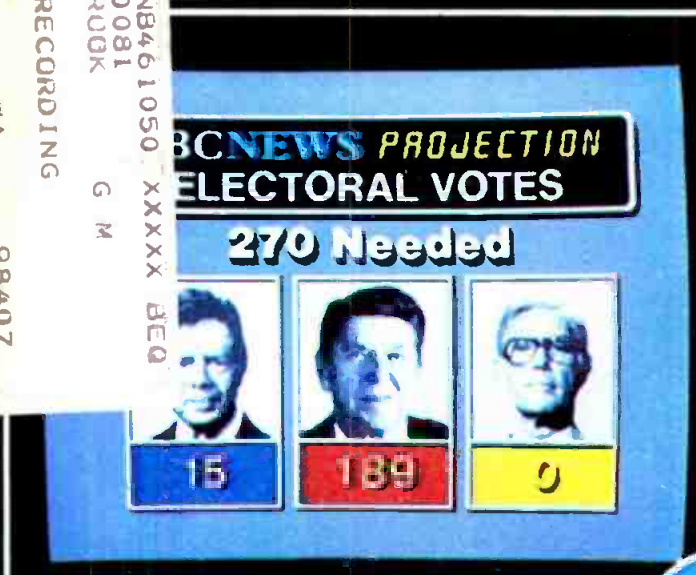
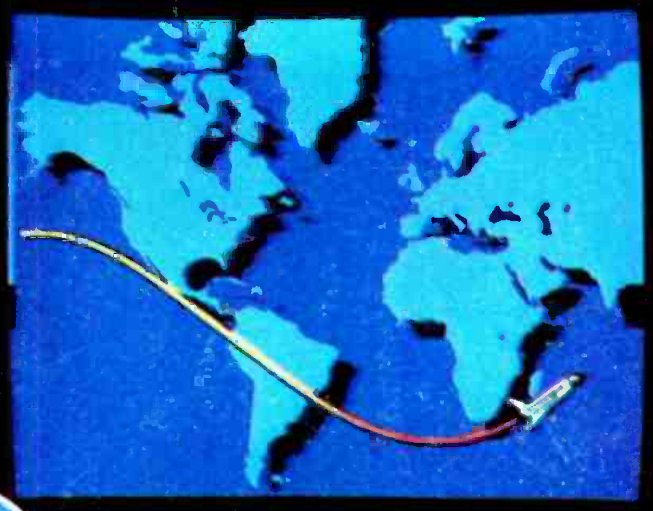
BROADCAST ENGINEERING®

February 1982/$3





abc

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- ANIMATION & VIDEO GRAPHICS
- PLANT EFFICIENCY
- TEST EQUIPMENT

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BROADCAST engineering

The journal of broadcast technology

February 1982 • Volume 24 • No. 2

THE COVER illustrates some of the graphics created on the electronic videographics system developed at the TV facilities of the American Broadcasting Company, New York. An article describing the features and capabilities of this unique system appears in this issue. Note: The lower right graphic lists highlights of this issue, presented on the ABC system.

NEXT MONTH we will focus on NAB '82/Dallas. The March issue will contain extensive pre-convention coverage, complete with maps, exhibitor locations, and exhibitor/product listings. Additional technical articles will be included as space permits.

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

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

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A picture worth a thousand hours.

Everything about our new video animation system is designed to save you many hours of costly production time. This means you can now use animation for perhaps the very reason you never used it before . . . time.

Now, topical animation can be produced quickly to accompany news, sports, weather or similar short deadline projects. Then, when you have more time, use the AniVid System for more entertaining station or advertising production.

Besides having time on your side, you'll also enjoy full color, broadcast quality first generation animation on video tape. Suddenly you have all the advantages of film animation with the time and cost savings of video tape.

Altogether, it's everything you would want in an animation system. The AniVid System consists of a microprocessor based VTR Controller, a three tube color camera, and a full featured animation stand.

The system accepts any kind of artwork from pencil tests, cel artwork, three dimensional subjects, animatics, pixillation, timelapse, titling, still storage and filmograph to computer generated graphics.

For further information contact Animation Video, Convergence Corporation, 1641 McGaw, Irvine, CA, USA, 92714, (714)549-3146, TWX (910)595-2573.

ANIMATION VIDEO

A DIVISION OF CONVERGENCE CORPORATION

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FCC update

February 1982

Test signal requirements deleted

The commission has deleted its test signal standards and accompanying mandatory transmission requirements for remotely controlled TV stations, allowing those stations to choose their own measures for complying with signal transmission standards. The action came in response to a petition by the American Broadcasting Companies Inc. ABC proposed changes in the specific vertical interval test signals (VITS) for remotely controlled stations. The commission then proposed to delete the signals and accompanying requirements.

Comments in this proceeding confirmed the FCC's perception that retaining specific VITS requirements burdened licensees without benefiting licensees or the public.

Under the new rules a station can choose the kind, timing and length of its test signal, as long as it does not cause harmful interference.

General Radiotelephone Operator Licenses issued

In January, the commission began issuing General Radiotelephone Operator Licenses. The license, formerly known as the Radiotelephone Second Class Operator License, will be issued to individuals who qualify by passing the required examinations. No change has been made to the examinations, which are the same ones that have been used for the Second Class License.

Outstanding Radiotelephone First and Second Class Operator Licenses remain valid until they expire. Upon renewal, holders of these licenses will be issued General Radiotelephone Operator Licenses.

Emergency shutdown rules adopted

The FCC has adopted rules that permit its Field Operations Bureau to shutdown temporarily equipment that interferes with other communications facilities and threatens the safety of life or property. This authority applies to equipment licensed under Part 74 of the rules covering various secondary broadcast services that share frequencies and will be limited to the rarest and most extreme circumstances.

At an open meeting last October, the commission declined to adopt a Broadcast Bureau proposal that would have given the commission authority to order equipment shutdowns in situations where the licensee could not or would not correct problems that threatened life or property. However, on circulation several commissioners expressed confusion concerning the vote taken at the meeting. As a result, the commission voted to adopt the Broadcast Bureau's original proposal.

The rule proposal came in the wake of an interference problem that threatened space shuttle communications last April. In that case, the commission had enough time to seek the voluntary cooperation of the users of interference-causing equipment. However, the agency is concerned about situations in which it might be necessary to act on a moment's notice to eliminate harmful interference to vital communications. The chief of the commission's Field Operations Bureau will administer the rule under delegated authority. □

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Motion sensing and CMOS logic control this spillproof 10½" transport, smoothly and positively. All functions are totally remote controllable with LED's indicating the operating mode.

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This powerful two-speed, three-motor transport operates over a wide range of 120/240 line voltages and features the Magnecord 3000 HSM tape drive, a virtually indestructible polyurethane drive belt and pressure roller. Modular plug-in boards assure the fast service broadcasters require. And, of course, Magnecords are made in the U.S.A. so parts are readily available.

With automation in mind, the 3000 represents a new generation of tape transport, but with the same rugged design and dependability you've come to expect from Magnecord.

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Videoprint technology used to capture events

John Cool, chairman of Image Resource, with a magazine that carried videoprints.

In order to cover the Reagan assassination attempt last spring, the April 13 issue of *Time* magazine carried a videoprint taken off of CBS newstape. *Time* was the first major magazine to use such advanced technology. The videoprint is the bridge between the TV news camera and the printed press.

The *Time* photo showed James Brady lying on the pavement. Since that time, many publications have carried videoprints of major international events.

- The July 25 edition of *TV Times* carried Royal Wedding videoprints taken off of ITV News videotape.
- Pacific Communications in Australia used the videoprint system to capture the wedding pictures from satellite TV for the Australian newspapers.
- Time-Life in New York and Telidon in Montreal are using videoprint to obtain photographic reproductions from the new teletext electronics news service.

The videoprint is a photograph of the material displayed on the videoscreen, which is generations above the quality of off-the-screen photography. Because of its ability to be used with either computer or TV signals, the videoprint has applications in electronic news and TV coverage of sports, as well as the computer graphics and medical fields.

The Videoprint System was developed by Image Resource Chairman John Cool and Leon Levinson, former Technicolor scientist, by combining electronic, photographic and chemical technologies. This combination solved the problems of color fade out and raster-lining caused by off-the-screen photography.

For more information regarding the Image resource Videoprint System, contact Image Resource Corp., 2260 Townsgate Road, Westlake Village, CA 91361; (805) 496-3317.

FCC grants MultiVisions direct access to foreign satellites

The Federal Communications Commission recently gave conditional approval to a petition filed by Visions, a multipoint distribution service company in Anchorage, AK, requesting direct access to international satellites. The decision, which has not yet been finalized, will enable Visions and its affiliated cable operation, MultiVisions, to streamline the satellite delivery-reception process and obtain special programming on a more cost-effective basis.

By obtaining authorized user status, MultiVisions Inc. will become the only independent pay TV system in the United States with direct access to international satellites.

Visions formally filed the authorized user status petition on May 1, 1979, seeking approval to receive transmissions from Canada's ANIK satellites. After two years of legal maneuvers involving several communications companies, the FCC concurred with the favorable opinion of the US State Department and granted conditional approval.

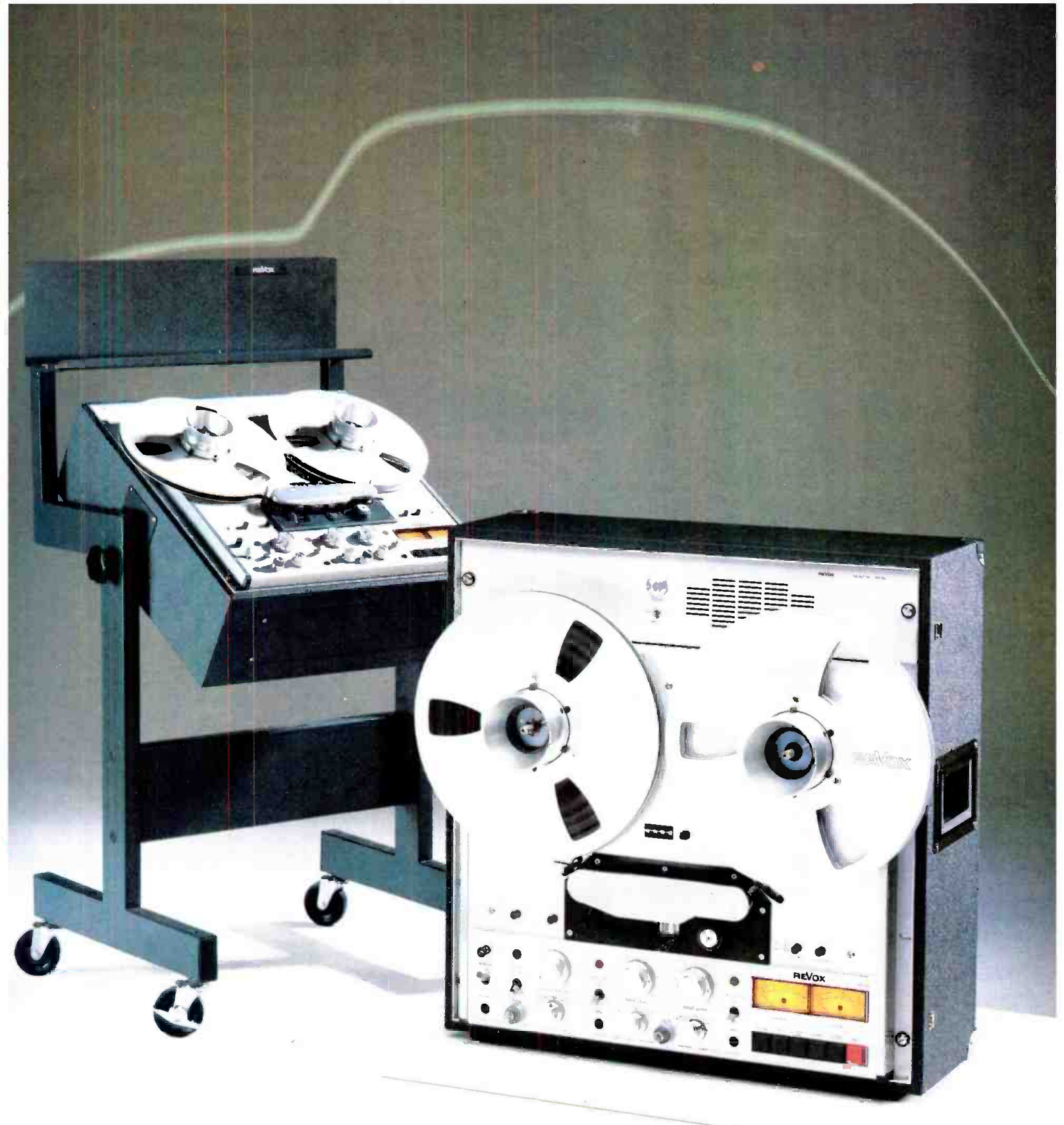
When the FCC finalizes petition approval, MultiVisions will have the opportunity to obtain special programming from foreign suppliers, thereby increasing the standard programming fare for subscribers.

Busignies Award presented to Forster

The Radio Club of America, the pioneer radio communications society of the United States, recently presented its new Henri Busignies Memorial Award to William H. Forster, vice president and product group manager for Telecommunications and Electronics of International Telephone and Telegraph Corporation.

The memorial award presented for substantial contribution to the advancement of electronics for the benefit of mankind, honors one of the Radio Club's most illustrious directors, Dr. Henri Busignies, ITT chief scientist emeritus, who died recently.

The 1981 award to Forster recognizes his work in coordinating international research, personal contributions in radar, TV and communications system design, and for semiconductor component development. □



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It's inexpensive to buy, easy to maintain, practical, reliable, made in West Germany, and built to keep on going through years of demanding use.

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What's more, the PR99 now comes in three versions: all-steel consale, transport case with snap-off cover, and rack mount. All three may be ordered with the new monitor panel: speaker, amp, volume control, and track selector.

Other features include: • Die-cast chassis • Precision machined headblock • Balanced line in and out switchable far calibrated or uncalibrated mode • Servo-controlled capstan motor • Edit mode switch • Tape dump • Self-sync • Choice of 3.75/7.5 ar 7.5/15 ips • Remate control and vari-speed available.

In short, the PR99 is so versatile, so dependable, and so downright sensible that you could almost call it a "volkscorder."

Except, well...the shape isn't quite right.

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Circle (9) on Reply Card

business

A noteworthy event at the recent SMPTE convention (coverage of which was presented in the January issue of BE), occurred off the exhibit floor. Visitors to the Digital Video Systems' hospitality suite were told of the company's recently acquired financial backing that has permitted its expansion.

Digital Video Systems makes changes

Digital Video Systems Inc. has completed the first steps in a major program of transition. John Lowry, company president and chief executive officer said that the changes were essential to the planned evolution from a small company into a corporate organization able to take advantage of emerging technological and market opportunities.

In September the company sold a sizable block of its privately-owned shares to an international multibillion dollar investment group that seeks out and supports companies committed to growth. The investment group includes many companies that are well-known–international banks, insurance companies and pension funds.

The infusion of new capital has allowed Digital Video Systems to add top industry experts in engineering and marketing to its team and to bring in professional management expertise to head various departments. The company also promoted those employees who had demonstrated exceptional qualities.

The following people joined the company or were reassigned: Dr. Keith Lucas, vice president of Engineering; Philip O. Smith, vice president of Finance; David M. Codling, sales manager for North America; James O. Moneyhun, manager of the company's Los Angeles facility; Robert W. McAll, manager of Advanced Systems Development; Steven F. Lawrence, manager of Customer Service; Joseph S. Gerkes, manager of Market Development; Harry Glass, Northeast regional sales manager; Jack Wood, Southwest regional sales manager; and David Comstock, Southeast regional sales manager.

In September the company opened its Buffalo factory service and distribution center to improve service response time. This is being followed by the establishment of a Los Angeles facility focusing on the needs of the Hollywood production community. □

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One of three CBG rooms at ABC. (Front to back), Mark Bernardo, operator, works with David Kelley, production assistant, on space shuttle graphics while co-author Max Berry looks on.

Real time animation and videographics at ABC

By Bebe F. McClain, president, B. F. McClain Productions, Asheville, NC, and Max Berry, director of Audio Video Systems Engineering, American Broadcasting Companies, New York, NY

Whoever said *there is nothing new under the sun* certainly had not seen ABC's Character/Background Generator, usually referred to as the CBG.

This microcomputer-based color TV graphics generator, which combines a character generator with a real time animation machine, uses a raster format and high speed disc technology to produce a new level of sophisticated graphics under the control of TV producers, artists and technicians. To say that it can replace film animation is similar to saying that a 7-course meal replaces a pot pie. Not only can the operator create text messages, geometric figures, lines, curves and complex animation sequences, and digitize any photograph or art work into a TV graphic but, using an electronic drawing board, he can integrate freehand drawing into any picture and delete unwanted backgrounds from existing artwork or photos.

In trying to describe just what the CBG can do, one is tempted to try to discover what it *cannot* achieve.

The CBG is definitely a highly specialized system. It has capability similar to that of graphic devices presently on the market and most of that offered by film, but it has additional scope that is unique. It has managed to give ABC a special look—as witnessed by those viewing the election coverage, the Olympics, *20/20*, and promos for news, sports, and other programs.

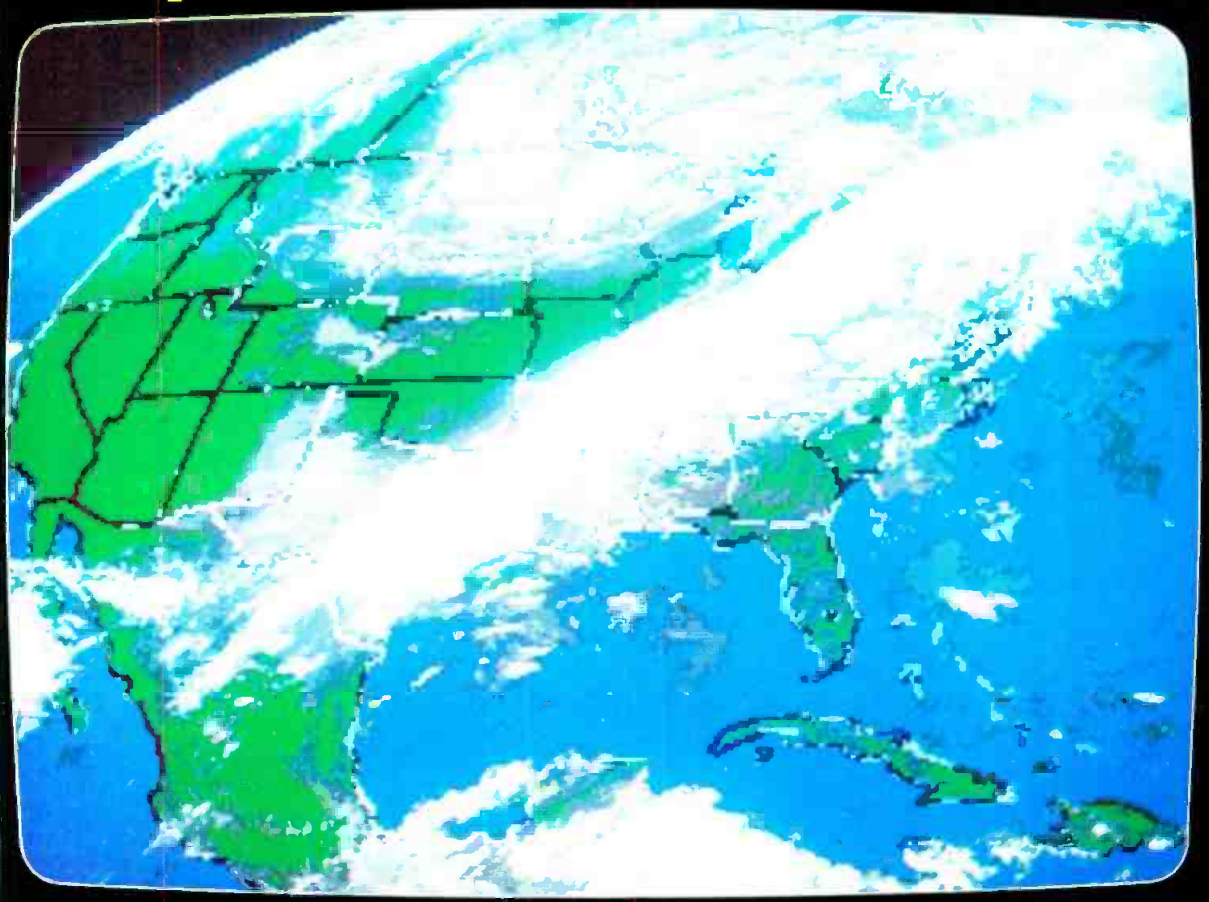
With the CBG, the graphic potentialities at ABC are almost endless. They are constrained only by the imagination of the producer, artist and operator, and the time that can be devoted to the creative task. Even though capability is constantly being increased, it would take years to exhaust the possibilities of the present device.

The ABC production people had asked the engineering department to devise an electronic graphics system to replace mechanical election result tallying boards. Instead of giving them the *molehill* they requested, one of the authors (Max Berry) gave them a *mountain*.

How the CBG evolved

Until 1972, televised election returns were displayed using solari boards. Generally, one person per three machines was needed to control the motors that changed the numbers displayed beside the candidate's name. When you consider that at that

Space, For The Future.



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Environmental Satellite Data Inc.

It's the data source of the future — clean, crisp pictures — precise color enhancements — your choice of regional or national pictures from GOES east or west* ESD data is wowing viewers now in Dallas — Kansas City — Des Moines — Toledo — Detroit — Cleveland — and many other markets, large and small.

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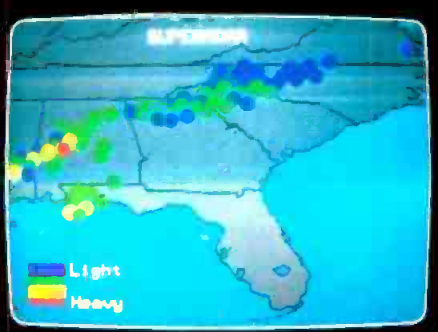

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At one low price, the same display also provides national and regional remote radar — and exciting full-color GRAPHICS!

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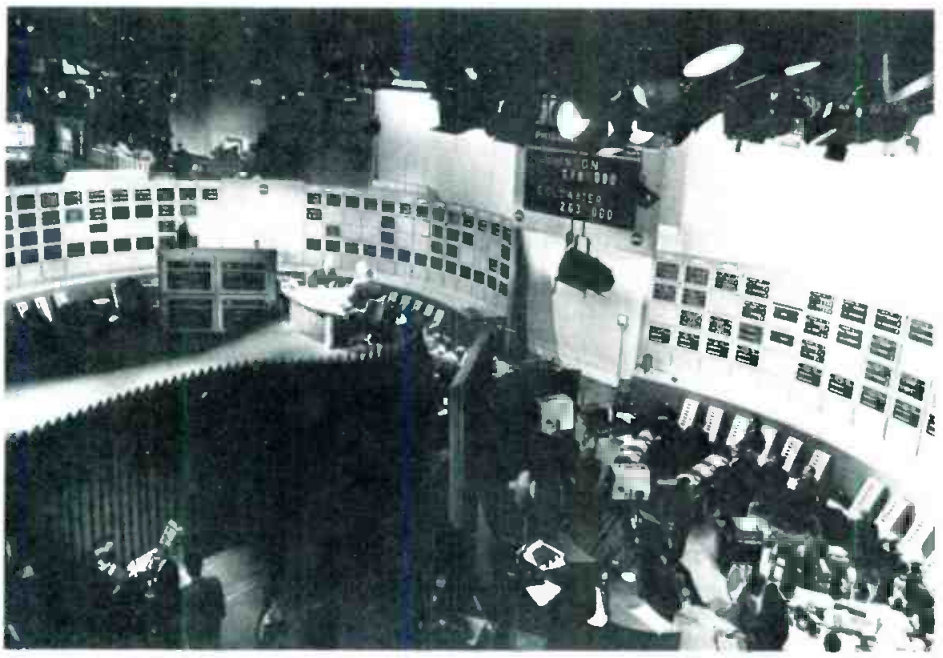

ABC News 1964 election headquarters with solari boards.

Videographics

time there were 51 states, with hundreds of races for Senate, House and gubernatorial offices, you can imagine the space needed to house these boards and the personnel required to mechanically change them. Also, numerous cameras had to be employed for effective switching between the boards. The studio had to be set up three months in advance.

The production staff wanted the figures to be displayed using a computer. The ABC engineering department responded by devising a system for the 1972 elections using computer-generated white numbers and characters that were matted over a blue slide.

It is interesting that the management insisted that the solari boards be set up and manned in case the computer, plus a back-up unit, failed. The Varian #1 computer worked like a dream, only once acting up enough to press the back-up Varian #2 into service. (Both are still in use at ABC.)

In 1974, the blue slide was replaced by an electronically generated background, and in 1976, an Arvin Still Store was incorporated, adding oval shapes that had been prerecorded and stored. These new backgrounds that framed the candidates' names proved inflexible. If recorded improperly, the candidate's name was off center or did not fit. It was obvious that for the '78 elections, more electronics were needed.

At this point, engineering approached a number of computer companies to design special hardware and software that produced multicolored geometric shapes and patterns that could be generated, modified and moved in real time.

A proposal from Dubner Computer Systems was accepted in 1977, and in 1978, the CBG-1 was used on the air. With a touch of a button, geometric

"VIVE LA PEIRCE-PHELPS!"

TELEFRANCE USA, the French cultural and entertainment cable programming system, asked us to design and build their new video production facility in New York City.

We designed a system to fit in their available space.

We chose the precise equipment to meet their budget requirements.

And we had it completed when they needed it.

TELEFRANCE said, "C'est incroyable! Merci!"

Now we'd like to do something special for you.

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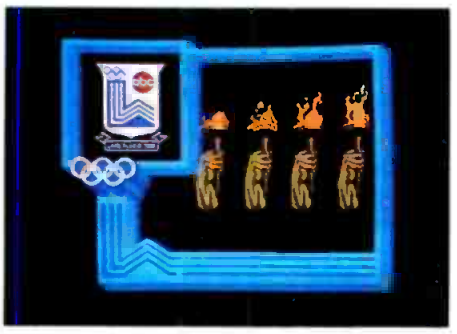


Flickering torch graphic used in 1980 Winter Olympics.

Black and white camera is used to digitize photos and art work used by the CBG.

Videographics

shapes could be generated, moved, enlarged or shrunk using more than 500 colors. Also, maps could be used and manipulated in ways never seen before, including having one state seem to grow by zooming out from the map and filling the screen. As Robert Siegenthaler, executive producer of News Specials said, "It was a whole new ball game."

Not satisfied with the quantum leap, engineering asked the production staff to present a *wish list* concerning the infant generator. They replied with such requests as shortening the time interval (18 seconds) between the actual command for *grow-a-state* and when it appeared on the screen. Also, they wanted a full-blown character generator to be incorporated, with more fonts and more size control than was available on existing units.

ABC Engineering and Dubner responded with the CBG-2, the present machine that uses 2-color display planes that may be merged. The modification gave the producers what they wanted, and more.

During the development period, engineering showed the CBG to several people at ABC News and Sports, including Roger Goodman, director of Production Development, who saw the possibilities presented by this amazing machine. By chance, he was occupied with a major project—the 1980 Winter Olympics. At that time, the ABC staff had the creative talent and the opportunity offered by the special event to fully use the machine that engineering had placed in their hands. Many of you will remember seeing the flickering torch, the international flags that were instantly called up, and the ski jumping in which the takeoff speed and the distance jumped were displayed with immediate computations of where that entry stood in the competition. The operators were amazed that the CBG could store 52 flags that could be punched up as fast as characters.

Goodman said, "Had we known in 1978 and 1980 what the Dubner (CBG) would do, we wouldn't have spent the half million dollars we did on film graphics. We could have done 90% of it on the Dubner."

Capability of the CBG

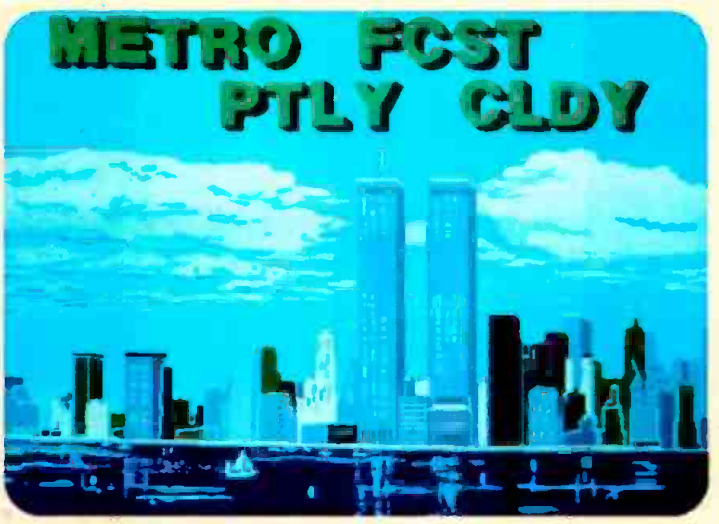
As previously mentioned, the CBG is a character generator and a real time animation device in which individual frames can be created and then played back in real time, up to 60 fields per second, creating the illusion of movement. Obviously, the more frames produced, the smoother and more sophisticated the animation. The myriad combinations make it possible to create graphics for almost any purpose. But what is more significant is the fact that major or minor changes can be effected at any time without reconstructing the entire graphic, as must be done with film animation.

This capability was clearly demon-

One line of the 525 lines of the video image can be isolated for graphic alteration.

The system's flexibility was shown when "Kentucky" was misspelled and was corrected in only 40 minutes.

The Best Graphics



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Circle (16) on Reply Card

**Actual Raster Photograph*

THE $250,000 CART MACHINE.

by Ray M. Kohfeld, President, Ramko Research

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

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

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

Early on, the goals were clear.

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

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

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

To have introduced another cart ma-

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

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

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

What about stereo matrix?

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

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

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

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

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

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

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

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

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

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

Compatability with your present system.

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

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

The deck is a 5/8" casting for stability, with a stainless steel cover plate for wear-resistance and EMI shielding. A crystal-controlled D.C. servo motor insures timing accuracy to within ±0.05% and, practically no heat generation. The speeds are field selectable: 3¾, 7½, and 15 ips.

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

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

With the kind of performance we didn't compromise.

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

It's been worth the wait.

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

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

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

Engineered For Your Bottom Line.

RAMKO

See us at NAB, booth 1909.

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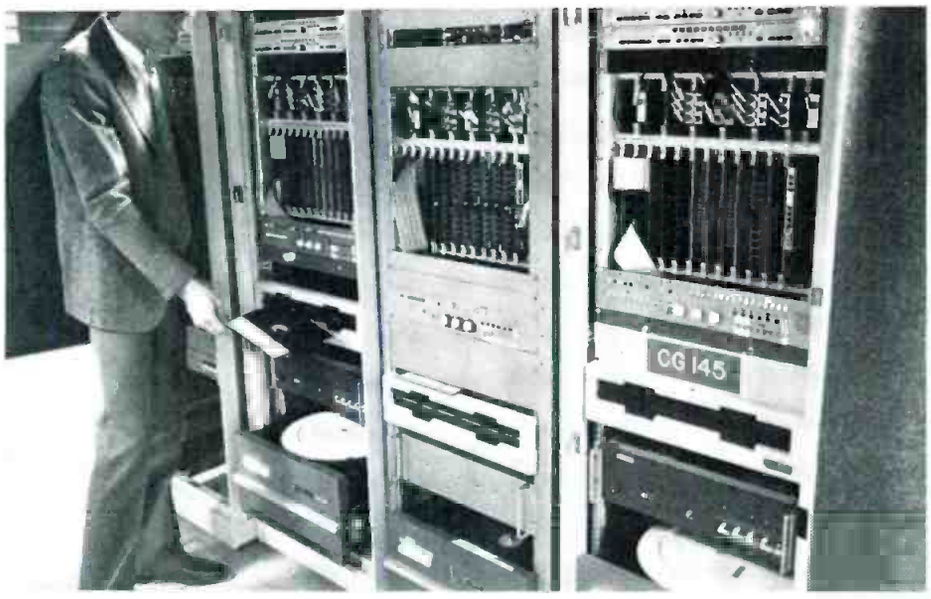
Circle (17) on Reply Card



Operator Mark Bernardo changes discs in the equipment rack of one of ABC's 10 CBGs.

Videographics

strated when CBG operator Mark Bernardo received a drawing from the Kentucky Derby outlining the clubhouse that framed the words "Kentucky Derby." After digitizing the drawing, coloring it and composing the promo spot, he realized that Kentucky had been misspelled as "Kentucy." With other systems, the work would have been scrapped and the drawing returned to the artist for correction, because the characters were stylized (not an available type face) and fit perfectly in the roof portion of the drawing.

Using the available programs of the CBG, Bernardo was able to take the capital "K" in the word Kentucky, shrink it down, move the "c" and the "y" apart and electronically move the new "k" into its proper place. Then he was able to create additional portions of the roof on either side of the apex, open up the roof line and insert the new pieces. This process took 40 minutes.

In addition to the more than 200 type fonts available in the CBG, the operator is able to create any new font and place it into memory. Not only can the characters be popped on, but words also can be written across the screen as if a hand were writing. Photos and drawings placed under the black and white camera are digitized and appear on the screen. They can then be colored using combinations available from the CBG's pallet of colors.

Originally, 512 colors were available as opposed to the 64 on previous graphic generators used at ABC. Soon more than 4000 will be available. With the CBG, up to 64 colors can be used on one character or item in the picture, whereas only two coud have been used before. Anyone who has ever tried to color a face, with its numerous shades of flesh color, or tried to create the effect of colors gradually changing (for example, from

THE MOST ADVANCED CHARACTER GENERATOR ISN'T JUST A CHARACTER GENERATOR!

The Dubner CBG is a full-functioned character generator with features you won't find anywhere else — like diagonal typing, colored edges and 3-D, two-color drop shadows.

But it's also a background generator! Its background capability allows complete control of *every* dot in *every* line.

Animated logo: Beginning with a single image, a complete, multi-colored logo design unfolds on the screen.

You can choose from over 500 colors to create pictures of startling complexity and beauty — and recall them in a fraction of a second!

You can play back a sequence of pictures at up to 30 frames-per-second and — without leaving your studio — produce animations that rival the most expensive post-production results.

The CBG has proven its superior performance on many of the ABC-TV Network's productions, including *Wide World of Sports* and *20/20*. You've seen the CBG's maps and vote boards on ABC's coverage of the most recent national elections, and the colorful flag displays the CBG created for the Winter Olympics in Lake Placid.

But that's not the end of the CBG's possibilities. It was designed to be expandable without hardware modifications. New effects and enhancements are constantly being developed which can be incorporated into your CBG by simply changing its program disk.

Growing Images: On a static background, a new image grows and zooms forward, overlaying the original image.

"Cut and Paste": Various images can be enlarged, reduced, repositioned, overlayed and recolored to produce complex graphics.

So, if you're in the market for an advanced character generator, why not get one that's a background generator as well, for about the same price! Check out the Dubner Character/Background Generator, today!

Dubner Computer Systems, Inc.

Our machines are getting smarter all the time!

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Circle (19) on Reply Card

Syringe graphic series shows droplets changing into letters spelling the title of a *20/20* story.

Videographics

purple to red to orange to yellow), knows that the availability of thousands of shades is not an extravagance, but a necessity.

Another feature of the CBG is the capability to isolate any one of the 525 lines. The cursor can be extended to span any one of the 525 lines, however the first 40 scan lines are not part of the usable screen area. Each scan line is 1024 pixels (picture elements) across, and any pair of these horizontal dots can be specified and altered. Producers can now sit with the operator, view the graphics created and make alterations with ease. For example, if the producer thinks that the characters of one word should be three lines taller, it can be accomplished with the push of a button.

Straight lines can be made to instantly appear by placing two dots where you wish the line to begin and end. A curve will result by adding a third dot above, below or to the side of the first two. Any geometric figure can quickly be created by defining the corner dots.

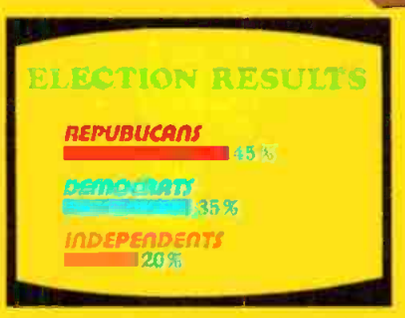
Items from two different pieces of art can be woven together to make one picture. That in turn can be woven with parts of a third, etc, until one graphic is made using pieces from dozens of sources. With the electronic drawing board, the operator can take the stylus provided and trace around one element of a picture, such as one face in a crowd scene, and drop out everything else, leaving only that one

THE GUY WHO SAID "MONEY ISN'T EVERYTHING" PROBABLY DIDN'T HAVE YOUR JOB.

He probably didn't have a Marquee-2000 either. The Marquee-2000 Video Production Generator from BEI gives you an impressive list of standard features for only $26,500. Call toll free 1-800-255-6226 for more details on the Marquee-2000.

MULTIFONT DISPLAY Up to four fonts from the font library can be loaded from the disc and mixed on a character by character basis.

DOUBLE-HEIGHT LOGOS Large station or client logos can be displayed alongside two rows of text when using the double-height logo capability.



ITALICS Any row of text can be made to instantly assume a 13-degree slope at the touch of a key.

PROPORTIONAL SPACING Proportional spacing, true character overlap and variable inter-row spacing help produce captions of correct density and weight.

KEY OUTPUTS R,G,B and keying outputs are supplied from the Marquee-2000 so the output may be downstream keyed with the surrounding or drop shadow edging.

STANDARD FEATURES:

- Multi-font display capability
- 31.25 nanosecond resolution
- Internal 150-page disc memory
- Internal character and background color generator
- Edging: full surround, drop-shadow or no edging
- Proportional spacing with true character overlap
- 4 speeds of roll and crawl with auto-stop
- Automatic row centering
- Italics at the stroke of a key
- 16 horizontal tab locations
- Word flash and underline
- Character insert and delete
- RS-232-C input interface
- Double logo capability up to 128 scan lines high
- Engineer's service diagnostics card
- Preview safe area and system status display
- Firmware programming
- Compact size of mainframe

LEASING PLANS ARE AVAILABLE

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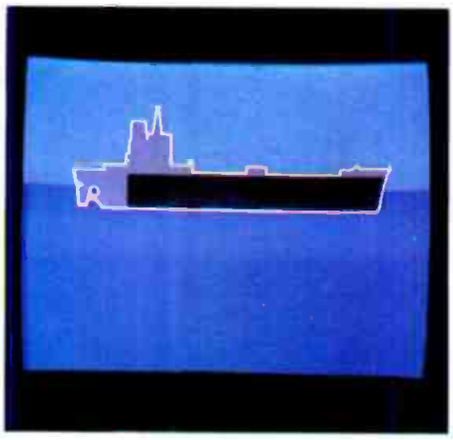
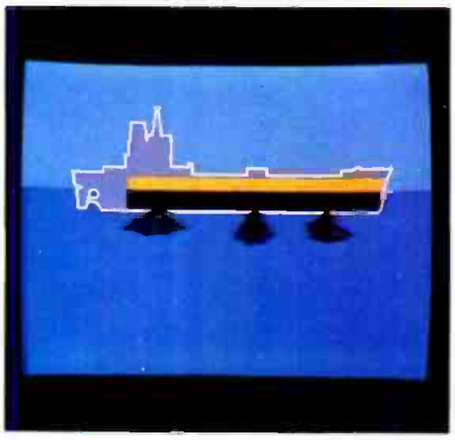




An animated sequence displays oil leaking out of a tanker. Oil leaks slowly out of the ship's hold while the words "Fumes & 0_2" are superimposed on the tanker. The sequence ends with a small explosion that starts in the hold and zooms out to fill the screen, destroying the tanker.

face. All types of freehand drawing can be done directly on the screen using the stylus.

Program graphics at ABC

The following are some concrete examples of how the CBG has been used to create the graphics that have given ABC its distinctive new look.

20/20

Each Monday when Donna Bedross, production assistant to Jan Rifkinson, producer/director of ABC News' weekly program *20/20*, sits down to plan out the animated graphics that will be used for the opening teaser describing what subjects are to be covered that week, she reminds herself of Rifkinson's advice. "The overall objective of the graphics is to make the story clear to the viewer," he had said. "Try to design it so that a hearing-impaired person, who could only see the graphic, could understand the story." The crisp, bold, clean look of the *20/20* graphics reflects this attitude. Bedross has a better grasp of the capability of the CBG than most production assistants, because she used to be a CBG operator.

In describing the process of evolution for each week's graphics, Bedross tells how, after being given the list of the week's stories, she sits down at the CBG and tries a lot of different things. Because Rifkinson has a monitor that allows him to keep tabs on her work, he often phones her to make comments. She calls on the art department for existing graphics, uses UPI and AP photos and drawings, recalls parts of previous graphics from stored discs, takes items from books or does freehand drawings herself and then fashions portions of the graphics using the CBG programs to obtain a final sequence.

By Tuesday afternoon, she has created the five seconds of animation needed for the introduction of each of the four stories to be aired, plus any graphics needed for use in the individual segments.

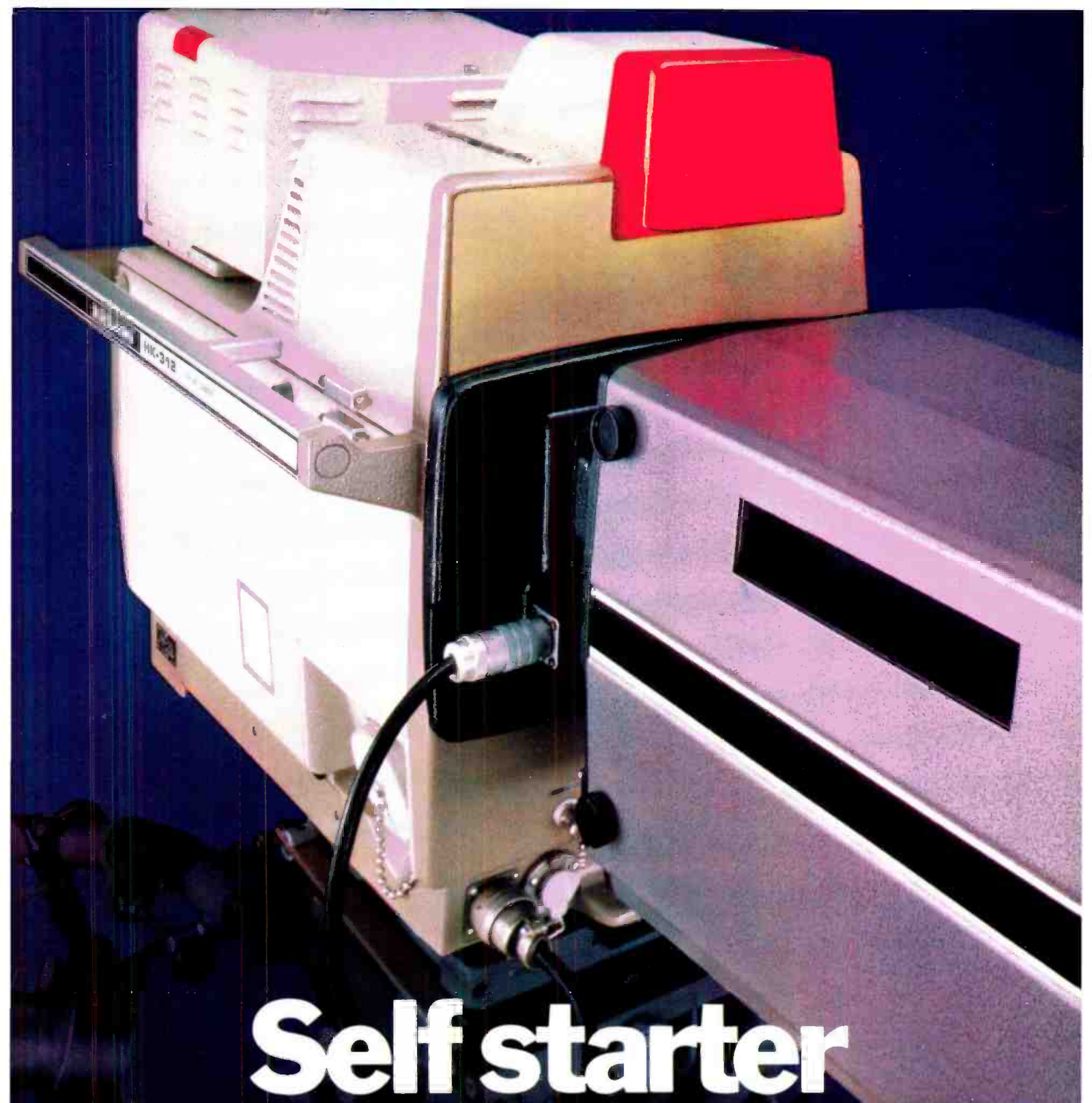
Sitting at the keyboard reviewing her ideas with Rifkinson, she can make changes in any part of the graphic or she can update any fast-changing story right up to air time.

One of her most imaginative CBG animations was a syringe that, using plunger pressure, spills droplets one at a time that change into letters spelling the title of the *20/20* story about illegal drugs.

Another, concerning the danger of tanker oil spills, was an animated sequence depicting oil slowly leaking out of the ship's hold while the words

A graphic piano provided an introduction for a story on Liberace. Its keys appeared to move, an effect created by using a series of frames featuring the piano, darkening various keys, then playing the sequence back in real time.

With the system, names and titles can be made to zoom out in a straight line, or in a curve leaving streaks, or in a trail of smaller images behind, and buildings can be built on screen.



Self starter

For a fast start, no other studio camera comes close to the HK-312. It comes air ready. Just unpack it and it'll give you superior performance the first time. And, it'll keep working. The HK-312 helped establish Ikegami's reputation for legendary reliability.

The HK-312 is also an extremely stable camera that doesn't require time consuming adjustment. Add the optional Emmy Award winning computer setup and you can trim your daily checkout time even more—to less than a minute. Computer setup that has already proven itself at many leading stations.

The HK-312 includes all the essentials for superior picture quality and performance. High resolution. Superb colorimetry. Plus an excellent signal-to-noise ratio. And with Ikegami Triax, you can extend the normal 600 meter cable length to 1500 meters with no compromise in picture quality.

One simple demonstration will show you why so many networks and leading independents are convinced that the HK-312 is the finest studio camera. To get started, contact Ikegami.

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Circle (22) on Reply Card

Videographics

"FUMES & O_2" were superimposed on the tanker. It ended with a small explosion that started in the hold and zoomed out to fill the screen, destroying the tanker.

CBG graphics can be used as a matte into which live video is keyed, as was done with the introduction for a story on Liberace. A graphic piano complete with moving keys was used as a frame in which Liberace was seen playing on a nightclub stage. To make the keys appear to move, a series of frames were created, using the same graphic piano but darkening various keys. When played back in real time, alternating groups of keys appeared to be depressed.

Names and titles can be made to zoom out dramatically in a straight line, or in a curve leaving streaks, or in a trail of smaller images behind, and buildings can be built on screen.

Similar to the way in which an interesting magazine cover entices potential readers to delve into the contents, so do these introductory graphics that arouse the interest of viewers, keeping them tuned to *20/20*.

Sports

Those watching the 1981 Kentucky Derby, or the related promotions during the preceding weeks, probably thought they were seeing film animation when they saw a cartoon horse and rider gallop across the screen. Actually this animated sequence was produced by digitizing seven different black and white drawings of a horse and rider in seven different galloping positions, coloring the individual parts of the image and playing all seven back in real time, making the horse seem to gallop across the screen with the jockey bouncing in the saddle. The CBG allowed the operator to select the playback speed and the size of the horse on the screen. This sequence was often matted over the live image of Churchill Downs.

Graphic scoreboard displays updated scores.

A seasonal promotion features a character named *Hambo* (he was first used to promote the Hambletonian Stakes harness race), who saws his way out of a pumpkin, releasing a bat carrying the ABC logo.

CONRAC

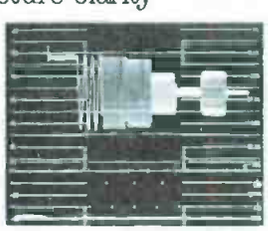
INNER VIEW 3:
A closer look at Conrac Monitors

Comb Filter Separator: Resolution Solution at 3.58 MHz.

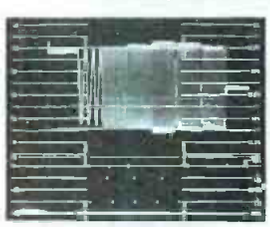
Conrac's Comb Filter Separator delivers the high resolution needed for today's high performance camera and taping equipment. It removes color information from the composite video signal without the luminance loss in the 3.58 MHz region produced by notch filters.

Conrac's Comb Filter takes advantage of spectrum interweaving to separate luminance from chroma, without reducing luminance bandwidth.

But the best part of Conrac's Comb Filter is that it gives you this improved picture clarity without the drawback of conventional comb filters. Because, unlike conventional comb filters which exhibit heavy dot patterns in the luminance path, Conrac utilizes non-linear techniques to virtually eliminate these patterns around vertical and horizontal transitions.



1. Multiburst test signal with conventional bandpass and notch luminance/chrominance separator.



2. Multiburst test signal with Conrac's Comb Filter luminance/chrominance separator.

Conrac Quality: Computer-controlled for the 80's.

The implementation of a failure analysis documentation system has become an essential new tool in the quality factor. This system provides the capability of daily test analysis from four different product test and inspection areas. The net results are improvements in product quality and long term reliability.

Conrac Technology: Over 30 years of leadership.

Conrac's track record of technical innovations stretches back nearly three decades; and what we've learned since then goes into every monitor we make today. That is important to you because the more technology we pack into each monitor, the more performance you will receive from it.

Comb filter separator and computer-controlled quality are just two ways Conrac technology can save you time and money.

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

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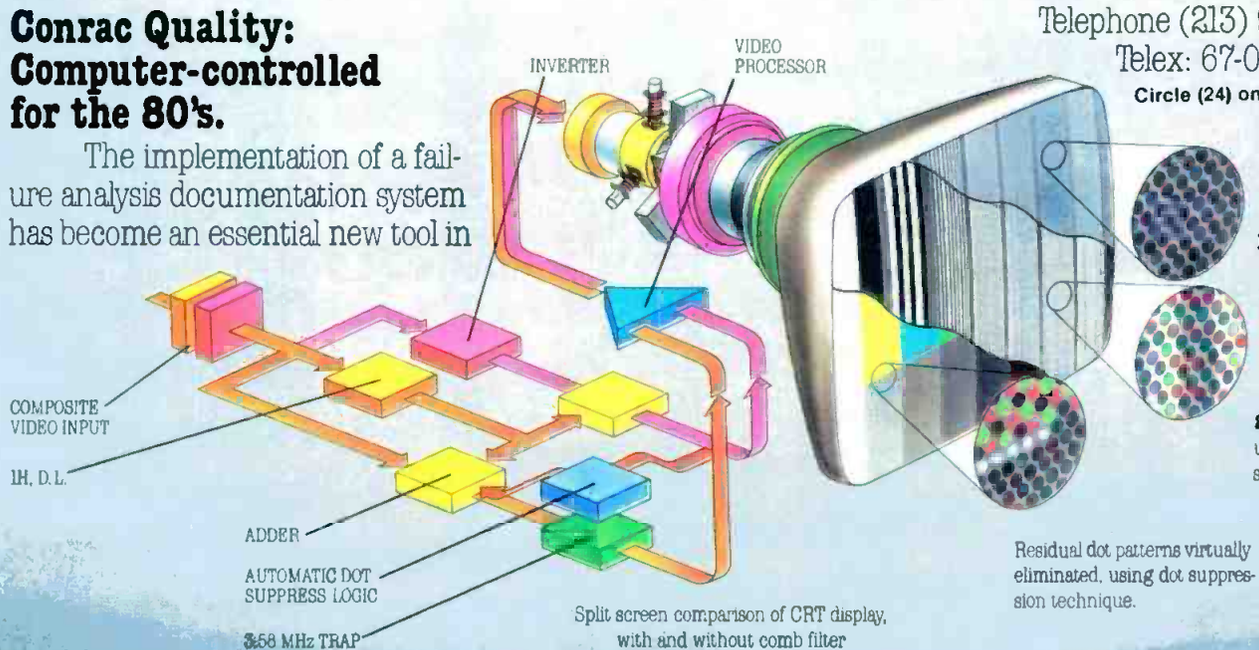


Split screen comparison of CRT display, with and without comb filter

1. Luminance resolution using the conventional notch/filter separator.

2. Luminance resolution using the comb filter separator.

Residual dot patterns virtually eliminated, using dot suppression technique.

Quality you can take for granted.

Orbits of the shuttle matted over the topographical map.

The *next event* graphic displays the shuttle and defines the present maneuver.

David Kelley, special events production assistant, holds a map supplied by NASA depicting all 84 orbits that had to be individually programmed into the CBG for the space shuttle graphics.

Videographics

One use that ABC Sports makes of the CBG is for its NCAA scoreboard show where a computer helps organize all the team names and all the scores that are then transmitted to the CBG. The result is the familiar graphic scoreboard that displays the updated scores.

At the Indy 500, the CBG was used for the time trials. Each of the four times the car went around the track, the lap times were instantly compiled and converted into miles per hour and added to the graphic display on the screen.

The seasonal promotion during Halloween featured a character (affectionately referred to at ABC as *Hambo* because he was first used to promote the Hambletonian Stakes harness race) that sawed his way out of a pumpkin, releasing a bat carrying the ABC logo.

Special events

The two 1981 space shuttles provided opportunity to showcase the ingenuity of the programmers and the efficiency of the CBG.

David Kelley, special events production assistant, recalls how he and Bernardo programmed all 82 orbits of the space craft. When you consider that a world map had to be broken up into three sections, and that the craft had to be pictured in 16 different positions to show it traveling across the screen in its orbit, you end up with 3936 individual frames to be programmed. It took about 200 hours of programming to give ABC the capability to pull up the exact position above the earth of the orbitor at any moment during the mission.

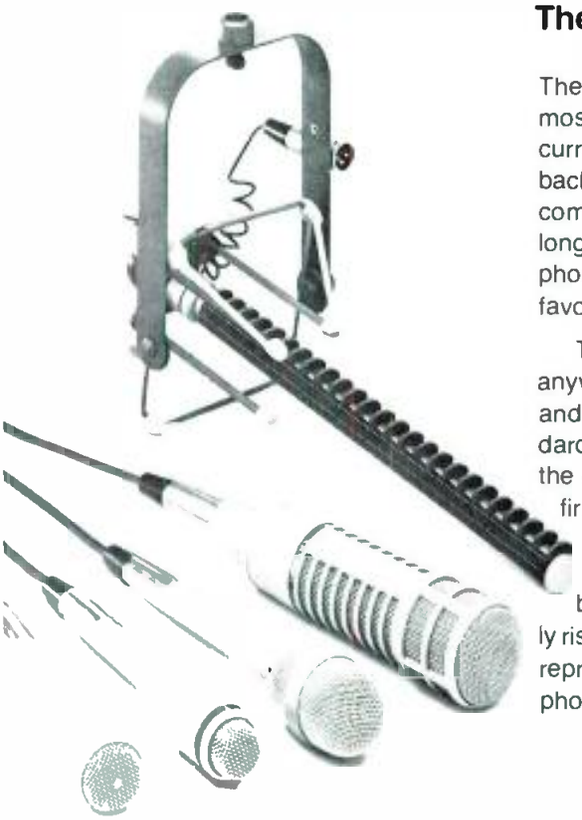
ABC was also the only network to offer complete graphic information concerning the next event, thanks to the CBG. A specially designed graphic displayed the orbitor and defined the present maneuver while two different clocks counted down the time until the next event and showed the mission elapsed time. The CBG can simultaneously count five clocks up or down.

According to Siegenthaler, the most demanding event, graphically, is election coverage. "It's a numbers game where we must do whatever we can to show who's winning," he said. "It's hard to overdo graphics in an election. The boxes and the colors are used to channel the eye. Graphics are only good if they deliver. And, we have to be able to call up and display information fast. Anything that takes over two seconds is too long."

The 1980 election coverage by ABC was a cornucopia of graphics inter-

Orbits of space shuttle being programmed using the 16 different orientations of the spacecraft.

Think of us as your mike expert.



The 635A – Perfect design from the start

The Electro-Voice 635A is probably the most widely used broadcast microphone currently available. Yet it was introduced back in 1967! There are microphone companies that haven't been around as long as the 635A! What makes a microphone continue to be the broadcasters' favorite after 15 years in the field?

The 635A was designed to be used anywhere. Its screw-machined steel case and mechanically nested parts set standards for durability and ruggedness that the competition still strives for. It was the first omnidirectional microphone designed to have a shaped, rather than flat, frequency response. A rolled off bass response combined with a slightly rising high end make it perfect for vocal reproduction. And it was the first microphone of its type to feature an elastomer encased head capsule for reduced handling noise and additional protection from severe mechanical shock.

Despite all the technological advances in the broadcast, recording and sound reinforcement industries, the 635A continues to be the "audio man's screwdriver" – a microphone tool that can be used anytime, anywhere, for almost anything. When a product is designed right to start with, there's no need for it to become obsolete. All Electro-Voice professional microphones are designed with the same goal in mind. That's why people think of Electro-Voice as their microphone expert.

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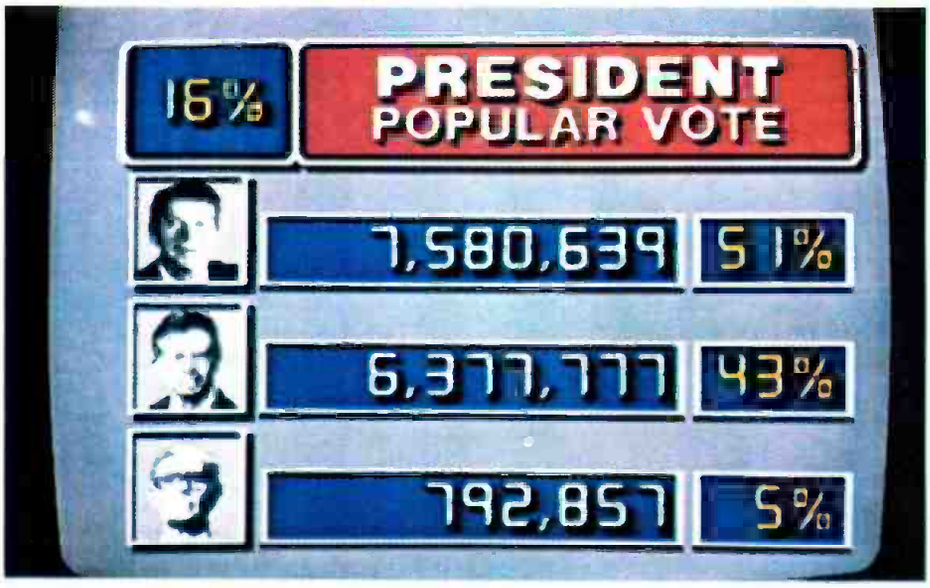

Graphic used by ABC during the 1980 election coverage showed percentage of precincts reporting, the number of votes each candidate had received, and the percentage split.

Videographics

twined with constantly changing computerized statistics supplied to the CBG. The most frequently displayed graphic exhibited the percentage of precincts reporting, the number of votes each candidate had received, and the percentage split. A unique feature of this graphic was that the faces of the candidates—Reagan, Carter and Anderson—appeared next to their totals. These were not real photos keyed in but images that were digitized by the CBG and woven into the graphic. The CBG alone was used to generate this unusual box.

The digitized images, which could be moved as characters to any position, also appeared on other boxes—such as the voter poll where bars grew on the screen.

The *growing states* that, in 1978, had required 18 seconds to respond to command, took less than two seconds. Extensive use was made of this animation effect, as was the logo used for the promos and the actual coverage—the *80 vote*. The words of this animated logo seemed to come together from hundreds of random pieces and from the phrase around a big red check mark.

Even the correspondents were framed by spectacular graphics, making the entire election coverage more graphically pleasing.

Hardware overview

The CBG-2 system includes an operator's keyboard, an operator's black and white monitor, two color monitors and an equipment rack, but the keyboard and monitors can be remote.

The keyboard of the CBG is similar to that of any character generator, but with many additional special purpose buttons. The black and white monitor displays the status of the CBG, relevant messages and diagnostic messages. One of the two color

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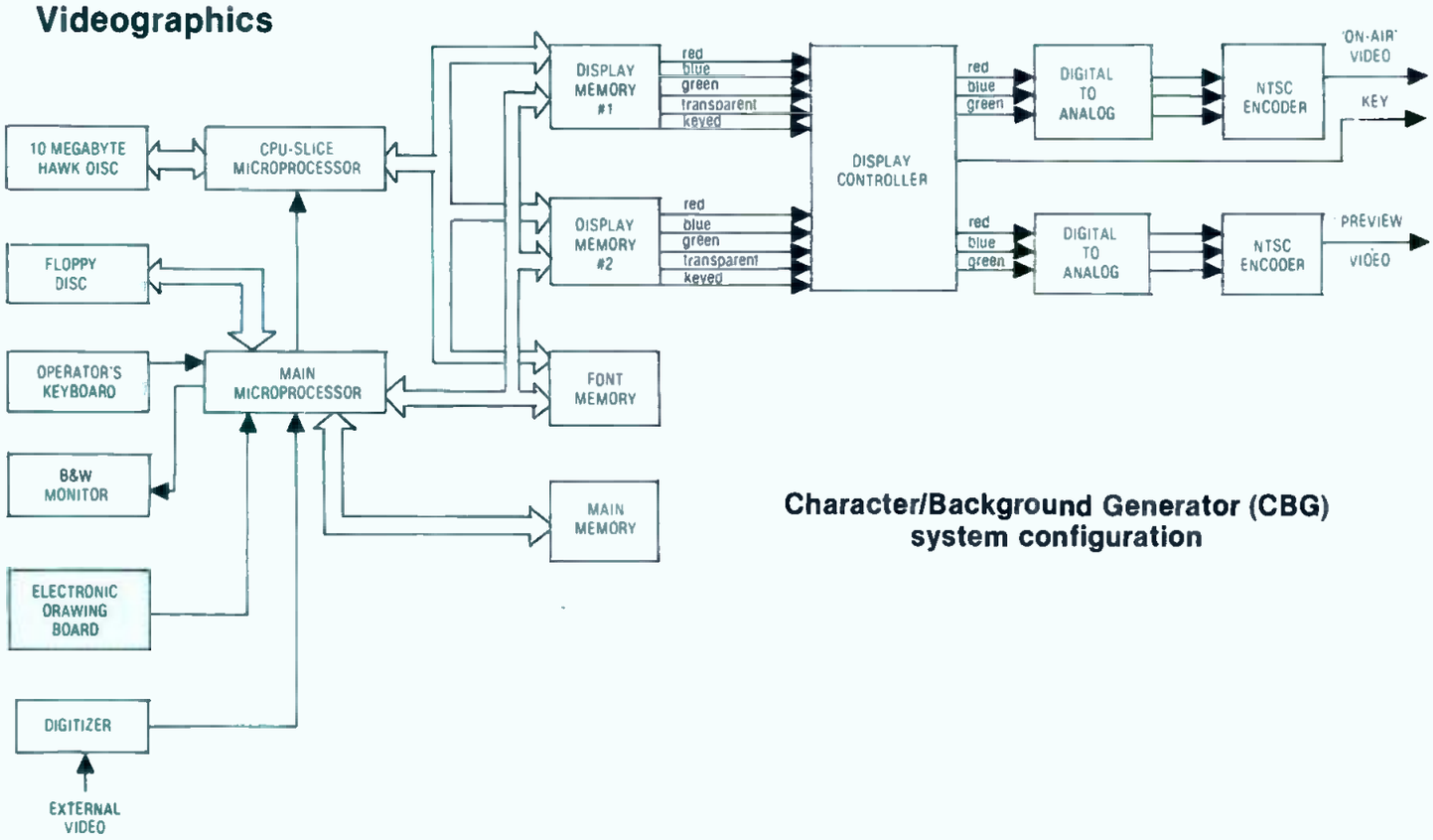


Character/Background Generator (CBG) system configuration

Technical aspects of the CBG

The Character/Background Generator (CBG) is a microprocessor-based system designed to allow complete, flexible software control of the generation and display of broadcast-quality color graphics. The accompanying block diagram shows the major elements of the system.

At the heart of the CBG is the main microprocessor. It is an Intel 8080-based 8-bit general purpose computer. In fact, with its 48k memory, keyboard, floppy discs, and black-and-white character display, it differs little from a typical home computer. The similarity ends there, for much of the CBG hardware is specialized.

The simplest element is *font memory*. This is a 64kbyte scratch pad memory critical for using the system as a character generator. Permanent storage of character data is on the Hawk disc drive. To speed message processing, selected fonts are read from the disc into font memory. Character data can then be rapidly transferred into the display memories as needed.

Considerably more complex are the two display memories where video pictures are built. Images are represented in run-length encoding, so that a 2-byte element specifies both the color and length of a line segment. This scheme, though awkward to manage from a software standpoint, pays dividends in memory usage. The efficiency of run-length encoding allows many reasonably complex images to be stored in each of the two 64kbyte display memories.

Color information is specified in a similar fashion. The run-length element contains only a color number. This number (zero through 63) indicates which color value in the 64-position color palette is to be used. Each color can have eight different levels each of red, blue and green—a total of 512 possible colors. In addition, any color can be specified as being *transparent* and/or keyed.

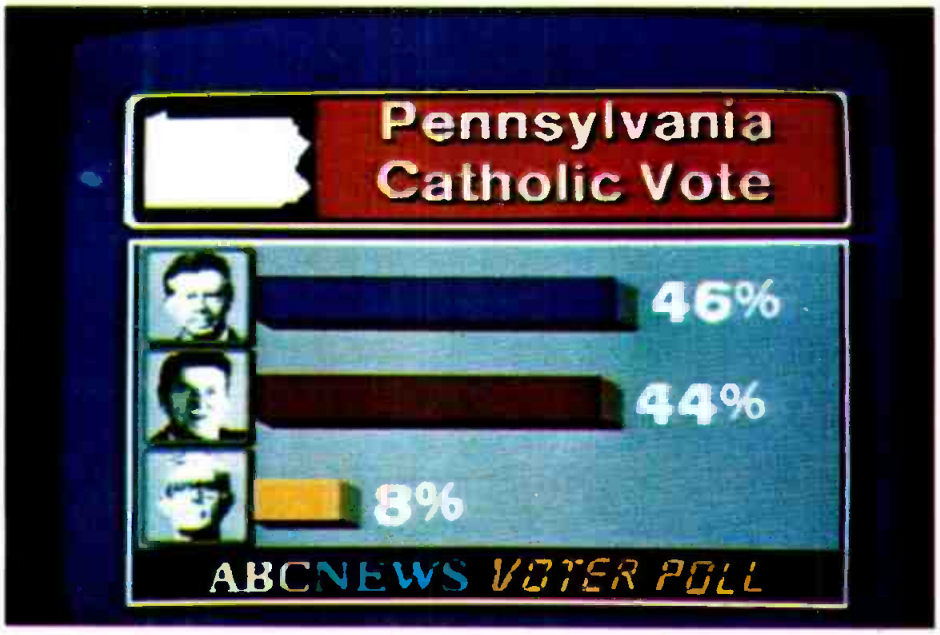
The digital RGB levels from each display memory are sent to the display controller. The display controller routes the data from either memory to either or both of the video outputs. In addition, both planes can be sent to an output, with one or the other specified as the foreground. The background plane will be seen through any transparent colors on the foreground.

The equipment has the capability of rapid image switching. This led to the early development of simple animation. The early CBGs, however, were equipped only with floppy discs with small capacity and low speed that frustrated more sophisticated animation efforts. These restrictions were mainly swept away with the addition of the 10Mbyte Hawk disc and its high speed CPU-slice controller. Images can be read from the disc into display memory at a rapid enough rate to allow animations limited only by the total capacity of the disc, a limit of several minutes worth of fairly complex images. Display speed is increased by *double-buffering* the input in the two display memories: while the images in one memory are displayed, the other is filled with the next set.

The 2901-based CPU-slice microprocessor that is used to interface the Hawk disc has enhanced the CBG's capabilities. As can be seen from the diagram, it can access both display memories and the font memory, and is not limited to disc transfers. Although it is difficult to program, its tremendous operating speed makes the effort worthwhile.

The capabilities of the CBG system include a built-in digitizer. Any NTSC video signal can be converted to a run-length encoded digital image in a matter of seconds. The software can then be used to colorize and manipulate the image into many other forms. An electronic tablet is also part of the CBG. This device, which accurately measures the position of a pointer on a flat surface, enables the operator to *paint* on the TV screen. It can also be used to draw new pictures, or change old ones.

The CBG was designed as a general purpose computer with specialized hardware added for video display generation. This hardware was designed to allow the software to control the video image in the most effective manner.



The voter poll graphic shows bars growing across the screen.

Graphics showing the "growing states" capability of the ABC system.

Graphic used as a logo during the 1980 election coverage.

During the 1980 election coverage, even the ABC correspondents were framed by graphics.

Videographics

monitors is a preview monitor that displays the cursor and has *safe* zone lines while the other color monitor is an on-*air* monitor.

The equipment rack, the heart of the CBG, houses the microprocessor, memory boards, disc controllers, A/D and D/A converters, two encoders, sync generator and power supplies. A CDC/Hawk Disc Drive is mounted on the bottom of the rack and has one fixed platter and one removable platter.

The Control Data Corporation (CDC) Single Platter Disc holds five to 20 seconds of animation, depending on the complexity of the pictures. Up to 9999 text messages can be put on one of the high speed discs, or up to 500 pictures. Floppy discs can be used but are not necessary.

Several different programs are used in the CBG, each of which is named after the programmer who devised it. One program is called "Take it away Keith." Humorous retorts from the computer—such as "Huh?" when an operator makes an error—are typical.

Reaction to the CBG

The ABC management is pleased with the results obtained from the use of the CBG. It has been nine years since the 1972 elections when it was agreed to use a computer only if the mechanical solari boards were kept on full standby. That skepticism has now vanished and has been replaced with support and increased demands for more electronic graphics.

Today there is no doubt that the production operations people at ABC delight in this machine. Watching operators' hands fly across the keyboard and listening to their exclamations when it all comes together gives understanding to the words of Verne Pointer, vice president of Engineering, when he said, "The Character/Background Generator (CBG) is perhaps the most creative tool that we have placed in the hands of the artist and operator for a new and different look on the air since the introduction of the color slow-motion recorder in 1967."

ABC Engineering will be the first to tell you that there were many birth pains for the CBG. Aside from the many equipment problems involved in developing the hardware and the software there were also people problems. A new type of art work was required from the artists for the most effective digitizing. Producers and production assistants had to be oriented and convinced to replace old methods with the CBG. Operators had to be trained. But it was exciting and interesting—even when ABC had to send the New York State Police after one of the Dubner programmers during the Olympics. He had come to check out the units at Lake Placid. After he left to drive home one started acting up; but the police found him and turned him around.

The TV industry has indicated it is pleased with the CBG by honoring ABC with various awards such as the Gold Medal in the International Film and TV Festival in New York. Amy Sacks, director of Promotion and Program Development at ABC Sports, won this medal for her Hambletonian Stakes campaign created on the CBG that introduced the *Hambo* cartoon character.

Bill Carter, in his article that appeared in the Baltimore Sun, compared ABC's coverage of the space shuttle with that of the other networks.

"ABC's approach is so much more visual, so much more innovative, so much more production oriented. While others were giving America views of boring-looking people sitting at desks in space control in Houston, ABC was pumping up 3-color graphics that included the name for the next event, when it would take place and a running clock counting down to that time. That coverage can't be dismissed as pyrotechnics. It was exceptional television. It was better television."

And what does the future hold for the CBG? According to Roger Goodman, who is responsible for the graphic look of ABC News and Sports. "We haven't even scratched the surface of the capability of this machine or the ideas of the programmers. Believe me, it's going to be spectacular." □

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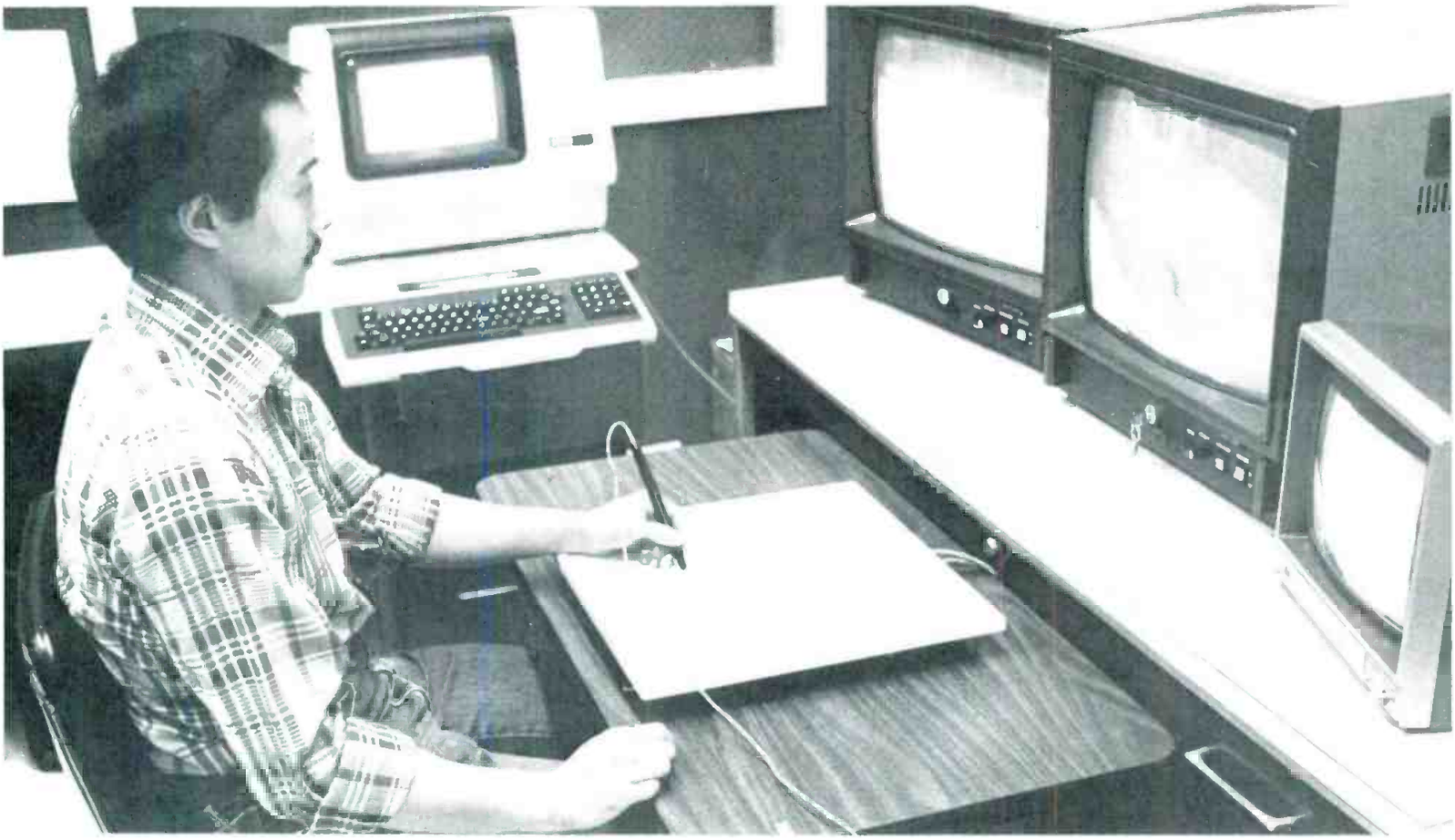

KRON-TV in San Francisco said it is the first TV station on the West Coast with an operational digital videographics system. The system, operated here by staff artist Norman Leong, provides the station's news and programming departments with tremendous flexibility, speed and creativity in its videographics, as well as limited animation.

Digital videographics at KRON-TV

By the KRON staff

Since the first image created on our digital videographics system (from Aurora Systems) sprang to life on KRON-TV-s *Live on 4 at 4* newscast slightly more than nine months ago, our station's artists and producers have been discovering some of its uses and have realized that they have only scratched the surface of its capabilities.

Our San Francisco NBC affiliate, locally owned by Chronicle Broadcasting Company, is the first TV station in the country to be equipped with the sophisticated videographics and animation system, designed by Dr. Richard Shoup, president of Aurora Systems in San Francisco.

The all-digital system includes image processing electronics, a central processor, disc storage units, the electronic pen and tablet, two RGB high-resolution color monitors (one for the menu, the other a display canvas), and an NTSC monitor. The output from the system is standard NTSC compatible video. KRON's system configuration also features a display unit in the control room that allows simultaneous call-up of stored graphics for on-air use while other materials are being created at a design station in the graphics department.

This videographics system allows graphic artists, with a minimum of special training, to create a wide variety of images and animated effects in *real time*. Using only the pen, the artist can paint directly into the video image, edit and change the picture, colors and sizes. The system's speed and flexibility are valuable to KRON, because the station leads the market in airtime allotted to live local news. Its debut coincided with the premiere of *Live on 4 at 4*, which brought the station's local news to more than three hours per day.

According to Mike Ferring, KRON news director, "The Aurora system helps us produce sophisticated, last-minute graphics for our expanded newscasts. There's a snap and a sharpness to that straight-on-to-the-screen computer graphics image that's just beautiful. When we add animation, it delivers even more to the newscast and to the explanation of news stories."

Freelance artist Dave Patton said, "Our system allows an artist to create almost instantaneous graphics for late-breaking stories. On occasions when no film or video is available, a news producer no longer has to settle for talking heads. The story can often be demonstrated with animation."

Development and start-up

The idea for this special system was first presented to KRON by Ziggy

The color graphics appearing in this article were designed on the KRON system. Dave Patton, freelance artist, took photographs of the graphics using a Dunn Instrument Camera.

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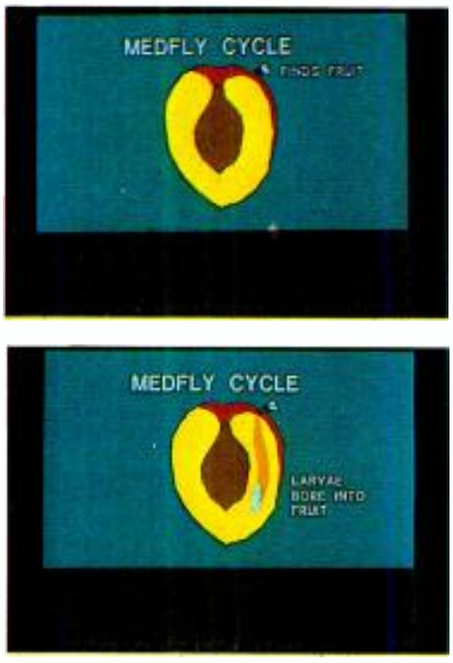
Stone, special projects producer. He introduced the station to Dr. Shoup, who had developed an early prototype at Xerox Laboratories. As Ron Near, production manager said, "We saw the opportunity to get in on the ground floor of a new piece of TV technology. While the basic system was being designed, our staff artists were sitting down with the computer programmers to develop the operational capabilities of the machine."



The Medfly life cycle was animated.

The system was installed at KRON under a co-development agreement enabling Channel 4's production and engineering personnel to evaluate its capabilities. After four months of experimentation within the facility, the system went on-line at KRON.

The system offers great latitude of artistic styles and almost unlimited variety of on-air graphics. The main emphasis has been news graphics, not only because of the amount of graphics necessary, but because of the need for speed. The system's speed and limited animation have allowed the station to come up with dynamic, informative news graphics well before the competition could.

One of the system's most valuable applications surrounded the coverage of the Medfly infestation in the Bay Area. The system was used to animate the Medfly life cycle, using a colorful cross section of a peach. Three flies bored into the fruit to deposit their eggs. Maggots left the fruit, entered the soil and the adult flies emerged. Electronically designed maps illustrated the spread of the infestation and designated the quarantined and spraying areas with flashing lights.

Animation was also used to depict the effect of the air traffic controllers' strike, illustrating the complex traffic patterns over the Bay Area with aircraft animation. Other uses illustrated the recent Libyan air incident using a relief map and exploding planes, the eruption of Mount Etna in Italy, the spread of a Napa Valley fire, and the expansion of California off-shore oil drilling for a special *Target 4* report.

Norman Leong, graphic artist, whose working day has been revolutionized by the system, had no previous computer experience. Still, he found the system easy to learn. Those who watch him demonstrate the system are amazed at his speed and dexterity. He said that the main problem was that everyone in the station wanted to use it, and there were limited hours in the day.

Warren Lamm, another graphic artist who has, at least in part, traded

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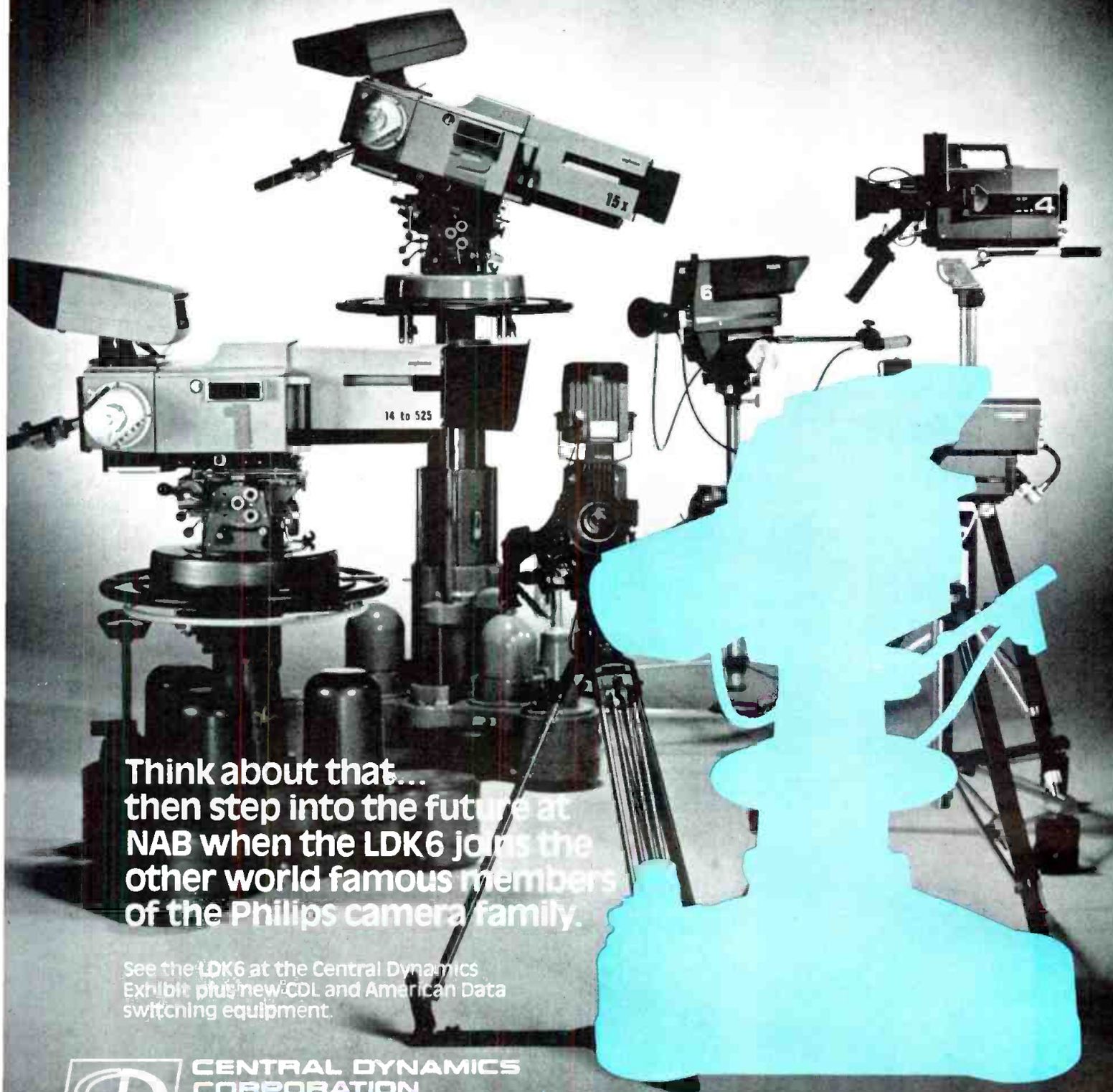

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A news map illustrated a Libyan air attack.

Digital videographics

pens, paste and scissors for the Aurora system stylus and menu, said that the greatest difficulty was communication. "The problem," he said, "is that many of those in the news department and elsewhere don't know what the system can do, so they don't know how and what to order, when and when not to ask for something. Basically, it's a problem of visualization and verbalization. There has to be an on-going educational process so that those who understand what the system can do share that knowledge with their co-workers.

"The color is one of the neatest things about it. You can do your artwork and then fine tune the intensity, the hue and value to get exactly what you want. You can flip to black and white to check contrast, and you can also check to determine how much green, blue and red are in each individual color to further fine tune."

Lamm said that the system's visual menu, as opposed to text display or buttons on the tablet, is an advantage for first-time users. Other advantages of the system, perhaps taken for granted, include the ability of the artist to change designs often. The 2000-page library disc allows recall and updating of stored graphics, a great time saver. The capability of digitizing by video camera adds to the system's variety and speed.

One drawback of the system, however, is the limitation imposed on animation by a maximum of 32 dis-

A typical sports graphic.

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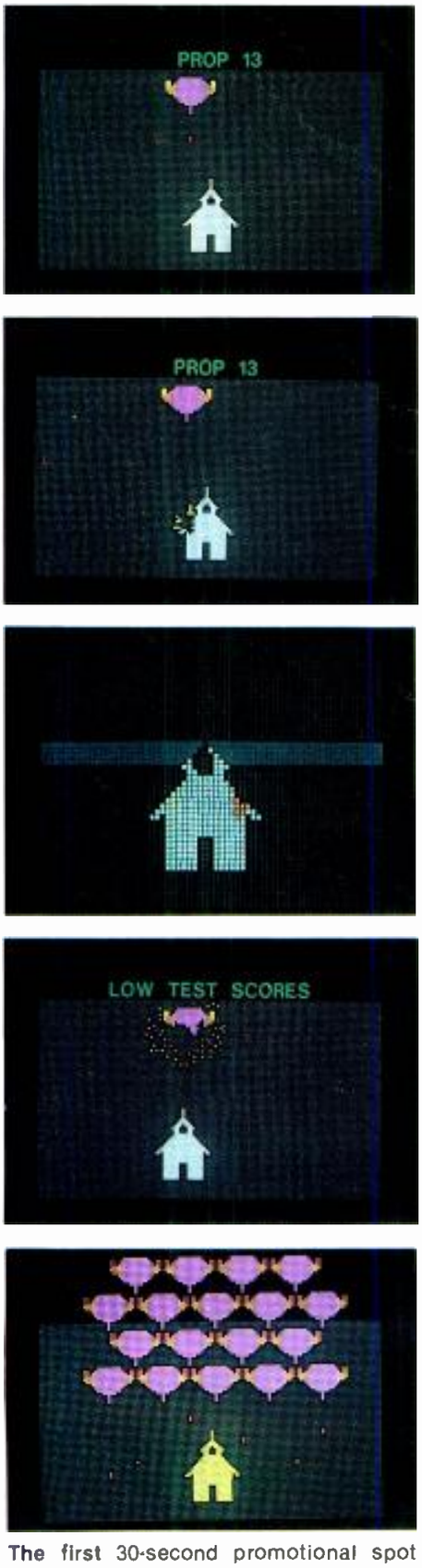
solved frames per animation. If more than 32 changes, or frames, are required, a second page can be used, but that necessitates pre-production editing. And editing facilities are often jammed right before news time.



The first 30-second promotional spot created on the Aurora system was fashioned after a video game.

Leong said that at least double the animation steps currently available were needed.

Leong was also concerned about the pixel size on the system. The videographics systems by Quantel and Ampex have a smaller pixel and, therefore, smoother edges on curves and diagonals. Digital smoothing of edges was a tradeoff with animation, and Aurora opted to compromise in order to provide the greatest possible real time animation. Shoup and other Aurora designers are continuing to develop the system, bringing in new software, expanding its applications and addressing the limitations of animation frames and pixel size.

Other applications

In addition to the illustration of news events, weather maps and sports, KRON's system has been used for animated bumpers in children's programming, on-air promotional spots, public service show openings, and an upcoming 1-hour special on the life of naturalist John Muir.

A bumper created for the *Kid Consumer* segment of *Just Kidding* featured a full-screen dollar bill that comes to life. George Washington rolls his eyes and his bright red tongue darts in and out. The voice-over is: "There's nothing funny about money!"

For a fall presentation, Marilyn Storm, on-air promotion producer, created an animated NBC peacock. A full-screen station logo, a *boxed 4* shrank to one-third its size, then a peacock ran out from the left, jumped on the box, spread his tail feathers, took on color, and became the famous NBC peacock with his tail pulsating in full color. Lamm created five pages of animation that were transferred to ¾-inch cassette and edited. The animation lasted approximately five seconds until the tail began to pulsate. The animation on the *tail* page was looped and held five seconds more.

Storm later built a 30-second promo on the system with freelance artist Dave Patton promoting a *Target 4* report titled *Public Schools Fight Back*. A video game was created in which a little schoolhouse is under attack by invaders, labeled *Prop 13, Teacher Strikes, Student Violence*, etc. The schoolhouse takes a lot of hits. The system registers the explosions: bricks fly off and disappear. The schoolhouse then proceeds to rebuild itself through *Back to Basics Approach* and *Tougher Discipline*, whereupon it fires on its enemies, destroying *Low Test Scores* and *Student Violence*. Just as it is beginning to win its battles, the schoolhouse is faced with *More Trouble*, a bank of invaders on the horizon, and is left dodging their missiles.

Storm said, "Patton had to build 15 separate pages of animation to accomplish all the action we planned. They were recorded on 1-inch tape directly from the system. Using the zoom feature, we recorded most of the pages full-screen first, then took close-ups of the invaders and the schoolhouse. We also recorded some of the pages at differing speeds of animation.

"Although we created only 15 discrete pages, recording them both full-screen and close-up allowed us many more choices when we got to editing. This proved especially effective when we had a full-screen shot of a missile being fired, then took the close-up of the hit, and vice-versa."

More than 65 edits were used in building the 30-second promo. Moog synthesizer sound effects were edited in after the video was complete. Patton explained the significance of this first full 30-second animated promo designed on the system. "I spent two days from conceptual art to final product for what was a considerable amount of animation. It would have taken five times longer and cost maybe four times as much using film animation. Another advantage of creating animation on our system is that the designer or conceptual person has hands-on contact. In addition, the production people are much closer to the creative process and can change colors and other elements easily, getting exactly what they want."

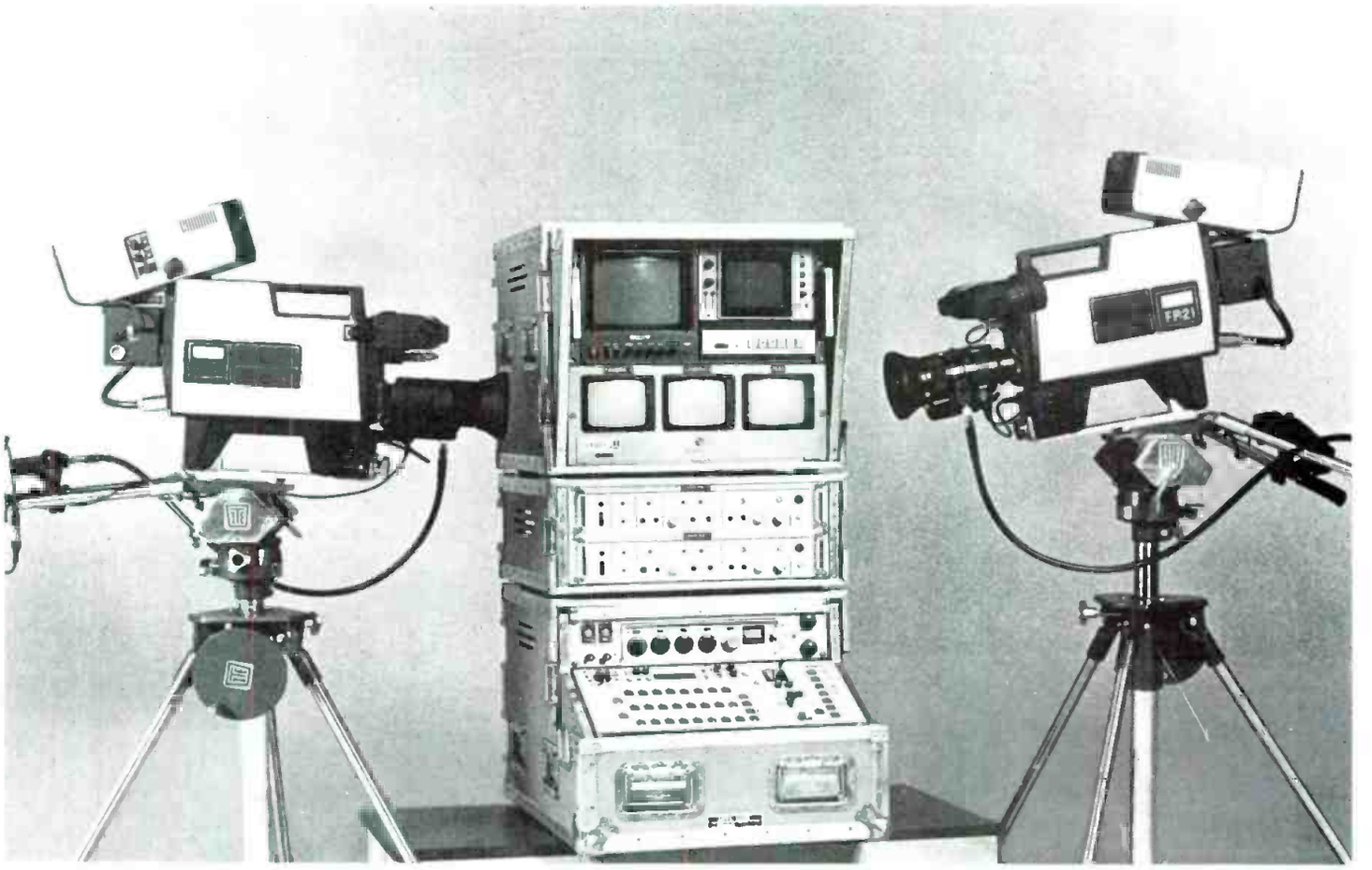
Muir recounts the extraordinary life of John Muir, the legendary mountaineer greatly responsible for protecting the wilderness as national parkland. It was shot on location in Scotland, Yosemite and San Francisco, recorded exclusively on 1-inch tape. The special, which will be syndicated domestically and internationally, will air on KRON-TV in 1982.

Stone recreated Muir's handwriting on the KRON system to graphically link and date segments in an authentic manner. "The method," he said, "perfectly matched the man as Muir recorded his life in diaries. After deciding which events and vignettes we were going to depict, we took the phrases as he wrote them and scripted them onto the screen."

Other uses in *Muir* were for background and effects video. Electronically designed special effects were created—sometimes in combination with real video scenes—to show shooting stars in the nighttime sky, smoke effects, additional fog in a scene aboard a clipper ship and to

HITACHI

FP21 COLOR CAMERA SYSTEM



2-FP21-3 Tube Saticon cameras
2-A10 x 11 BRW 10-1 lens power zoom F1.6
2-Operation panels with 50' camera cable
2-5" View Finders
2-I.T.E. Tripod sets H9PH, T6H, D6G
2-Lens drive kits
2-Battery-charger systems
1-PVM-8200T 8" color monitor
1-Triple 5" mono monitor WV-5203
1-M-67 Shure audio mixer
1-BPM-1 Burst Phase Meter
1-6114 Crosspoint production switcher
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1-528 Tektronic Waveform monitor
1-McMartin amplifier and speaker
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The title of KRON's special, *Muir,* was illustrated by re-creating John Muir's own script.

Digital videographics

paint the *aurora borealis.*

"Clearly, in an historical recounting such as *Muir,*" Stone said, "we wanted to avoid anything that appears electronically created. So what you see are some modified experimental uses which we think assist us in telling the story. Hopefully, they are acceptable within our format without betraying their debt to electronics. Many of these effects would not have been attempted prior to digital videographics due to time and cost factors."

Engineer Roy Trumbull said that the KRON videographics systems is only a tool. "Just because you have the finest tools doesn't mean they'll be put to effective use," he said. "I feel there must be a strong commitment to being visual. Gone are the days of putting the art department under the staircase and budgeting for one set of water colors a year. Art deserves a strong voice in setting the visual impact of a station."

Ferring said that the station's next step will be to move into direct data entry for weather presentation, and then perhaps for other applications. He said that the staff was looking for ways of getting more creative graphics on the air.

Patton said, "The Aurora is a machine, not an artist. It requires creativity and imagination on the part of the user." He said he thought that the Aurora is revolutionary for TV graphics—not just because it is an animation device, but because it is a short-order animation device. "The hardware," he said, "isn't extraordinary, but the applications are. In a high technology business, the way we've been producing art is from a previous era. Digital videographics is allowing art to catch up with the rest of broadcast technology." □

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Electronic animation and videographics

A roundup of some current systems for broadcasters

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

In recent years, there has been an almost exponential rise in interest in graphics systems tailored for television. Our September 1978 *Buyers' Guide* contained no separate category listings for this technology. In the October 1978 issue, we briefly covered part of this technology and referred to some accompanying advances occurring in the computer graphics industry.

Since that time we have seen a rapid growth in videographics at both the NAB and SMPTE conventions. In fact, the SMPTE has devoted entire afternoon technical sessions to this subject, and the lecture halls were packed. **BE** has responded to this rising interest by adding categories to the *Buyers' Guide* and to its product files to cover this technology.

We know that people in the computer graphics industry view broadcasters' rising interest in electronic graphics/animation as an expansion market for their existing technology. Some of these companies plan to be at NAB '82/Dallas as new entries into the field. **BE** will report their progress and products in the March and June issues.

Electronic graphics systems

Preparing this report on current approaches to electronic videographics and animation systems, we first decided to feature the special system developed at ABC for its needs and to look at the operations at KRON-TV. Those systems are reported in other articles in this issue. We decided to follow up with a brief review of other general systems developed for broadcasters as listed in our *Buyers' Guide* and product files.

Not everyone responded to our mailing for latest data and photos on their companies' electronic videographics/animation systems because of pressure to prepare for NAB '82/Dallas. However, appropriate product data provided in response to this request are summarized in the following limited roundup. More information on these products, and on those products available from companies found in the accompanying listing, may be obtained by using the reader service card and circling the appropriate numbers.

Roundup scope

Graphics/animation systems fall into two general categories: computer-assisted and moving image graphic art systems. The most prevalent is the computer-assisted graphic art system, which, with high speed recall techniques from disc memories, may produce animated sequences easily. Camera inputs are not required. Control and input data is generated via keyboards, graphics tablets or via databases for weather display systems.

Circuitry refinement leaves operator artistic talent as the limiting factor in electronically assisted videographics generation and animation. Gone are the man-hours needed for creating drawings for animated se-

Videographics/animation directory

The **BE** September *Buyers' Guide* and our product files list a number of companies making electronic and mechanical systems available to broadcasters for creating videographics and animation systems for television. A mailing was made to these companies to obtain their latest product data and photos for this report. Not everyone responded because of pressures in preparing for NAB '82/Dallas.

The *Buyers' Guide* and file listings are repeated here along with a reader service number. If you would like to have literature from these companies, even though we may not have reviewed their products in this roundup, circle the appropriate numbers on the reader service card for more information.

Animation equipment

Animation Video, Division of Convergence Corporation . . 320
Arvin/Echo Science Corporation 321
Cromemco Inc. 322
Forox Corporation 323
Interand Corporation, Telestrator Division 324
Logica 325
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MPB Technologies Inc. 327
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Electronic graphics systems

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Weather display systems

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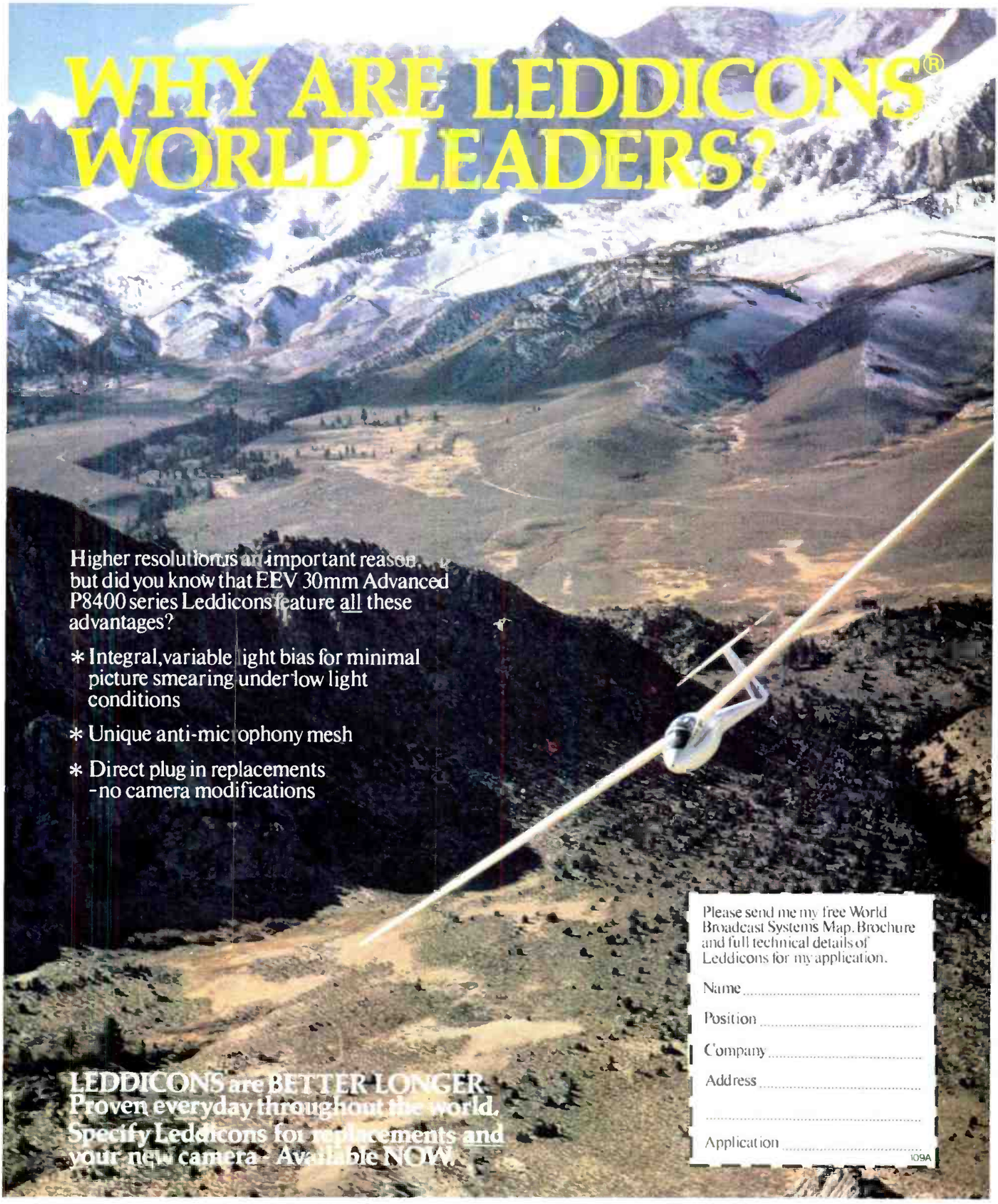
Information Processing Systems of California Inc. 349
Logitek Electronic Systems Inc. 350
McInnis, Skinner & Associates 351
Sperry Weather Systems 352
Technology Service Corporation, Development Labs Division 353
Weathercaster Inc. 354
Weathermation Inc. 355
Weather Services Corporation 356

Another field, that of computer graphics, is, in many cases, far ahead of the broadcast applications in the art of electronic graphics. We have already heard from some companies that are looking at the broadcast field as an expansion market. You can watch NAB '82/Dallas for entry of some of these products and software.



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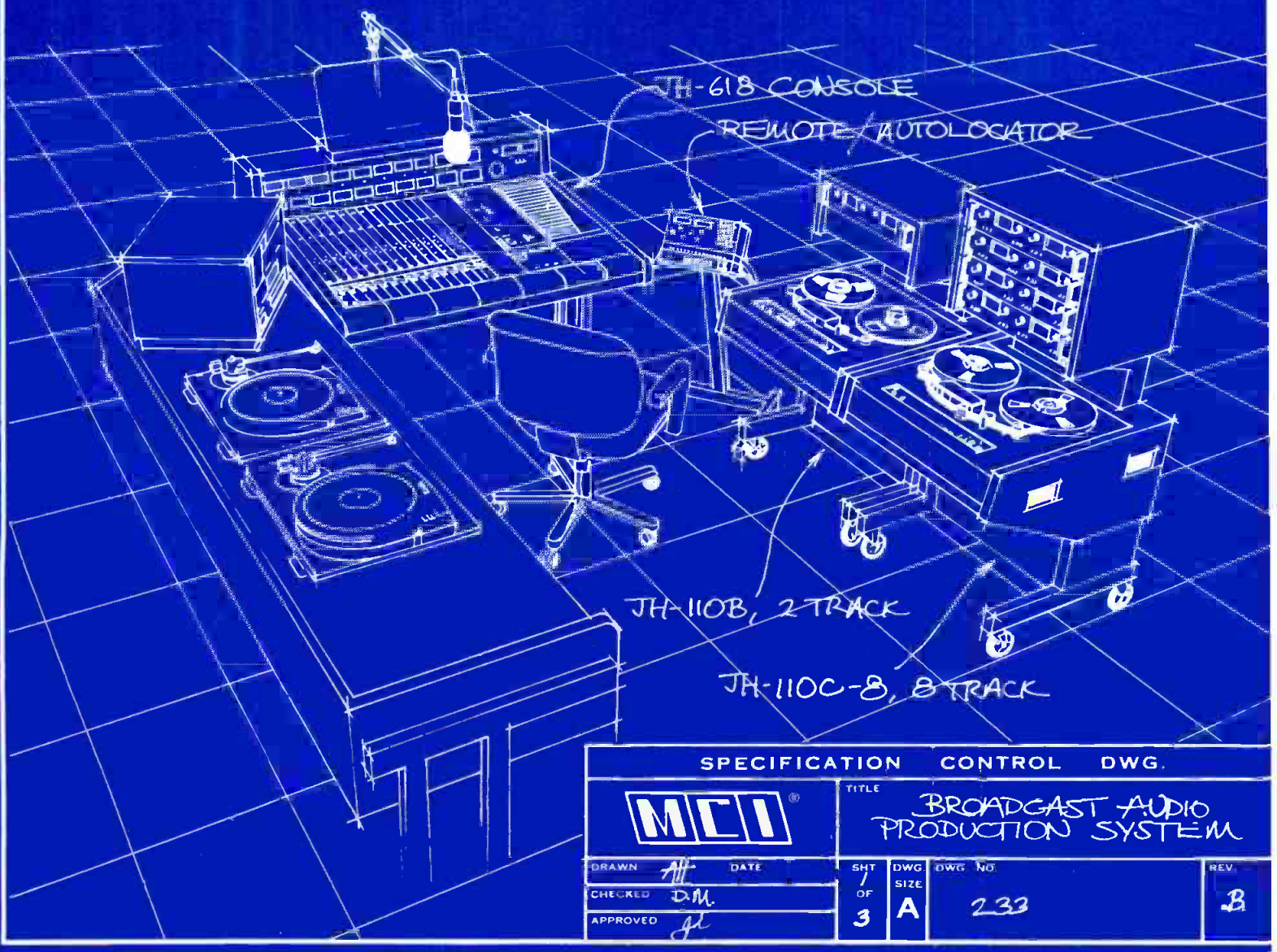


TWA-B001-B

quences. Minute changes needed on a frame-by-frame basis for apparent motion may be made quickly. Color changes and images fitting a producer's storyboard are created at the touch of buttons, in a fraction of the time once needed. Applications include newscasts and weather presentations, as well as documentary or other productions. This group of more sophisticated systems are reviewed briefly as follows. The moving image group is covered in an accompanying article.

Robert Abel and Associates

Robert Abel and Associates use computer created and digitized video within the realm of its own software. The company's "review" system allows generated graphics to be combined with live action or other generated materials. Its efforts seen recently on sportswear commercials, the Abel equipment includes a modified version of the Evans and Sutherland Picture System. A graphics tablet with a DEC computer complement the system hardware with a picture memory of 64Kwords.

Circle (299) on Reply Card

Ampex Corporation

The Ampex Video Art System (AVA) places the artist in charge of more than 200 color choices, predrawn shapes and stored images ready for recolor or reorientation. Cut and paste modes augment a picture storage/retrieval capability that allows sequential playback of the artist's creative process. All functions are controlled from the drawing tablet, including titling, brush selection and paint medium, as well as "menu" choice selection.

Circle (300) on Reply Card

Aurora Imaging Systems

The Aurora Model 100 Digital Videographics System offers image resolution to 512H x 486V pixels. One of six display stations may operate at a time with a design station in use. Picture storage per system disc may include more than 100 typical pictures. Up to three additional disc drives are each capable of at least 200 images. Two to five seconds retrieval time is typical. Animation sequences, selected brush shapes, vast color selections, auto-generated geometric shapes and titling are possible. Inputs range from the keyboard to the graphics tablet to any video source.

Circle (301) on Reply Card

Colorgraphics Weather Systems Inc.

The Colorgraphics equipment packages are intended for, but not limited to, weather related displays. Three different configurations are available. Winchester-type hard disc storage is used for up to 100 graphics, satellite or radar pictures for sequential presentation. More than 4000 color choices for land, water, grids, graphics and overlays are possible with the 400 x 256 pixel limits, currently being upgraded. Inputs are from a keyboard, disc, weather teletype service and graphics tablet. "SupeRadar" dial-up services from Weather Services International (WSI) give nationwide data. Ten different character fonts are included as well as a font generator.

Circle (302) on Reply Card

Computer Graphics Lab

Computer Graphics Lab Inc., a department of NYIT, offers the Images System. The system has a stated resolution of 32,768 x 32,768. Six painting modes provide various brush and paint styles. Dimensional, filtered and mirror images may be mixed with titling from the keyboard. A standard graphics tablet or inputs from a video scanning unit may also be used. The CPU, framestore and 8Mbyte system disc storage couple with 10Mbytes of removable storage.

Circle (303) on Reply Card

Cromemco Inc.

The Cromemco Inc. graphics system Model Z2H/GS is a specialized system developed from the company's Z-2H computer for broadcast use. The system has two floppy disc drives and an additional 11Mbytes hard disc capacity. 754 x 482 pixel resolution images include graphics tablet inputs and text materials via keyboard. Selection of color from 4096 choices, creation of artwork and control of record/recall of images may be made with the graphics pens. Two image planes allow almost instant recall of stored materials for animation purposes.

Circle (304) on Reply Card

Dubner Computer Systems Inc.

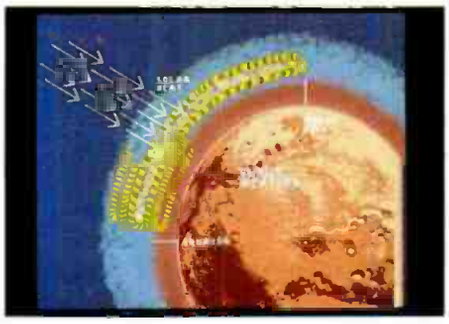
See "Real Time Animation and Videographics at ABC" on page 12 for information on the Dubner equipment.

Circle (305) on Reply Card

Echo Sciences

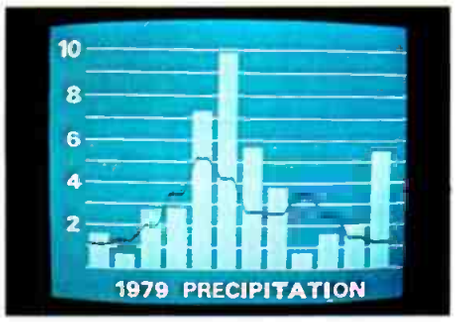
The Echo Sciences Image Maker uses 256 tracks per disc of floppy storage. Combining the advantages of the EFS-1A Frame-Stor and the Slo-Mo-1 systems, the Image Maker uses video from other sources with editing

Aurora Imaging Systems



Computer Graphics Lab

McInnis-Skinner & Associates



Animation roundup

and speed control for animation. Resolution is source-dependent.

Circle (306) on Reply Card

Information Processing Systems (IPS)

The IPS CGS-1000 Color Graphics System is intended to be an add-on to the IPS Weather Satellite Recorder. Non-weather users may still use any seven backgrounds and seven overlay colors from 4095 choices. The graphics computer handles 88Kbytes of memory. Included in the system are a bit-pad tablet, a colorizer and a timebase corrector. Handwritten notes and typed characters enhance illustrations.

Circle (307) on Reply Card

Interand Corporation

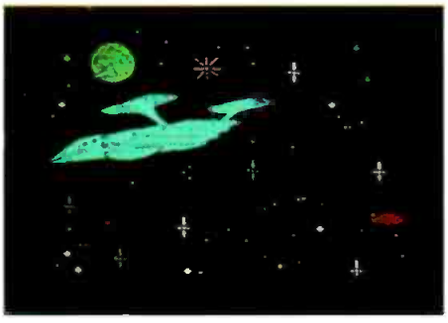
From Interand comes the Telestrator Pro-Forma systems. Graphic symbols or artwork may be added to other video. Also, animation may be created with an electronic stylus on the unit's monitor display screen. Information storage for the Pro-Forma systems is on audiotape. Pro-Forma A handles up to 64 colors and a 12-symbol generator. Character generation is added with a 3M unit.

Circle (308) on Reply Card

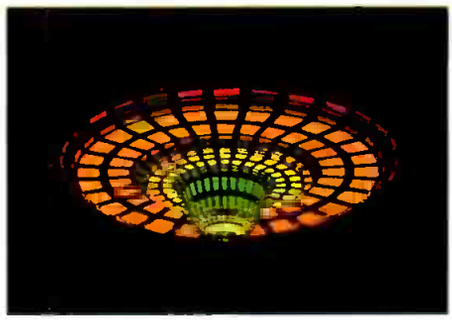
Logica

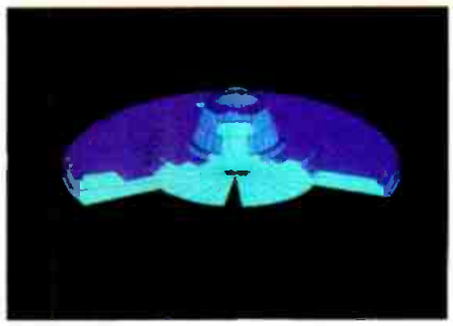
Logica Ltd. and Logica Inc., manufacturers of teletext related equipment, also offer the Flair System for graphics and animation use. From 256 colors and selected brush images a

MPB Technologies Inc.



MediGraphics Inc.





768 x 574 pixel resolution includes mirroring, overlays, autogenerated shapes and airbrush techniques. Floppy discs store 40 pictures typically with titling described as equivalent to dry transfer techniques. A second Logica system, Icon, increases resolution to 1024 pixels horizontally. Icon includes a keyboard with the tablet for control functions as well as totally positionable generated characters.

Circle (309) on Reply Card

MPB Technologies Inc.

MPB offers the Vista 80 Graphics System with animation by rapid successions of stills from individual element building techniques. A camera compose accessory is available for artwork on this 2-channel system. One channel with backgrounds may have the second channel of motion superimposed on it. Available either in a desktop or rack-mount system format, discettes provide storage of up to 985 pages of 180 characters. Two 94-symbol fonts may be used on each of the two channels independently.

Circle (310) on Reply Card

McInnis-Skinner & Associates

McInnis-Skinner & Associates Newscan works with a palette of 4096 colors, up to 256 at a time with 640H x 480V pixel detail. The Weathergraphics system may display charts, maps or graphics programmed into the system as well as materials entered via the graphics tablet. Interconnection to the FAA "604" weather circuit also provides an input. A keyboard allows control of this automated newsroom unit and its optional news and election reporting databases.

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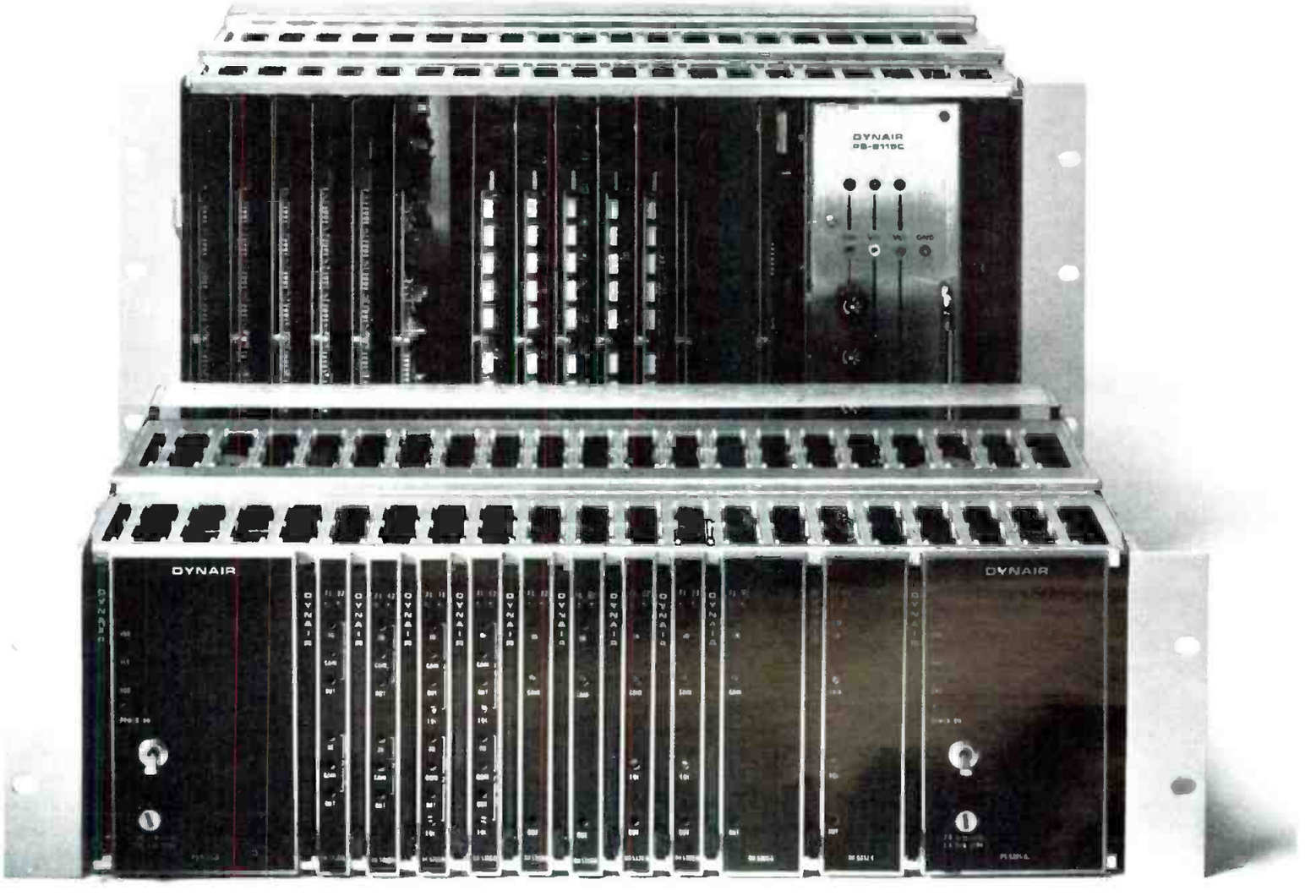


Animation roundup

MediGraphics Inc.

MediGraphics markets the Patran-H Computer Graphics System. It can instantly produce solid color construction, perspective and x-ray views of three dimensional objects. Simple line drawings take on form with animation.

Circle (312) on Reply Card

Spectra Computer Systems

Computer resolution of the Spectra CT-1000 System is 512 x 512 lines. Weather sensor inputs to the forecasting computer provide on-demand weather displays. A keyboard allows alphanumeric character generation. From the sketchpad, custom images are transformed to the screen in a color palette of 80 hues. Floppy and/or rigid disc storage systems are optional if data recall and animation effects are needed.

Circle (313) on Reply Card

Symtec Inc.

The Professional Graphics System PGS III from Symtec boasts a 412H x 480V pixel resolution image with up to 16 colors on any one line from a palette of 4096 choices. Typical configuration is for use with an Apple computer. Overlay text materials may be scrolled, rolled or moved with optional light pen system. Graphic generation on the screen with the Hi-Res Light Pen or from an Apple graphics tablet may be processed and compressed for transmission via telephone line if desired. Super and subscripts, scientific notations as well as custom or foreign fonts are easily generated.

Circle (314) on Reply Card

Technology Service Corporation (TSC)

TSC Weather Radar may display information from dial-up remote or live radar systems. Two color backgrounds combine with a 16-picture storage, time lapse storm motion analysis, 16 sector 2:1 zoom feature and selectively flashing precipitation levels for weather presentations. Display centering of a specific locale is possible as is a radar sweep line.

Circle (315) on Reply Card

Texscan/MSI

The Zgrass System from Texscan/MSI presents a continuously variable palette of 256 colors. Resolution to 320 x 204 2-bit per pixel displays may include a character font of upper and lower case. Brush stroke effects, repeated patterns and rotated images enhance closed image color filling, geometric patterns and expansion or shrinking of display screen segments. Brownout and power loss protection are provided.

Circle (316) on Reply Card

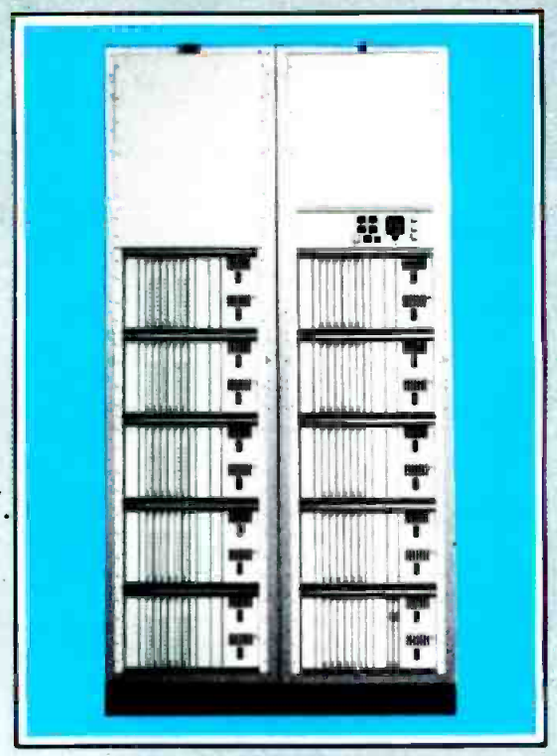
Thomson-CSF Broadcasting Inc.

Thomson-CSF products include the Vidifont IVA and Vidifont Graphics V systems. With the Vidifont IVA system, graphics composition is possible with a camera compose accessory. On the Graphics V, up to eight keyboards in operation simultaneously may control separate tasks. Complete character generator functions from the keyboard combine with a font compose module for composition from artwork or electronic synthesis, all in 4096 color choices. Design is possible from the keyboard or a free-hand controlled bit-pad and stylus. Clear, fill, cut and paste instructions aid design before storage to double density floppy discs. Resolution in NTSC operation to 1088H x 483V pixels resolution in the character plane. Two character and two background planes may be independently stacked.

Circle (317) on Reply Card

OUR SWITCHER SPECS SPEAK FOR THEMSELVES

Following is a summary of test data compiled from the final test measurements made on a 50-input by 50-output audio/video switching matrix sold to Capital Cities' Houston outlet KTRK-TV. We invite comparison of these test results with our published specs and with the published specs of routing switchers manufactured by others.



50 x 50 KTRK MATRIX

KTRK TEST DATA BREAKDOWN

	Worst	Mean	95th Percentile	Published Spec	
VIDEO					
Crosstalk @ 3.58 MHz	−63	71.1	65	−60	dB
Diff Gain	.05	.042	.05	0.1%	
Diff Phase	0.1	.056	.08	0.12°	
Diff Delay	1.0	.89	.95	± 1°	
Freq Response	.05	.02	.05	±.12	dB
Hum & Noise	−79	−84.6	−80	−75	dB
Gain Uniformity, All Paths	.017	.006	.017	±.07	dB
Input Return Loss	46	51.2	46	40	dB
Output Return Loss	45	48.8	46	40	dB
AUDIO					
Crosstalk @ 20 KHz	−80	−84.7	−81	−75	dB
Hum & Noise	−88	−91.8	−90	−85	dBm
THD 30 Hz - 20 KHz					
@ 0 dBm	.017	.011	.015	0.1%	
@ +24 dBm	.24	.13	.17	0.5%	
Gain Uniformity, All Paths	0.1	.044	.09	0.2	dB
Common Mode Rejection	80	88.3	83	70	dB

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Circle (46) on Reply Card

Moving image graphics systems involve use of an animation stand and a video camera connected to an editing/recording unit. Control of the animation stand and the recording equipment may be through a computer-based controller. Electronic graphics systems produce finished products more quickly. However, animation equipment *not* using electronic generation still finds use where art to video is needed with lower initial costs. Besides lower equipment costs, artist-created material overcomes the occasional complaint of finite pixel sizes of graphics generators.

Several manufacturers market systems, some involving a microprocessor animation controller. Of these, single frame accuracy, as well as multiple frame sequences, may be created with the AniVid system from Animation Video, a division of the Convergence Corporation, and the VAS series from Lyon Lamb. Both companies provide x-y directional control and 360° rotation of the table. Video into the controller may be from a 3-tube camera or any other video source. AniVid indicates various mounting arrangements for different cameras. The VAS IV broadcast system brochure specifies an Ikegami camera. SMPTE time code is used with AniVid, while vertical interval frame code (VIFC) is the reference for VAS IV. Interfacing to a variety of editing ¾-inch U-Matic or 1-inch Type C recorders is possible. The AniVid system includes a computer-controlled "InteLens" for image size determination. The VAS IV system uses VAS-CS 4-axis computerized motion control to change image dimensions. Although either system may be used for any level of video animation quality, Lyon Lamb's VAS series includes three other models for less exacting requirements.

The Forox Corporation also produces an animation stand, as was incidated in the product listing.

A novel approach to flow motion and repetitive movement is featured in the Frank Woolley & Company Inc. Motionmaster system and Polarmotion materials. The system uses a specially designed light box animation stand. A rotating light polarizer illuminates a transparency placed on the viewing surface. The transparency lincludes coloring and polarizing films for a variety of motion effects (swirl, flame, bands, wheels and others). The camera views the transparency with the resulting inexpensively created marque-effects or flowing motions for instructive or promotional sequences. The company's materials have been used on the Sesame Street production of the Children's Television Workshop, among others.

Animation roundup

3M

Adding the 3M Camera Compose Accessory to the D-8800 System allows custom font creation. High speed playback from floppy discette storage offers animation effects from three to 20 pages per second. Eight colors may be selected for use with font styles of varying heights, including Cyrillic, data processing, script and Spanish characters.

Circle (318) on Reply Card

Weathermation

Weathermation offers the Environmental Satellite Data Inc., GOES image service. Satellite data, scaled into a TV raster of 240V x 360H elements, allows up to 16 display levels per element with color and luminance effects to designate various meterological conditions. The NOAA Geostationary Operational Environmental Satellite data provides visible and infrared imaging of the Western hemisphere approximately each half-hour with additional imaging from the polar-orbiting TIROS satellites. □

Circle (319) on Reply Card

Spectra Computer Systems

Texscan/MSI

Thomson-CSF

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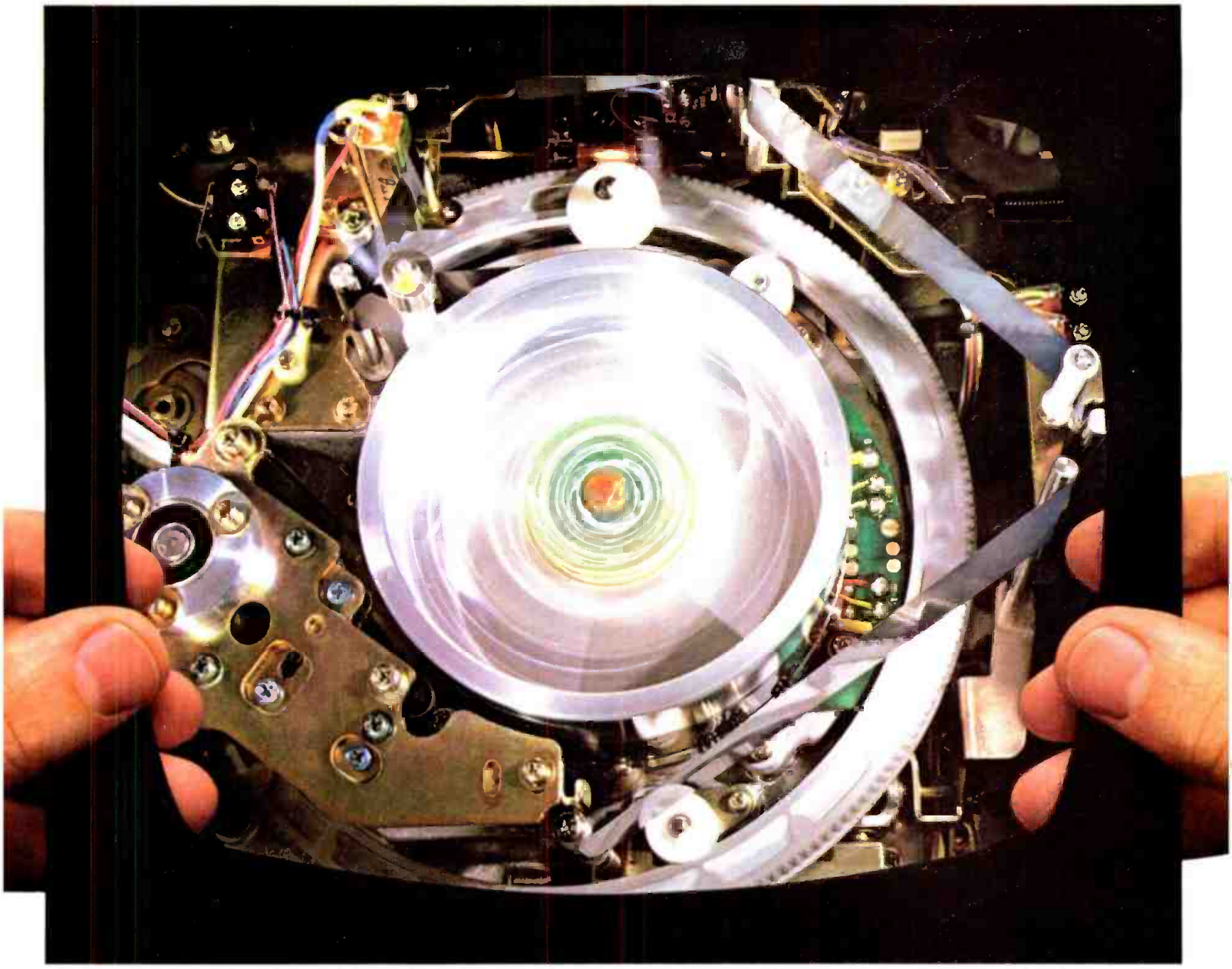

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Tailoring test equipment to your needs

By Gary A. Breed, chief engineer, WCBU-FM/WTVP-TV, Peoria, IL

At first glance, choosing test equipment for a radio station does not seem to be one of the most exciting management decisions to be made, but after some thought it seems to be a matter for serious consideration. On the assumption that you want the complement of test equipment for your station, there are a number of factors to keep in mind:

- the capability of engineering personnel;
- the type of equipment to be maintained;
- the desired level of system performance;
- future plans; and
- financial considerations.

These items are in order of importance. Note that money is last on the list, but not because money is unimportant. Money matters should have been resolved when the other items on the list were established. (The most important item, the engineer's ability, is discussed in "Abolishing the First Phone: What Does it Mean to You?" later in this article.

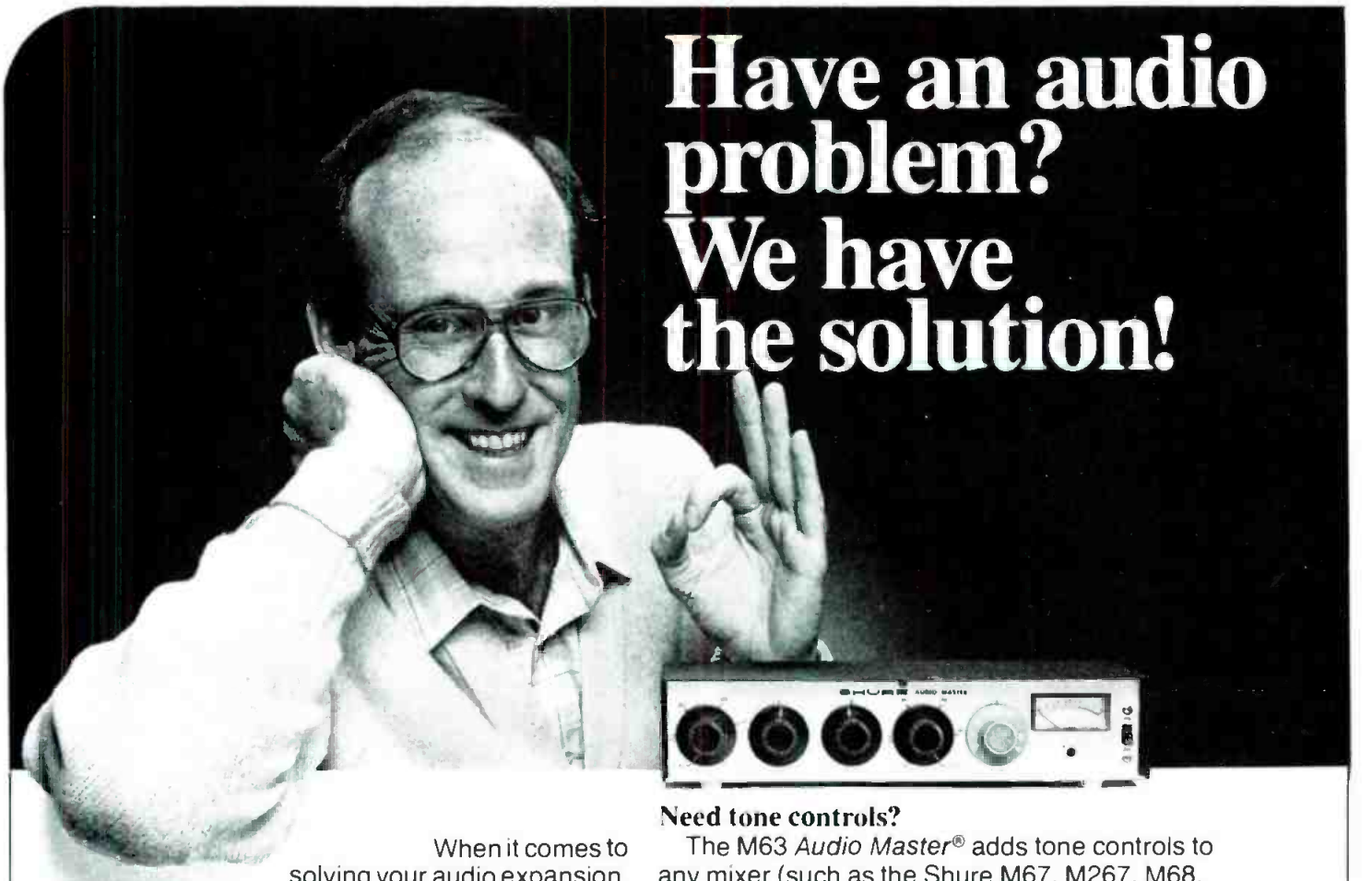
Test equipment, an essential part of a station's facilities, should have its cost included when the technical aspects of a station's goals are considered. Too often, test equipment is overlooked and provides several thousand dollars of unexpected costs later on. More often, test equipment is the area in which costs are cut. A great deal of frustration is brought to the engineers who do not have the right *tools* and to everyone else, when maintenance and performance are lacking. A good engineer needs good equipment. Sophisticated equipment needs to be maintained in the proper manner. Top performance needs to be constantly evaluated, and any future plans should include all of the equipment necessary to carry them out. Test equipment must not be shortchanged or left to chance.

Test equipment selection

Consider several examples of the needs of some typical stations, from the smallest to the largest, in terms of their engineering requirements and priorities, and the way test equipment selection is made at each.

A small station in a small town:

The budget is carefully drawn. Profits are adequate, but not excessive. The owner/manager runs nearly every aspect of the station, except engineering, about which he may know little. His primary concern about engineering is that he meets FCC requirements and does not have too much equipment broken at the same time. After employing a few combo jocks and



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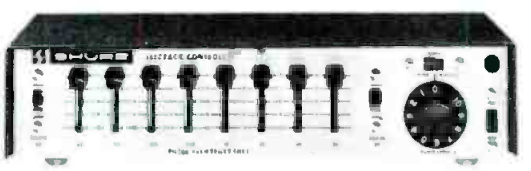

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Test equipment

"engineers," he is convinced *that* is not the way to handle his situation. He arranges for the top technician at the local 2-way shop to come in part time to keep his station going. He hires a consulting engineer to do the annual audio proof.

This station has chosen the simplest route for test equipment: None. A number of stations choose to leave all engineering responsibility, including test equipment, to outside contracts and consulting engineers. This removes the worry from the station

Abolishing the First Phone: What does it mean to you?

Many stations are experiencing a situation parallel to choosing test equipment: the selection of an engineer. Because the FCC abolished the First Class Radiotelephone License, and removed the requirement that any higher-class licensee be required to work on equipment, the broadcaster has one less criteria to judge a prospective engineer. Regardless of the pros and cons of the FCC ruling, and regardless of the argument that there were too many *crash course* memory methods of obtaining the First Phone, having the ticket was one of several basic criteria that a manager could use to establish the capability of an engineering applicant.

It seems appropriate to review the other criteria that one can use to judge the capability of an engineer. An applicant with a work record presents no problem. References speak for him. However, an entry-level position may be filled by a person with little or no on-the-job experience, and no past broadcast employers' references. The following aspects should be considered.

1) References: Personal character references are valuable in assessing the applicants' honesty in representation of themselves. Although there may be little judgment of technical ability, references are useful in creating a picture of the person as a whole.

2) Education: In these days of rapidly moving technology, the self-taught engineer is becoming scarce. In an engineering or technical school curriculum, it takes at least two years to learn the basics of electrical theory. Most 2-year technical school or junior college graduates have sufficient course work to equip them with the raw knowledge of electronics. Someone with two years or more completed toward an electrical engineering degree has been through the basics of electronics, math, physics and chemistry, providing a sound foundation. That education needs to be followed with specific training, because education in specific broadcast technical aspects is *virtually nonexistent*. Few schools offer such a program. Although education is a good indicator of ability, there are Ph.Ds who do not know which end of a screwdriver to use. Don't rely solely on an applicant's education.

3) Experience: If there is any broadcast-related experience in an applicant's resume, you can assume that the person knows what equipment looks like and how it functions in an operational sense. Non-broadcast experience needs to be considered in its relation to technical work, problem-solving, mechanical ability and independent responsibility. A previous employer can give additional information on character, and perhaps a feeling for the potential of the applicant as an engineer.

4) Personal interview: A manager can make a judgment on the character and honesty of a job applicant, but it takes an engineer to *feel out* the raw talent and basic knowledge that an applicant has, and whether it is a good bet that he or she will make a good broadcast engineer. It is worth providing lunch and mileage money to a trusted engineer, or having a consulting engineer conduct a telephone interview and give his opinion.

In one important way, the abolition of the First Class License makes the job easier...the candidates need not be limited to those who have the license. The FCC now places the ultimate responsibility for all aspects of broadcast operation on licensee, including technical operation. Broadcasters should be careful and knowledgeable in their method of hiring engineers, whose responsibilities will include a number of technical functions that must be maintained in accordance with the *FCC Rules and Regulations*.

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Editing starts with CMX because it did. CMX built the first simple, practical, computer-assisted editing system over ten years ago. Along with our original customers we have continued to grow and to lead. While others have come and gone, CMX continues to be the world standard for editing. We have the ten-year track record to support you now and in the future.

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management, providing that a trustworthy, competent engineer is contracted. This arrangement works well for many stations. A major disadvantage is the possibility of being left high and dry if the outside services are ended and a temporary fill-in has little or no test equipment.

A successful small market or a smaller facility in a medium market:

Finances are sufficient to provide a decent salary for a combo man, or a competent part-timer, or even a full-time engineer. They want to have a good quality sound and reliable equipment, but cannot justify going to the *n*th degree.

To support an engineer with the minimum in-house test equipment setup that will work well the following are necessary:

- a good analog multimeter. The Simpson 260 is almost a generic term for a VOM, but other quality units are available from B&K, Triplett, VIZ and Heathkit.
- a digital multimeter. Modern equipment needs more accuracy for many jobs than a VOM allows. The above VOM manufacturers make DVMs. There are also well-known units available from Fluke, Dana, Keithley, Hewlett-Packard, Data Precision and Sencore.
- an oscilloscope with 5MHz bandwidth, preferably dual-trace, for AM, FM baseband, audio, and digital work. Good units are available at reasonable prices from Tektronix, B&K, Philips, Hitachi, Heathkit, Non-Linear Systems and Leader.
- a bench power supply, with 2A capacity and 0-36V output. Negative voltage output is desirable, as is a separate 5V regulated output. Many of the companies already mentioned for other equipment make power supplies. They are also easily home-built using readily available parts.
- an inexpensive logic probe or *dip clip* for digital IC troubleshooting. Add Global Specialties to the growing list of test equipment manufacturers as an additional source.
- a frequency counter, good to the highest frequency in use at your station: 108MHz for FM, 175 or 500MHz for RPU equipment and 950MHz for an STL. Accuracy should be good and calibration should be easy. The frequency counter will pay for itself when used for monthly frequency measurements instead of an outside service. A receiver capable of tuning one of the WWV frequencies can be used to calibrate the frequency counter on a periodic basis. Because it is not needed for any other purpose (except perhaps AM harmonic checks), it can be borrowed, or maybe an inexpensive older receiver can be used. Avoid the small hand-held units; they often give up sensitivity or calibration stability in exchange for small size.
- audio proof-of-performance test equipment including an audio generator, a distortion analyzer and a calibrated attenuator (gain set). These units are available as separate units or as self-contained units combining all the test functions. Audio test generators with ultra-low distortion can be obtained from Hewlett-Packard, Tektronix, Genrad and Heathkit. Some models have built-in attenuators. Output levels should be at least +10dBm, and the attenuator should provide outputs from -80dBm to the maximum. If your digital multimeter has a decibel scale, the attenuator

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need not be of precise accuracy for proof measurements. Distortion analyzers are available from H-P, Tektronix and Krohn-Hite. Combined test packages can be purchased from Tektronix, Potomac Instruments, Sound Technology and Amher. Watch for proper 150/600Ω outputs and inputs (there are some units on the market designed mainly for hifi equipment servicing.) If size and weight are not of concern, this is a place to save money by getting used, older equipment from a good manufacturer.

- alignment test tapes and cartridges. NAB test tapes or those from Standard Tape Laboratory (STL) are widely accepted standards. Test tapes produced by tape equipment manufacturers are also acceptable.
- a test record, with frequency response, standard levels, vertical and lateral modes and dynamic tracking test bands. The NAB test record is most common, but there are others that are usable.

This list of test equipment will allow an engineer to perform most routine maintenance, repair, and performance measurements needed at any station. It is a complete in-house engineering shop. Of course, individual needs may vary. For example, if a consulting engineer does the annual audio proof, skip the audio test equipment and substitute a low-cost audio generator for routine troubleshooting. Also, specific applications may require some special test equipment. Stations with heavy use of RPU equipment may need wattmeters and a high-frequency oscilloscope. Directional stations may require RF impedance measuring equipment to keep tabs on the common point.

Major markets, top medium market stations and others that allow no compromises in quality, reliability and performance: Some of the additional equipment that a station needs to have when the best is the only acceptable way of doing business in all departments is listed as follows.

Audio test equipment

- wow and flutter meter;
- intermodulation distortion analyzer;
- audio sweep generator or multifunction test sets with sweep, multiburst and automatic test operations;
- pink noise generator;
- audio spectrum analyzer;
- head flux (magnetic) meter;
- sensitive ac voltmeters; and a
- tape tension gauge.

RF test equipment

- spectrum analyzer;
- impedance bridges for AM and VHF, with appropriate detectors, signal generators and accessories;
- oscilloscope, dual trace, triggered sweep, with 100MHz bandwidth;
- directional couplers, wattmeters for FM and RPU or 2-way maintenance;
- VHF FM deviation meter;
- signal generators with outputs available in microvolts for receiver testing; and
- specific custom test equipment from manufacturers.

Other equipment

- WWV receiver for test equipment calibration;
- precision voltage sources and other test equipment for the calibration of other test equipment;

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Test equipment

- pulse generator for digital troubleshooting;
- FM field-strength meter; and
- telephone line test sets for remote lines.

There are many small test sets, fixtures and special tools that are needed to keep specific pieces of equipment in top condition. Even the smallest stations will want a few of these items, such as head height gauges, tape strobe or turntable strobe discs and stylus tracking force gauges.

Some basic questions

To summarize, the process that precedes the final decision as to what test equipment is required to handle the needs of a specific station, we must return to the list of concerns at the beginning of this article.

One, does the amount and type of test equipment fit the needs of the engineering staff? Will a good engineer have equipment matching his capabilities, making him efficient, or will he be left wanting now and then? Will a combo man have a bench full of stuff he does not know how to use?

Two, do station programming and production needs require sophisticated equipment, or is the station equipped with more basic facilities? An investment in higher technology will require a parallel investment in personnel and supporting test equipment to keep it working as it should.

Three, does the station require the best performance to keep pace in a highly competitive situation, or is it a single-station market with no real competition? Does the station's financial situation match the desires for competitive performance and the effort and investment needed to achieve that performance?

Four, will the station be changing courses in the future? Is it management's intention to add features to the station operation such as remote capability, news 2-way systems, automation systems, additional production facilities or equipment replacement? Money might be saved by equipping the engineering test bench ahead of schedule, considering inflation.

Five, have the dollars required to purchase necessary test equipment been considered in all of the station's plans?

If you plan carefully, the right test equipment will be available to the engineering staff, making them worth more to the station because of their increased efficiency in keeping station equipment at the required level of performance and reliability.

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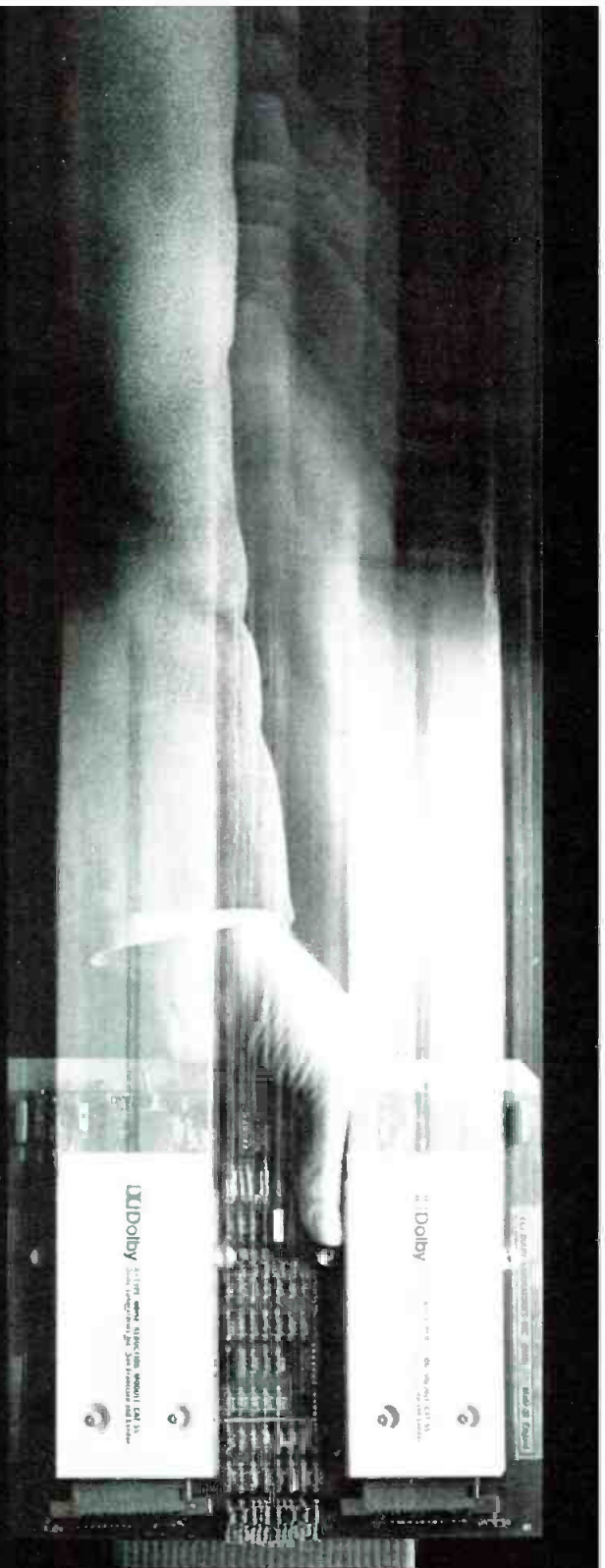

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Transmitter plant efficiency

By Donald L. Markley, facilities editor, D. L. Markley & Associates Inc., Consulting Engineers, Peoria, IL

Even the most sheltered observers should have realized by now that the cost of energy resembles a song by Johnny Cash: it is "high and rising." It does not seem likely that any significant technological breakthrough will cause a drastic reduction in the power bill for those who use copious amounts of electricity. This category would include most high-powered facilities, particularly those that operate high power TV stations.

Much has been written about routine ways in which energy consumption can be reduced at a broadcast plant. These steps primarily involve using good common sense and reasonable maintenance techniques. For example, it is not a good energy conservation measure to allow tower lights to stay on 24 hours a day, simply because a photocell is inoperative. In a similar manner, if it is desired to maintain the heat inside the transmitting building during the winter months, the transmitter exhaust air should be used to the maximum practical extent for this heating function. It makes no sense whatsoever to draw in outside air to cool a transmitter, which is then exhausted and at the same time to have a heating system in the operating building.

An additional waste of energy that is often overlooked is an inoperative antenna heater controller. Often the antenna heaters are turned on when the weather appears threatening and are left in the full "on" mode until about two days after the last cloud has disappeared from the area. A controller can be purchased for a

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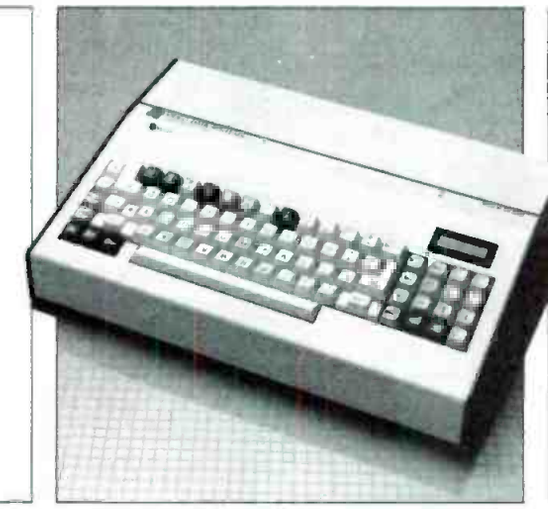

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reasonable price and will minimize the amount of energy used and maximize the protection to your antenna system. A controller should be used that senses both precipitation and temperature. These units provide more reliability than depending upon an operator who may be miles away from the antenna site.

Transmitter building heat

Many transmitting facilities are unattended. Also, a large percentage of transmitting buildings do not have any water inside the building. Silicon diodes do not have the demand for heat dissipation that mercury vapor rectifier tubes possessed. A modern air-cooled transmitter can be expected to function at temperatures well below freezing without deterioration of performance. Therefore, the question of building heat should be given some consideration. It may be desirable to leave the heater turned off except during periods of maintenance. In any case, thermostats should be reduced to their lowest setting while the building is unattended. Locations in which water-cooled transmitters are used, whether liquid or vapor type, must be carefully protected from freeze-up in the winter. Complex heating systems are necessary with safeguards and backup systems to ensure that freezing does not occur. However, this is a different problem than that of simply maintaining efficiency, and one that is more properly covered in discussions of transmitter plant design.

The largest energy consumer at most transmitting facilities is the transmitter itself. Depending upon the type of facility and the power level used, this may or may not be a profound realization. For example, a 250W transmitter will draw little power from the line and certainly will not justify any great amount of expenditure in an effort to reduce the power bill. For example, with AM and FM stations, the only reasonable tactic when buying a new transmitter is to evaluate the transmitter's anticipated power demands. This evaluation becomes more critical as the power level increases.

AM transmitters

For AM stations the most important factor is the anticipated power demand from the mains when the transmitter is operating under modulation. The power demand at zero modulation is only of academic interest, as this is far from the normal operating mode for AM transmitters. Yet 100% modulation under tone results in a greater energy demand than when the transmitter is operating with normal modulation. However, the tone-modulated power demand will be much closer to the operating power demand of the transmitter when heavily modulated with program material. Therefore, this specification is the one that would be of most concern.

Actual efficiency of the final amplifier stage in the transmitter is also only of interest to engineering. Management is not concerned with rather mundane things such as the size of the power bill and the coverage of some far away city. For this reason, managers normally expect to see the transmitter operating at the maximum allowable power and would prefer to see the power bill disappear complete-

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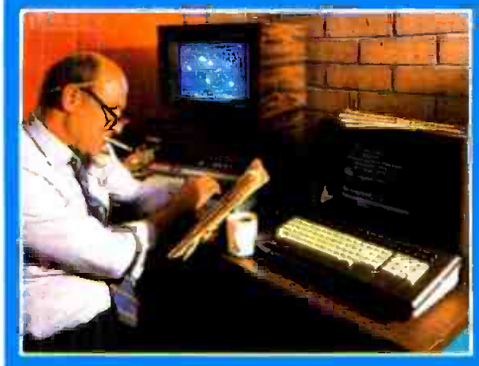

3. What about applications? The Flexicaster fits to your needs. Remote access channels, weather programs, up to 15 channels controlled from one keyboard, newspaper computer interfaces, many software programs, external video interfacing, you name it.

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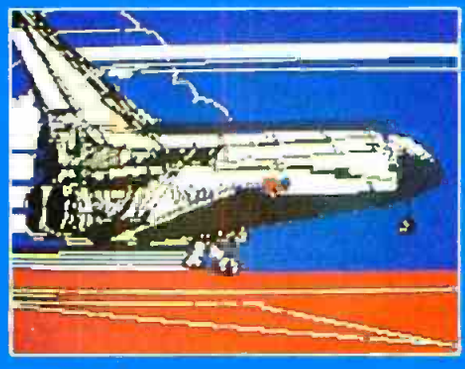

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ly. In an existing facility, not much can be done about the energy consumption of the transmitter itself other than to keep it carefully tuned to see that the overall efficiency is optimum.

When replacing an AM or FM transmitter at the higher power levels, it is wise to evaluate the power consumption of the equipment itself; not the final amplifier efficiency but the overall power demand of the equipment when operated at the rated power output. Once the transmitter is in place, no significant changes can be made to its efficiency. It should be realized that the manufacturer's attempt in the design stages of a piece of equipment is to cause it to operate as efficiently as possible. It is highly unlikely that a field modification by other than factory design personnel will cause any significant efficiency increase without resulting in unwanted side effects. Beware of the "shadetree" engineer who has a wonderful idea for adjusting the screen grid on your final amplifier to improve overall efficiency. Changes outside of the design area are more likely to result in such unwanted phenomena as shortened transmitter life and decreased overall bandwidth. If you are not a design engineer, do not try to change the design of an accepted product. Modifications of the transmitter may cause it to lose its type acceptance as specified in the *FCC Rules and Regulations*.

FM transmitters

FM transmitters carry only a single power demand rating. FM transmitters draw the same amount of energy from the line whether or not they are modulated. The total power resides either in a carrier or in a carrier and sidebands as the transmitter is modulated. That is why the plate current meter on a FM transmitter does not vary under modulation (if properly tuned). Again, the FM transmitters are normally designed for the optimum compromise between efficiency and bandwidth. Any significant changes in the final amplifier section to improve overall system efficiency are not advised.

The largest consumers of energy are TV transmitters, and in particular UHF TV transmitters. VHF transmitters still use vacuum tube technology in tetrode amplifiers. Most modern transmitters are only using tube-type amplifiers at the high-power levels with the low-power stages being transistorized and, in some cases, broadbanded. The area of UHF TV transmitters is where the greatest variation exists.

UHF transmitters

All high-power UHF transmitters use klystron amplifiers. These vary in that they may be of either 4- or 5-cavity design with either internal or external cavities and may be cooled either by liquid or vapor. This paper will not attempt to argue the advantages of one type of klystron over the other.

The earliest klystron amplifiers were external cavity types and were liquid and air-cooled. A big change in the industry occurred when internal cavity klystrons were introduced at the 30kW and then 55kW power levels. These klystrons came pre-tuned for the low, middle or high UHF channels. Some tuning was available externally in that the cavities could be adjusted for operation on the desired channel. However, coupling between cavities was not readily adjustable in an integral or internal cavity klystron system. External cavity klystrons offered the advantage of slightly greater adjustability in that both the tuning and coupling between cavities was adjustable in the field to optimize the performance on a given channel. However, this advantage of greater range of adjustment is accompanied by much more lengthy setup time to prepare the klystron for use. It cannot be disputed that the integral klystron is easier to place in service when it arrives at a transmitting facility. In a similar fashion, it cannot be disputed that the external klystron can be adjusted more critically for use on a particular channel in the field. However, the point of efficiency does vary somewhat.

In the use of integral cavity klystrons, an anode pulser was developed that switched the anode voltage to change the beam current during sync pulses. Effectively, the pulser switched the klystron between two different operating conditions in an attempt to conserve energy during those periods when less than maximum power output was required. This savings in energy also brought a new problem. It was necessary to include more pre-correction circuits in the transmitter exciter to reduce incidental phase modulation distortion caused by switching the klystron. This efficiency battle has continued between the internal and external klystron manufacturers to this date. It must be realized that efficiency should not be the sole criteria for evaluating klystron amplifiers. The ac-

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Plant efficiency

tual quality of the transmitted signal should still be given primary consideration. Techniques to improve efficiency should only be used when minimal degradation of the output signal is maintained.

Transmitter manufacturers have done an outstanding job over the years of improving exciter quality and the efficiency of the klystron amplifiers themselves. The advent of SAW filters and micro-electronics have combined to produce TV transmitters that have specifications approaching those advertised for video distribution amplifiers in the not-too-distant past. It is not unusual to look at the output of a 55kW transmitter and see differential phase and gain measurements that previously were thought to be acceptable at the output of the studio-to-transmitter link. However, beautiful exciters do not reduce the power bill.

Recent improvements

Some areas of recent development have caused improvement in klystron efficiency. Others appear to have great promise for the near future. Varian has developed a transformer for the output of klystron amplifiers that improves the efficiency of the klystron by optimizing the impedance match at the output coupling. Tests using the variable output coupler have demonstrated efficiencies as high as 59% while maintaining transmitter output characteristics within FCC minimum standards. This was done by using a considerable amount of correction for differential phase and gain errors in the exciter itself. On the other hand, other klystron manufacturers have been experimenting with anode pulsers on external cavity klystrons with some improved efficiency noted.

Perhaps the development that shows greatest promise for UHF TV transmitter efficiency improvement is the grid-modulated klystron. It appears that the industry may be coming full cycle and returning to TV transmitters that are modulated in the final amplifier section. Considerable work has been performed by Philips and Valvo to produce a klystron that is modulated by a grid electrode. Preliminary indications with this device indicate that amplifier efficiencies in the mid 70s should be realized in the near future. This is obviously a significant improvement over the low 40s of recent years. Although grid modulation of the klystron will require some additional RF filtering following the final amplifier, the 1-time cost of this RF plumbing should be more than offset by the savings in the power bill.

Amplifier efficiency improvement results in energy savings both directly and indirectly. The direct savings is in the obvious reduction of beam power supplied to the klystron amplifier. The indirect savings results from the reduction in the amount of waste heat that has to be carried from the transmitter in the form of hot water or steam. The reduction in the heat that must be dissipated permits smaller blowers and smaller pumps with a resulting reduction in the overall power bill. Also, the reduction in the beam power requirement permits smaller power supplies with a lower initial cost for the transmitting system itself.

In purchasing a new transmitter, the engineer should give careful study to the actual power demands of the equipment and the possibility of future changes to the equipment that might cause overall efficiency to be improved. Except in those cases in which the effective radiated power of the FM or TV station is at the maximum permitted value, no great savings can be accomplished by changing the transmission line size or type. Although it is possible by such changes to decrease the transmitter power output for a given effective radiated power, human nature dictates that management will ask to have the effective radiated power increased to the maximum allowed by the transmitter output capability. This author has never been asked by a licensee to design a more efficient plant while maintaining the same effective radiated power. Instead, the request has always been to get that one or two additional kilowatts of ERP with the hope that such a fractional increase might finally fill in the hole that the manager discovered 10 years ago in some distant suburb.

In existing transmitting facilities, energy conservation can best be accomplished by good maintenance and by maintaining the transmitting equipment in the best possible condition. The greatest improvement in plant efficiency can be effected at those times that new equipment is being purchased. However, it must be remembered that energy efficiency is not the sole criteria. The transmitter that will barely pass the proof is going to be a continuing headache for years to come, and the station manager will forget about the low power bill if the signal does not look or sound good or if his transmitting plant fails to be reliable. □

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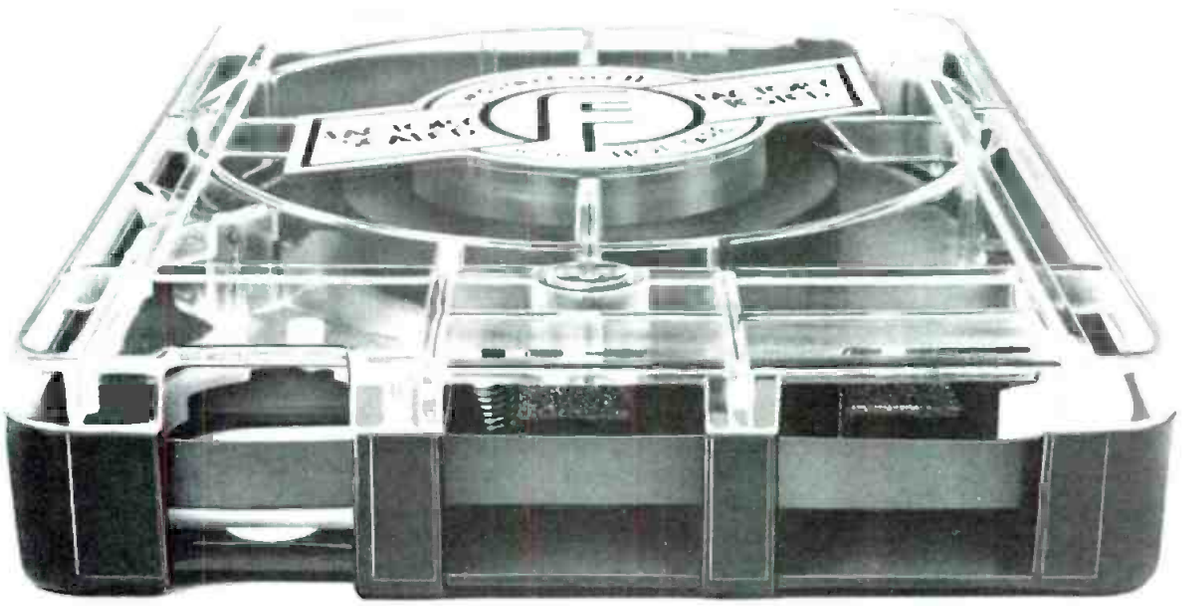

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Bob Cooper (left), sales manager, and Dan Mulhern, vice president of Cramer Video Inc., look over the company's equipment inventory, much of which is now sold into the broadcast market.

Equipment and service from a dealer's viewpoint

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

Many broadcasters who formerly bought much of their equipment directly from manufacturers have recently joined those traditionally preferring to buy from dealers. These dealers provide a wide array of equipment and all types of services including modifications and advice.

As specifications of so-called industrial video equipment approach that of broadcast gear, many broadcasters are turning to dealers servicing the industrial market with the newer, high quality industrial equipment. In many cases, they are finding that the line between industrial equipment and broadcast equipment has not only grown faint but has, in essence, disappeared.

The following comments were drawn from an interview with Bob Cooper, sales manager, and Dan Mulhern, vice president, Cramer Video Inc., Needham, MA. The company, serving both the industrial and broadcast markets, has a good vantage point from which to observe definite trends effecting the future of broadcasting. The main areas discussed were cameras, test equipment, processing equipment, audio equipment and editors.

Cameras

The use of moderately priced cameras in the $20,000 to $40,000 range in broadcasting is not new. In the past, small market stations had to use these cameras. What is new is the use by large market stations and the fact that they are using the cameras in fairly good numbers. There are two basic reasons for these trends.

First, the requirements for ENG/EFP cameras has outgrown the news crew. From news to programming, including magazine format production, employees want their station to provide ENG gear to shoot location footage. The large stations did not bat an eye at spending up to $70,000 for a good ENG camera when they knew that eight to 10 of these would satisfy the needs of the news department. But now they are concerned because they need four times as many cameras to supply the various departments.

Second, these cameras are being placed in the hands of younger, less experienced crews that are more artistically oriented, without the engineering background to run the complicated ENG equipment. Furthermore, they are not particularly interested in learning how.

These new cameras were designed for the high end industrial and educational market, which is populated by the same type of people. These cameras have more automatic cir-

ARRI HMI® LIGHTS:

ARRI HMI lights are available in the four standard AC configurations: 575W, 1200W, 2500W and 4000W, plus a 200W battery-powered unit. Shown here: the 4000W.

HMI is the first new light since quartz halogen. ARRI HMI lights are also new: specifically designed to make the most effective use of the HMI bulb's efficiency.

By now it's common knowledge that a 4K HMI bulb puts out 102 lumens per watt at 5600 degrees Kelvin; whereas a tungsten bulb, filtered for daylight balance, puts out between 15 and 20 lumens per watt.

That's astounding efficiency. But that's the *bulb's* output. How much of that light gets onto the subject depends on the efficiency of the lamp-head. How many watts are drawn depends on the efficiency of the distribution system.

HMI bulb efficiency has made it worthwhile to overcome the drawbacks — notably flicker. ARRI began on that early. We've been making motion-picture lighting equipment since the Thirties. In the Sixties, we began experimenting with HMI's forerunner, Radium street lights. In 1972, we pioneered the use of HMI for filming, at the Olympic Games.

Connectors and switches on ARRI HMI ballasts are recessed. A yellow ground test button lights up if you have a good ground.

But at the Olympics we were still plugging the new HMI bulbs into conventional lamp-heads designed for tungsten point sources. (HMI, of course, is an arc.) As Osram perfected the HMI bulb, one thing became obvious: Since efficient output was the HMI bulb's claim to fame, the delivery system must, above all, be as efficient as possible. That meant *new* lighting designs.

ARRI's engineers didn't have to adapt. Their new lamp-head designs take maximum advantage of the HMI bulb's characteristics. The ARRI 4K, for example, has a 19.7 inch diameter Fresnel lens. Most other 4K HMIs use a 14 inch.

Peter Edwards is Supervising Lighting Director at CFTO-TV in Toronto; and he is Chairman of the Society of Television Lighting Directors, Canada. He has won two Emmy Awards for lighting. He ran side-by-side tests for CFTO of the ARRI HMI 4K and two other brands of imported HMI 4K lights. "At 40 feet and full flood position, the best of the other two measured 150 foot-candles; the ARRI measured 200 foot-candles," says Mr. Edwards.

4000W light shown here has 19.7 inch Fresnel lens with wire safety grid.

Tube frame protects ignition housing, acts as floor stand.

Yoke position is adjustable for altered center of gravity.

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cuits, so that setup is a matter of turning on the power switch with nothing more complex than pushing a white balance button. Many of the cameras selling for $10,000 to $20,000 today are technical spin-offs of those 5-year-old designs with the added benefit of having found, in the interim, a cheaper way to make a camera with similar quality.

Test equipment

The fact that these cameras make use of the automatic circuits to offer easy setup means that many pieces of sophisticated test equipment no longer have to accompany the crew into the field. The argument for making the cameras simpler to accommodate the technically less knowledgeable personnel also argues that they would not know how to use the field test equipment. The most sophisticated pieces of test equipment going into the field today are the portable battery operated units such as small waveform monitors and oscilloscopes. These are used to check gross camera operating parameters and levels to make sure that the signal is there.

In terms of overall test equipment, we are seeing a drop off in field use. However, the studio use of test equipment is being maintained.

Processing equipment

Because the automatic circuitry is used and superfluous test equipment is not dragged into the field, sometimes the resulting video needs some manipulation—such as correcting an improper white balance setting. In some cases where a scope was not used, the tape ends up with the levels too low because the iris was not calibrated.

Processing equipment includes a time base corrector, color corrector, audio equalizers and special parametrics to get rid of unwanted background noise. It has become increasingly more important to have good processing equipment.

Another use for this equipment is for the mixing of formats. Today, much ¾-inch footage is cut into recordings from 1-inch equipment. When those ¾-inch scenes are bumped up to 1-inch, they often need compensation.

For these reasons we have seen a sales upsurge in the area of processing equipment.

Audio

The audio that we are selling into the broadcast field tends to be of fairly good quality. There is definitely a preference for the rugged design. A good example is the AKG microphones that can stand a great deal of punishment. You can drive nails with them. Also many of them are field repairable. The AKGs have a field replaceable element.

We also see a greater degree of the portable battery-operated audio mixing equipment. Many people are using standard U-matic video equipment that has only two sound tracks. If one is given over to time code (as it nor-

Dan Mulhern, vice president of Cramer Video, at the SMPTE convention, inspects a new low priced industrial/broadcast camera.

mally is), that only leaves one audio program channel.

We used to be able to put program audio or closed microphone on one track and wild sound on the other and then mix them when we got back to the station. This is not possible anymore. Even in the so-called broadcast, or BVU type portable U-matic, people are finding that the third track designed for the time code is not adequate for the task for a number of reasons. Many are opting to put their time code information on one of the higher quality audio tracks, usually channel 2 if they are into the CMX system. This leaves only a single audio track to do the live mix. That requires some good audio monitoring if you are going to dump the field mix onto that single track of audio and then process it when you get back. It's either that or live with the audio mix that you do live in the field.

Editors

Editors are as important as everything else because we have gone to great pains in other areas to select items that are easy to use and fairly inexpensive. Yet with editors we are creating programs that are more sophisticated than the slapped together news shots cut half an hour before airtime and reduced from a 5-minute piece down to a 20-second spot. The editorial process for these special programs is much more complex. Often there are requirements to intercut field footage with studio footage, to do split edits, to sweeten the audio, and to add music under or voice over. These are things that cuts-only type systems—such as the Sony 440, the JVC RM-88 and the Panasonic equivalents can not handle. We see people using the simplicity of the front end equipment and bringing the necessary sophistication to the production process in the post-production area. To do that, a lot of the broadcasters are turning to editors like the CMX Edge, which can guarantee them absolute color frame accuracy.

Broadcasters are making use of both internal and external transitional effects such as lap dissolves, wipes and keys, which are cumbersome, if not impossible, to do with standard editor controllers.

We find that broadcasters want the capability of such things as an edit decision list and an edit event bulk memory storage to prepare several different versions of the same basic program for evaluation and possible subsequent recutting. These new editors make that sort of manipulation much more feasible and efficient.

We also find broadcasters preferring the subjective simplicity of systems such as the CMX Edge that does not intimidate the less experienced or part-time editor. Many more people are wanting access to the editors at the stations, and there is little time for extensive technical training. The turnover rate is also something that the stations have to contend with, so they prefer editing equipment that is not too complicated or customized. And, of course, they are purchasing more editors because of increased production demands.

The bottom line, as far as the dealer is concerned, is that many of these items that were originally intended for the high end user and the educational community have found definite cost effective applications in broadcasting. Thus, more broadcasters are seeking out the video dealer to inquire about applications of this new equipment for television. □

Waveguide improves transmission line efficiency

By Richard E. Fiore, president, Comark Communications Inc., Southwick, MA

The typical approach for selecting a transmission line system for broadcast installations is to choose the most appropriate coaxial line size. Today, when every unnecessary kilowatt used is money wasted, it is important that the optimum transmission line is tailored to meet the needs of the system to obtain maximum efficiency. Calculations show that for UHF TV frequencies, which fall within 80% to 95% of the high frequency cut-off range of an applicable waveguide size, optimum attenuation characteristics can be obtained, while avoiding extraneous moding problems. This is particularly true of long, straight sections of waveguide such as a vertical tower run. Because there are no waveguide bends, twists or other asymmetrical components, the possibility of higher order modes is virtually nonexistent. Also, optimum impedance characteristics occur in this frequency spectrum because waveguide impedance variation becomes less susceptible to normal manufacturing tolerances.

A careful examination of technical aspects and economics of using waveguide instead of coaxial line will reveal that the only undesirable feature of waveguide on tall tower structures is that of additional wind loading. Just how much of a problem this really represents is debatable, because some tower manufacturers make a fuss over the use of waveguide. Others make no fuss at all. From a practical standpoint on a new tower installation, the difference in initial cost of waveguide vs. ($8\frac{3}{16}$-inch and 9-inch) copper coaxial line will more than pay for any beefing up of the tower structure in the short term, and the greater efficiency of operation will delight the station owner in the long run.

An excellent example is born out by the use of WR 1400 waveguide for a vertical tower run designed for Channel 63. At the centerband frequency of Channel 63 (767MHz), the attenuation factors of the line sizes in question are:

	Theoretical dB/100'
$8\frac{3}{16}$-inch DIA -75 Ω coax	.113
WR 1150 waveguide	.112
WR 1400 waveguide	.06

Various manufacturers' waveguide materials including Comark's WR 1500 and WR 1400 waveguides, exhibit optimum attenuation characteristics, as shown in Table I. For minimum wind loading considerations of those shown, WR 1400 should be the waveguide size used. By custom designing the waveguide run to the desired channel, maximum power transfer can be achieved with considerable monetary savings.

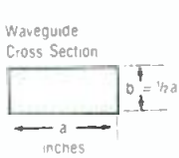
If the financial reduction associated with using waveguide is not convincing enough, consider that a properly designed and installed waveguide system will provide trouble- and maintenance-free operation for many years at a lower purchase price than another type of transmission line of comparable power capability.

Based on percent efficiency, $8\frac{3}{16}$-inch DIA coax and WR 1150 are essentially equal. However, WR 1500 waveguide computes to be 12% more efficient. For each 100kW of power generated on the ground level, 12kW more will be delivered to the antenna. The long term savings associated with this improvement in efficiency amounts to more than $7500 per year based on national average energy costs (1980 power costs) and a 36% plant efficiency factor.

Waveguide exhibits the unique feature of decreasing attenuation with increasing operating frequency. Operating bandwidth is defined as a function of low frequency cut-off where:

$$\lambda co = 2\,a \text{ (inches)}$$

$$f_{co}(MHZ) = \frac{11{,}803}{\lambda co''}$$



The operating bandwidth of any given size waveguide is defined as:

f_1 = Lowest frequency of operation
f_2 = Highest frequency of operation

Plotting attenuation vs. operating frequency for any size waveguide that will operate between the frequencies of 470MHz to 800MHz, it is shown that for frequencies defined by $f_1 = 1.50\ \lambda co$ and $f_2 = 1.90\ \lambda co$, then the attenuation characteristic will be minimum and not vary by more than .01dB/100' between the limits of f_1 and f_2. Table I lists the optimum size waveguide for minimum attenuation of frequencies contained in the UHF TV broadcast band. □

Table I.

Optimum Dimensions	Operating Frequency		Theoretical Attenuation	
	Low	High	Maximum	Minimum
WR 1600 a = 16" b = 8"	470MHz	650MHz	.07dB/100'	.05dB/100'
WR 1500 a = 15" b = 7.5"	580MHz	750MHz	.06dB/100'	.05dB/100'
WR 1400 a = 14" b = 7"	690MHz	800MHz	.06dB/100'	.05dB/100'

Ac power distribution for optimum performance

By J. B. Pickard, AM products development manager, Harris Broadcast Products, Quincy, IL

For many years, engineers have recommended that 3-phase power distribution systems should be closed delta or WYE configurations providing better radio and TV transmitter performance by helping prevent line unbalance. Operation with substantial voltage unbalance from line to line results in higher than normal signal-to-noise ratio in the transmitter output signal, increased 3-phase transformer heating, and hot 3-phase motors.

Even a device as simple as a 3-phase motor should be operated from a power line in which the voltage is balanced within 1%. It takes only a 3.5% line unbalance to produce a 25% increase above normal temperature. A 5% unbalance will cause destructive temperature rises of 50% greater than normal.

Similar characteristics can be expected in the windings of a 3-phase power transformer inside a transmitter. Transformers and motors can be designed with extra safety features where thermal rise is limited to acceptable levels. However, in this case, other transmitter parameters cannot be made acceptable at a reasonable cost.

The most difficult parameter to meet with power line unbalance is transmitter noise performance. Most large transmitters use 6-phase or 12-phase high voltage power supplies. The energy storage capacitors are expensive to install and large stored energies make destructive faults inevitable. A good design will have sufficient energy storage capacitors to meet the specified signal-to-noise ratio, but not much more. When the equipment is then operated from an unbalanced line, the power supply ripple frequency will be twice the line frequency instead of six to 12 times. It becomes obvious that it would take three times as much energy storage to achieve the original performance goal.

How does a line unbalance occur? Rarely would a large commercial power producer generate unbalanced voltage, so we must look elsewhere in the system. Large single phase power users on a power circuit can cause uneven distribution of the line currents in the system. Uneven currents through balanced impedances will result in line-to-line voltage unbalance.

Another likely source of this problem can come from unbalanced impedances in the power distribution system. Unbalanced impedance will always be seen when an open delta 3-phase distribution system is used. Transformer design textbooks clearly show that voltage regulation of an unbalanced system is poor.

Figure 1 shows open and closed delta systems. The closed delta impedance looking into each terminal (A, B and C) is exactly the same. That is not the case in the open delta configuration. Depending on the impedances of the transformers in the open delta circuit, line voltage unbalance sufficient to impair satisfactory operation of the overall transmitter may result.

The only advantage of the open delta is lower cost, and this is partially offset by the fact that two transformers capable of .577 the total KVA are required instead of three .333 KVA transformers. Some broadcasters have experienced difficulties with open delta systems. However, when a third transformer was added to close the delta, the problems disappeared.

Another problem that can occur with an open delta system is caused by lightning and switching transients. When lightning strikes or heavy loads are switched on a power distribution system, high voltage transients are propagated throughout the system. Unbalanced impedances will enhance these transients and can cause transmitter damage, particularly to solid state rectifiers.

Many transmitters are located at the end of a long transmission line that is highly susceptible to transient phenomena. Devices such as metal oxide varistors are inexpensive and effective in reducing overvoltage spikes. These units are limited in the amount of energy that can be dissipated, but will handle very large currents if designed properly. You cannot take a direct lightning hit and still operate, but not many things will. Installation of a third transformer and transient protection devices, in some cases, have eliminated the difficulty of transients.

The WYE connected system is also considered a symmetrical form of 3-phase power distribution. All impedances are balanced as seen from each terminal (see Figure 2). It is important when using a WYE connected system that the fourth wire (neutral) is connected to the mid-point of the system as shown in the diagram. When this connection is made, it provides a path for the zero sequence currents as well as any harmonic currents that are generated due to the rectification of the secondary voltages.

Many transformers are supplied with all of the primary terminals available so that either a delta or WYE connection can be made. Table I shows the different line-to-line voltages that are available with this configuration.

In summary, both symmetrical power distribution systems are satisfactory because of their balanced impedances. Use either a closed delta or a 4-wire WYE system for maximum transmitter performance. Never use an open delta system just to cut costs—it could cost you dearly in the long run. □

Table I. Typical line voltages with Delta or WYE.

Delta connected transformer	WYE connected transformer
210	364
220*	380*
230	400
240*	415*
250	433

*Typical voltages in some areas of the world.

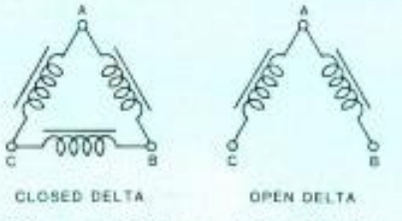


Figure 1. 3-phase delta distribution transformers.

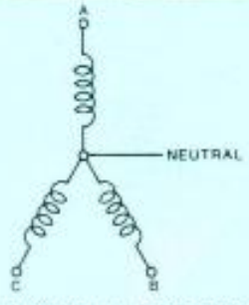


Figure 2. 3-phase WYE distribution transformer.

Spec Book Supplement

By Carl Bentz

Editor's note: The following remarks are provided for updating your Spec Book. This entire page may simply be removed from this issue and added to your copy of the Spec Book.

AUDIO PROCESSOR

*The IMP3 processor is a product of *Processing Plus.* (Page 21)

*The Auto Gain Adjuster is a product of *Comrex.* (Page 22)

**Orban Associates Inc.*, Professional Audio Division, 645 Bryant St., San Francisco, CA 94107 should be included with other manufacturers. (Page 26) The Pro-Audio group provides equalizers, reverberation systems, sibilance controllers and stereo synthesis equipment.

AUDIOTAPE RECORDERS

*The *MCI* JH-24-16 is a 16-channel system. (Page 32)

*The *Otari* 5050B equipment is available in two channels. The MTR-10 line includes a 4-channel model, MTR-10-4. MTR mastering recorder series includes a production-oriented model 90 for 2-inch, 16- or 24-channel. (Page 33)

*The *Studer* name applies to the A80VU equipment as well as A800-8-1 and A80RC-1. *Revox* produces the B77 and PR99 series equipment. (Page 33) *Studer* also produces the B67-2/2 – B67 Series. (Page 34)

SERVICE AND PARTS CENTERS

The following advertisers' service centers should be added to the listing. (Page 124)

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8 Haven Ave.
Port Washington, NY 11050
516-883-4414

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of America
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Montebello, CA 90640
213-726-0303

Tascam/Teac Service
539 W. Golf Road
Arlington Heights, IL 60005
312-640-6181

Tascam/Teac Service
63 Bergen Turnpike
Little Ferry, NJ 07643
201-641-5600

Tascam/Teac Service
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Honolulu, Hawaii 96819
808-845-4512

Temtron Electronics Ltd.
15 Main St.
East Rockaway, NY 11518
516-599-6400
800-645-2300 Toll Free

Tennaplex Systems Ltd.
34 Bentley Ave.
Ottawa, Ontario
Canada K2E 6T8
613-226-5870

Thomson-CSF Broadcast Inc.
37 Brownhouse Road
Stamford, CT 06902
Product Support Department
203-327-7700

Western Regional Office
1919 West Magnolia Blvd.
Burbank, CA 91605
213-849-2188

Total Spectrum Manufacturing Inc.
20 Virginia Ave.
West Nyack, NY 10994
914-358-8820

US JVC Corporation
41 Slater Drive
Glenwood, NJ 07407
201-794-3900

US JVC Corporation
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Compton, CA 90220
213-537-6020

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US JVC Corporation
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Houston, TX 77018
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Salt Lake City, UT 84119
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800-453-8782 Toll Free

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250 N. Wolfe Road
Sunnyvale, CA 94086

TIME BASE CORRECTOR/SYNCHRONIZER

*The CVS516, CVS520 and CVS digital frame synchronizer are more properly the HVS516, HVS520 and HVS630, products of *Harris Video Systems,* a division of the *Harris Corporation.* (Pages 86, 87)

STL EQUIPMENT

**Farinon Video* is a division of the *Harris Corporation.* The correct address is 1680 Bayport Ave., San Carlos, CA 94070.

*The *Leaming Industries,* 180 McCormick Ave., Costa Mesa, CA 92626 also produces STL equipment.

EDITING CONTROLLER

The Edge is a product of the CMX/Orrox Corporation. Editing accuracy of the system is ±0 frames. The Edge does not accomplish assemble edits. A printer EDL output is optional. The *CMX-340X* system from CMX/Orrox Corporation may control up to 32 devices, any eight of which are active at one time (1 record, 7 play). With an event storage of 999 events, the CMX-340X does not perform assemble edits.

CHARACTER GENERATOR

The following information should be added:

Manufacturer	Thomson-CSF Broadcast	
Model	Vidifont IVA	Graphics V
Page Format	Font Dependent	.....
Character Format	Font Dependent	....
Inter-row Spacing	Programmable	.....
Character Resolution	45nsec	48nsec
Proportional Spacing	Yes	Yes
Character Overlap	Yes	Yes
Character Manipulation	Individually H and V	Individually H and V
Italicizing	Yes	Yes
Surround Edging	Yes	Yes
Drop Shadow	Yes	Yes
Edge Luminance-Color	Selectable	Selectable
Color Pallette	Color Bars, Black, White	to 4096 Choices
Background Coloring	By Page, Row, Partial Row	from 1TVL by 90nsec
Character Coloring	Colors or See-through	to 16 Quads of 3
Display Flashing	3 Rates	Infinite Control
Tabulate Positions	4 Tabs	Unlimited H and V
Auto Centering	Line and Page	Line and Page
Roll Speeds	8 and Pause	7, Pause, 2 Directions
Roll Window	Selectable	Selectable
Crawl Speeds	8 and Pause	7, Pause, 2 Directions
Subtitling	Auto Lower Thirds	Auto Lower Thirds
Resident Fonts	Multiple	to 48 Fonts
Internal Page Memory	1 Page	Multiple Plane
Disc Memory Storage	Floppy	Dual Density Floppy
Disc Drives	2nd Optional per Unit	2nd Optional per Unit
Worst Case Access	0.3 sec	0.5 sec Average
Edit Channel	Yes, 2 Outputs	Yes
Output Channels	Dual Available	Multiple
Colorizer/Keyer	Additional Unit	Per Channel
Separate Keyboard	Multiple, Delegated	To 8 Simultaneously
Font Compose Input	Yes as Option	Yes

people

Larry Finley has been named to the board of directors of Orrox Corporation (ASE-ORR). Finley is recognized as one of the world's leading authorities in the home videotape and disc industry, in both systems and software. In that regard, Finley was the founder of ITA, the International Tape/Disc Association.

Modulation Associates Inc. has announced the appointment of **Alan Lee Zimmerman** to its board of directors. Zimmerman is a specialist in corporate law. In 1980, he was appointed by the California State Bar Board of Governors to the Bar's Business Law Executive Committee.

Marcom has announced that **Doug Howland** has joined its staff as sales manager of the Southern California sales area, based in the Woodland Hills office.

Hitachi Denshi America Ltd. has announced that **Richard Alexander** has been appointed product/marketing services manager for the company's GP/FP series cameras, as well as its new VHS portable VCR. Before his appointment, Alexander served as sales manager for Adcom Communications.

David Parmelee has been named director of sales and marketing for Electronics, Missiles & Communications Inc. (EMCEE). In his new position, Parmelee will direct sales and marketing activities as well as coordinate advertising and convention work for the high technology TV company.

Convergence Corporation recently announced that **Julian Hansen** has been named vice president of Engineering. Hansen's duties include directing all engineering activities, including technical guidance in new product development. Hansen, who joined Convergence in April 1980, was promoted to vice president from the position of director of Engineering.

William R. Fitzgerald has been promoted to vice president/Programs for the Satellite Communications Division of Harris Corporation. Fitzgerald will be responsible for coordinating telecommunications projects for customers such as Argentina's telephone company, "Entel"; Martin Marietta Corporation; Atlantic Richfield Company; and users of private satellite networks. He was director of programs before his promotion.

One Pass Inc. has announced the vice presidential appointments of **Larry Kingen** and **Tom Werner.** Kingen presently is director of Sales and Marketing and Werner is in charge of Engineering, Research and Development. Both will continue with those responsibilties.

Gary Youngs has been named product manager for the Broadcast Division of Sony Video Products Company. Youngs will be responsible for the marketing and development of Sony's editing systems, timebase correctors and time code products for the broadcast industry.

Moseley Associates Inc. has announced the appointment of **David O. Fairley** as director of Engineering. Fairley was principal founder and vice president of Farinon Video Corporation, and was chief engineer heading development of their video product line. □

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HELP WANTED (CONT.)

TV MAINTENANCE TECH. ENGINEER: Experience with IVC 9000's. Ampex Quads, CMX Systems. Analog electronic animation equipment valuable. Career opportunity for someone with broad experience in maintenance planning and supervision. Salary commensurate with experience. Write in confidence to Dolphin Productions, Inc., 140 East 80 Street, New York, N.Y. 10021. 2-82-3t

MAJOR PRODUCTION FACILITY IN FLORIDA, is offering top salaries to experienced Maintenance Engineers. Work in a modern new facility with state-of-the-art equipment. Contact: Robert Hemsky, Chief Engineer, (1-305-920-0800), 2040 Sherman Street, Hollywood, Florida 33020. 2-82-3t

VIDEO SALES – NEW YORK BASED DISTRIBUTOR of professional video products seeks outside salesman for New York City Metro Area. Position requires good working knowledge of professional equipment. Will consider technical type with ability to sell. Send resume to: Adcom Communications Inc., 555 West 57th Street, New York, New York 10019. 2-82-1t

MAINTENANCE ENGINEER FOR GROWING post-production facility. Experienced only; familiar with 1", 2" and ¾" videotape recorders. CMX editing and switchers helpful. Send resume to Greg Reis, Edit/Chicago Video, 160 E. Grand Ave., Chicago, IL 60611. (312) 280-2200. 2-82-2t

ASSISTANT CHIEF ENGINEER: Responsibilities include operation/training of the Maintenance Department, overseas equipment installation and repair. The qualified applicant should possess general class radio/telephone license. Prior transmitter and studio maintenance experience is preferred. We are a group-owned network affiliated VHF station. Send resume and salary requirements to: Personnel, KLTV-TV, P.O. Box 957, Tyler, Texas 75710. Equal Opportunity Employer. 2-82-2t

HELP WANTED (CONT.)

ENGINEERS WANTED FOR NEW YORK POST production facility. Requirements: ability to maintain state-of-the-art broadcast equipment including quads and 1" videotape machines; editing equipment; film chains, including the Bosch FDL-60; switchers; digital effects; computerized graphics; and audio consoles. Must have 4-5 years engineering experience, formal education in electronic or electrical engineering. **TECHNICIANS WANTED TO TRAIN AS ENGINEERS** in same facility. Requirements: ability to maintain ¾" VCR's; maintenance and repair of monitors; and ability to do circuit construction and wiring. **QUALIFIED APPLICANTS SEND RESUME** and salary requirements to: J S L Video Services, Inc., Engineering Department, 25 West 45th Street, New York, New York 10036. 2-82-1t

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER at San Antonio has an immediate opening for a Television & Electronic Control Technician. Candidates must be highly skilled in repair & maintenance of video tape recorders and color camera equipment. Should have 3 years experience in a television station or industrial television operation. Please send resume indicating salary history to: Personnel Office, U.T.H.S.C.S.A., 7703 Floyd Curl, S.A., TX 78284. Equal Opportunity/Affirmative Action Employer. 2-82-1t

CHIEF VIDEO ENGINEER: New York's largest non-profit media equipment access center is seeking a self-motivated person to manage and upgrade maintenance/repair department. Facilities include; TV studio w/IKEGAMI cameras and chroma key; 16mm sound mix; ¾" video edit system w/TBC, CG, and switcher; Film to video transfer; and ¾" ENG units. 2-3 years experience w/above and some systems design experience; ability to supervise full and part time technicians; strong organizational skills. Excellent opportunity for person committed to growth of independent film and TV production. Salary negotiable; excellent benefits; equal opportunity/affirmative action employer. Send resume or phone: David Sasser (212) 673-9361. 2-82-1t

HELP WANTED (CONT.)

SYSTEM DESIGN ENGINEER – CCTV. Must be able to specify, design, supervise installation and de-bug top quality industrial CCTV systems. Experience required. **SYSTEM ENGINEER – AUDIO VISUAL and PROFESSIONAL AUDIO.** Hands on experience with audio/visual equipment a must. Digital knowledge helpful but not required. Responsibilities include complete job oversee and client interface. Both positions provide paid health, life insurance, vacation, etc. Please call collect 201-288-6130, Stylist Systems, Teterboro, N.J. 9-81-tfn

ENGINEER (TV): 1st class FCC license plus experience desired. Send resume to: WXXI Personnel Department, P.O. Box 21, Rochester, New York 14601. EOE. 2-82-1t

U OF ALASKA CENTER FOR INSTRUCTIONAL TELECOMMUNICATIONS – OPERATIONS MANAGER: Responsible for daily operation of Learn/Alaska Instructional TV and audio conferencing networks; develop and maintain system for monitoring, evaluation and maintenance of technical performance of the two network receiving sites statewide; coordinate dept. activities with other units and functions; administer budgets. Applicants must have experience in the supervision of personnel, budget development, and administration; demonstrated knowledge of TV and audio systems and their operations. Extensive experience in broadcast or cable TV and audio conferencing is desired (ops. mgr. level). **PRODUCER/DIRECTOR:** Write, produce, direct & edit instructional and public service film, TV, audio & photo programs and materials. Must have extensive knowledge of production techniques, treatment, script & storyboard formats, TV camera operation, audio & editing operations, production facilites mgmt. procedures and experience in media productions for rural audiences. Submit resume to Personnel Director, Community Colleges Rural Education & Extension, 2221 East Northern Lights Blvd.-Rm. 135, Anchorage, AK 99504. AA/EEO. Resumes must be received by Feb. 26, 1982. 2-82-1t

Se Necesita Director Técnico: La revista RADIO Y TELEVISION necesita un Director Técnico que tenga la habilidad de escribir y leer fluentemente el inglés y español para traducir terminología técnica. También debe tener amplios conocimientos sobre equipo de radiodifusión y teledifusión. Enviar las solicitudes conjuntamente con antecedentes profesionales y requisitos de salario a: Publisher, Radio y Televisión, P.O. Box 12901, Overland Park, Kansas 66212.

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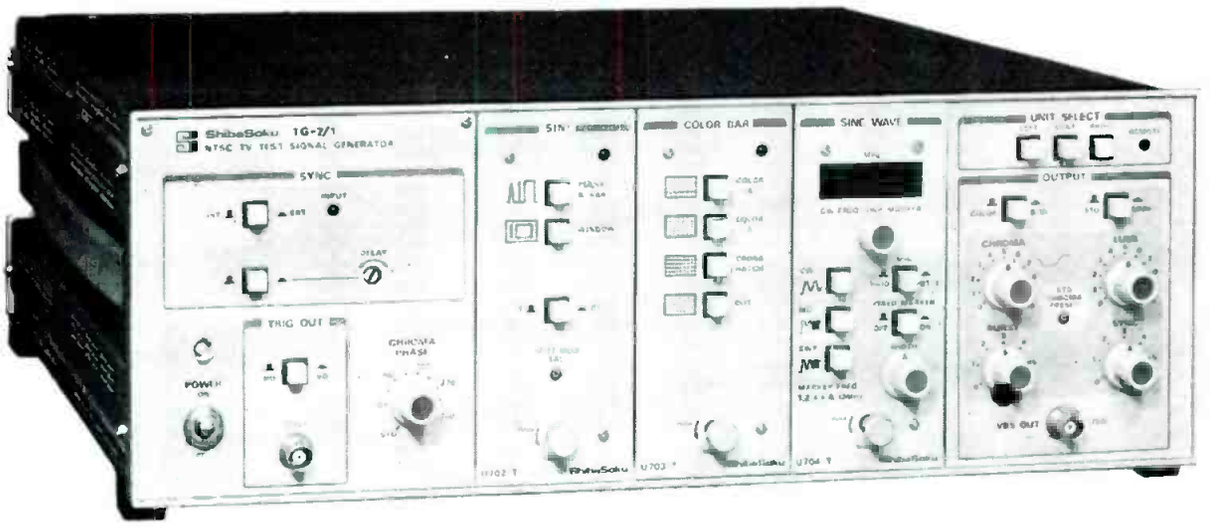

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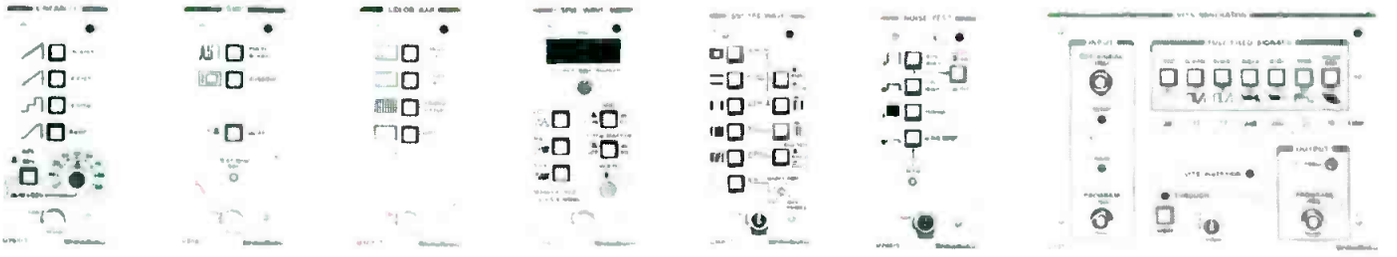

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