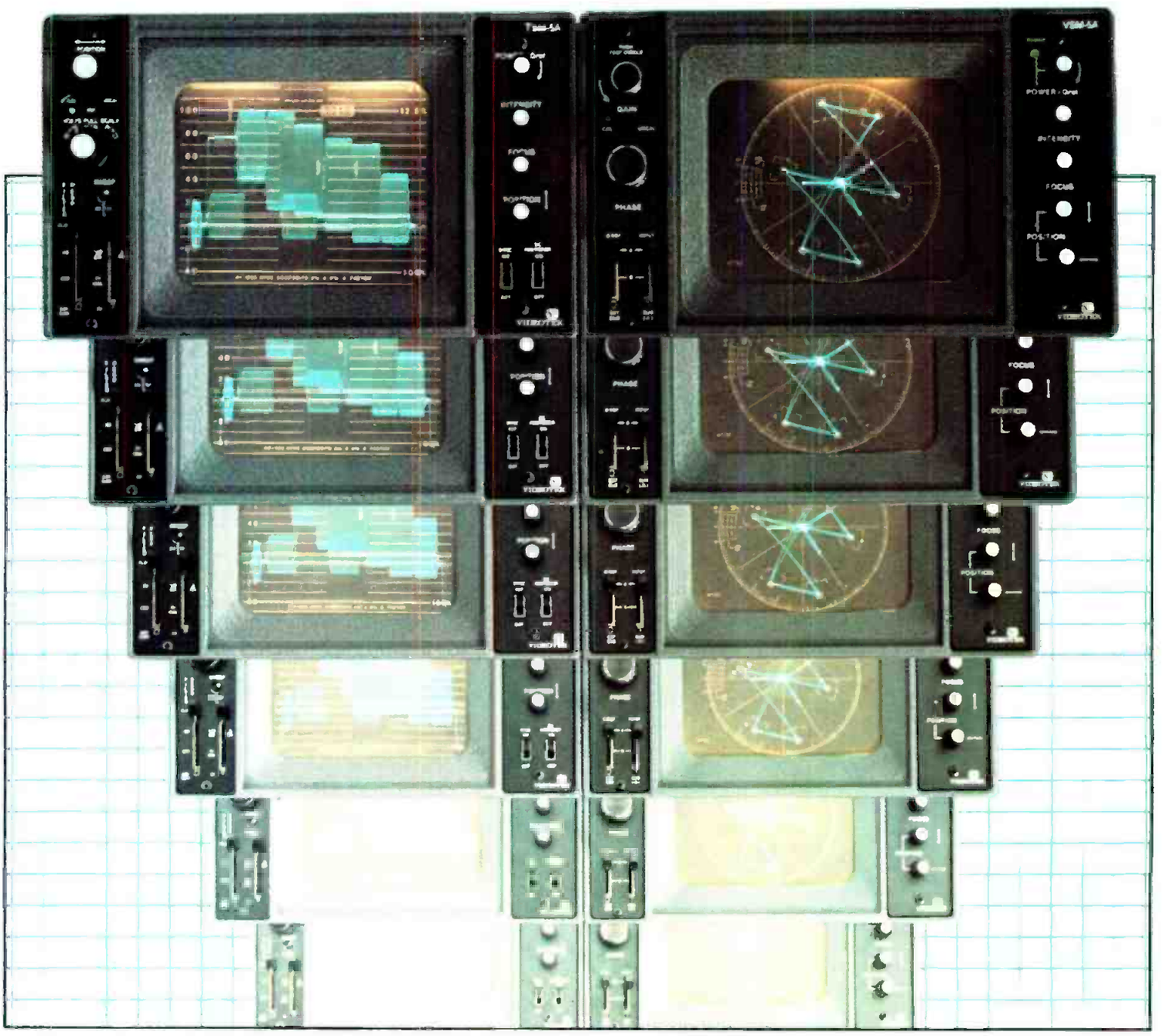
TEAC products often have been included in systems by other manufacturers, based on records of excellence, reliability and cost. TEAC expertise also may be found in cooperative ventures, one of which was with the Sony Corporation in the development of the U-matic format videotape recorder in 1966. TEAC's VCRs continue to be used in projects such as the NASA space shuttle program.

The TEAC product line revolves around equipment for the storage and retrieval of information. A major part of the company's business centers on systems of cassette and open-reel data instrumentation recorders. Also in the data field are floppy and Winchester disk units, for which the company holds a top share of the domestic Japanese market and has many OEM accounts in the United States.

Katsuma Tani, although more than 70 years old, continues to take an active part in the operation of TEAC.

Consumer-oriented audio products, with open-reel decks and cassette-based systems using integral Dolby noise reduction, are more widely known in the United States. Several models include interfacing for dbx noise reduction as well. TEAC professional audio products, under the subsidiary name TASCAM, are increasingly important to professional audio users around the world. For broadcast and production applications, TASCAM markets audio mixing consoles for music recording, sound rein-

Movin' up!



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forcement and on-air installations. Also, multichannel control consoles are matched by open-reel recording equipment, interfaceable to SMPTE-based editing systems. Cassette decks, emulating many typical open-reel features, include the same engineering approach and manufacturing care that go into the other products.

The beginning

Tokyo Electro-Acoustic Company was formed on Dec. 24, 1956. Tomoma Tani brought a homemade 3-motor, 3-head stereo tape recorder to his brother Katsuma for an inspection. Katsuma, the elder of the two, already known in Japan as the "King of Sound Technology," was impressed sufficiently to organize the new company to manufacture the tape recording system.

Tani's work in audio products preceded the tape recorder, however. A graduate of the Tokyo Institute of Technology, he worked for a time with Tokyo University's aircraft research center. But as time passed, and Tani's personal opinions and feelings changed, his love of fine music directed his interest toward acoustics. Among the early products developed by Tani and the Tokyo Television Acoustic Company, which later merged into today's TEAC, was a phono disc-cutting system. The first Japanese-designed disc-cutter was soon modified to include models for on-site recording of audio program-

Continued on page 112

Only a few of more than 3000 different recording system designs are kept in the TEAC museum at the Mitaka headquarters building.

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Now, you know, we load those cartridges with tape from manufacturers whose tape meets our specifications. And we're very picky about those specs.

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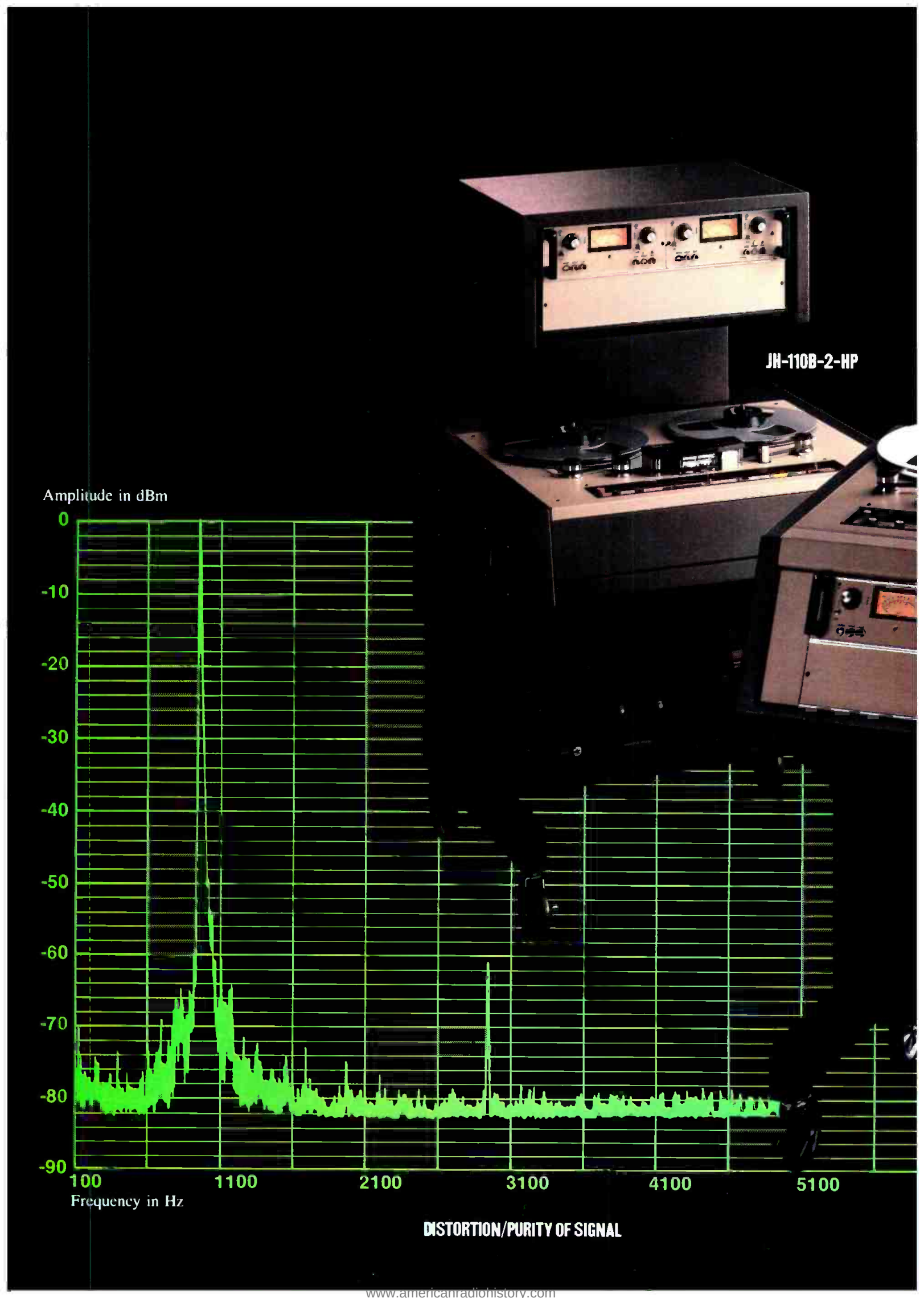

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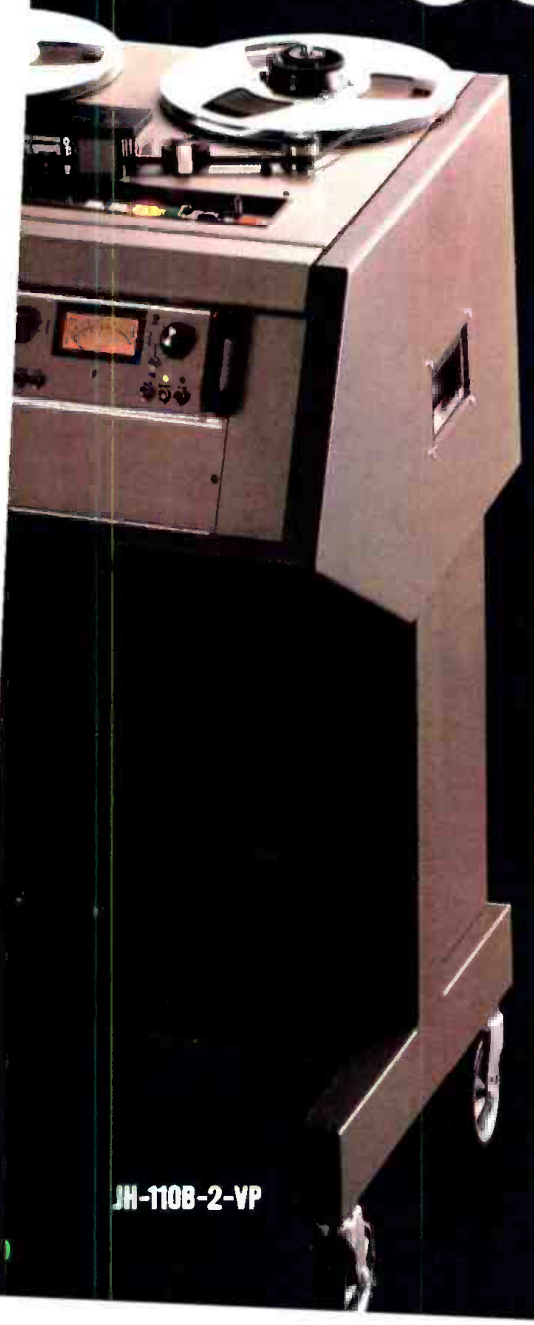

In a world filled with claims and counter claims for high performance audio products, sometimes it's hard to separate opinion from fact. That's why MCI has provided complete graphic proof of all important tape recorder/reproducer performance characteristics. Now available in a handy Engineering Notebook,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

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Does MCI really outperform the rest? We'll let you decide. For your free copy of the Engineering Notebook and more information about our demonstrator program, contact Professional Audio Products, Sony Communications Products Company, Sony Drive, Park Ridge, New Jersey 07656.

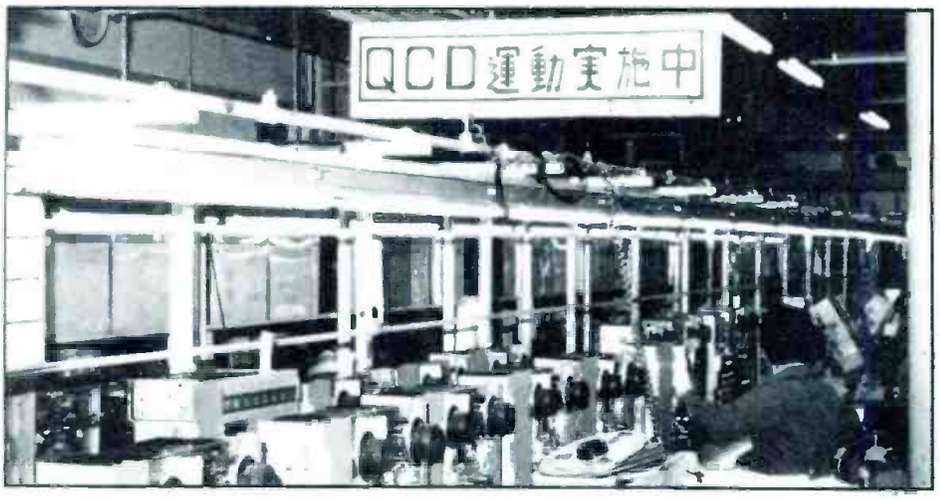
SONY®
Professional Audio

Continued from page 108

ming. The disc recorder and, later, tape recording systems were adopted by the Japanese Broadcasting Company, NHK. A driving force today in the development of new, improved broadcast communications, NHK urged Tani to design a slow-motion color playback system that won acclaim for its use during the 1964 Tokyo Olympic Games.

Storage/retrieval

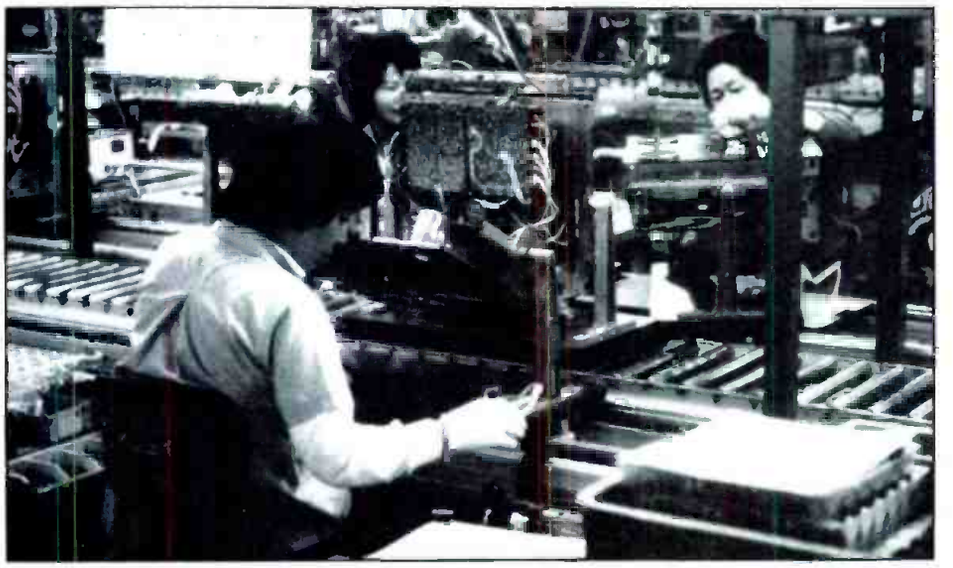
From the first designs executed by Tani to the more recent TASCAM products, which include the prototype FXZ-100 fixed-head digital audio recorder and an optical disc write/read system, the ultimate goal is information storage and retrieval with high accuracy. Whether the information to be stored is a digital or analog datastream, or perhaps Tani's musical favorites (ranging from Beethoven's symphonic works to Rachmaninoff's piano concertos), the result of the process must stress accuracy.



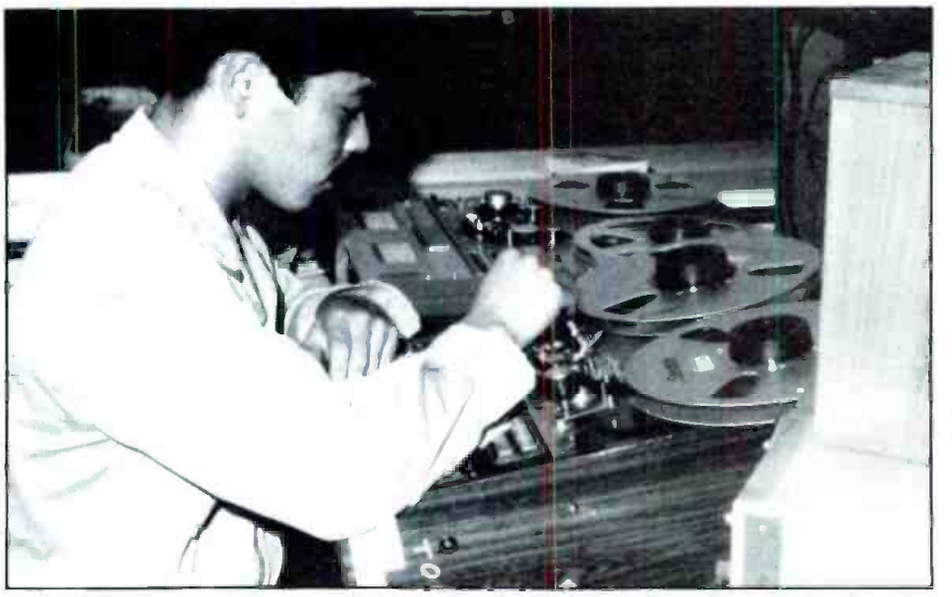
Quality, Cost, Deliver is stressed, symbolized by a banner at the reel-to-reel assembly line in the Toyooka factory.

The accuracy of the TEAC floppy disk drive has created a demand for production of the FD series 3- and 5¼-inch disk systems to increase from about 100,000 units per month during the latter half of 1983 to more than 150,000 units per month early this year. To meet the demand, an assembly line system has been instituted that includes automated and manned stations. Even with the larger number of units, a failure rate in the floppy disk product of 0.3% or less will be maintained, according to a TEAC representative. The FD series units may be found in many computer products in the United States as well as in Japanese products. The 5¼-inch Winchester drive units, an SD-506 with 6Mbyte and SD-412 with 12Mbyte storage capacities, both housed in the same space as a typical 5¼-inch floppy drive, are no less important.

To maintain accuracy in reproduction, TEAC's staff includes separate divisions for TEAC and TASCAM products. Even though many of the same signal handling processes may be used in data and audio recording products or in audio mixing, individual engineering design groups ensure that the intricacies of each process are not overlooked. To make sure that the products meet the industry's needs, much consideration is given to feedback from equipment users. In addition to such feedback, some staff members have worked in the record-



All assembly lines are constructed with people in mind to make movement from one work station to another as easy as possible.



Every recording head constructed in the factory is placed *in service* for a complete checkout before it is released to the assembly department.

ing situation, checking to see how an audio console might be improved for simpler operation, to find ways to increase operation facilities of a reel-to-reel recorder and to create a cassette-based system that almost equals the reel-oriented recorder.

Extra effort taken for operational simplicity, with increased reliability and performance, has been an important part of the TASCAM program. The first products introduced by Tani and his associates stressed professional quality and performance. TASCAM equipment for the professional market also emphasizes quality and performance with an equal stress on providing equipment for the industry at as low a cost as is realistic.

Many details are taken into consideration during the design of each product. In audio consoles, each mixing channel allows microphone, line and multitrack recorder inputs to be connected at all times, with switch selection of the desired signal. No repatching is required, saving on possible plugging errors as well as connector failures, and adding to reliability. In recorders, specially designed heads are manufactured by TEAC at the Toyooka factory for audio and data recorders, allowing punch-in edits to be performed in audio without level changes often found in such situations. Automated component insertion and wave soldering add to circuit board reliability. Capstans and flywheels are manufactured and spin-balanced to exacting tolerance requirements within the factory.

The people

The success of TEAC and TASCAM products is based on the efforts of many people. Certainly the leadership, provided by Tani, is a guiding force. The work of Norio Tamura,

Continued on *page 119*

INNOVATIONS FROM ABROAD

Sequenti
PA

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

PAG Power Ltd. has solved many of the problems associated with battery recharging and dc power supplies facing the users of ENG and EFP equipment. At the InterBee-'83 Exhibition in Japan, the company showed its Speedcharge 6000 and, for the first time, the new Sequencer 6000. The two together constitute PAG's microcomputer-controlled fast charger and battery management system.* This new development in the battery-charging field, incorporating a microcomputer, will effectively and safely fast charge a variety of batteries in sequential order.

Eight different-type batteries can be connected at one time and can be charged, one after another. Using automatic switching, eight batteries can be fully charged in eight hours or less. Batteries not needing a charge will be skipped.

modate eight separate batteries.

The Speedcharge 6000 system was developed in response to demands from professional video users for a battery charger with the following capabilities:

- The unit should be capable of charging a wide range of nicad, lead-acid and silver-cell batteries from major manufacturers.
- The unit should be capable of fast charging batteries safely, *without* the need for special sensors in the battery pack. Such sensors usually are used when batteries are to be fast charged. Various incompatible arrangements have been used by different manufacturers, and not all batteries are so equipped. The new system ignores conventional sensors, using a unique and proprietary charge termination method.
- The charger automatically should adjust itself to the battery type and size and should require no manual adjustments.
- The charger should be compatible with, and automatically adjust to, virtually any ac supply worldwide.
- The charger should incorporate an ac adapter or smooth dc power supply suitable for running ENG/EFP equipment where ac supplies are available.

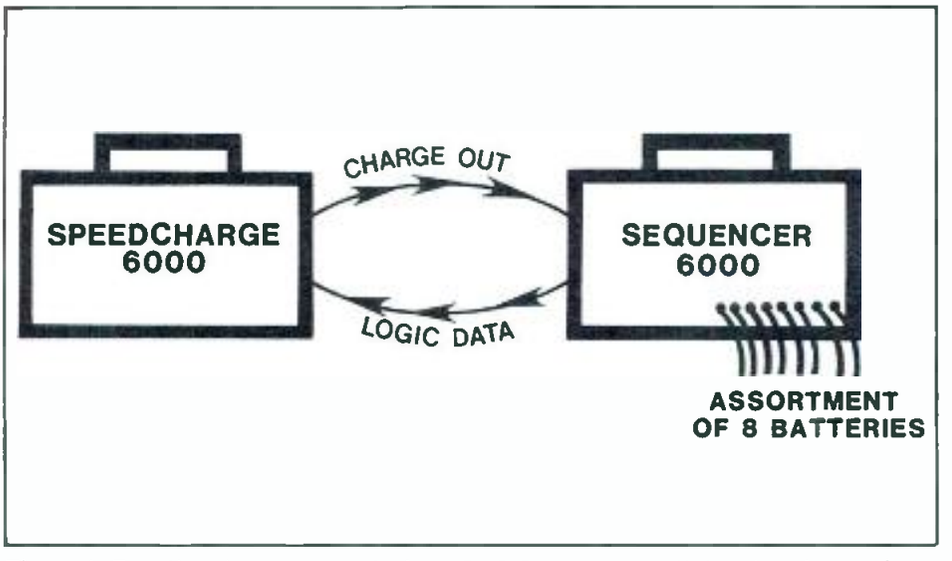


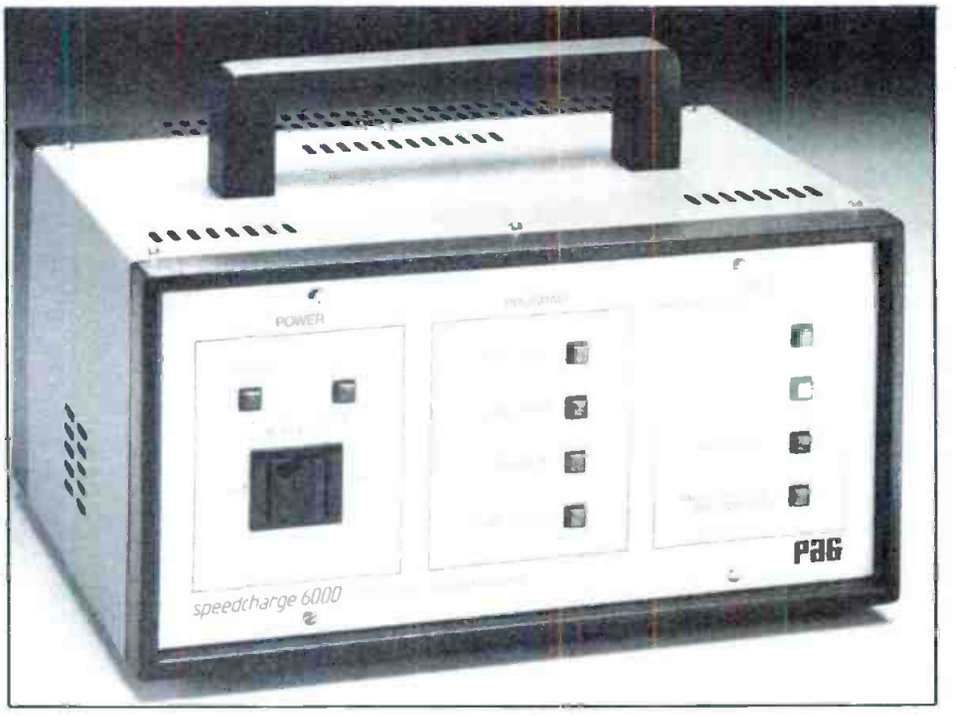
Figure 1. Functional arrangement of the PAG Power sequential recharging system.

The heart of the system, the Speedcharge 6000, already is widely used by broadcast stations and rental companies in England. It also is offered by some camera and VTR manufacturers as a recharger/power supply in standard ENG/EFP packages. The Sequencer 6000 is a new addition that plugs into the Speedcharge to accom-

*A guide to other types of battery charging systems can be found in the BE September 1983 *Buyers' Guide.*

In the Speedcharge 6000 system,

harging:
ower's 6000 system



The Speedcharge 6000 microcomputer-controlled charger from PAG Power.

electronic measurements are taken during the fast charge, effectively using the battery cells as their own sensors. The rate at which these measurements are taken is a critical factor in determining the cutoff point for fast charging an individual battery. The data is accumulated and continuously analyzed. The control system rapidly becomes complex, and a microcomputer is essential to handle it. The onboard computer, programmed by PAG and using unique and proprietary analysis techniques, is the heart of the 6000 system.

Extra features have been added to the fast charger's software, offering extra capability for little increase in cost. Included are a controlled slow-charge facility; a "revitalize" system to restore "bad" batteries; cell-balancing, trickle charge and power supply programs; battery backup during ac power failure; and self-test and diagnostic routines.

Fast charge

A 4A current is delivered until the Speedcharge detects that the battery is charged fully. The software to detect this cutoff point is the most complex part of the microcomputer design. Undercharging gives poor performance and overcharging can permanently damage batteries. Also, the wide range of battery types and capacities, variations of battery characteristics between manufacturers, the temperature, age and history of the batteries, imbalances between cells and the possibility of damaged cells created a challenge to software designers.

To ensure that the fast charge is consistently and precisely stopped at the right time, and to detect faulty batteries, 10 algorithms are used in combination. Upon completion of the fast charge, the unit switches to a safe balancing charge, if the data from the subject battery indicates that cells are out of balance. The intensity and duration of charge depends on factors determined during the main fast-charge program.

Once balanced, the Speedcharge will indicate that the battery is ready for use. The battery can be safely left connected to the charger, which will continue to monitor the state of charge, applying, when necessary, a precise trickle current to compensate

BUICK IS ROLLING WITH MOTOROLA C-QUAM AM STEREO!

GM's Buick division is the first domestic automaker to offer AM Stereo radios.

Delco single-system radios, using the Motorola C-Quam® decoder integrated circuit, will be introduced in selected 1984 models.

But one of the most enthusiastic responses to this news came from a man who isn't even a Buick dealer. He's Tom Cassetty, General Manager of WSM, Nashville. "I heard the Delco playing C-Quam AM Stereo at the National Radio Broadcasters meeting in New Orleans, and I was really impressed. The sound was terrific! If they'd been playing WSM, I never would've gotten out of the car!"

If your station had the choice, wouldn't you really rather be heard in the new Buicks? You can be. Just call Dick Harasek at (312) 576-2879, or Chris Payne (202) 862-1549.

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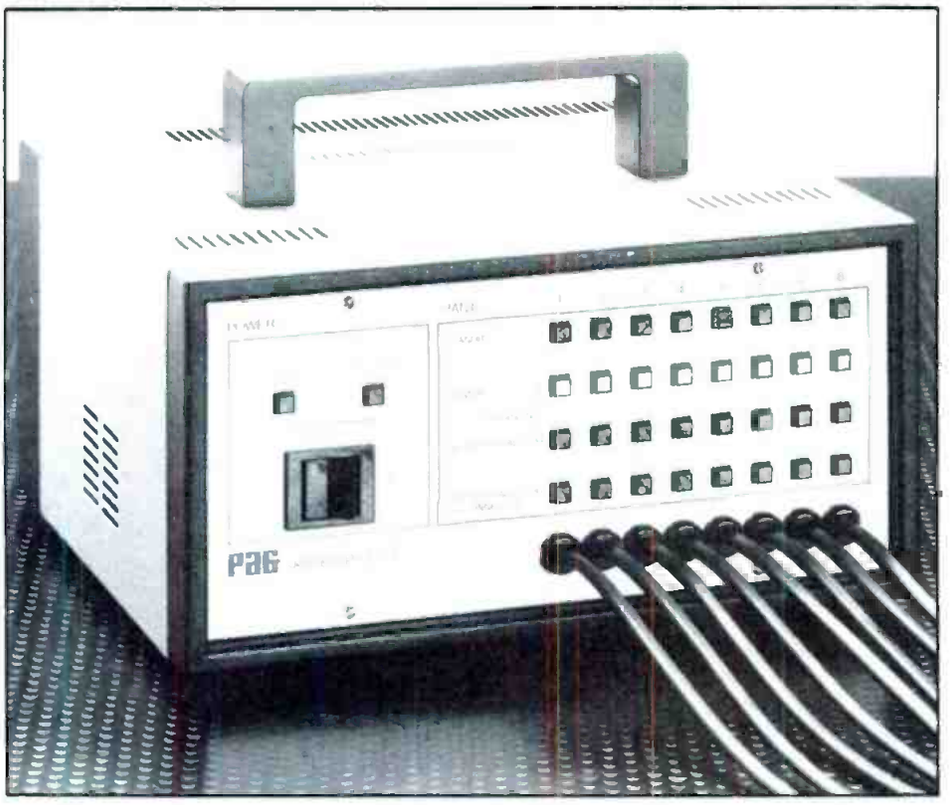
Circle (85) on Reply Card



The newly developed Sequencer 6000, which when used with the Speedcharge 6000 will sequentially charge eight different batteries.

for any self-discharge.

Slow charge

The slow-charge program starts at 0.4A. As the program proceeds, the current continually is adjusted to match the size of the battery. This reduces the charging time needed for larger batteries, while maintaining a charge rate that is "slow" relative to the battery capacity. The slow-charge program incorporates algorithms that prevent overcharging. Users may prefer to slow charge batteries when time permits.

Revitalize program

The purpose of revitalizing is to recondition a battery that is suffering from low capacity or poor output on load. This program will work only in cases in which battery deterioration is reversible. If a battery has been stored four weeks or more, it is advisable to revitalize it before putting it into service. Batteries in constant use will benefit from this program after every 50 cycles. The revitalize program prevents buildup of the so-called *memory effect* in nicad batteries.

Revitalization is, in essence, a carefully controlled discharge/charge program that uses the full power of the microcomputer in its execution. The rates of discharge and charge are continuously varied according to the data gathered from constant monitoring of battery performance by the Speedcharge 6000. With badly treated batteries, some 30% to 40% have been recovered after a single application of the revitalization process.

Sequential charging

The Sequencer 6000 operates in tandem with the Speedcharge 6000. The Sequencer is an optional unit that provides the charger with eight sequential fast-charge channels, each computer-controlled by the host charger (Speedcharge 6000), and by the Sequencer's own on-board microcomputer. Eight batteries of mixed voltages and capacities within the charging range specifications of the Speedcharge 6000 host unit can be connected at any time. Charged batteries can be removed from the Sequencer, and other batteries can be connected without affecting the status of those already on line. The Sequencer scans the eight channels continuously, skipping over channels with no battery connected, or where one already is charged.

The Sequencer adds immense power and flexibility to the Speedcharge system. The concept and adaptability of the process is unique. One of the main advantages is that users of ENG/EFP equipment no longer are restricted to *dedicated* battery chargers. Now, one system can be used that accommodates all batteries, sequentially charging them unattended, with the capability of revitalizing those in poor condition. For more information, circle (300) on the Reader Service Card. |:(:-)))||

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TEAC

Continued from page 113

who serves as managing director of the Tokyo activities and president of TEAC Corporation of America, is of equal importance.

TEAC's success also is due in large part to the Oriental feeling of pride by each employee. If the work is to be done, it must be done well. Copies of quality assurance and quality control reports are always on hand for employees to check on the results of their performance. Each worker believes that only the best is acceptable, whether the project at hand is the machining of precision parts (capstans or accurately balanced flywheels); the design and construction of recording and reproducing heads for the entire line of products; the operation of automated testing systems for circuit checkout and alignment; or the construction of equipment side-by-side with automated processes. At least part of that pride of workmanship is derived from the Japanese method of employment. A worker joins a company for life, knowing that although automation may be implemented to increase overall productivity, the automation will not replace the worker. Instead, the worker may redirect his efforts, through company training, toward additional productivity and creativity. The security afforded the individual increases the worker's wish to do well.

In addition to the three facilities in Tokyo, TEAC has a factory in Taiwan for manufacturing consumer-oriented cassette recording decks. Domestic and international sales are directed from Tokyo through three major marketing arms: TEAC Corporation of America (TCA) in California, TEAC Tonband in Germany and TEAC Australia Pty. Ltd. A network of distributors operates with each of the marketing divisions to supply the products to the end users and to provide product support as required.

Tomorrow

Where is TEAC Corporation going? There is little question that the answer is upward. The rising sun symbol so often associated with the Orient can be equated with a desire of constancy – in quality, value and performance. Each day brings continued efforts toward creativity, reliability and product support. So where is TEAC going? According to Tani, TEAC is in pursuit of information technology. This may also be expressed as:

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CREATE WITH Q8

from the keyboard:

roll it - instant readout for roll timing - "elastic" roll pages - insert/delete with auto ripple

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new products

Fiber-optics kit

Link II from *Advanced Fiberoptics Corporation* is designed for those desiring to learn about fiber-optics. The kit, with transmitter/receiver module, 5 meters of optical cable and informative literature, sells for $75.

Circle (275) on Reply Card

Headset design change

Enhanced field servicing of *Setcom Corporation* series 5 dual- and single-speaker headset systems results from structural design changes. New products and retrofit parts for existing systems are available.

Circle (276) on Reply Card

Frequency counter

For measurements to 1GHz with FCC accuracy, the FC71 from *Sencore* finds applications in avionics, broadcasting, 2-way communications and general electronic servicing. A 9-hour battery capability in the instrument and microprocessor-controlled time base aid in portable uses.

Circle (277) on Reply Card

Video text editing

Mycro-Tek's Mycro-Vision Supra-Edit terminal interfaces to Supra or SupraTwo character generators for text editing and manipulation through a horizontally split-screen scheme. Applications include CATV or other text display systems.

Circle (278) on Reply Card

Monitor mount

Bretford Manufacturing specs the TVM-1 universal ceiling mounting bracket as capable of handling loads up to 200 pounds. Adjustable members allow displays with 17- to 26-inch screen sizes to be mounted.

Circle (281) on Reply Card

Lavalier mic

An electronically created dip at 730Hz and acoustically generated boost above 3kHz allows the *Shure* SM83-CN lavalier microphone to produce natural sound without boominess or excessive brightness.

Circle (279) on Reply Card

Satellite receiver

High performance and commercial quality are claimed by *ICM Video* for its model SR-4600P. Dual conversion in the downconverter section, extended threshold and a drift-free quadrature detector are featured.

Circle (280) on Reply Card

Stereo buffer

Balanced inputs on professional equipment interface to unbalanced audio products with the *Sescom* SB-1 MKII. The unit also offers gain adjustment from 0-30dB and a – 101dB noise level below rated output.

Circle (282) on Reply Card

Graphic overlay

Animation and text for video programming are possible with an Apple II computer and a *Synetix* VideoSprite graphics card. Up to 32 levels of sprites may occupy a screen simultaneously through the Texas Instrument TMS 9918A video display processor-based plug-in card.

Circle (283) on Reply Card

Voltage regulators

The *Powermark Division of Topaz* series 77000 ac voltage regulators for single- and 3-phase circuits handle 1-100kVA, 47-63Hz power loads. A voltage as much as 27% below nominal is corrected to within 7% of nominal, usually within one cycle of line frequency.

Circle (284) on Reply Card

Multipair wire

A 100% Beldfoil aluminum-polyester shield in *Belden's* 9990 (3-pair) and 9991 (6-pair) cable protects against interference. The wire includes stranded, tinned, polypropylene insulated conductors with a drain wire, all 24AWG.

Circle (285) on Reply Card

Work station lighting

Two flexibly mounted high intensity lamps and a 21-square-inch rectangular lens on the *Pace* POL-15 optical lighting system ease work on circuit board repair and reduce eye strain.

Circle (286) on Reply Card

Field mixer

The *Shure* FP31 portable mic mixer includes three lock-type input connectors for mic or line-level signals. VU metering, quiet switching from external dc to internal batteries and switchable low-cut filters are features.

Circle (289) on Reply Card

Talkshow equipment

"Caller Control" on the SPH-4 telephone hybrid from *Gentner Engineering* determines caller/talent balance from full 2-way conversation to full gain reduction of caller. The system includes an internal beep-tone generator to let the caller know he is on the air.

Circle (290) on Reply Card

Improved insertion system

Panasonic Industrial Company introduced an updated version of the MVP-100 multifunction player system at the SMPTE conference in November 1983. First shown at NAB-'83, the MVP-100 computer-controlled, multi-VCR automation system uses M Format Y/I/Q component transport decks for post-production or automated on-air applications. Up to 24 decks and threading mechanisms all are easily removable in case of individual failures, but the large number of playback units also provides a flexible multisource library function in production editing. Editing control permits playback/record, audio/video cueing and on-line start sequences on any transport, in any combination.

With standard NV-T120 M Format cassettes, up to 20 1-minute spots may be recorded on each cassette, preceded by a menu index. The computer control, through an RS-422-compatible serial data interface, allows individual addresses to be sought for and spot cued via time code. For longer segments, the NV-T180 cassette will contain 30-minute programs. Depending on the choice of cassettes and the program schedule, one MVP-100 system will play 12 hours of material before reloading is necessary.

Switching flexibility allows built-in, backup rolls for 100% redundancy in spot playback by using time code synchronization. Should a primary machine fail, the alternate backup automatically is switched on-line. Also, monitoring and playback may involve 24 video, stereo audio and time code sources to A and B outputs.

Circle (294) on Reply Card

Customer Orientation
Subject: Design Concept—
Auto Suggestion

200 SERIES

An editing system should anticipate its operator the way a great car seems to anticipate its driver. When Convergence decided to build the 200 Series, the goal was to put the Editor in the driver's seat with an extra margin of control at his fingertips. Not just for those once-in-a-while problem situations but for the day-to-day editing tasks.

One designer said it should handle like a sports car—fast on the straightaway and quick in the turns.

Another imagined a fine touring car—built for going long distances in comfort.

A third visualized a four-by-four—able to cover rough terrain with power in reserve.

When the 200 Series was complete, we could see that each of them had made his mark. From the glow of the amber status display to the feel of the new joystick, this is an editing system made to be driven. The 200 Series...built for speed, cruising and the rough uphill climb.

Test drive one today.

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Circle (109) on Reply Card

Scope options

Improvements to the *Tektronix* 2400 series portable oscilloscopes now are available as options that may be requested at the time of purchase.

Option 05, the TV option, with improved triggering, provides an enhanced display that rivals waveform monitor performance. New trigger modes allow viewing of a selected line of Field 1 or Field 2, alternate viewing of a selected line from Field 1 or Field 2 and viewing of all lines. A microprocessor assists in trigger selection of a given line in a given field.

Option 10, for IEEE-488 GPIB programmability, introduces the 2400 series to semiautomated test systems and other computer-based operations. All front-panel controls of the oscilloscope—except intensity, focus and CRT adjustments—are under standard GPIB bus control as talker and listener functions. The option makes the Tektronix instruments the first portable units to offer complete IEEE-488 bus capability.

The options list at $550 for TV Option 05 and $400 for the GPIB Option 10. An additional interface module, at $400, is required for one or any combination of the options. Tektronix may offer more modular options in the future. Current owners of 2400, 2445 and 2465 instruments should be aware that retrofit for the new options is not possible.

Circle (295) on Reply Card

Miniature receiver

Coupled with *Nady Systems'* 49 LT lavalier or 49 HT hand-held wireless mic, the company's 49 VR attaches easily to video or film cameras for hands-off, 49MHz, 2-way communications.

Circle (287) on Reply Card

Portable lighting

Arriflex's 650W, 1kW and 2kW tungsten Arrilites are constructed of fiber glass-reinforced, injection-molded thermoplastic, combined with an aluminum inner shell for lightweight durability.

Circle (288) on Reply Card

Head stacks

Replacement heads for MCI recorders include 16- and 24-track formats. Record, erase and reproduce heads, manufactured by *Applied Magnetics Belgium*, are available through *Sprague Magnetics*.

Circle (292) on Reply Card

Ikegami ITC-730 expands your ENG coverage, tightens your budget.

When Ikegami designed the ITC-730 ENG camera, we set out to create the world's finest modestly-priced, hand-held TV camera. And we succeeded.

Look at what the ITC-730 ENG gives you for under $10,000* (less lens). A lightweight, 3-tube prism optics camera featuring advanced Saticon II** tubes, a 2H detail corrector, noise-free contrast compression circuitry, and a character generator in the viewfinder that indicates filter selection, gain selection, auto-white balance, VTR start/stop, gen-lock, and battery test.

The f/1.4 RGB prism beam-splitter delivers low-light performance (a standard sensitivity of 2000 lux at f/4), and a consistent 54 dB S/N ratio from the preamp.

And when you're out there shooting, you get even more. You can go farther and last longer because the ITC-730's unique circuitry makes it a miser on power consumption. Shoot up to three hours on one fully charged Nicad battery.

The ITC-730 is easy to handle. It has an excellent weight/balance ratio for smooth shooting from the shoulder. And its low profile makes it as easy to see over as it is to handle. A rugged magnesium alloy, die-cast housing takes the inevitable bumps in stride.

Equipped for EFP, the ITC-730 expands the limits of field production. It can be remotely operated up to 1000 feet from the CCU on AC; up to 300 feet on battery power from the camera.

ENG or EFP, you'll never have to accept anything less than an Ikegami again. Contact us for details.

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Texscan's Spectrum Analyzer can make you a popular person with the right people.

Some of the best decisions are made by people who don't always get the credit. But every so often someone discovers something so good it simply can't be ignored. Like the Texscan AL-51C. It's got so many outstanding features that we couldn't possibly list them all here. That's why we'd like you to ask for our specs. Get a live demonstration. And then make a decision you can feel good about.

The Texscan AL-51C Spectrum Analyzer. It can't promise you instant fame. Or even a promotion. But it can make your job a whole lot easier. And help you impress the right people, too!

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Circle (191) on Reply Card

FCC update

Continued from page 6

separate open filing windows for TV translators. Pursuant to this proposal, there would be alternate filing windows for translators and LPTV applications. Another alternative is to wait and see how the overall window approach described previously changes the situation. Priorities may not have to be assigned at all if the new approach, which would not invite conflicting proposals as current procedures do, substantially diminishes the number of competing applications for unserved or underserved areas.

Call sign assignment procedures revised

The FCC has made sweeping revisions to its rules and policies governing the assignment of call letters to broadcast stations. The new rules, which became effective on Jan. 20, make the following provisions:

- Requests for new or modified call letters will continue to be made by letter to the secretary of the commission. Notification to all broadcast stations within 35 miles no longer will be required.
- A request for a call sign for a new station will not be accepted until a construction permit has been granted.
- A call sign may be requested by a proposed assignee or transferee of an existing station when the assignment or transfer application is filed, or any time thereafter.
- The commission no longer will arbitrate the question of whether a call sign is in good *taste*, because such standards traditionally have been set and enforced by local communities.
- The rule proscribing the assignment of call letters using the initials of the president, a living former president, the United States of America or any of its agencies or departments unless "suitable clearance" is obtained has been eliminated. If a station attempts to use such call letters in a manner intended to suggest a relationship with a president or federal agency, there are adequate remedies outside the context of call letter processing.
- Objections to the assignment of requested call signs will not be entertained by the commission. This, however, will not hamper any party from asserting its rights in some other forum.
- Call signs will continue to be assigned on a first-come/first-serve basis. If requests for the same call sign are received on the same date, the assignment will be made to the station having the longest continuous record of broadcast operation under substantially unchanged ownership or control.
- A change in a call sign assignment will be made effective on the date specified in the telegram authorizing the change. However, the applicant now may include with its application a request for a specific effective date within 45 days of the submission of its application for a call sign.

Station totals released

The commission has announced the following totals for broadcast stations licensed as of Nov. 30, 1983:

AM radio	4732
FM radio	3513
FM educational radio	1113
UHF commercial TV	334
VHF commercial TV	533
UHF educational TV	172
VHF educational TV	112
UHF low power	67
VHF low power	181
Total radio	9358
Total TV	1399

Editorial

Continued from page 10

transmitter is going to solve their problems. It is not that simple.

AM improvement requires standards agreed upon by broadcasters and receiver manufacturers. Each group cannot continue to go its own way, and to blame the other for the problems that AM radio is facing.

If you ask AM station managers why they are overprocessing their transmitted audio, they will tell you it is primarily because the receivers used by their listeners are, in a word, lousy. On the other hand, if you ask receiver manufacturers why they do not make better AM radios (we asked that question at the 1983 Consumer Electronics Society show), they will tell you it is because AM broadcasters transmit a signal that is, in a word, lousy. The point is obvious. We have to stop blaming each other for causing the problem, and devote our energies to its solution.

AM stereo by itself will not save the standard broadcast band from further audience slippage to FM. However, it may be the vehicle for the eventual rescue. AM stereo can sound as good as FM stereo, given careful attention to the transmission chain and a good quality receiver.* High performance audio and RF transmission equipment is readily available. Hundreds of AM stations have updated their plants to the state-of-the-art. Thousands more should follow suit.

Receiver manufacturers that have taken the financial risk and produced high quality AM radios for the public should be congratulated and encouraged to move forward. Today's technology can deliver advanced receivers with improvements such as:

- more sensitive and selective front ends with automatic fine tuning to eliminate the problems associated with mistuning;
- noise blankers to strip off impulse energy, and thereby to clean up reception even in hostile environments;
- variable bandwidth IF strips that can be controlled by signal strength levels or day/night digital codes from each broadcast station;
- improved demodulators to replace the outdated envelope detector; and
- improved audio output amplifiers and speaker systems for true high fidelity.

With mass production and integrated circuit technology, these improvements can be made affordable to the average consumer.

The NAB subcommittee on AM improvement will look at these issues and others in its examination of the technical future of the industry. Part of this study will concern standards that could be implemented to help in converting AM radio from *low fidelity* to *high fidelity*. The issue of high frequency pre-emphasis standardization (if used at all) will need to be addressed, as will restricted bandwidth transmission questions. To reduce the problem of skywave interference, it has been suggested that AM stations restrict their high end audio frequency response, especially during nighttime operation. Other avenues the NAB will explore include digital techniques that might be used anywhere along the station-to-listener chain to improve performance.

The question reasonably can be asked as to what AM broadcasters can do in the meantime. The answer is simple. Clean up your act. Some AM stations have kept their operations well-maintained and updated to the state-of-

*See "The AM Stereo Challenge: AM Stereo vs. FM Stereo" by Dave Obergoenner on page 84 of this issue.

the-art. Many others, perhaps the majority, have let their plants slip into various stages of technical chaos. AM systems too long have been taken for granted. Standard operating procedure at most stations, we think, has been to fix the gear if it breaks, but otherwise to ignore it. Our experience has shown that most of the new equipment and renovation dollars have gone into FM systems, rather than AM.

Any transmitting facility allowed to slip into disrepair will show it on the air, and despite what some managers might say, listeners care how a radio station sounds. The dramatic shift in audience from AM to FM proves that point.

Stations in technical trouble (this applies equally to FM stations) should spend the time, effort and money required to bring their transmission systems up to current standards of performance and reliability. We are not proposing that every station go out and buy a new transmitter and antenna. We *are* suggesting, however, that the present system should at least be thoroughly tested and repaired. Direction for this effort must come from the top of the station management chain. An employee will not think that AM improvement is important unless his supervisor thinks it is important.

AM radio is basically strong and resourceful. It *can* reverse the trend of audience flight to FM if it makes a concerted effort at standardization and cooperation. This cooperation must be not only between the broadcast and consumer electronics industries, but also among *and within* AM stations themselves. |:-)))))

Satellite update

Continued from page 12

discrimination and perhaps 6dB more isolation caused by cross-polarization isolation and frequency planning, an acceptable total isolation from adjacent satellites of 15dB or more can be achieved with a 1.5m antenna.

For the medium power Ku-Band satellites, a 1m antenna provides the same degree of isolation for 1° satellite spacing as does the 1.5m C-Band antenna for 2° spacing. Otherwise, the EIRP level of this class of satellites could be increased beyond the 50dBW point to allow an even smaller antenna size, because there is no practical limit on downlink EIRP as in C-Band. Also, the 50dBW level is about optimum in terms of satellite design because of the state-of-the-art in medium power Ku-Band TWT power amplifiers.

Thus, for the C-Band and medium power Ku-Band satellites, delivery technology is reaching the optimum state in terms of most cost-effective receive earth terminals and most efficient and reliable satellite designs. Also, the number of orbital positions possible (35 for C-Band and 70 for Ku-Band), makes the total number of channels that can be expected at these frequencies so large that a competitive market for available channels is almost assured, virtually guaranteeing a low cost per delivered broadcast channel.

The general economics of satellite delivery is beginning to look so attractive that important signal originators and broadcasting organizations are making moves in that direction. Home Box Office (HBO) is experimenting with DBS-type delivery at C-Band and Ku-Band frequencies to increase its total penetration into homes beyond that offered by cable access alone. CBS, the last of the major US broadcasting networks to get into satellite technology, now is discussing the possible use of the first high power DBS system, the Satellite Television Corporation system planned for 1986, to expand its delivery capabilities into the home.

An examination of the characteristics of high power DBS shown in Table I (page 12), when compared to the other two delivery technologies, reveals a much lower overall capability in terms of total channels that can be offered, and at apparently minimal gain in terms of lower earth terminal costs. The high power DBS satellites also are much higher cost satellites on a cost-per-channel basis, making the prospect of large scale economic feasibility even more doubtful.

Satellites delivering 55-60dBW in EIRP per channel cannot provide more than a few channels (3-4) per satellite, and a system using this technology must have a satellite for each time zone of the country to provide coverage. Thus, the total cost of such a system is much higher than with more conventional delivery technologies. The continued development and expansion of C-Band and medium power Ku-Band systems during the coming year will do much to determine the probable future of the planned high power DBS systems.

Feedback

Continued from page 18

equipment are addressed by a new publication from the European Broadcasting Union (EBU). The spiral-bound book, ***The Design of Handbooks for Broadcasting Equipment,*** *is available from the Technical Centre of the EBU, Avenue Albert Lancaster 32, B-1180 Bruxelles, Belgium. Request Document Tech. 3239-E, indicating English- or French-language editions.*

The book is based on EBU Recommendation R29-1982, which, in part, suggests that proper documentation for equipment should include three separate manuals, or a single volume in three sections. The approach of the three sections should address planners and installers; operators and technical people; and repair personnel.

Further, each section should be presented in a logical manner with information applicable to the segment of the technical/engineering community at which it is aimed.

Presentation of the information, including aspects of language, cover, pagination, printing material, print and graphic materials are discussed. Pictorial graphics, schematics, wiring diagrams and indexing also are covered. Finally, 11 illustrations of material from a variety of manufacturers are included as samples of well-produced documentation.

BE staff

people

Tektronix's Communication Division has announced the following reassignments within its Television Products Business Unit: **Larry Kaplan,** named business unit general manager for the Television Products Business Unit; **Chuck Barrows,** named strategic business and engineering development manager for the Communications Division; **Austin Basso,** named national sales manager for the Television Products Business Unit; and **Steve Kerman,** named marketing manager for the Television Products Business Unit.

C. Robert Thompson, manager of video recording systems programs for RCA Broadcast Systems Division, has been elected a Fellow of the Society of Motion Picture and Television Engineers.

Peter Gloeggler has joined Sharp Electronics as product manager for the company's Professional Products Division. Gloeggler has more than 10 years' experience in the broadcast industry.

HEDCO has announced the appointment of **John Hayes** as vice president of manufacturing. Hayes has been with the company more than three years, following a career with Memorex, IBM, Vendo and Lockheed in various manufacturing management positions.

Acrodyne Industries has appointed **Richard J. Broadhead** as vice president, marketing. Broadhead had previously been business manager, UHF transmission systems, for RCA Corporation.

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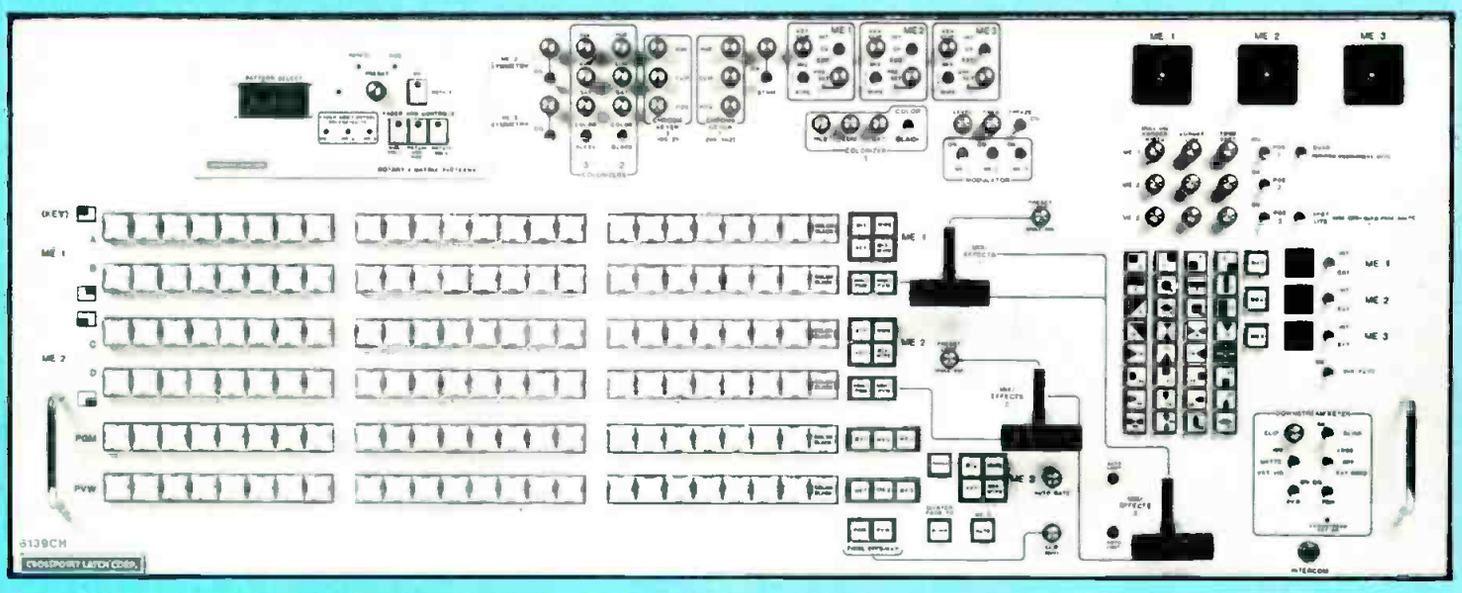

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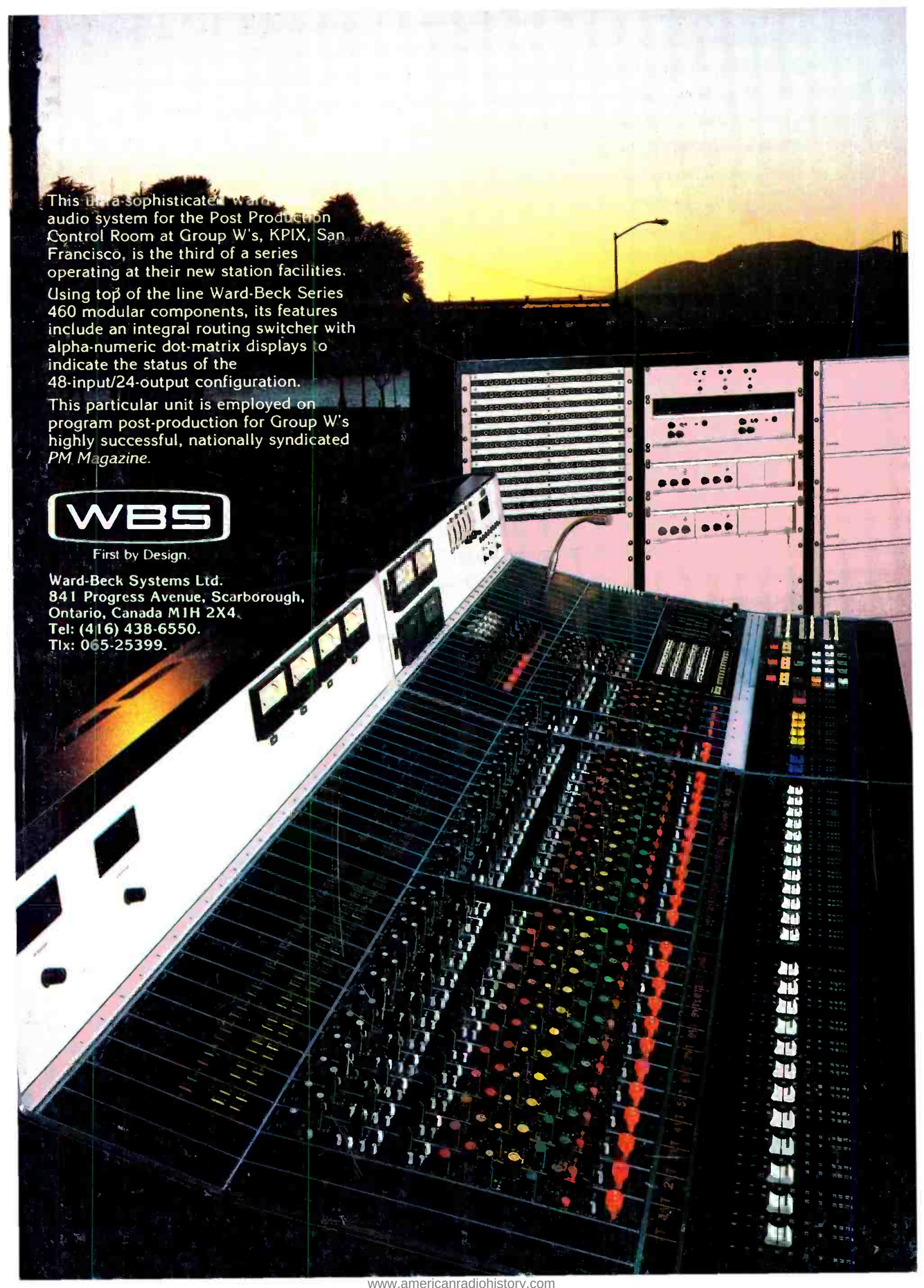

This ultra-sophisticated Ward-Beck audio system for the Post Production Control Room at Group W's, KPIX, San Francisco, is the third of a series operating at their new station facilities.

Using top of the line Ward-Beck Series 460 modular components, its features include an integral routing switcher with alpha-numeric dot-matrix displays to indicate the status of the 48-input/24-output configuration.

This particular unit is employed on program post-production for Group W's highly successful, nationally syndicated *PM Magazine*.

WBS

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