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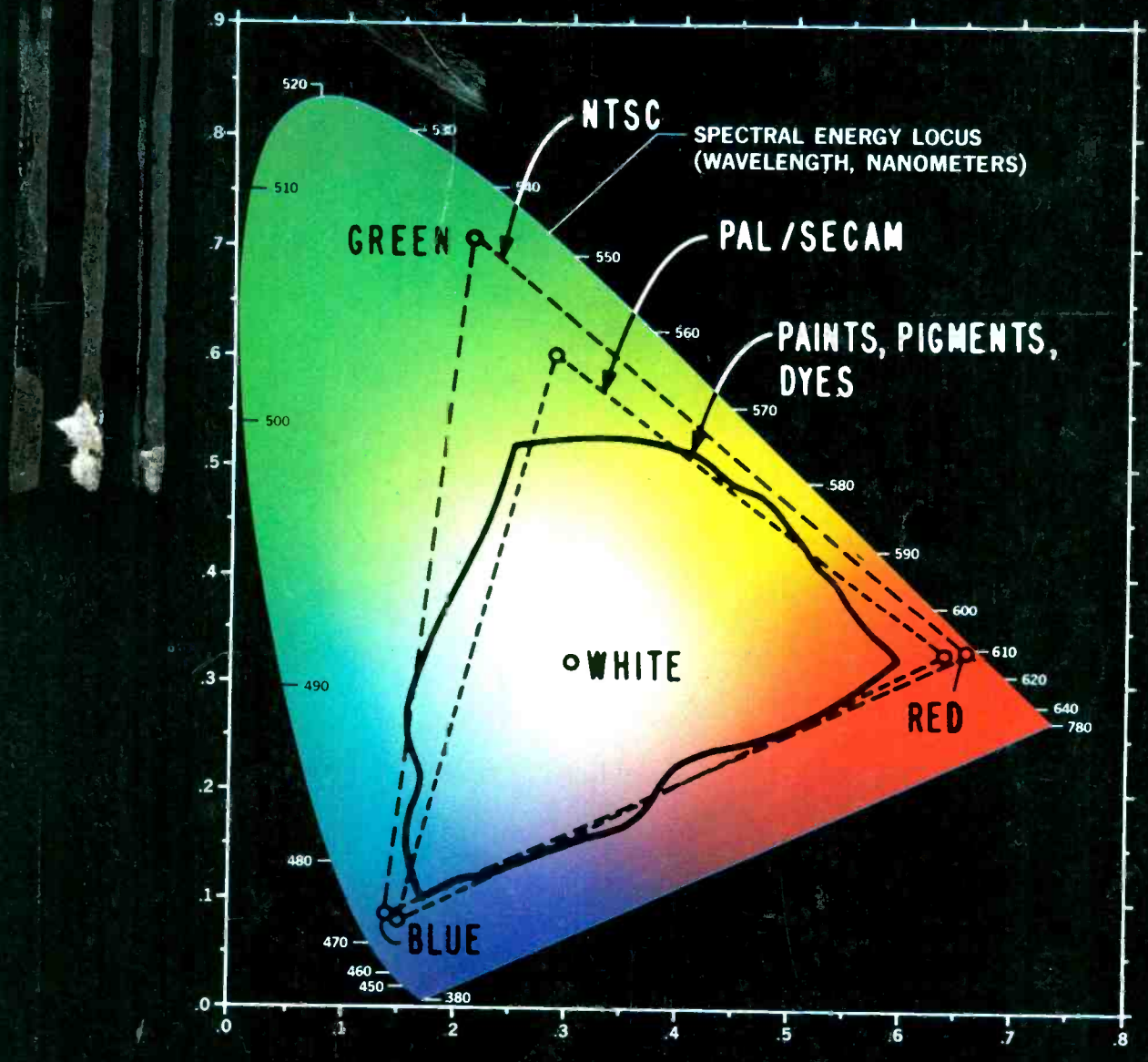
August, 1980/$3.00



Worldwide TV Standards
Satellite Earth Stations

Best In The Field

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Outside the studio, the remarkable Hitachi SK-90 does it all. For EFP, it sports a studio style 5" viewfinder. All key functions can be controlled with your choice of Remote Operating Unit (ROU) or Digital Command Unit (DCU). For ENG, slip off the SK-90's studio viewfinder, slip on the 1.5" viewfinder and shoulder mount. Your SK-90 is now a compact lightweight self-contained portable!

ENG with EFP image quality. And EFP with *total* remote control. SK-90 has the field covered!

Hitachi SK-90: portable ENG mode

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ADM

Control the complete audio spectrum

Our ADM 1600: modest but mighty

Although it's a desk-top model, our 1600 Series audio console offers a brilliant array of features and capabilities for handling the most demanding program material.

One of our new breed of consoles, the ADM® 1600 is available with up to 16 discrete inputs, 4 submaster and 2 master outputs. Combined with a host of pre-selector, buss selector and processor modules, the ADM 1600 creates perfect harmony with today's video. Like all ADM consoles, the 1600 is designed to exacting standards and manufactured to the most rigid tolerances. Each ADM console is backed by an exclusive 5-year warranty.

Make sure you control the entire audio spectrum. Contact ADM Technology, Inc., 16005 Sturgeon, Roseville, MI 48066. Phone (313) 778-8400. TLX-23-1114. *The Audio Company.*

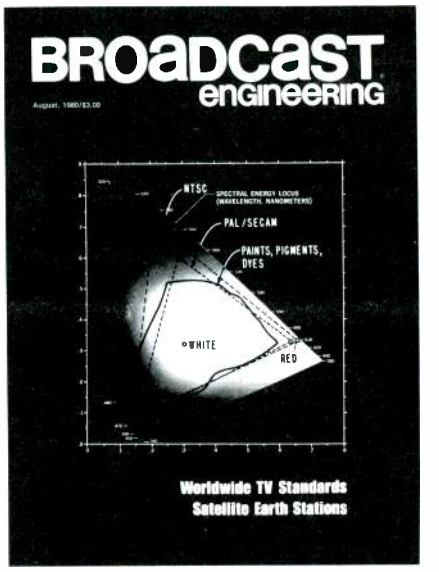
BROADCAST ENGINEERING

The journal of broadcast technology

August, 1980 ☐ Volume 22 ☐ No. 8

Satellite Technology

ARTICLES



THE COVER is a duplication of the C.I.E. chromaticity diagram over which has been superimposed the color reproduction capabilities of NTSC, PAL, and SECAM systems along with those of printed media. An article on worldwide TV standards by Pritchard and Gibson of RCA references a black and white version of this chart.

The color material on the cover was provided by General Electric Company, Nela Park, Cleveland, OH, from its brochure TP119, *Light and Color*. The original art is the property of the C.I.E. (Commission Internationale De L'Eclairage, i.e., the International Commission on Illumination) which specializes in all matters relating to the science and art of lighting. Color reproductions of this chart appeared in Eastman Kodak publications and as plate 24 in the *Science of Color*, Optical Society of America, 1963.

NEXT MONTH
The September issue is the annual **BE** Buyers' Guide—the industry's comprehensive product directory. A number of articles will be included to round out the issue.

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Introducing the first all-digital generator.

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With the new SMPTE Color Bars test signal, just three quick monitor adjustments take the aggravation out of matching color monitors. The 1900's SIN X/X signal provides an extremely flat, 4.5 MHz spectrum for fast and simple checking of the system frequency response and the multipulse signal capability greatly simplifies the testing of group delay characteristics.

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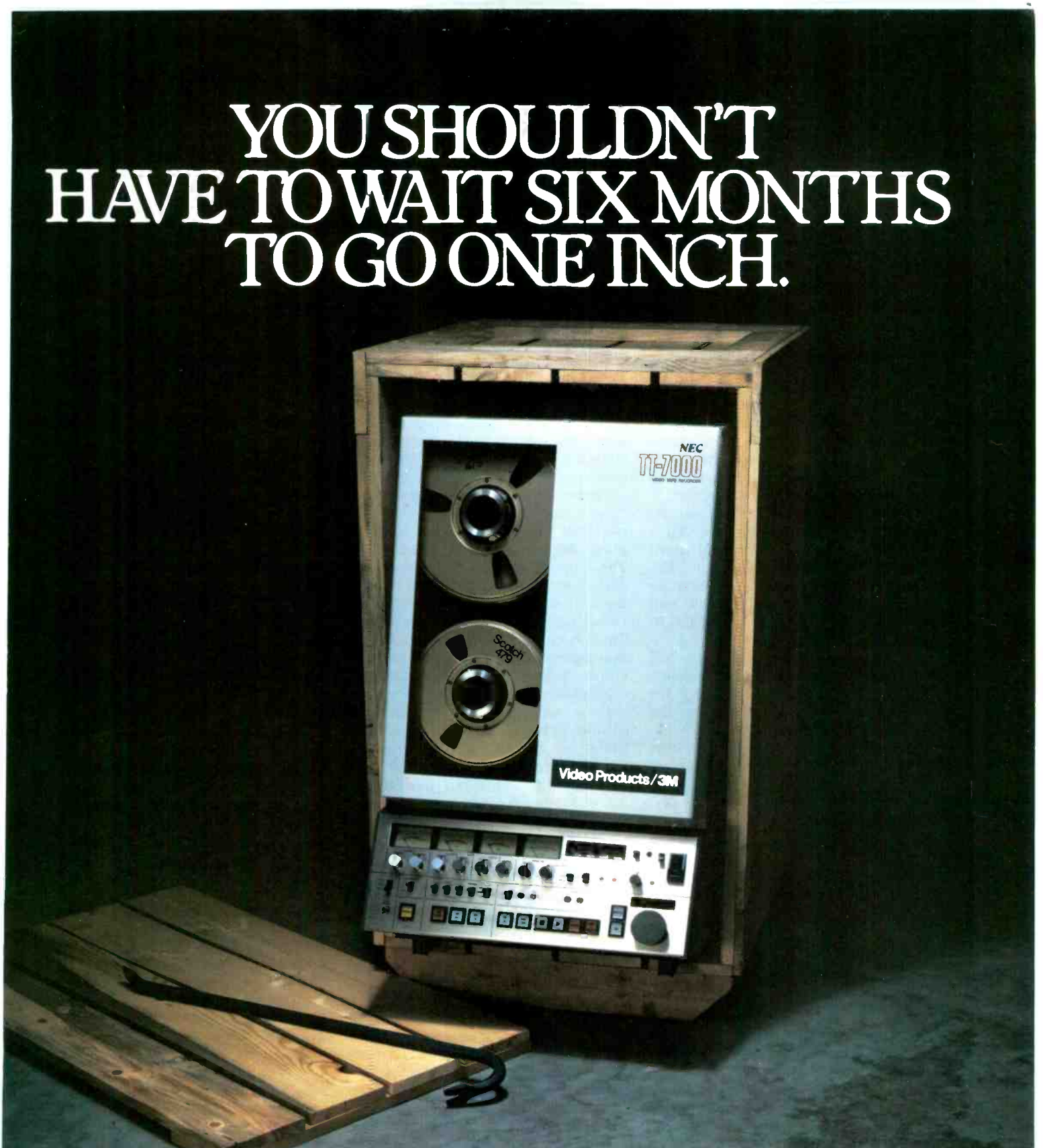

After spending six months researching the purchase of a 1" VTR, you shouldn't have to wait another six to get it.

Introducing the 3M TT-7000 "C" 1" VTR. The technology of today that's available today.

The TT-7000 is sold and serviced by 3M. One of the largest suppliers to the broadcast industry. And it's built by one of the most respected manufacturers of video equipment: Nippon Electric Company.

Which means you get all the standard features found in other 1" VTRs. Plus a few important extras. Like full audio/video confidence heads, built-in FM calibrate oscillator/marker and a sync channel.

For complete details and technical specs on the TT-7000, call (612) 733-7914. Or write: 3M/Mincom Division—Video Products, 3M Center/223-5E, St. Paul, MN. 55101.

If you don't take too much time making your decision, you can get the TT-7000 in practically no time at all.

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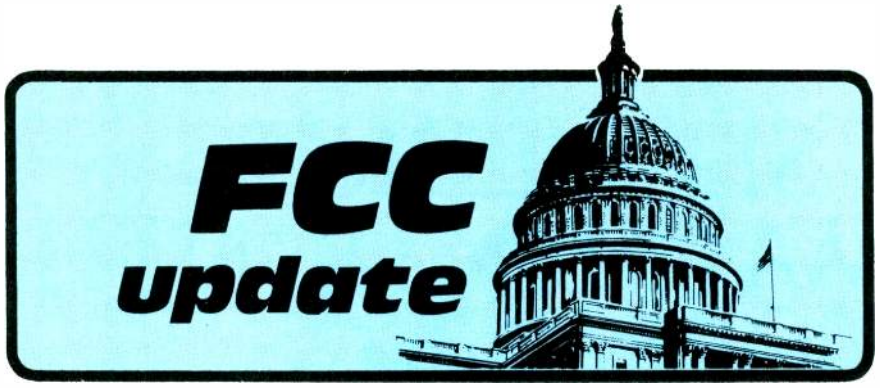
3M



August, 1980

Transponder lottery

The commission has denied petitions to reject or suspend and investigate the proposal of RCA American Communications, Inc. (RCA Americom) for a lottery to allocate the remaining two unassigned transponders on the SATCOM F-3 replacement satellite scheduled for launch in June 1981.

Petitions filed by Eastern Microwave, Inc. (EMI), Home Box Office (HBO) and Spanish International Network (SIN) claimed that the planned procedures are unreasonable, unjustly discriminatory and violate Sections 201(b) and 202(a) of the Communications Act.

RCA Americom proposed to poll its Comstar D-2 customers to determine if demand exceeds supply for the remaining transponders on the satellite that will replace its SATCOM F-3 that disappeared after launch last December. To serve customers originally assigned to F-3, RCA Americom leased Comstar D-2 from AT&T.

Model EEO program

The commission has proposed changes in its Model Equal Employment Opportunity (EEO) Program designed to give the commission a more complete and accurate picture of licensee EEO performance while minimizing the administrative burden.

The major changes proposed in the model program include:

- Requiring **all** licensees and permittees to report employment by race, sex, job title and category instead of only requiring those with 50 or more full-time employees to report such data; a requirement that the full-time or part-time status of each employee be reported also would be added.
- Requiring a section on promotions including a summary of those promoted by race, sex, former job title and category and new job title and category.
- Requiring the specific reporting of applicant flow and job hires showing recruitment source, race, sex, job title and category and disposition of each application but not names of individuals.
- Revising the section on "effectiveness of the affirmative action program" to suggest that applicants and licensees who find their employment profiles unsatisfactory adopt voluntary goals and timetables for compliance.

Currently, broadcast stations with five or more full-time employees are required to file an Annual Employment Report with the commission. This report gives a breakdown of station employment as of the reporting date by specified job categories, racial and ethnic groups, and sex. The job categories are: officials and managers; professionals; technicians; sales; office and clerical; craftsmen; operatives; laborers; and service workers. The racial and ethnic groups include American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; Hispanic; and white, not of Hispanic origin.

NAB's EEO guidelines rejected

The commission rejected the National Association of Broadcasters (NAB) petition for reconsideration of the FCC's equal employment opportunity (EEO) processing guidelines. It also denied NAB's rulemaking petition seeking a reassessment of the FCC's entire EEO program.

The processing guidelines are used by the commission as a screening device to determine which of the approximately 3000 broadcast licensees filing renewal applications each year will have their station EEO programs subjected to in-depth staff-level review.

NAB contended that:

- The guidelines are substantive requirements improperly adopted without the benefit of notice and comment rulemaking procedures;
- The guidelines are "discriminatory, unfair and unrealistic," in part because they do not properly take into consideration the actual workforce availablility of women and minorities in the top four FCC Form 395 job categories—officials and managers, professionals, technicians and sales workers; and
- The adoption and rapid implementation of the new guidelines were "unwarranted" and ignored "the broadcast industry's EEO-related good faith efforts."

NAB requested that the commission initiate a rulemaking to "reassess its entire EEO regulatory program—processing standards and substantive rules and policies—with a view toward examining its own jurisdictional limitations, the true workforce availability of top four minority and women employees and the good faith EEO-related efforts of the broadcast industry."

Rulemaking changes

The commission has amended its rules to allow it to dismiss or deny petitions for rulemaking received from the public which are moot, repetitive, premature, frivolous or do not warrant consideration. Action dismissing such petitions would be taken without requesting public comment on the petitions, thereby saving time and effort for both the public and the commission's staff.

It also delegated to the chief, Broadcast Bureau, authority to act on these petitions. Similar authority is already delegated to all other bureau chiefs as well as the general counsel and the chief scientist.

Interface compliance

The commission has proposed establishing methods of measurements and procedures for manufacturers to show their products comply with the FCC's new technical standards for computing equipment adopted last fall.

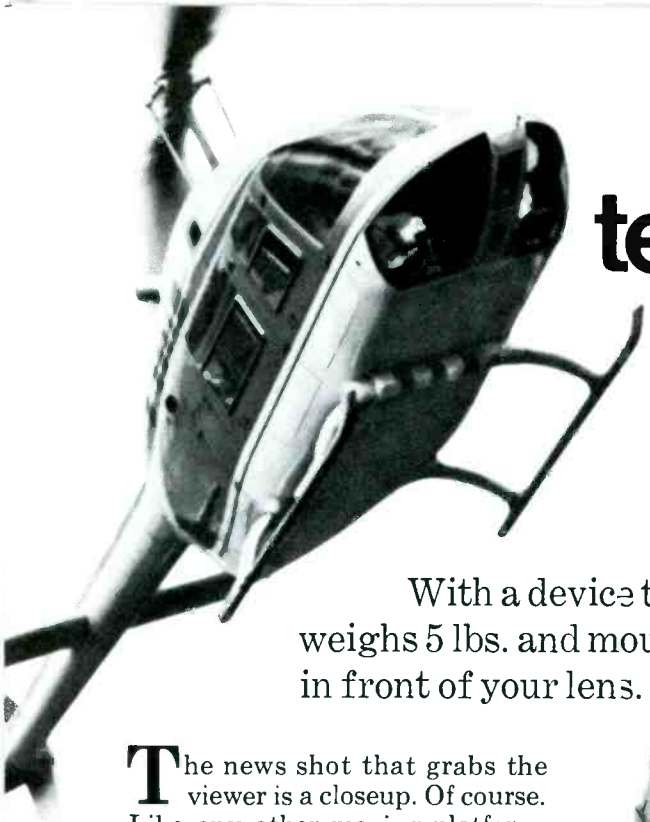
The new standards control the interference caused by computers and similar digital electronic equipment to radio and TV reception.

In addition to test procedures, the commission proposed new rules to clarify the manufacturer's responsibility under the verification program. Verification is a new equipment authorization procedure where the manufacturer is required to make measurements or do whatever is necessary to verify compliance, but is not required to submit data to the Commission unless specifically requested.

(GEN DOCKET NO. 80— 284)

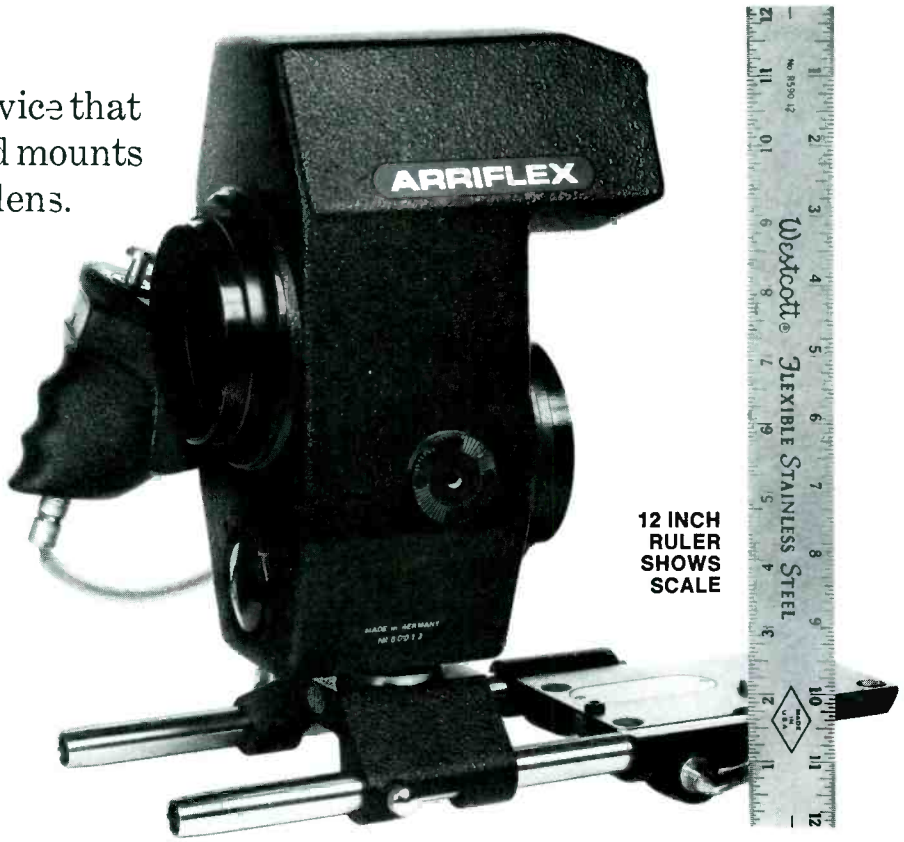
More amateur bands

The Commission has proposed changes in its rules to allow amateur radio operators to transmit television and facsimile signals on all of the amateur radio frequency bands above 3.775MHz where voice transmissions currently are authorized. □



How to get steady telephoto shots of the news action from 300 feet up:

With a device that weighs 5 lbs. and mounts in front of your lens.



12 INCH RULER SHOWS SCALE

The news shot that grabs the viewer is a closeup. Of course. Like any other moving platform, though, the helicopter isn't steady enough for the camera to zoom in tight. Needless to say: at the long end of the lens, vibration is magnified.

You pay good money for that helicopter. You should get high-quality images.

The police, the F.A.A. and the pilot all quite rightly want you to keep a safe distance from the action on the ground. *But you need close shots.* You're paying for the helicopter to make your news operation look good. Shaky pictures don't help.

Get 3 times closer.

Without stabilization, you can't go longer than about the 50mm focal length on your ENG camera. With the Image Stabilizer, depending on air turbulence, you can get smooth shots at 150mm or longer.

No special training needed. It's just another (astounding) accessory.

The Image Stabilizer comes with its own Support Plate and bracket. You mount your camera on the Plate and position the Stabilizer in front of your lens. Switch on the Stabilizer. Switch on the camera. Shoot. Any competent cameraman can use it. It works with any camera and with any prime lens longer than about 35mm. (With zoom lenses, the widest focal length varies slightly.)

The new Arriflex Image Stabilizer

an important ENG/EFP accessory.

At focal lengths wider than 35mm, the Stabilizer vignettes. A small price to pay for getting *three times* closer. And if you need a panoramic shot, that's easy: Pull the helicopter back.

How it works:

The entering light rays are reflected off a front-surface mirror mounted on two gimbals powered by a battery-driven gyroscope. The mirror is effectively floating in space, as though on two trapezes – one oriented N-S, the other E-W. The image from this mirror is reflected onto another (fixed) mirror and thence into the camera's lens.

Aerospace technology.

A gyro's directional stability makes it resist off-axis movement – such as panning the camera. If you insist, it tumbles in that direction. British Aerospace, the designers, have turned this tendency to advantage. A precession brake causes the gyro to *lean with* the panning motion, steadily. This is military aerospace technology, ingeniously adapted.

The British Aerospace Steadyscope uses the same stabilization method. Above: surveillance from a NATO army helicopter.

British Aerospace is a company very much involved with high-precision technology. Military missile systems, orbital satellites...

One of their products is the Steadyscope. It uses the same gyro-stabilization as our Image Stabilizer, whose moving parts are also made by British Aerospace.

How well does it work?

In the November 16, 1978 issue of the British magazine NEW SCIENTIST, there's an article by Guy Parker on stabilized binoculars. Referring to the Steadyscope, Mr. Parker writes:

Anchored in space

"On pressing the uncage button there is an immediate transformation which is both psychological and optical. The impact is of course greater if one is being shaken in a helicopter, but even on land the image appears in an almost uncanny way to anchor itself in space, even if the instrument is deliberately jiggled about."

Detail resolution

"An optical phenomenon now becomes apparent," writes Mr. Parker. "After the initial pleasure at the disappearance of jitter, the eye seems to demand needle-sharp resolution, now that the visibility of detail is determined mainly by the quality of the optical design. *There is no future for a stabilizer which does not give the highest resolution under all conditions of use.*"

IMAGE STABILIZER SPECS:

Length (Image Stabilizer alone): 6 5/8 ins. Width: 4 11/16 ins. Height: 9 1/4 ins. Weight (Image Stabilizer alone): 5 lbs. Weight (on Support Plate with 9 1/2 inch rods and with cable-release handle): 7 lbs. 4 oz. Maximum panning speed: approx. 4 degrees/second. Maximum accelerative force: 6g. Equalizes vibration frequencies 1 Hz and higher. Camera lens focal lengths usable with ENG/EFP format: 35mm and longer.

Rear view of Image Stabilizer shows Support Plate with threaded camera mount. Custom brackets are available for various cameras. Stabilizer can be removed from camera in less than two minutes.

No light loss, no image degradation.

There are no lenses or prisms in the Stabilizer. Light rays pass through optical flats front and rear, and reflect off two front-surface mirrors. If you meter the light at the exit port, it measures the same as the light entering.

Doesn't perform miracles. *Does* work in a car, though, or any other moving base.

The Stabilizer is for making shaky shots smoother, *not* for simulating a rock-steady tripod. Its low mass is vital in the unwieldy g forces inside a helicopter. But that's useful in a car, too, or on horseback... You can get out of the car and continue shooting with a body-brace. And the Stabilizer is quiet enough to shoot sync sound out of doors.

Circle (8) on Reply Card

Elegant proof of low mass space-hardware sophistication: a gyroscope powered by one flashlight battery.

To improve a gyroscope's effectiveness, you can increase either its mass or its RPM. For military purposes, British Aerospace had to make it small, light and efficient.

High speed with low mass requires exact dynamic balance, of course. Eccentricity and bearing friction would impair accuracy and soak up power. One measure of the phenomenal precision of this device: The gyroscope – with its double gimbal and mirror – will run about four hours on a 1.5 volt D cell!

Low mass saves money.

A low mass device is likely to be compact. With this one, you can rent a 5 place helicopter at $300 an hour, and get steady shots *from inside.* No need to hang out of the open door. And no need, either, for a 7 place helicopter at $400 an hour, or more. The Image Stabilizer, incidentally, rents for about a tenth of that.

5 PLACE BELL JET RANGER

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IMAGING EQUIPMENT SINCE 1917

industry news

Finley honored as "Man of the Decade"

The 1980 ITA/Time Magazine "Man of the Decade" award was presented to Larry Finley, vice president, events/membership, International Tape/Disc Association. Finley is responsible for the formation of the ITA.

British Teletext and Viewdata group looking to build in USA on European successes

Against a background of growing commercial success in Europe and Australia for their public Teletext and Viewdata services and related equipment British electronics industry, broadcasting and telecommunications representatives had a coordinated demonstration of their achievements at the Chicago Spring Conference on Consumer Electronics (Arlington Park Hilton, Arlington Heights, IL June 18-19).

The team consisted of representatives from the UK semiconductor industry, original equipment and software companies, the British Broadcasting Corporation (BBC) and Independent Television Companies Association (ITCA), and the British Post Office. It demonstrated the Post Office's Prestel (Viewdata) service, and the Teletext services operated by the BBC and ITCA.

The British Teletext system uses spare lines of the regular TV program transmission signal to carry extra information such as news, weather and sports summaries, stock exchange prices, games, captions for the deaf, travel information, etc. The viewer uses a small key pad to summon the desired *page* on to the screen in place of, or superimposed on, the regular picture.

Teletext is a UK invention and the BBC and ITCA are the world's most experienced producers of Teletext services, having operated them for some years. Consumer demand for the service, with its ease of access to information, reliability, low cost, and ready availability of the necessary semiconductors from a number of sources, has risen rapidly. Nearly 300,000 Teletext sets will be in use in the UK by the end of 1980, and in a recent survey 30% of those polled said they would be willing to pay the small extra cost to have Teletext adapted sets in their homes.

Although other countries are experimenting with distinctive Teletext systems of their own, successive broadcasting authorities have adopted systems based on Britain's for their public services. Austria and West Germany are the latest countries to do so, along with Belgium, Holland, Sweden and Australia. Thus all currently operating services in Europe and Australia follow the British pattern.

The US has been involved from the start in the development of UK Teletext, with Texas Instruments and Mullard Signetics leading the way in LSI chip development, followed more recently by General

TIRED OF PATCHING FEEDS TO THE GM'S OFFICE?

(OR TO OTHER OFFICES, CLIENT VIEWING ROOMS, EDIT SUITES, ETC.?)

Give them one of these Utah Scientific Routing Switcher Controllers and let them do their own patching.

Utah Scientific's new CPD/PL control is a **Party Line** panel with a single coax control connection — no bulky cables to install. It is powered by a transistor radio battery providing many years life expectancy. It features a pull-out directory to aid the operator in source selection.

Since multiple CPD/PL's can all be connected to a single party line, many stations are installing coax drops throughout their plants giving them complete flexibility for present and future routing switcher control using these versatile panels.

SINGLE COAX CONNECTION — BATTERY POWERED — UNOBTRUSIVE

TRY THAT ON YOUR GRASCOMFERNSAMDYNATEK SWITCHER!

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Instruments. Britain is now looking to further develop this partnership with US interests with a view to the promotion of Teletext services in the US.

Sony Broadcast receives special recognition award from Videotape Production Association

Sony Broadcast recently received a special recognition award for engineering from the Videotape Production Association. The award was presented to Sony, Ampex and the Society of Motion Picture Television Engineers (SMPTE) for the development of the one-inch Type C videotape format at the Association's second annual Monitor Awards Dinner.

Accepting the award for Sony Broadcast was Arnold Taylor, vice president of Sony Video Products Company and general manager of the Broadcast Division. "The award signifies the increased usage of videotape by independent production houses who once worked exclusively in film," according to Taylor. "Sony is both proud and grateful to receive this award," he added.

According to Taylor, "The growth and impact of one-inch tape would have been unthinkable without the SMPTE standards. Those standards would have been just another one of these good ideas without the cooperation of SMPTE and our colleagues in this exciting business."

Broadcasting industry among fastest growing in the 80s

The US economy will provide more jobs for radio and TV announcers than ever before, according to recent projections compiled by the US Bureau of Labor Statistics, and private career schools will train thousands of new workers in the specialized skills required by the broadcasting industry.

The BLS predicts total employment for radio and TV announcers will continue to grow, increasing by about 22% by 1989. Some 850 jobs will open each year for radio and TV announcers, the government says.

Private career schools will train many of the new radio and TV announcers needed in the coming decade, in as little as 13 to 48 weeks, according to the National Association of Trade and Technical Schools.

According to the National Center for Education Statistics, private career schools graduate their students 25% faster than their public competitors on the average.

Radio spectrum program invites intern applicants

Commerce's National Telecommunications and Information Administration (NTIA) is recruiting five graduate engineers for training as interns in its Radio Spectrum Management Intern Program. The program is designed to produce a pool of federal government experts in radio frequency management. The interns selected will be virtually full-time students during their eight to nine months of training.

In addition to intensive formal classroom training, the program provides on-the-job experience and rotating assignments between field activities and NTIA headquarters in Washington. Each intern will obtain a working knowledge of national and international radio frequency planning, engineering, coordination and assignment processes during work assignments with several federal agencies.

Upon successful completion of the program the interns will be recommended for a permanent radio spectrum management assignment in the Washington, DC area. □

The Power Paradox:

The AC power your computer needs in order to operate is also a major cause of computer error, malfunction and damage.

The computers that control your operations (and therefore your profits) are designed to operate from a clean, steady supply of ac power.

This ac power *must* be kept within manufacturer-specified tolerances in order for the computers to operate properly and safely.

In fact, the U.S. Department of Commerce states that "if a computer's voltage exceeds 120% [of the rated voltage] for a duration as short as 1 to 10 milliseconds, the computer will make errors."[1] Unfortunately, interruptions and disturbances of this nature are commonplace occurrences within most computer facilities.

A comprehensive study of power line disturbances which affect sensitive computerized equipment was conducted by two IBM researchers. They concluded that such disturbances occur on an average of 128 times each month.[2] For users of computer-based equipment, power disturbances can and do create a variety of costly problems.

Effects upon data processing computers.

When these power disturbances occur in your data processing center they can cause entry errors, program changes or loss, head crash, data loss, the generation of false or garbled data, the need to rerun programs, and computer downtime.

Effects upon computerized process control equipment.

Process control equipment is also vulnerable to power disturbances. Common problems created by these disturbances include improper batch termination and even program changes. The program changes can result in the repetition of process errors and in downtime while equipment is being reprogrammed.

Effects upon energy management systems.

Most energy management systems use small computers to make energy-saving decisions, but their effectiveness can be offset by these same disturbances. Program changes and errors may prevent useful operation of these systems as energy savers.

Thus, the computers your company depends on to reduce operating costs actually may be increasing them.

Topaz power peripherals can protect all of your computers.

Topaz can provide the power peripherals specifically designed to keep your company's data processing, process control and energy management computers from making costly power-related errors.

And if you manufacture computers or computerized equipment, Topaz peripherals can make your product more reliable as well as reduce the requirements for needless service calls.

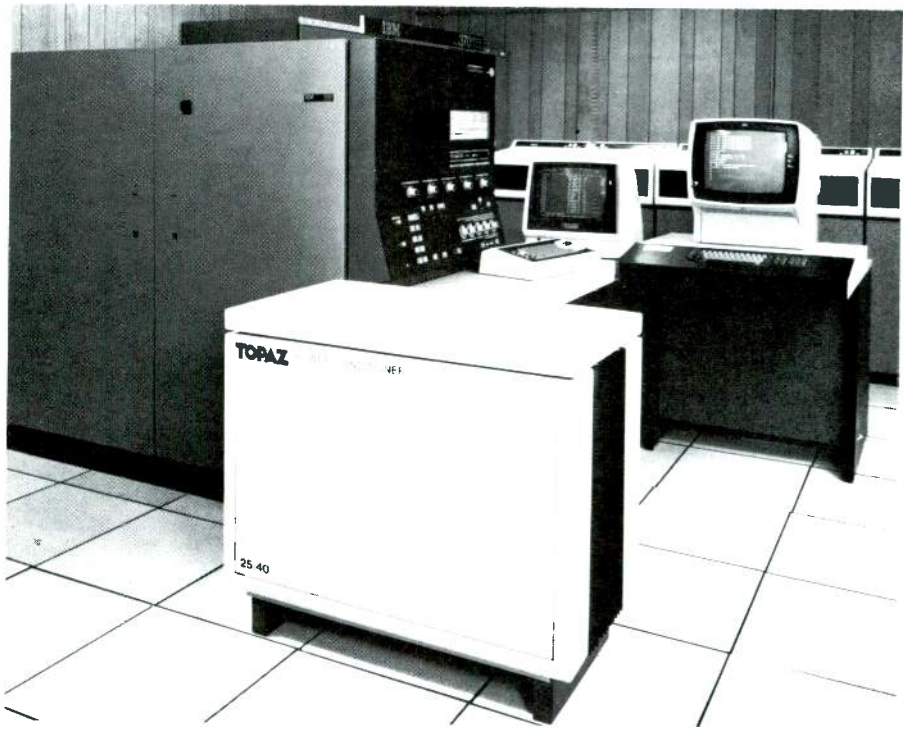
Immediate delivery and guaranteed solutions to power problems have made Topaz the leading computer power peripheral company in the world.

For more information about Topaz and its products:

1. Tear out this ad and mail it to us along with your business card; or
2. Circle the reader service card; or
3. Call us:

References:

1. *U.S. Department of Commerce, "The Effects of Electrical Power Variation Upon Computers: an Overview."*
2. *George W. Allen and Donald Segall, IBM Systems Development Div., "Monitoring of Computer Installations for Power Line Disturbances," presented to the IEEE Power Engineering Society.*



Topaz peripherals solve the power paradox by conditioning normal ac power for your computer and computer-based equipment.

TOPAZ
ELECTRONICS DIV.
3855 Ruffin Road, San Diego, CA 92123
(714) 279-0831 — TWX (910) 335-1526

Circle (12) on Reply Card

National Association of Broadcasters
1771 N Street, NW
Washington, DC 20036

In-depth studies on radio's future

Saying that recent international and domestic actions by the federal government "make it clear that a potentially disruptive restructuring of the American system of broadcasting...may be imminent," the National Association of Broadcasters' radio board of directors took action to urge Congress to assure that the FCC develops a master spectrum allocation plan before implementing any new proposals and appoint a government/industry advisory committee to chart the course.

Emphasizing the importance of such a master plan, the board also authorized the immediate formation of a special NAB task force that would oversee the preparation of in-depth studies dealing with technical and economic realities of additional radio stations and their impact on service to the public.

FCC authorization

The NAB and seven other organizations have asked the Supreme Court to overturn an appeals court decision requiring the FCC to authorize a particular format change for a radio station.

At issue is the US Court of Appeals for the District of Columbia's ruling that the commission, under certain circumstances, must conduct a hearing whenever a unique program format is changed. The FCC maintains it should not tell broadcasters how to program and the appellants agree. In its pleading, NAB said the appeals court decision requires the commission to abandon a 40-year tradition and charged the court with establishing communications policy and ignoring "important statutory and constitutional restraints on government intrusion into broadcast programming."

Fritts, Tarleton elected officers

Edward O. Fritts, president, Fritts Broadcasting, Inc., Indianola, MS, has been elected to a one-year term as chairman of the NAB's Radio Board of Directors.

Cullie M. Tarleton, vice president, radio, Jefferson Pilot Broadcasting Co., Charlotte, NC, was elected to a one-year term as vice chairman.

Fritts, who has served as vice-chairman for the past year, succeeded Arnold S. Lerner, chairman, WLLH Inc., Lowell, MA, who did not run for re-election.

As chairman and vice chairman, Fritts and Tarleton also are members of NAB's Executive Committee, which advises Vincent T. Wasilewski, president, on the implementation of NAB policies.

Chuck Mangione to entertain at NAB Radio Programming Conference

Chuck Mangione, the Grammy-Award-winning flugelhorn player and composer, will perform at the August 26 dinner concert during the National Association of Broadcasters' Radio Programming Conference. □

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NRBA

National Radio Broadcasters' Association

1705 De Sales Street, NW
Washington, DC 20036

EEO Inquiry

On May 30, NRBA filed with the FCC a petition calling for a broad inquiry to review its EEO policies and to "adopt new EEO procedures and policies more reasonably related to the circumstances of American society generally and the broadcast industry in particular."

The NRBA petition stated that the FCC's EEO policies have "evolved into a quota system, which is based on workforce statistics and individual licensees employment profiles."

NRBA suggested that the inquiry be "undertaken in cooperation with the Equal Employment Opportunity Commission, the primary governmental agency charged with enforcing the EEO laws.

Abe Voron, executive vice president, said that the petition was prompted by "the growing uneasiness among broadcasters and objective observers caused by the FCC's rapidly proliferating EEO policies and rules...rules that seem to be rigid, inequitable and perhaps counterproductive."

"It takes courage to question policies in an area as sensitive as EEO," Voron stated, "but as sympathetic as we are to the goals of EEO, we can no longer remain silent."

ARB negotiating committee on hold

The embryonic All-Radio Negotiating Committee has retained a New York law firm specializing in antitrust matters to provide advice and counsel to the committee that may be formed to negotiate Arbitron's new radio contract.

NRBA will issue updates on the status of the negotiating committee pending further developments.

Full-time authorization for daytimers

NRBA last field a Petition for Rulemaking urging the FCC to amend Section 73.37(e) of its rules to permit daytime-only licensees to operate on a full-time basis, providing it would not create objectionable interference or prohibited overlap with other stations.

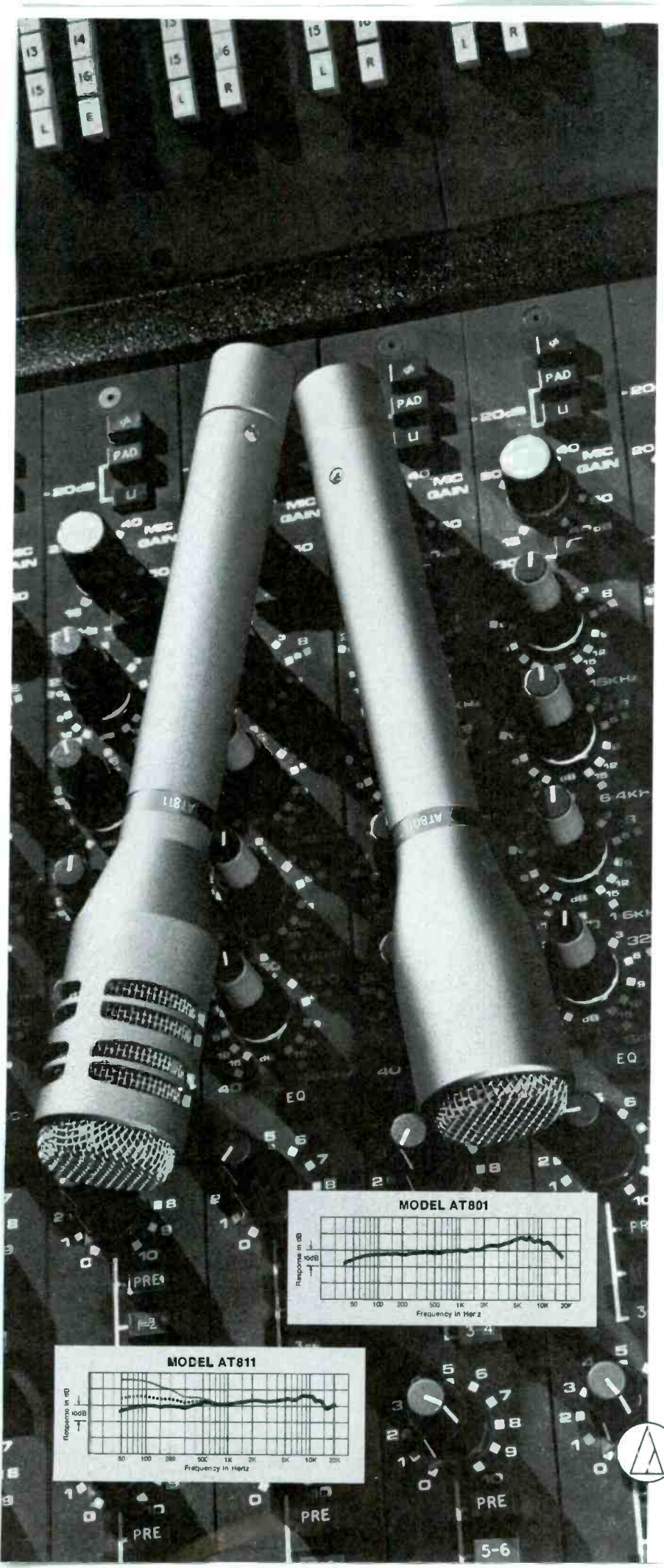
NRBA's petition called many of the restrictions, such as the "two-station to a community" rule, "unjustifiable" and "discriminatory." This discriminatory effect will become even more pronounced should the FM channel allocation proposals, which would create hundreds of new FM stations, be adopted.

Eliminating the artificial barriers to full-time service "would permit freer interplay of marketplace forces to the ultimate benefit of the public interest," NRBA stated.

All-radio industry negotiating committee

Reacting to certain provisions Arbitron has proposed to include in their new radio contracts, the Arbitron advisory council is advocating the establishment of an All-Radio Industry Negotiating Committee to negotiate a new contract with Arbitron. It is expected that the committee will be patterned after committees formed to establish ASCAP/BMI licensing fees.

One of the new contract provisions calls for fees to be based on a station's highest open minute rather than market size. □



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EQ should be used to improve the sound... not to fix the mike!

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Response like this has a number of benefits. First, your EQ is used only to touch up the sound, not to correct built-in errors of the microphone. Which leaves more leeway to control the overall sound.

And without unwanted peaks you have more usable headroom. That's vital when you're working near the dynamic limit of a preamp or line amp. Sound stays clean and sharp. Compressors or limiters sound less forced, because they are controlling peaks in the *sound,* not peaks in the *mike!*

But perhaps the biggest advantage is the versatility of these A-T condensers. Because they have just the right amount of presence for today's recordings, they're not limited to just one kind of instrument... just one type of voice. Put them *anywhere* in the mix: brass, reeds, percussion, chorus, or strings. Then listen. What you hear in the studio you'll hear at the console. Which is a great place to start in miking any session.

At their highly affordable prices, these are two of the best bargains you'll find these days. Reliable, clean-sounding, and the most predictable microphones you can use. Make them a mainstay in your studio today. Write for spec sheets and dealer list.

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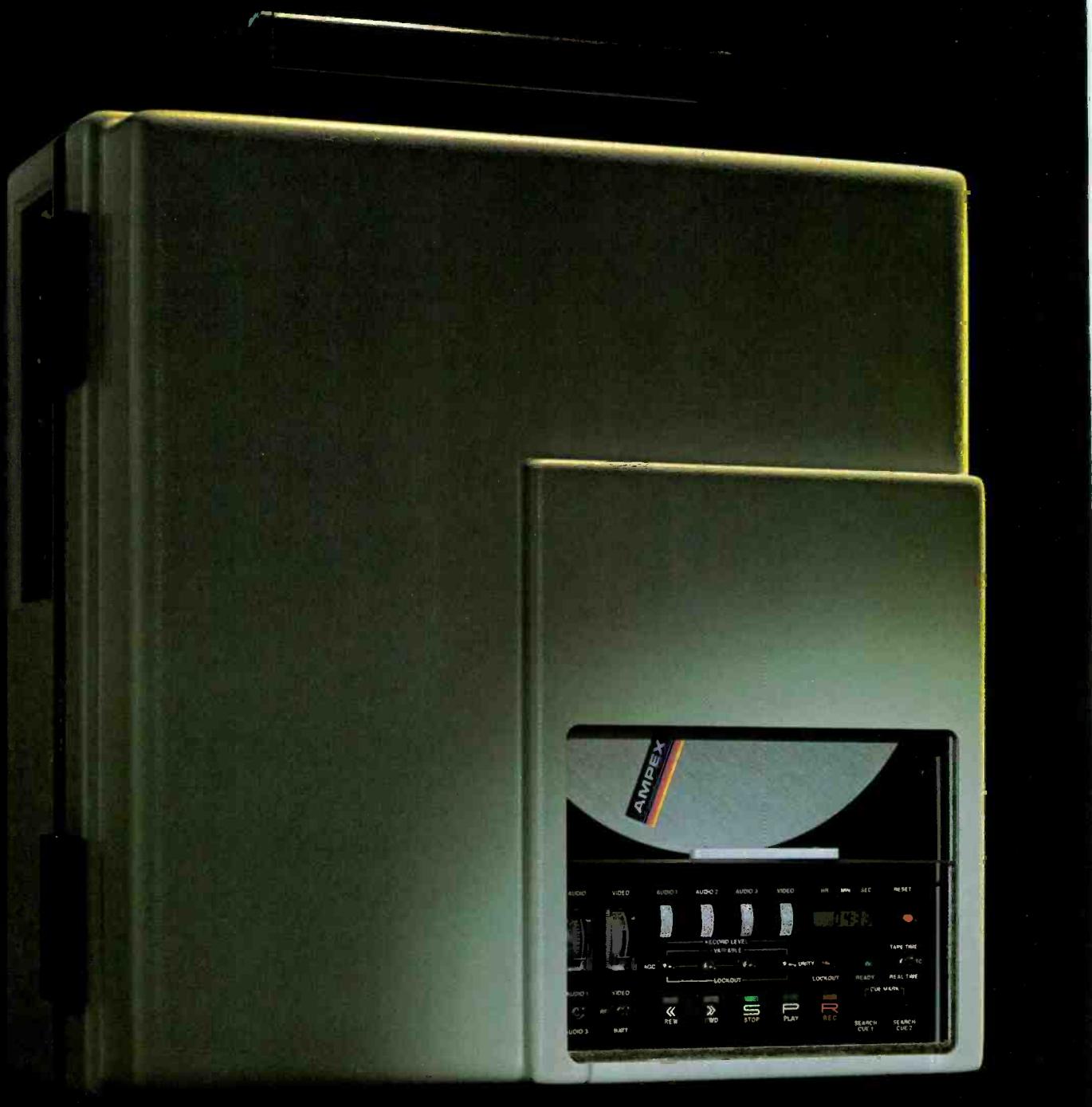
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AMPEX ON PORTABLES

The VPR-20 Edge. Total Performance in the Field.

Post-production in the field becomes an option when you take the VPR-20 on assignment. Its capabilities are so complete that you can return with a finished production.

Advanced Editing Technology. From Ampex, Of Course.

The intelligent design that went into our VPR-2B videotape recorder was also applied to our smart, rugged 1" portable.

For example, our exclusive dual-cue editing gives you studio-type control. Four edit-related functions give you the edge: From "let's see it" reviews, and precise returns to the next edit point, to total control when replacing undesired material, and even mid-segment edits to new material. All in one, easy to use portable.

The VPR-20 remembers through its exclusive tape timer and servo system, so your "cue-ups" are accurate and fast, and your edits are clean and color-frame accurate.

The VPR-20's performance continues with a video confidence feature that plays the picture back from the tape into the camera viewfinder during recording. You can use any color television receiver for playback. And thanks to our exclusive built-in color stabilizer, you can leave the time base corrector behind and still show full color in the field.

A Portable Should Be Portable.

The VPR-20 is. Even with non-battery use you'll be free of the burden of cumbersome additional equipment.

Unlike other portable recorders, the VPR-20 has a simple-to-use, plug-in AC power pack. It replaces the battery in our portable and allows you to forget the bulky external power supplies necessary with other portables.

The VPR-20 from Ampex. Total performance in a 1" portable videotape recorder.

Call your Ampex representative today. Tell him you're ready for the VPR-20 edge.

Get the Ampex Edge.

EXCLUSIVE DUAL-CUE EDITING

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Circle (16) on Reply Card

Planning a receive-only satellite earth station

By Elmer Smalling III, president, Jenel Corp., Dallas, TX

Many earth station owners, potential owners or users know very little about the technology of communications satellites that provide their programming. A broad description is given here of these satellites and their workings.

There are two basic types of satellites that differ by the way they maintain orbital stability: spin stabilized and three-axis stabilized. Once a satellite is parked in orbit, it must remain in a stable position so that its antenna and solar cell arrays are pointed in the proper direction.

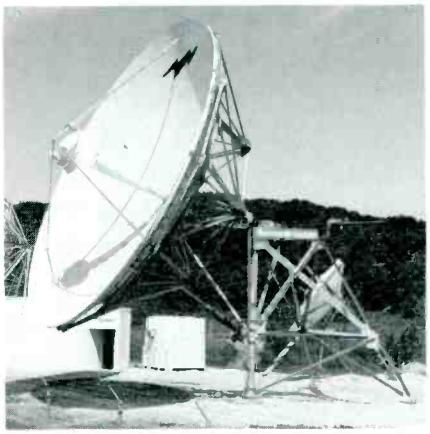
Many factors perturb satellite orbital stability (to varying degrees), including: (1) gravitational pull of the earth or moon, (2) solar wind or the bombardment of photons from the sun, (3) perturbations of the earth's magnetic and gravitational field, and (4) reaction to on-board mechanical motion. Of the two methods for orbital stabilization, spinning the satellite about its longitudinal axis is the oldest and most frequently used.

Like a gyroscope, the spinning mass of a satellite resists the positional counter-vectors brought about by the aforementioned forces. Small thrusters, working in concert with the spinning vehicle, maintain a given attitude and inclination.

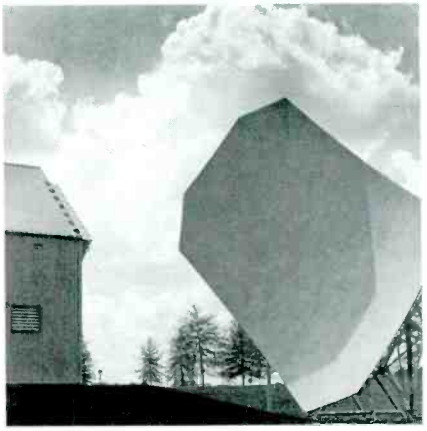
A spin-stabilized satellite should have a minimum of appurtenance. The solar cells as well as the beacon and telemetry antennas are mounted around the periphery of the satellite so that, as the satellite rotates, the cells or antennas are always spinning by the earth or the sun respectively by virtue of the rotation of the vehicle. They rotate rapidly enough to provide ample coverage of their receiving arcs.

The high gain directional communications antenna cannot be spun for it must always point toward the earth with a great degree of accuracy. To accomplish this, the antenna is rotated at the same

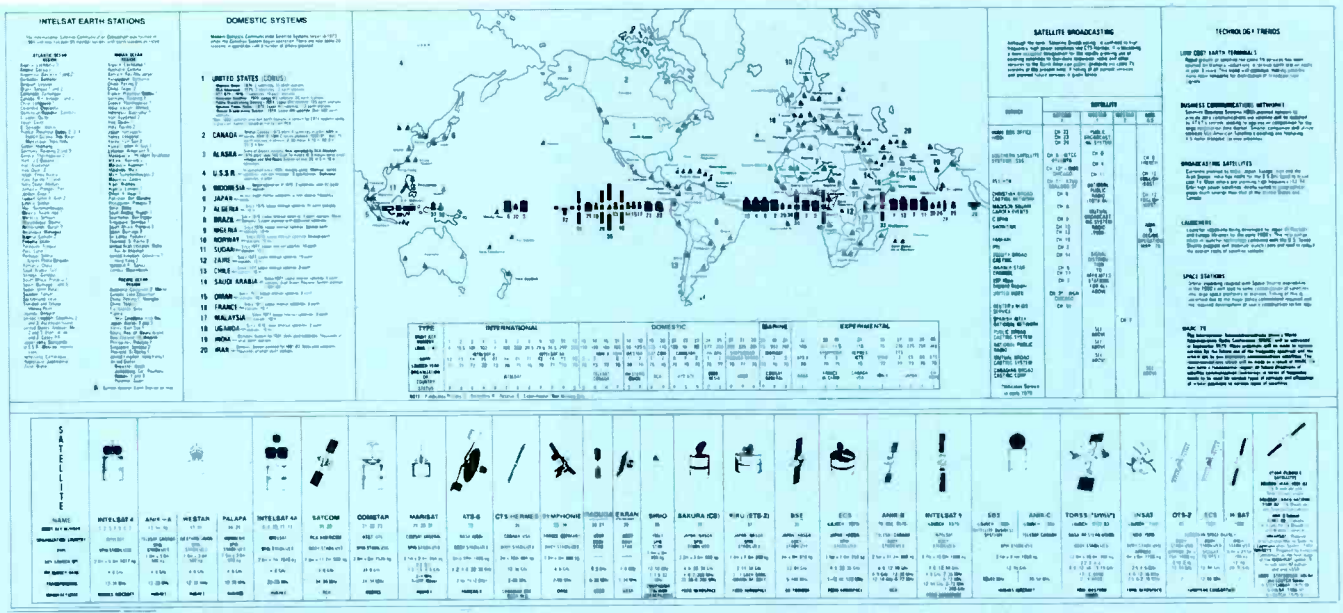
California Microwave: Small aperature terminals for satellite communications.



Andrew: The 12m Intelsat B earth station antenna modular system.



COMSAT: Multi-Beam Torus Antenna designed to communicate with as many as seven satellites simultaneously.



A comprehensive, up-dated wall chart on world communication satellites is expected to be available later this year from Kintech. If you would like to receive purchasing information when this chart becomes available, circle (324) on the reader card.

TM 500 now gives you the quickest distortion measurements ever.

Introducing the AA 501 Distortion Analyzer and SG 505 Oscillator. Fast, automated and accurate.

This new pair of TM 500 Plug-ins makes distortion measurement truly automatic to save you both time and money. For production testing, the AA 501's automatic speed provides substantial labor reduction with no loss in accuracy. Together, the AA 501 and SG 505 have the lowest harmonic distortion plus noise (THD+N) rating in the entire industry: 0.0025%.

The SG 505 Oscillator outputs a sine wave with the lowest residual distortion on today's market (.0008%). The AA 501 Distortion Analyzer uses digital processing to lock in on test signals, set levels and adjust the notch filter for nulling. All measurements, including dB levels are precalculated and then displayed on an LED readout.

The AA 501 and SG 505 are both TM 500 Plug-ins that can be installed in any of five mainframes, including rackmount, bench and portable. They can also be separated and still used as a team, even though miles apart. Or configured with over 40 other TM 500 Plug-ins currently available.

To find out more about the AA 501 Distortion Analyzer and SG 505 Oscillator, contact your local Tektronix Field Office or write Tektronix, Inc.

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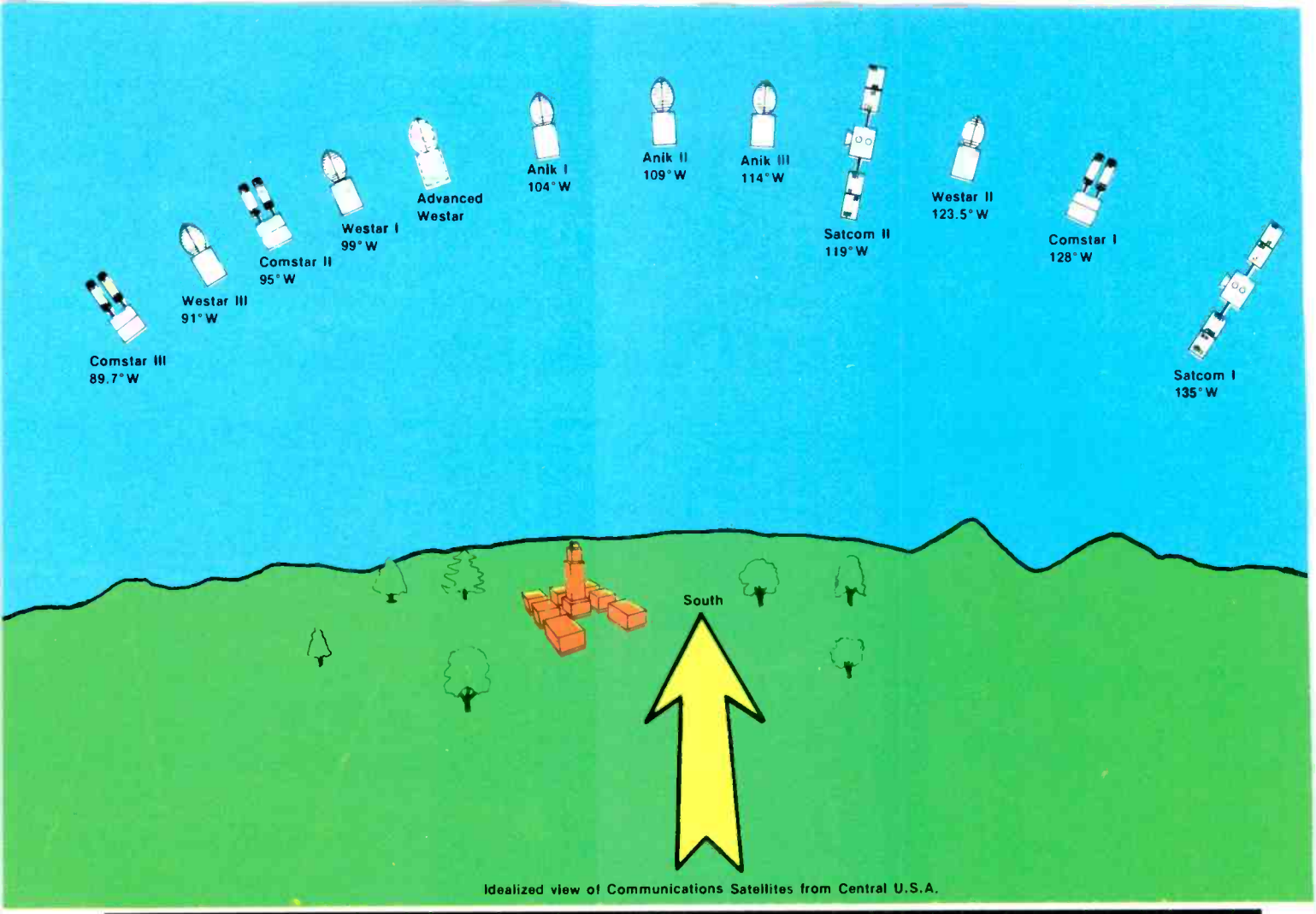
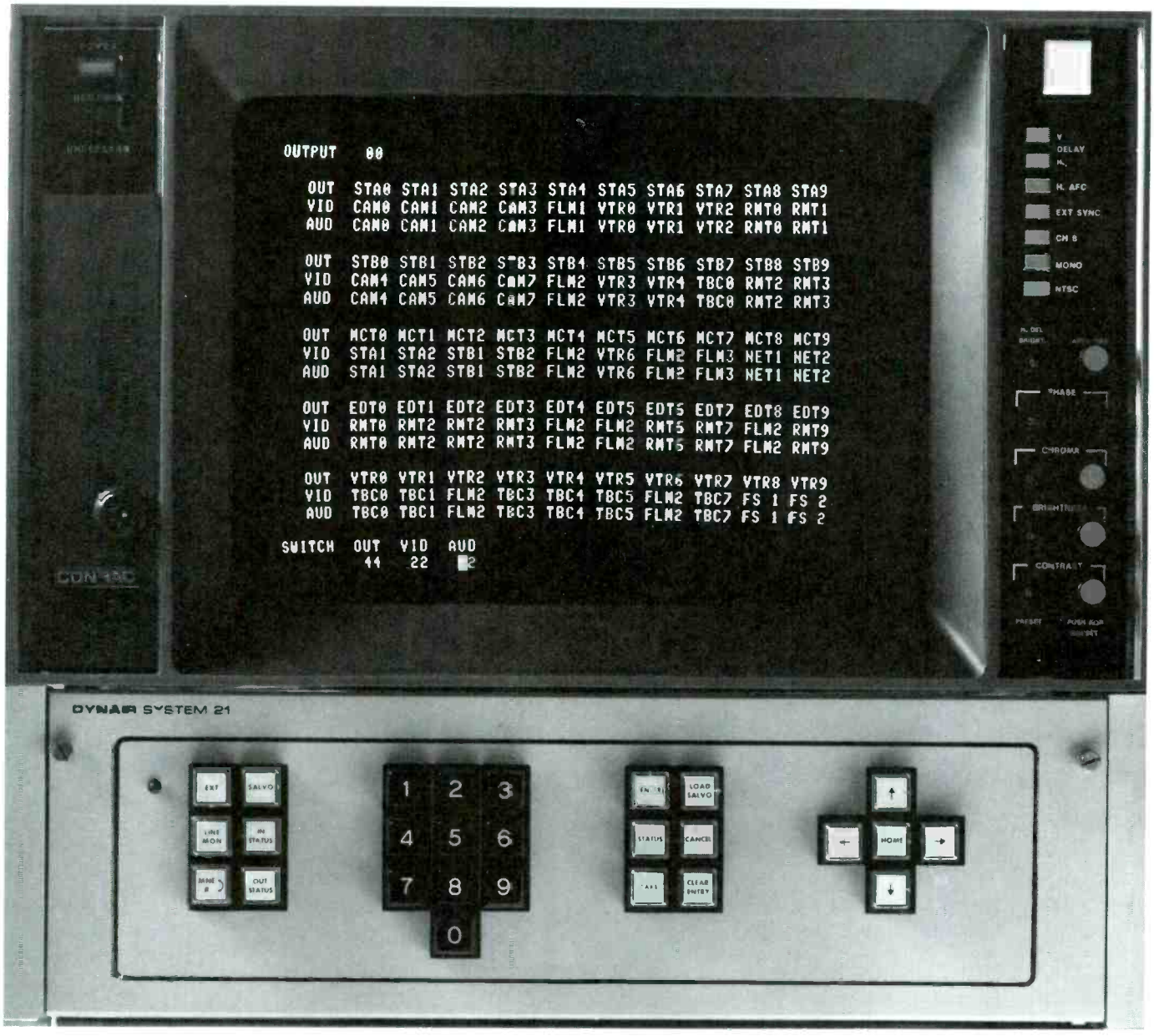


Idealized view of Communications Satellites from Central U.S.A.



What's up?

Plenty! CRT distribution switcher status monitors are not new, but DYNAIR's SCA-250B is in a class by itself. It makes the System 21 tell all.

It's a master control . . . using easy to understand keys, call for any one of the System 21's 1000 outputs. Connect it to any of the 1000 inputs, different video and audio if desired.

Not enough? Load 80 preset selections. Edit at will and then make all switches on the *same vertical interval.*

Status by the output? Pick a number and you'll see that output plus the next 49. Choose numerics or mnemonics. Roll through outputs 50 at a time.

Status by the input? Key in a source and the display lists all outputs on line . . . *right now* . . . in numerics or mnemonics.

There's more! So ask about System 21's capabilities. The SCA-250B is only a 5¼" example.

SYSTEM 21

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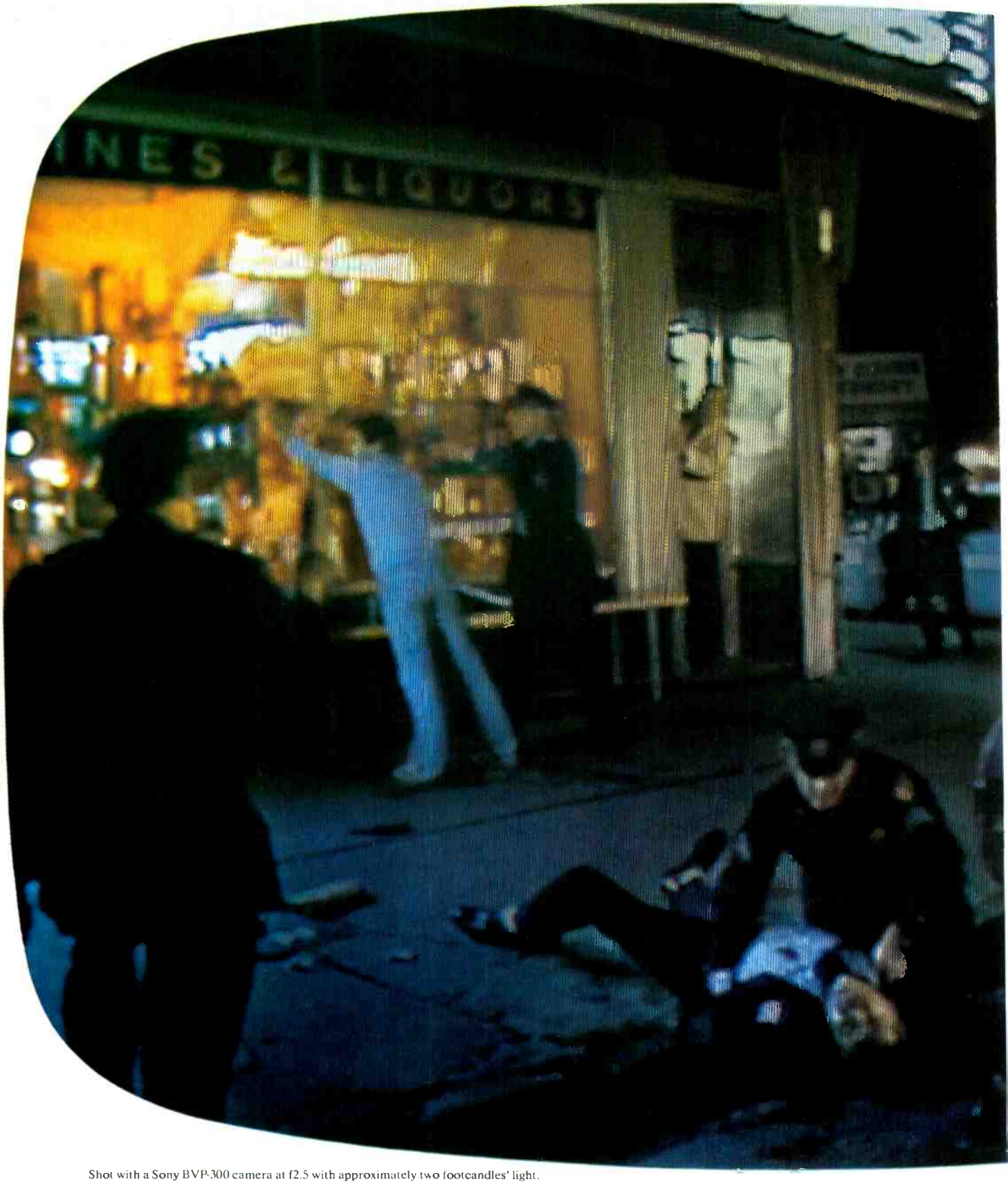
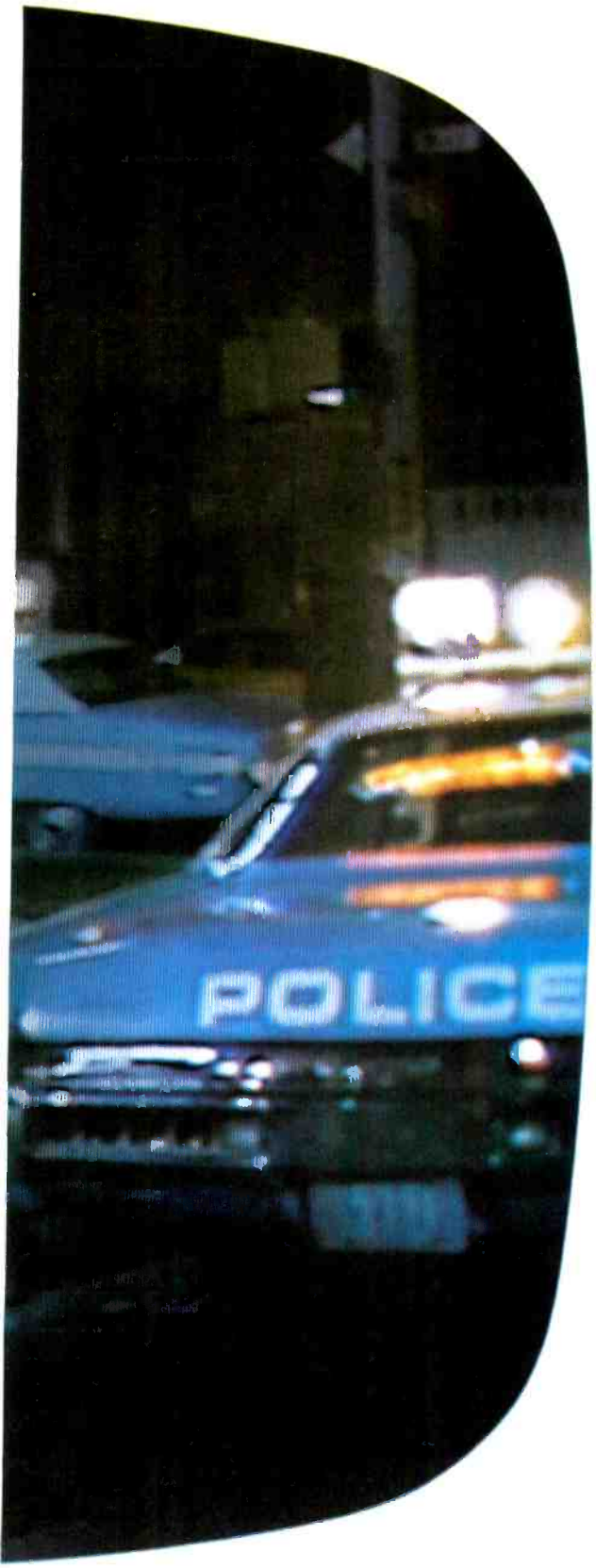
"IF YOU WANT TO COVER THE USE A CAMERA THAT'S ONLY GOOD



Shot with a Sony BVP-300 camera at f2.5 with approximately two footcandles' light.

DARK SIDE OF A CITY, YOU CAN'T WITH BRIGHT LIGHTS."

Henry Sheppard, WCCO-TV, MINNEAPOLIS



"There are news-gathering and documentary situations where the use of artificial light is just too intrusive or difficult to achieve," says Henry Sheppard, Chief Engineer of WCCO-TV, the CBS affiliate in Minneapolis.

"That's why our Sony portable BVP-300 cameras are such a big plus. With them, we can shoot in low-light conditions and get a lot of detail other cameras might not pick up. We even get good pictures with as little as two footcandles of light."

WCCO-TV owns seven Sony BVP-300's, which the station's photographers use together with Sony BVU-50 recorders. The cameras are used to shoot public-affairs programs and segments of PM Magazine, as well as for ENG and documentaries.

"We're very particular about picture quality," says Sheppard. "And before we committed ourselves to Sony, we evaluated just about every portable color camera available.

"Sony's colorimetry is excellent, its signal-to-noise ratio is high, and it always turns out pictures that meet our standards. Many of our engineers find its quality comparable to studio cameras. And our photographers like the way Sony handles. For example, in a helicopter, they can cradle the camera on one shoulder to reduce vibrations and get a very steady picture.

"And with the Sony system, each photographer can operate independently, without a second person along to monitor sound."

When asked about Sony durability, Sheppard replied: "We don't coddle our cameras here. Each one gets handled by about 15 or 20 different photographers. They come in in the morning, grab their equipment, throw it into the back of the car, and they're off. Sony takes that kind of treatment remarkably well, and it's a good thing, because we can't afford to have our cameras down."

Of course, Sony makes a full line of one-inch broadcast equipment, including cameras, recorders, editors and the BVT-2000 digital time base corrector.

For information, write Sony Broadcast, 9 W. 57th Street, New York, N.Y. 10019. Or call us in New York at (212) 371-5800; in Chicago at (312) 792-3600; or in Los Angeles at (213) 537-4300.

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Earth Station Antennas

The selection of an earth station antenna is just one step in achieving a satellite hook-up for broadcasting. There are many factors to consider in this selection, and the accompanying article delineates these details. The following chart is representative of the available antennas and current manufacturers. (For company literature, circle the boldfaced number, following each firm, on the reader service card.)

Check List / Company	Model	Transmit/ Receive	Receive Only	Antenna Size (meters)	Frequency (GHz) Uplink	Frequency (GHz) Downlink
Andrew Corp. (150) Notes (1, 2)	ESA10-46B	X	...	10	6	4
	ESA10-46HP	X	...	10	6	4
	ESA10-46CP	X	...	10	6	4
	ESA12-46	X	...	12	6	4
	ESA12-46HP	X	...	12	6	4
	ESA12-46CP	X	...	12	6	4
Anixter-Mark (151)	ES-40200SD	...	X	5	...	4
California Microwave (151) Note (3)	SAT4	...	X	1.2	...	4
	SAT6	...	X	1.8	...	4
	SAT10	...	X	3	...	4
	SAT15	...	X	4.6	...	4
	C6040	X	...	10, 11, 12	6	4
Compact Video (153) Note (4)	Compact 42	X	...	5	6	4
COMSAT (154) Note (5)	Multibeam Torus	X	...	5-10	6, 14	4, 12
Fairchild (155)	SDX	X	...	5,9	6	4
	...	...	X	2,2.5,3	...	4
Gardiner Communications (162)	5.6	...	X	5.6	...	4
Harris Broadcast (156)	5242	...	X	6.1	6	4
	5251	X	...	8.8	6	4
	5260	X	...	11	6	4
Holzberg (157)	NEC-790	...	X	1.2	...	12
Hughes (158)	SVRT	...	X	4.5,5,6	...	4
Microdyne (159)	PR23	...	X	7	...	4,12
Scientific Atlanta (160)	8006	...	X	3.0	...	4
	8005	X	...	4.6	6	4
	8008	X	...	5.0	6	4
	8010	X	...	7.0	6	4
	8002	X	...	10	6	4
	8007	X	...	11	6	4
	8101-5.5	X	...	5.5	14	12
	8101-7.7	X	...	7.7	14	12
US Tower (161)	USTC 3.3	...	X	3.3	...	4
	4 MLF	...	X	4.0	...	4
	5 MDF	...	X	5.0	...	4
	6 MDF	...	X	6.1	...	4

Note 1: HP configurations exceed US and CCIR pattern recommendations for greater frequency co-ordination in frequency-congested areas.
Note 2: CP configurations are specifically designed for use with Intelsat satellites.
Note 3: All systems designed to handle program audio material; in addition, SAT6, 10, and 15 designed to handle data transmission; the C6040 handles program, data and TV transmissions.
Note 4: Mobile uplink/downlink system uses Scientific Atlanta 5m parabolic antenna.
Note 5: COMSAT: The Multi-Beam Torus Antenna (MBTA) was developed to transmit/receive from as many as seven satellites simultaneously.

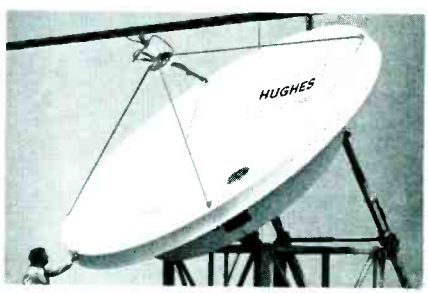
speed as the satellite only in the opposite direction causing it to appear stationary. The drawbacks of this system are the complex mechanics of coupling a spinning antenna with multiple feeds to a fixed vehicle and its transponders and the maintenance of a motor system for a long period of time in orbit.

The second method of orbital stabilization is three axis stabilization. After the satellite is parked in orbit, control is maintained using an internal gyroscopic inertial wheel that serves, in a small way, like the spinning satellite. Minor position correction is accomplished using three axis thruster jets located outside the vehicle. On this type of satellite the solar cells are deployed mechanically on long telescoping or folding arms and are kept pointed toward the sun by small solar array control motors and an on-board computer.

The antenna system which is firmly attached to, and an integral part of, the satellite is kept point toward the earth by the position of the vehicle. It can be seen that, in this type of vehicle design, the rather large supply of propellant needed determines the usable life of the satellite, which is in most cases seven years.

However limited, the two previous schemes for stabilizing a satellite

Harris: Earth stations dominated the parking lot at NAB-'80, and the Harris 8.8 meter dish was part of the scene.



Hughes: Antennas have dual-polarized feeds for choice of focal point or prime focus feeds.

Lost Air Time Problem Solved

IMAGINE! Going from one back-up Transmitter or Antenna to another without blowing a spot.

For the Broadcaster who would rather switch than fight.

Announcing "The Patchless Panel" the 2 second change, from stop to start. The surprise, is it's less than ONE HALF THE COST of a MOTORIZED SWITCH. Just as fast as some easier to maintain than most and probably more reliable. (Since we don't use Finger Stock that will bend or break.) The secret, we use our patented Connector with its Wristband Spring that has years of proven reliability.

Most TV - FM and AM stations have used a three port 3⅛ patch panel to perform this function. It's sometimes very cumbersome and much slower (at the cost of air time.) Others have over-corrected by buying unnecessary, EXPENSIVE MOTORIZED SWITCHES that are used in a maintenance function or by a manned transmitter.

The features of our switch are:

1) Can be operated by 1 man with 1 hand from latch-lock to latch lock in 2 seconds.

2) Has positive lock-in-place latch action.

3) Any maintenance to switch does not necessitate removal of coax or mounting brackets. Can be done by removal of front panel.

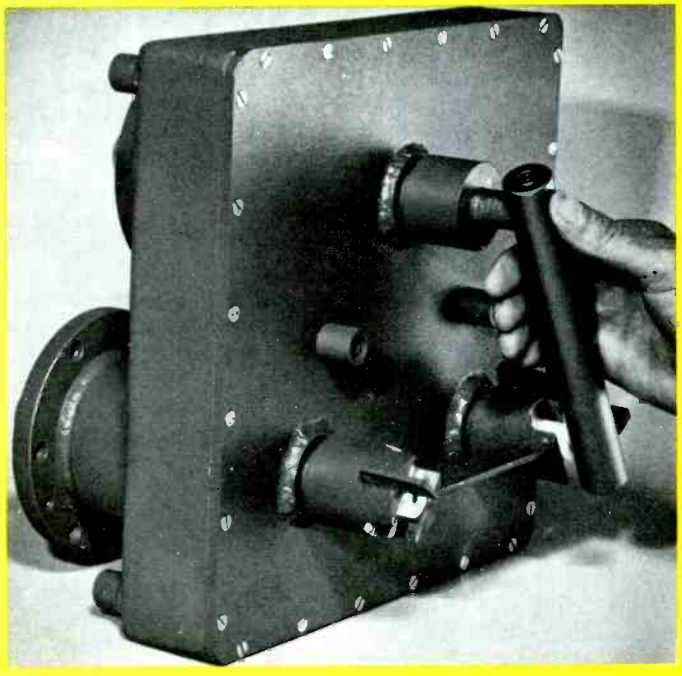
4) When switch wrist-band contact needs replacing (about every 10 years depending on switch use) the total maintenance time to change these is 30 minutes with time for a coffee break.

5) Most electric switches come equipped with E.I.A. flanges, but adaptors must be purchased at additional cost to adapt to your present system (at the cost of approximately $75.00 each x 3.) Our switch flange ports, all male out-puts, are available at no additional cost, in Unflanged Straight Couplings, E.I.A., or Universal Marmon.

6) Weight — 25 lbs. or less depending on flanges ordered. Size — less than 1 cubic ft. Power handling capability — same as 3⅛ unpressurized line.

Price $825.00 — FOB Goffstown, N. H.

For data sheet, circle reply card No. given below.



The three port 3⅛ 50 Ω Patchless Panel photo above shows the selector bar before being pressed into switch lock position. Note: Fingers placed behind bar release lock lever and when bar is pressed into position lock automatically closes. Bar visually shows path selected. The Patchless Panel may be used overhead or in a vertical position. (Patent Pending)

In making this unit available we are maintaining the same engineering standards built into our transmission line. Just like our first 10 years, if we don't make it better, we don't make it at all. Remember SWR Inc. is Systems with Reliability.

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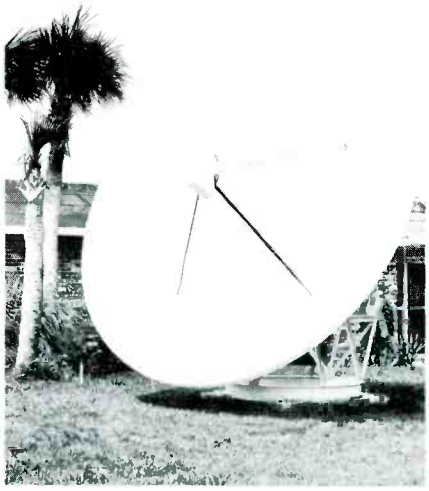
Circle (21) on Reply Card

are utilized on all existing vehicles. The loss of mechanical coupling, thruster engines, system power, or propellant can doom a $25,000,000 communication satellite.

Both types of communications space vehicles have many systems in common. Some of the general features are described below.

Antennas. The main antenna system, which provides spot beams, horizontal and verticle polarization and gain is one of the major elements of a communications satellite. Engineers have had to incorporate all of these functions, along with considerable gain and highly controlled bandwidth, into the communications antenna design. Satellite-borne antennas are usually

(*Continued on page 32*)



Microdyne: Receive-only dish specified at 6 and 12GHz.

Scientific Atanta: Earth station antennas at NAB-'80/Las Vegas.

SATELLITE TELEVISION BACKGROUND

The first use of a man-made orbiting satellite to relay television pictures occurred in 1962, with an early generation satellite called *Telestar.* Compared to today's sophisticated satellites, this early Telestar, like many others lifted into orbit by rocket in the '60s, was a *low-orbit* instrument. Because of limited rocket power, it was not possible to lift a weighty communications relay station (television satellite, and its on-board control systems into a *high orbit.*

This early satellite, therefore, orbited close to the earth's surface, often as close as 100 to 150 miles, and circled the earth at high speeds. To transmit or receive a message from such a satellite relay station, a ground-based earth station was utilized with an antenna that was capable of tracking the satellite as it orbited overhead. Since the satellite's elevation was quite low, the earth station antenna could view the satellite for only a small portion of its orbit.

In 1963, these primitive satellites gave way to a new concept, pioneered by the Hughes Aircraft, which was called *Syncom.* The Syncom experiment placed a satellite approximately 22,300 miles above the earth's equator and pointed the satellite's motion along a line identical to the earth's rotation on its axis. Telemetry was used to carefully control the speed of the satellite to match that of the earth's rotation, and the satellite achieved a *geostationary orbit.* For communications, this means that the satellite appears fixed in space, and an earth receiving station merely has to direct its antenna at this location to receive the satellite transmission.

Glossary of Terms

C/I: Carrier to Interference

This measurement is the ratio in (deciBels) of the level of the received carrier above the total interfering radio frequency source/s such as: (1) satellites other than one desired; (2) terrestrial microwave; and (3) terrestrial radar. The minimum ratio should be 18dB (received carrier approximately 63 times that of received interfering signals).

C/N: Carrier to Noise

This measurement is the ratio (in deciBels) of the desired carrier received to the noise detected at the same frequency. The sources of noise may be considered as: (1) atmospheric absorption; (2) rain attenuation; (3) pointing accuracy of the satellite and earth station antennas; (4) polarization; and (5) satellite and earth station equipment degradation.

Other elements that degrade the signal are: (1) thermal noise (due to motion of electrons and defined by Boltzmann's constant at -228.6 dBW/K); (2) path loss (in geostationary satellite work this loss amounts to approximately -200dB); and (3) noise bandwidth (where noise increases as bandwidth increases).

The greatest factor, by virtue of weakening of the received signal after 22,000 miles through space is approximately -198dBW (about 10^{-18}W).

T: System Temperature

Measured in degrees Kelvin (K), the system temperature is derived by adding: (1) antenna temperature, consisting of line, sky, ground, rain temperatures, to (2) Low Noise Amplifier (LNA) temperature (K). Typical values are 30K for antenna temperature and 100K for LNA temperature.

G/T Figure of Merit
(gain/temperature)

Assessment of the quality of communications between earth stations and satellites is complex because of the extremely long path, complex noise calculations, and various signal degradations. An overall figure of merit can be established which relates to the performance of a receiving station (satellite or earth) by considering the following factors: (1) carrier-to-noise ratio; (2) FM threshold characteristic of the receiver; (3) free space bars; (4) transmitting and EIRP; (5) bandwidth; (6) thermal noise; and (7) system losses. An average G/T for a small TVRO would be about 23 (dB/K).

EIRP: Effective Isotropically Radiated Power

An isotropic antenna is a theoretical radiator which has a gain of 1 or 0dB, for it radiates equally in all directions. Antennas are passive devices and have no way of creating gain or other through directionality, e.g. a particular antenna might radiate power applied to it in one direction only.

Actually, isotropic radiators are almost impossible to construct because of the following effects: mechanical and electrical nonlinearities and near-field coupling. Since gain measurements would have little meaning with every antenna (having a possible variance of up to 3dB), the isotropic source is used as a standard of comparison.

Effective isotropic radiated power

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is then the transmitter power times the antenna gain (above isotropic, or dBI) less any transmission line loss.

FM Threshold

The FM threshold can be considered the signal capture point of a receiver. There are two thresholds to consider:

1. Noise Threshold—the point where, for every 1dB increase in the carrier to noise ratio (C/N), the signal to noise ratio increases by 1dB. This normally occurs above a C/N of 10dB on most receivers.
2. Improvement Threshold—a point close to the noise threshold where the signal to noise ratio takes a sharp jump, at least 30dB.

Beyond the Improvement Threshold, the signal to noise ratio improves 1dB for every increase of the carrier to noise ratio of 1dB until the receiver is saturated—that is, the mapping of C/N and S/N is no longer increasing on a one-to-one basis.

C/T: Carrier to Thermal Noise Power

Power measurement will increase or decrease with bandwidth. The C/T measurement enables calculation of absolute power regardless of bandwidth. It is related to the carrier to noise measurement by the addition of the logarithmic functions of bandwidth and Bolztmann's constant to C/N.

TVRO: Television Receive Only Earth Station

Receiving satellite television signals requires a sophisticated system of microwave equipment called a TVRO, that features:

1. Low Thermal Noise—accomplished in some cases by thermoelectric or cryogenic cooling.
2. High Gain—accomplished by using Gallium Arsenide field-effect-transistors, stripline circuits, and parametric amplification.

LNA's are sold with varying gains and noise temperature ratings, e.g. 40K at 55dB to 200K at 42dB, each to fit a particular TVRO application.

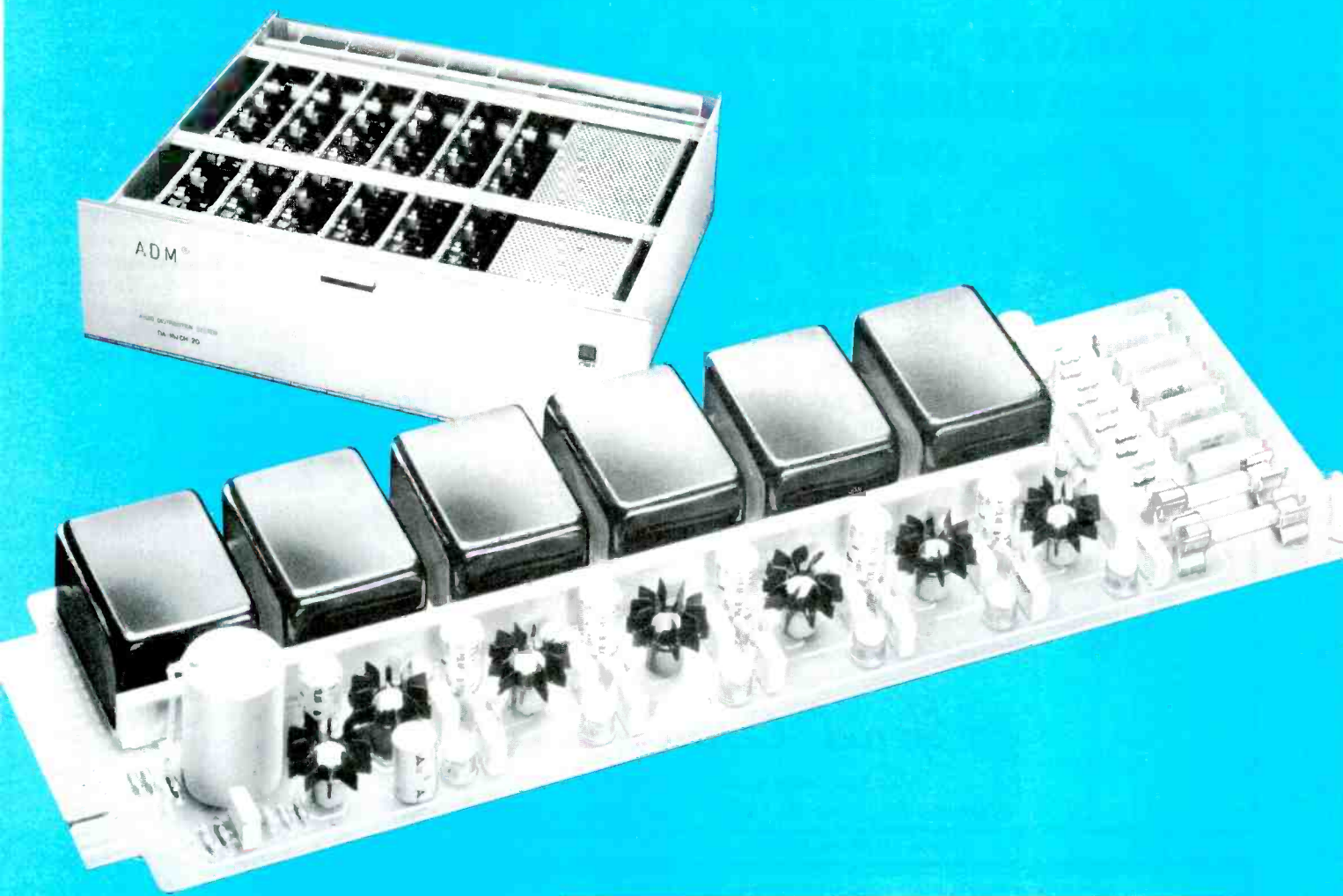
ELEV: Antenna Elevation Angle

Depending upon the location of the satellite in the geostationary arc to be received, or transmitted to, and the geographical location of the antenna, the vertical *look angle* or *elevation* will change. Because the location of most of the communications satellites above the equator is between longitudes 90° and 137°, most Eastern US and Canadian stations look to the Southwest, and most West stations look toward the South. Since the orbital location from 90° and 137° appears as an arc above the horizon, the vertical elevation (look angle) will be slightly different for each earth station, varying from 15° to 45°.

Because transmission through more of the earths atmosphere, stratosphere, and ionosphere (static cover) encounters more thermal noise, higher elevation angles are preferred.

AZ: Antenna Azimuth

Depending upon the location of the satellite in the geostationary arc to be received, or transmitted to and the geographical location of the antenna, the *horizontal bearing* or *azimuth* will change. Because of the location of most of the communications satellites above the equator is between longitudes 90° and 137°, most Eastern US and Canadian stations look to the Southwest and most West stations look toward the South. Since the orbital location from 90° and 137° appears as an arc above the horizon, the horizontal bearing (Azimuth) will be slightly different for each earth station.



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- Input levels up to +27 dBv.
- Output levels up to +27 dBm before clipping.
- Each of the six output amplifiers has an individual, front accessed gain adjustment, as well as a test point.
- Each CH20B will house up to six DA16B cards, and has a complete set of redundant power supplies with automatic changeover.
- The DA16B/CH20B system is designed and built to meet ADM's highest quality and performance standards, and carries a five year unconditional warranty.

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modified parabolas or small aperature horns. In addition to the main communications antenna, there are omni-directional antennas for telemetry, initial post-launch location and beacons. These are small, low gain, broadband devices—the type which have been used for years in the aerospace industry.

Transponders. A transponder is normally a device that receives a signal on one frequency and retransmits it on another. Satellite transponders normally consist of sophisticated and redundant low noise input systems that feed redun-

The Future of Satellite Communications

This issue has dwelled on existing communications philosophy and technology, both of which are evolving rapidly. In the near future, satellite systems, as now known, will be replaced by far more sophisticated systems.

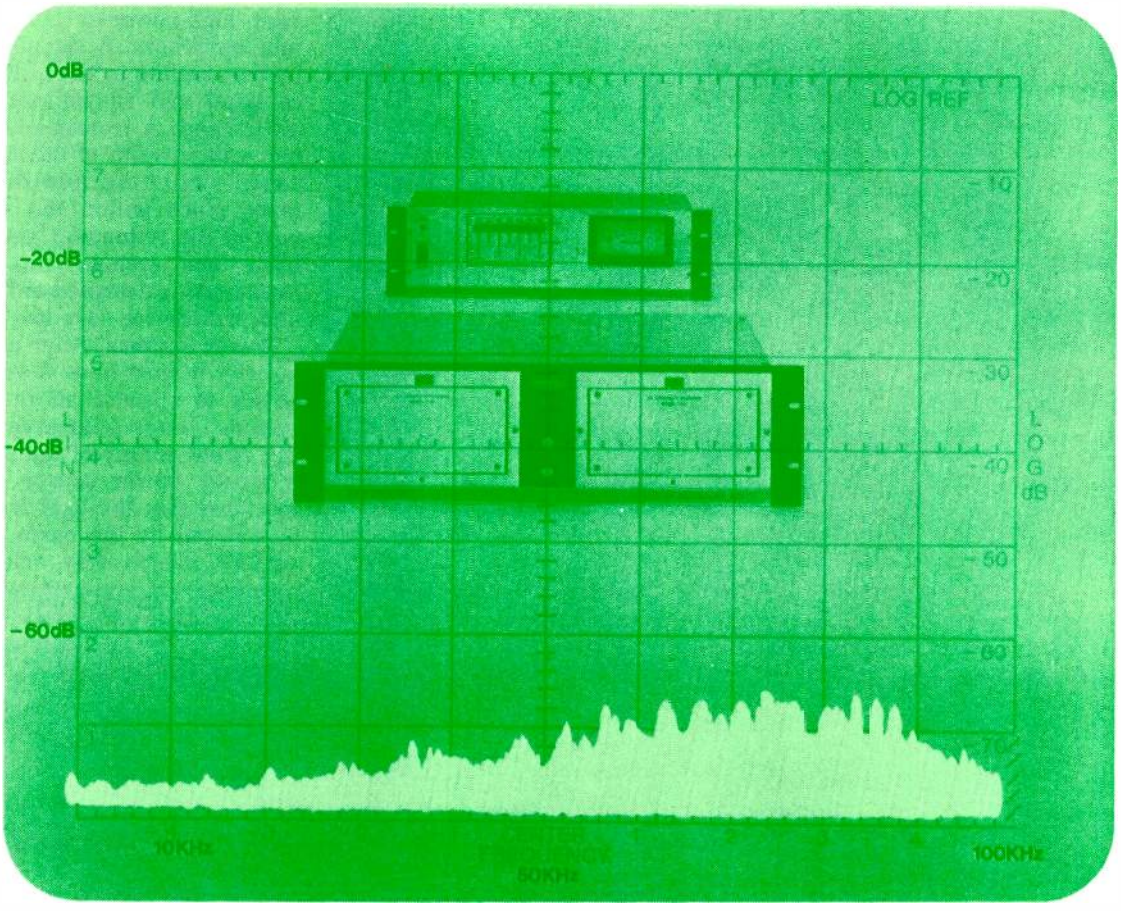
The present system of small, transponder-limited satellites that ring the earth is certainly not in keeping with the state of the technology. A severe curtailment of the space program some years ago, and the small amount of funds and research allocated to space travel, have severely limited the implementation of satellite communications technology.

One large space "antenna farm" that would be put in place, constructed and serviced by a shuttle-type vehicle would satisfy most communications needs.

Spot beams, multiple transponders (1000+), and variable power transmitters (which would be serviced in-place) could cover the western hemisphere, providing a host of communication possibilities. Some concepts which could be realized are:

1. Direct-to-home broadcasting.
2. Small (aperature) antenna usage (1 to 3 foot diameter).
3. Personal communications (to wristwatch type transceivers).
4. Manned space communications center.

In addition to improving the space transponder systems, schemes for bandwidth reduction for video broadcasting must be developed. Systems that employ fast transforms and statistical signal reconstruction are already in the works. With the advent of large scale micro-storage and very quick miniature computers, extremely wide bandwidth will no longer be required for high quality color video signals.



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FREQUENCY STABILITY: Fully frequency-synthesized transmitter.

POWER: Adjustable up to 12-watts to compensate for degradation and handle long and difficult terrain.

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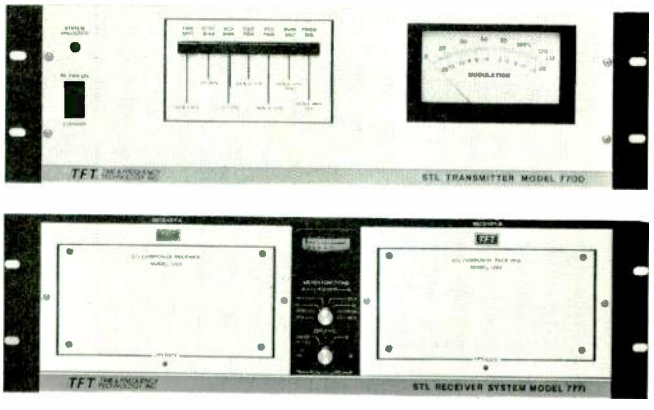
All sound too good to be true? We'd like to show you our recent field test reports and complete specifications, so you can judge our STL for yourself. Call or write TFT.



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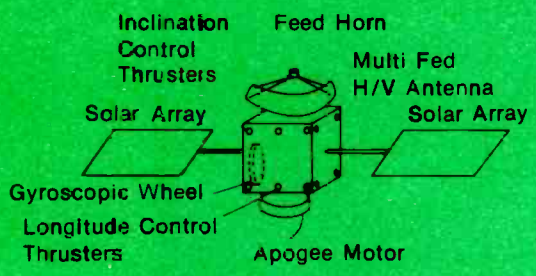
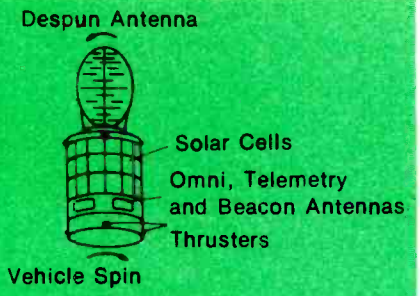


Idealized 3-Axis Stabilized Satellite



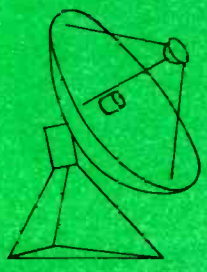
Idealized Spin Stabilized Satellite

Types of Satellites

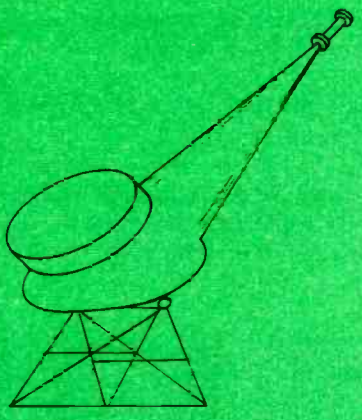
dant high-powered traveling wave tube amplifiers. A signal is received by the satellite in the 6GHz frequency band and re-transmitted in the 4GHz band. A transponder normally has a bandwidth of 36MHz. Complicated switching and distribution takes place within the satellite as part of the redundant amplifier and horn feed system. This *plumbers nightmare* is designed to be compact and provide for very low loss.

Power Systems. After a satellite is in orbit it must have a good deal of power to operate all the on-board systems. Large solar arrays that tap the direct energy of the sun provide a steady power source except for the times that the light from the sun is eclipsed by the earth. For these periods (which may amount to an

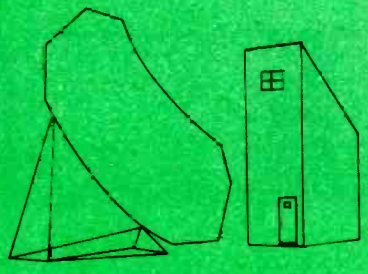
Types of TVRO Antennas



Parabolic Reflector



Small Aperature Horn



Spherical Antenna

SATELLITE PROGRAMMING

SATCOM I	
T*—Programming	
1	KTVU
2	PTL Network
3	WGN-TV
3	WFMT (FM)
5	The Movie Channel
6	WTBS
6	UP1 Newstime
7	ESPN
8	Christian Broadcasting Ntw.
9	Madison Square Garden Sports
9	Calliope
9	Thursday Night Baseball
9	Black Entertainment TV
9	C-SPAN
10	Showtime West
11	Nickelodeon
12	Showtime East
13	Trinity Broadcasting
16	Showtime Plus Sports
16	Apalachian Comm. Service Ntw.
17	WOR-TV
18	Reuters News Service
18	GalaVision
19	RCA Message Traffic
20	Total Communications Systems
21	English Channel
21	Satellite Programming "Network"
21	Home Theater Ntw.
21	Jesus Is Savior And Lord
21	Disco Network
21	Seaburg World
22	HBO West
22	Modern Satellite Network
23	HBO Take 2
24	HBO East

COMSTAR 2	
T*—Programming	
9	ESPN
11	Rainbow Communications
13	Southern Satellite Systems
15	Showtime
17	HBO
18	HBO
19	Satellite Communications Ntw.
20	Spanish International Network
22	TCS
23	United Satellite
24	National Christian Network

*T - Transponder Number

Westar Customers

Westar I: Dow Jones; PBS; Mutual Radio; Muzak; Rasmussen Enterprises; Family Network; Sun Belt Radio; National Public Radio; Satellite Business Systems (SBS); Bonneville International; Westinghouse Group W's Vidsat (in fall); and Satellite Communications Network.

Westar II: Robert Wold Co.; American Satellite Corp; and Western Union's message services.

Westar III: Spanish International Network (SIN); ABC; Video Communications Inc.; Cable News Network; Intelsat/Mexico; Hughes Television; CBS; AP Radio; RKO; UPI; Time Inc; Southern Satellite Systems; and BlairSat (in fall).

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- Remote control capability
- Play only or record/play combinations
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- Two torque spooling motors
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- 120/240 volt operation
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hour and a quarter per day), batteries are included in the satellite, providing an uninterrupted power source. These cells are charged by sophisticated demand battery chargers and can usually provide power for up to three times eclipse time (about 4 hours). Satellite power is efficiently managed by way of an on-board housekeeping computer and telemetry from the earth. Power systems must have a great deal of redundancy as well as fall-off protection built in.

Thrusters. In both types of spacecraft, spin stabilized and three axis stabilized, small thruster rockets mounted in strategic positions permit positive control over momentum and changing space conditions. An on-board computer and telemetry control firing of these rockets to maintain proper attitude and inclination. Controlled low thrusts of less than a third of a second are quite common.

The numerous thrust rockets mounted about a satellite are critically-machined devices that cost around $1000 each. Preheating of the thruster orifices is available on command for increasing the unilateral vector of thrust from the rocket. This preheating is one application of the spacecraft on-board power system.

Sensors. Monitoring and controlling the many systems on-board a satellite and in the vehicles near space requires a number of sensors that normally correct analogue measurements to data for handling by space and earth computers. Some of the parameters sensed are: earth position, sun position, magnetic field, solar array position, solar array power, battery power, battery drain, battery charge and charge rate, fuel on board, gyro wheel or despin motor rpm, transmitter amplifier parameters, receiver parameters, temperature, micro meteorites, thruster status, and telemetry transmitter and receivers. Most of these sensor (transducer) circuits are redundant.

Thus, a satellite is a complex and delicate instrument that must be designed to withstand the harsh environs of space as well as the hazards of launch and transfer. Satellites have become quite sophisticated over the last 20 years, but satellite design is still in its infancy. As more engineers are trained in space vehicle design and as circuittry improves, the next 20 years should show vast improvements in lifetime sophistication of communications satellites.

How To Specify An Earth Station

There are many things to be considered in planning a TV Receive-Only (TVRO) earth station, especially because the system must be capable of receiving high-quality video and audio for rebroadcasting. The following steps should be taken by prospective earth station owners to make the start-up task simpler.

Step 1: Selecting the satellite

Determine which communications satellites (Satcom, Weststar, Comstar) are to be received and which transponder(s) on the satellite(s) the programming will be transmitted on. This year, there will be increased use of Westar and Comstar satellites because of the loss of Satcom III causing some schedule juggling. It will be necessary to make certain the site selected is capable of viewing the whole satellite arc from 85° to 140° West longitude.

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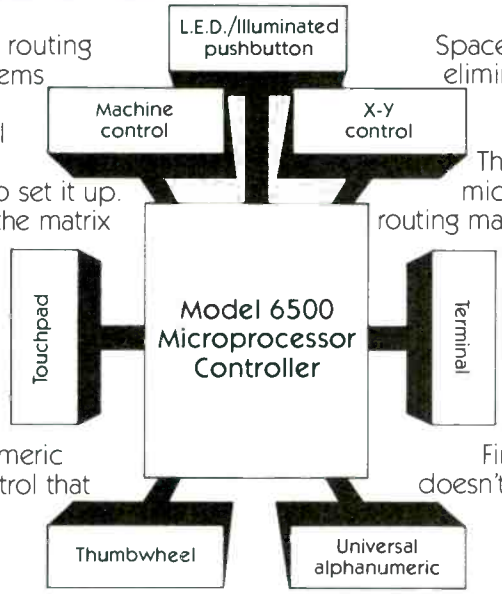
It all depends on how you'd like to set it up. Our design engineers can then tailor the matrix for you. From your smallest requirement on up to any desired size. And they'll help you select the control that's best suited to your needs, too.

The choice is yours. Touchpad, thumbwheel, illuminated or L.E.D. pushbutton, machine, X-Y, or alphanumeric universal control. Even a terminal control that allows you "supervisory" control throughout the system, or computer control through our RS-232 port.

What's more, 3M routing switchers are easily expandable. Start with a matrix that matches your present requirements. Then as your studio grows, your routing switcher does, too. With the simple addition of extra frames and switch cards.



Space-guzzling, multi-conductor cables are eliminated. And so are unnecessary output panels. Because with our system, outputs can be reallocated as required. The heart of the system, the Model 6500 microprocessor, as well as controlling the routing matrix, can be integrated with a machine control system to offer absolute production control of film chains, VTR's and other production machines. Or it can be used as a stand-alone machine control system which offers the same coaxial wiring and expandability of the routing switcher panel. Finally, a routing switcher whose growth doesn't depend on the size of your building.

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3M

For the past four years, most broadcast and cable programming has been via Satcom I. It was thought that with the launch of Satcom III most of the broadcasting and cable programming would be relayed on this satellite, making antenna orientation simple for the earth station owner. However, with the loss of Satcom III and the need for many additional transponders, the load has been taken by other carriers: Americom, Westar and Comstar. Because permission can be obtained to re-broadcast programming from the originators, it is advisable to negotiate agreements with programmers before purchasing TVRO hardware.

Step 2: The feasibility study

Conduct a feasibility study for each earth station (receive site) proposed. This study should include:

(**A**) Latitude/longitude and elevation identification.

(**B**) Determination of any terrestrial interference, such as microwave or radar.

There are a number of services available that, using a computer data base, can determine potential interfering sources by azimuth and signal strength. The FCC requires this type of interference identification in the license application. Prior to contacting a search bureau, obtain a geographic survey map and determine zone latitude and longitude and indications of mean sea level. An *X* marking the site location will help the service bureau retained for the feasibility studies.

(**C**) Determine the physical feasibility of mounting the antenna and associated hardware at the receive site.

The location must have a clear sight to the southwest sky for locations in the Eastern or Central United States or to the south for locations in the western states. There should be no obstacles more than 50 feet high within about 100 yards of the site. Constraints at an existing broadcast or cable facility that do not meet these qualifications may require a good deal of engineering.

There are three general types of antennas from which to choose: a spherical antenna, a simple parabolic reflector, or a small aperature horn. The spherical antenna allows the use of multiple feeds, thereby reducing the number of large, single-use reflectors, if multiple satellites are to be received at the sight. The spherical or torus antenna has just become commercially available. As many as four satellites may now be receiving simultaneously, or in quick succession by moving the feed horn. The spherical antenna system takes up more ground space than one small parabolic antenna, but less than two or more. However, a multiple feed spherical antenna costs more than standard off-the-shelf parabolics.

Be certain that the gain of the antenna and the side lobe characteristics meet FCC requirements for license filing. The spherical antenna, being a relatively new device, has had less commercial experimentation than the horn or the parabolic reflector antennas.

In addition to antenna selection, determine the boresight angle (including the FCC pre-requisite sidelobes) making certain that it clears any obstacles near the antenna site. In certain cases, receive-only earth station owners have actually mounted their antennas in a hole in the ground or in a screened off area to shield it from terrestrial interference and to provide a site aesthetically pleasing to neighbors. Complaints from neighbors about a large antenna affecting the environment

The end of the endless loop.

Eumig's new FL-1000 makes cassettes the broadcast medium.

The Eumig FL-1000, an extraordinary new cassette tape deck, has started a revolution in the world of broadcasting. We believe—and radio engineers agree—that it will soon make the cassette the standard tape format in the broadcast industry.

The FL-1000 is the world's first computer-interfaceable cassette recorder. Up to sixteen FL-1000 decks can be controlled by any 8-bit computer. Some of the decks can be used for commercials; others for news and weather; still others for music and station ID's. And the location of *every* item on *every* cassette can be stored at the beginning of each tape and then in the computer, so *any* sequence can then be played back—automatically, with no human intervention, all day and all night long.

Watching a bank of FL-1000's working together is an awesome experience. One deck is rewinding while another is playing, and still another is moving in fast-forward to locate the next selection. Meanwhile, other decks are copying from a network feed and recording an air check.

The technology of the FL-1000 is so advanced that half a dozen units can do the work of more than 100 individual cartridge players—plus several reel-to-reel recorders. And they do it better, at far less cost, with sound quality comparable to that of the finest open-reel equipment. And the Eumig FL-1000's have none of the mechanical problems that plague endless-loop broadcast cartridges.

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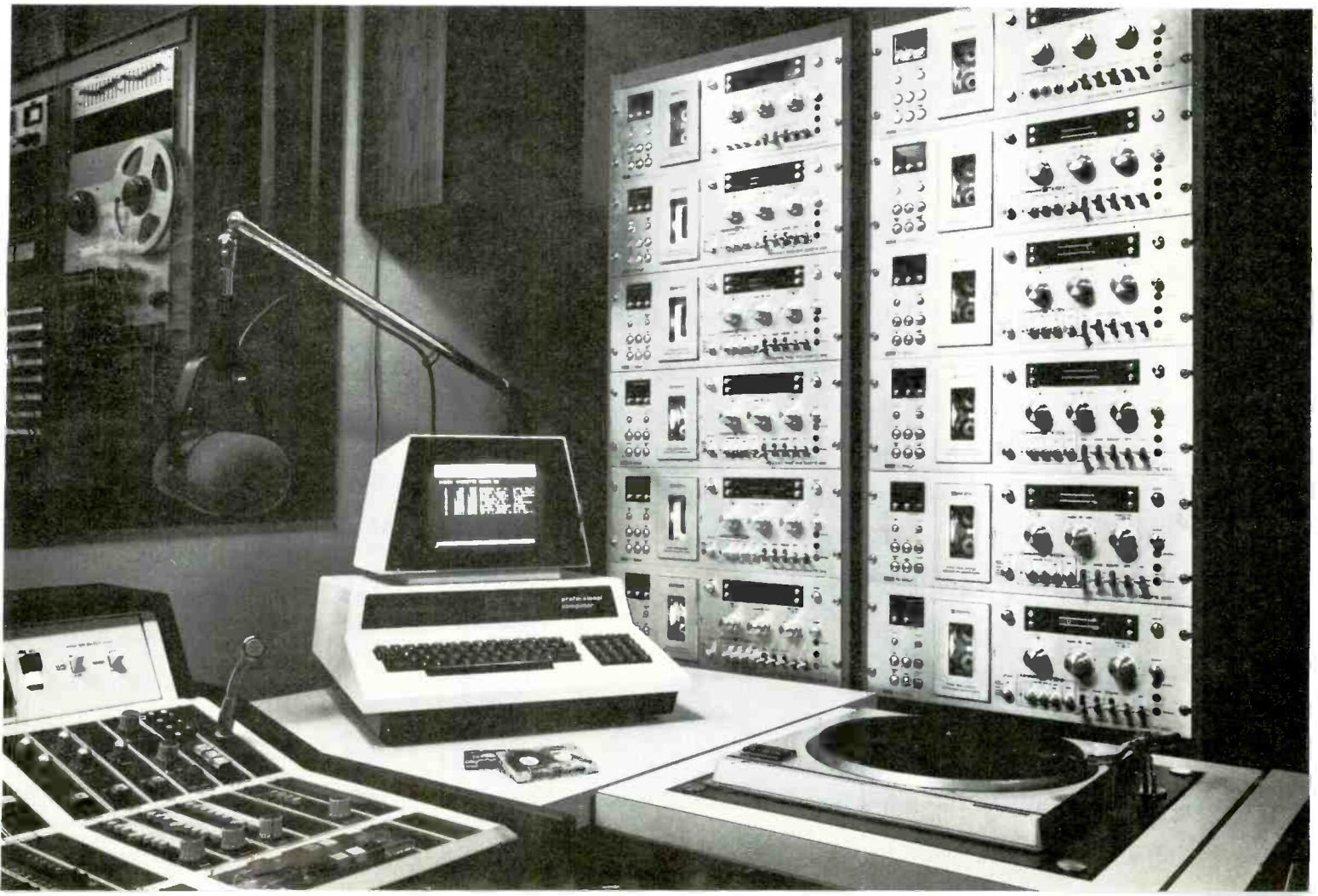


can quell the filing and license.

Another factor to consider is weather.

In cold regions, ice or heavy snow build-up can reduce frequency/gain characteristics of the antenna. Consider a radome de-icer or take steps to keep ice and snow from covering the antenna.

(D) Once the site has been chosen, establish the satellite *footprint* and calculate the gain needed for that site. Satellite footprints, from the standpoint of effective isotropic radiated power, differ around the conus (contiguous United States). An antenna gain or station G/T which is sufficient in Wisconsin may not be adequate in Florida.

Step 3: Processing the paperwork

Preparing clearance, exhibits, filings and FCC license data can be time-consuming. The FCC requires data to be prepared both technically and financially, but will gladly furnish the license forms and documents.

The FCC application forms must indicate the geographic coordinates of the earth station including the city, county and state. Proof of ownership, or option to buy or lease the land on which the earth station is to be constructed, should also be included. An overall technical description of the facility will be required, beginning with the major components, such as the antenna, low-noise amplifiers (LNAs), antenna feeds, transmission lines, transceivers, etc. The manufacturer's type will be necessary on all the major equipment.

Drawings of the facility plans, the antenna construction and location, and the electrical/electronic functional diagrams of the TVRO must also be included. The intended use of the earth station, the number of transponders to be received, and the plans for programming should also be provided.

The TVRO applicant must also specify the amount of time required to build the earth station, a date for completion and the estimated total cost of the station, including the land, buildings, transmitting and receiving equipment, antennas, engineering, installation, etc. If this TVRO is part of a downlink or uplink for a particular service, this should be specified.

Finally, a comprehensive description of the antenna facility must be provided on the TVRO application. The FCC requires:

- A description of the antenna: manufacturer, model, diameter and the type of feed.
- Description of the mounting of the antenna, including the range of elevation and azimuth over which the antenna will be moved.
- Gain patterns (these will be provided by the manufacturer of the antenna) and, particularly, a statement concerning antenna performance according to the standards specified by the rules and regulations, Part 25.
- The frequency range over which the antenna will operate, this is usually the entire TVRO segment microwave band from 3.7 to 4.1 GHz.
- The main beam width of the antenna and a full description of the 3dB down bandwidth.
- The polarization capable of the antenna (both horizontal and vertical).
- The noise temperature at the receiving system at the operational elevation angle.
- The elevation of the antenna base above mean sea level (the height of the antenna center-line above the antenna base and, also, the maximum antenna height above the antenna base).

Step 4: Designing the earth station facility

There are many facility design

factors to be considered because earth stations can range from simple single frequency/polarity units to rather complex multi-antenna/multi-amplifier or receiver systems. To receive more than one transponder or source of programming, an agile receiver or separate/single frequency receiver is needed (although an agile receiver is far more economical). A single antenna with multiple feed horns (and again at far more expense) or multiple dishes are required if more than one satellite is to be accessed. For those who wish to select various satellites with one parabolic antenna, motor control or azimuth and altitude angle of the antenna are provided. However, these are quite costly and require a degree of maintenance.

Alarm systems and backup systems are also important for a TVRO providing programming for a broadcast entity or cable system. There are numerous combinations that include multiple low noise amplifiers, multiple or redundant receivers and alarm systems that detect the loss of video and automatically switch amplifiers or receivers.

Many equipment vendors provide total earth station design, but TVRO owners often find that it is most economical to have their facility custom designed and to use the best of each possible vendor in such a figuration.

Step 5: Selecting vendors

A number of manufacturers serve the TVRO field, and the list of such vendors has grown over the last five years.

Important considerations in studying hardware from manufacturers are: price; availability; delivery; warranties, and the vendor's expertise in installation and construction; the interfacability with other equipment in the plant or existing earth station.

A bid document specifying the exact nature and type of the earth station and the functional component parts should be developed even if the equipment is not sent for bids. Such a document provides a better accounting of the hardware and cost than using *shotgun* purchasing that can be costly.

Step 6. Construction and assembly

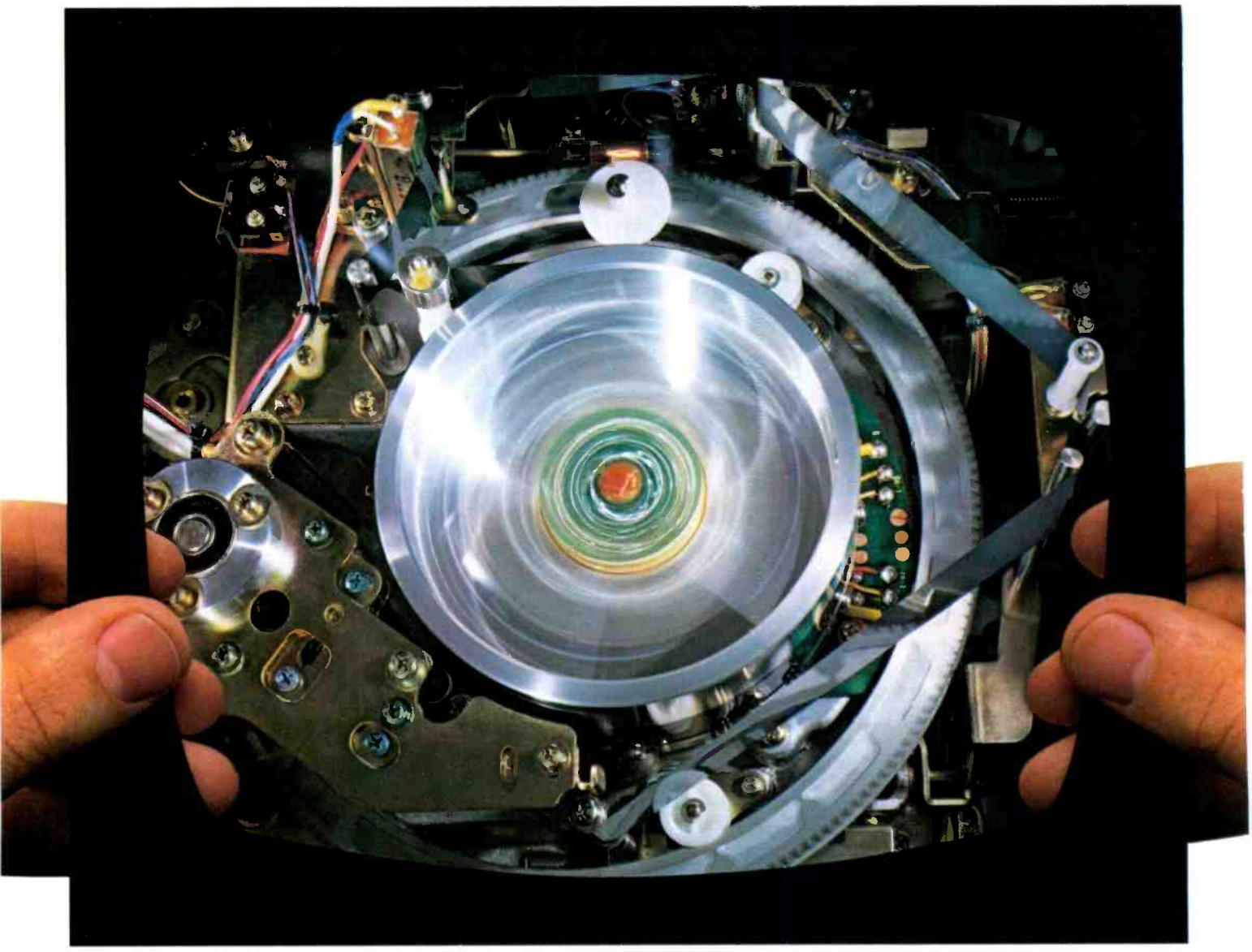
After all the hardware has been purchased, the earth station can be assembled. Most skilled technicians and engineers are capable of installing a complete earth station from the mechanical work on the antenna mounting and boresighting to the rf, video and audio systems. Often manufacturers provide mounting templates and instructions for directing the TVRO antenna once it is in place.

Summary

There are a number of things that must be taken in consideration when thinking about designing a TVRO facility. Because more programming will become available, on more and more satellites, the capability of looking at almost any of the satellites at an arc from about 80° to 140° will soon become a prerequisite.

Multiple agile receivers will be necessary if it is desired to switch transponders in a second or so, or if the satellite programming is a large part of the operating schedules. Receivers, LNAS and dishes are becoming less expensive as more are built and manufacturing techniques are refined. Also, as an increasing number of amateur satellite receiver hobbyists develop new ways of reception and unique applications of hardware, it seems that in the near future an earth station will become as much of a part of any broadcasting or cable facility as a TV camera or video recorder. □

Video:



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With their ruggedness, the six separate units can be used in varying combinations by anyone involved in video. And they interface without modification with most other microprocessor-based editing units on the market.

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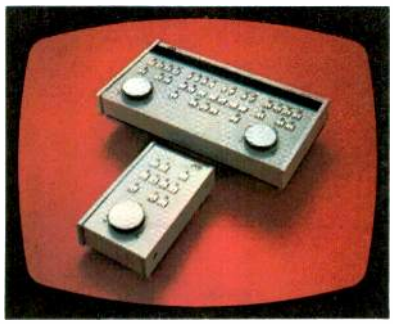
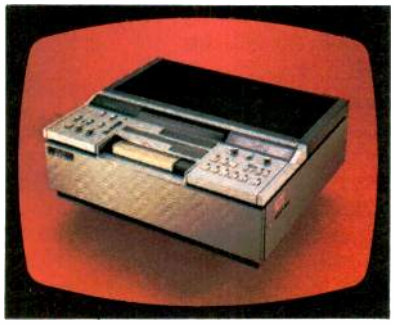
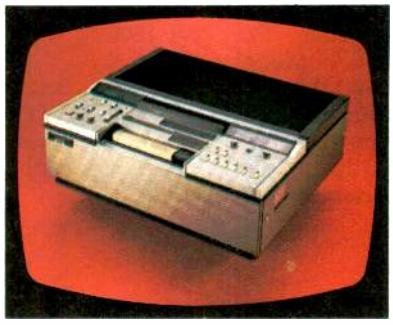
The leader of JVC's TapeHandler Series is the all-purpose CR-8200U Recorder/Editor. A built-in rotary erase head and blanking switcher make it







easy to perform automatic assemble (back space) editing and split insert editing—a must for professional quality video productions. The new FM-FM dubbing system transfers the chroma and luminance signals in FM form, to cut deterioration significantly. Capstan servo, of course, for top editing performance. Random access capability. Direct mode change without going through "Stop," to allow full remote control. Subcarrier and external sync capability for use with Time Base Correctors. And, naturally, the new TapeHandler Direct Drive reel servo system to keep tape tension constant in all modes.

The CR-8200U TapeHandler is the ideal core unit around which to build a fully automatic electronic editing system

CR-6600U TapeHandler: THE FULL-FUNCTION RECORDER WITH ASSEMBLE-EDITING CAPABILITY.

The CR-6600U is the videotape recorder designed for the busy studio. Its rugged construction and gentle tape handling give you the kind of reliability you need when workloads are heavy. The built-in automatic pre-roll mechanism and blanking switcher let you do assemble editing using only the record and pause buttons. FM-FM dubbing makes it perfect as a master VTR for multi-generation duping. Microprocessor-based logic allows full remote control Two audio level control meters. External sync capability. TBC connections.

This is the recorder you'll value for its quality, reliability, versatility.

CP-5500U TapeHandler: THE COST-EFFICIENT PLAYER WITH ON-AIR QUALITY.

Want a low-cost player for stable and reliable on-air playback? That's the CP-5500U. Or use it with the CR-8200U and an automatic editing control unit and you have a superb, fully automatic electronic editing system. Or take advantage of its FM-FM duping capability and use it as a companion to the CR-6600U.

It's a TapeHandler, with the stable tape transport that makes it perfect for these critical applications.

MICROPROCESSOR-BASED EDITING REMOTE CONTROL UNITS.

JVC offers you a choice of compact control units: the easy-to-operate RM-88U for precise timing of machine functions, the low-cost RM-82U, and the RM-70U full remote control unit with shuttle-search function. All are based on a full logic circuit using a microprocessor. And all have JVC's new SOFTOUCH shuttle-search control for fast and accurate location of editing points. Turning the rotary dial varies the tape playback speed continuously from still to 5 times normal, in both forward and reverse. When the desired speed is reached, just let go, and it remains locked at that speed. When you change modes, the dial automatically returns to the still position. No locking latches or pulling of knobs when you change from still to playback speed.

GET ALL THE DETAILS

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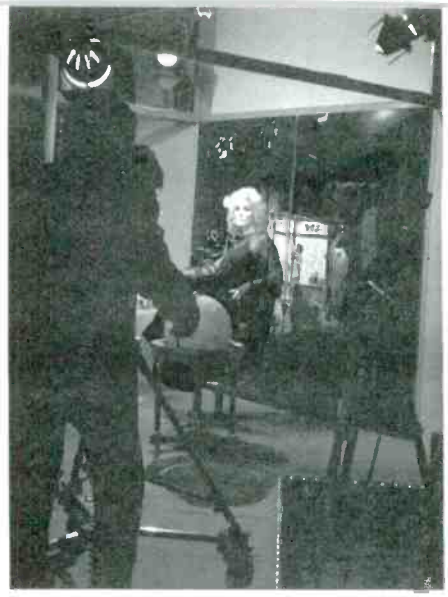
Circle (36) on Reply Card

NAB '80: Some additional new products displayed

The June issue of **Broadcast Engineering** presented an in-depth review of hot topics at NAB-'80 Las Vegas and a comprehensive coverage of new products exhibited. The listings below continue **BE's** June coverage so that you can request data on equipment needed in your facility. And, as indicated in June, selected new equipment at NAB-'80 will be covered as hardware reports in future issues of **BE.**



Commercial Electronics, Inc. (CEI)

Commercial Electronics Inc. [CEI]

CEI 340—A self-contained camera powered by 12Vdc or ac. It features microprocessor-based automatic black-and-white balancing and has the capability of attaching to existing CEI 310 camera heads to form a self-contained unit. Will also accept future options, such as SMPTE generator.

Circle (200) on Reply Card

Digital Video Systems

The Phaser, a frame store TBC/synchronizer with exceptional performance and low prices. Computer technology saves money; microprocessors and adaptive digital circuitry eliminate adjustments and mode switching.

Circle (201) on Reply Card

Fernseh

TCS-1 machine control and station automation system; digital VTRs; and fiber optics systems were all displayed. Included were the following: BCN 50 Videotape Machines, FDL-60 Digital Telecine, BCN-100 Automatic 1-inch Multicassette VTR, Compositor I Character Generator, KCK Studio Cameras, Mach One VTR Editing System, TVS/TAS 1000 Switcher, TCS-1 Machine Control and Broadcast Automation Bosch Fernseh Broadcast Monitors, and TCF-3000 Film Camera. Telecine, TDF-2 Noise Filter.

Circle (202) on Reply Card

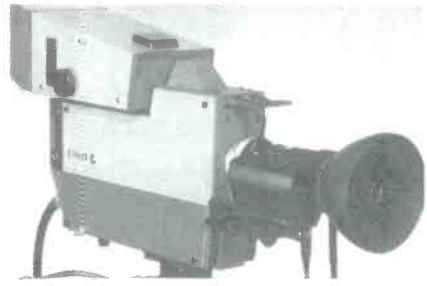
Fidelipac

Cartridge equipment test system containing Model 390 wow and flutter meter and complete set of test tapes and gauges were highlighted. Products displayed included: NAB broadcast tape cartridges, on-air recording lights, cartridge storage racks, cartridge alignment tapes & gauges, audio & video bulk tape erasers, wow & flutter meters, high-output low-noise (HOLN) and standard back-lubricated certified cartridge tape, removable cartridge labels, delay cartridges.

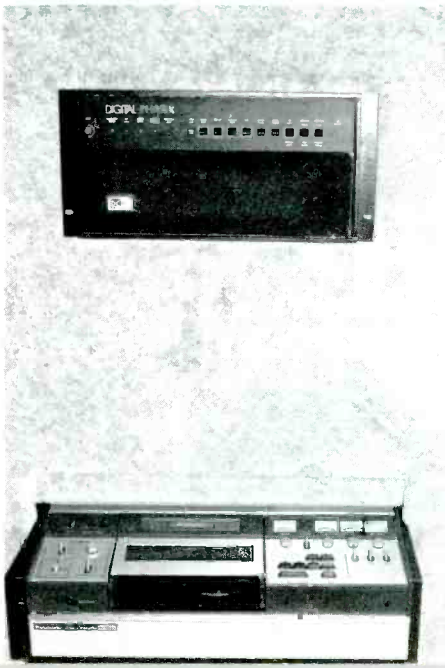
Circle (203) on Reply Card

Ikegami

ITC-350 camera—This unit has a prism-optic, 3-Plumbicon (or Saticon) front end, consumes only 17W



Digital Video Systems



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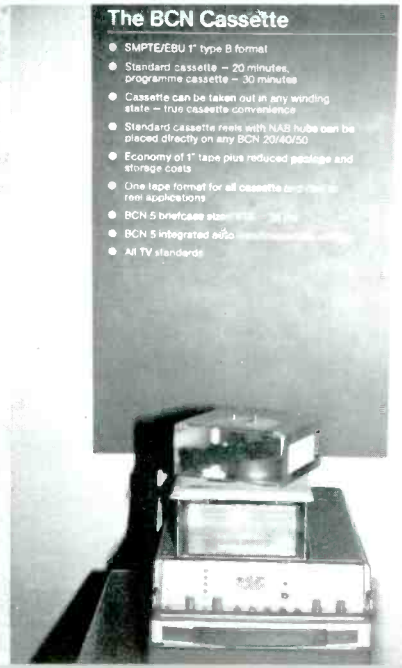

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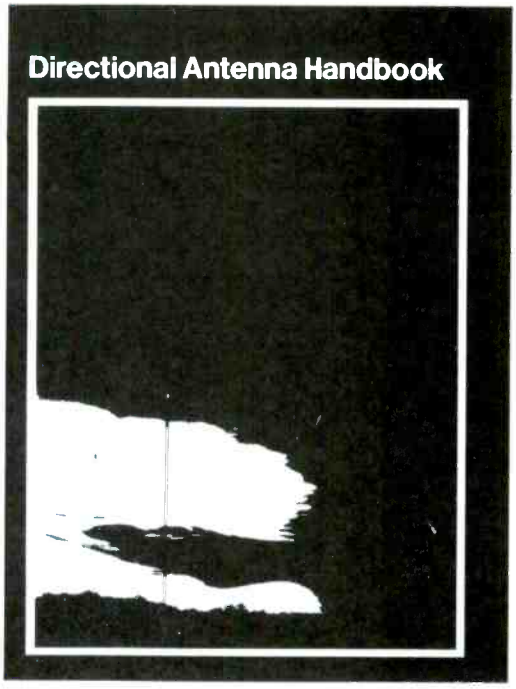

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- Calculating RMS efficiency
- The FCC's Standard Method of calculating directional antennas for submission with FCC applications.

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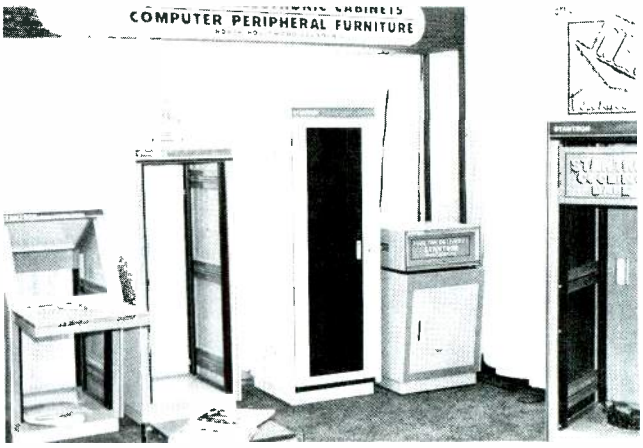
Modular Audio Products



Stantron

of power and delivers 52dB signal-to-noise. It features auto-iris, automatic white balance and is equipped with a three-day memory after shutdown. The camera also offers +6 and +12 video gain setting.

Circle (204) on Reply Card

Modular Audio Products

Model 9222—The model 9222 is a 9-channel, 18-stereo line and up to 18-microphone input audio console. The unit features stereo program and audition On-Air board with cue, talkback and full monitoring to control room, studio and phones. The unit is expandable in 9-channel increments and is vertically expandable to add equalizers, limiters, multi-channel switching, submasters with LED VUs and stereo mixdown.

Circle (205) on Reply Card

Panasonic

AK-750B—This 3-tube Plumbicon camera employs a dichroic mirror optical system and offers a standard 2-line vertical enhancer, signal-to-noise ratio of 49dB and +6dB gain switch.

AK-760—This is a prism optics camera with three ⅔-inch diode gun Plumbicon tubes. The camera will produce a signal-to-noise ratio of 54dB at 200 ft.cd. at F/4 with horizontal resolution of 600 lines.

AK-710—The AK-710 is a prism optics ENG/EFP camera with ⅔-inch Plumbicon or Saticon tubes. The signal-to-noise ratio is 50dB at 200 ft.cd. at F/4 with horizontal of 500 lines.

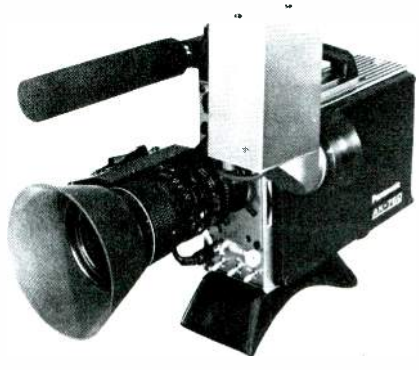
WR-130—This is a portable 8-in 2-out mixer. Features include pre- and post-sub mixing; high and low equalizer and pan pots. Other features include echo send and receive and headphone audition.

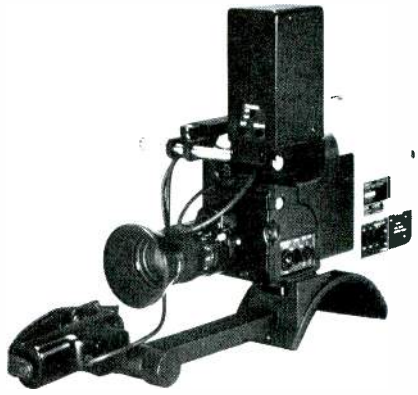
WR-8608—The WR-8608 mixing console can mix and control up to three stereo inputs—either turntable or tape deck—and has microphone input circuits which incorporate an echo generator. VU level is indicated on a fluorescent digital meter.

Circle (206) on Reply Card

Sony

DXC-1800—This camera features a newly developed Sony SMF Trinicon image tube. Its signal-to-noise ratio is 48dB, resolution is 300 lines. The unit weighs less than 11 pounds complete with viewfinder, F/1.4 power zoom lens and shoulder brace.





DXC-6000—A 3-tube color video camera with F/1.4 full prism optics. The camera features +9dB and +18dB gain boost and its signal-to-noise is better than 53dB.

BVP-330—A portable ENG/EFP or studio camera with signal-to-noise ratio of 57dB and 600 lines of resolution (center). The camera will operate in as little as 2 footcandles of illumination. It is equipped with F/1.4 prism optics with built-in quartz filter, a 1.5-inch viewfinder and a gain switch that can be set for up to +18dB.

Circle (207) on Reply Card

Stantron Div. Wyco Metal Products

Modular electronic **cabinets** and computer peripheral furniture with 5 days delivery, new improved method of selection, and descriptive brochure 5DD-79.

Circle (208) on Reply Card

Thomson-CSF

Microcam MC-601—This camera features F/1.4 prism optics with built-in infrared filter, quartz filter and bias lighting. Other features include digital automatic white and black balance and two-line image enhancement.

1525 Studio Camera. This new color studio camera was the main event of the NAB display and around which was developed a crowd-stopping magic-based production-type show.

Circle (209) on Reply Card

Thomson-CSF Broadcast

US JVC

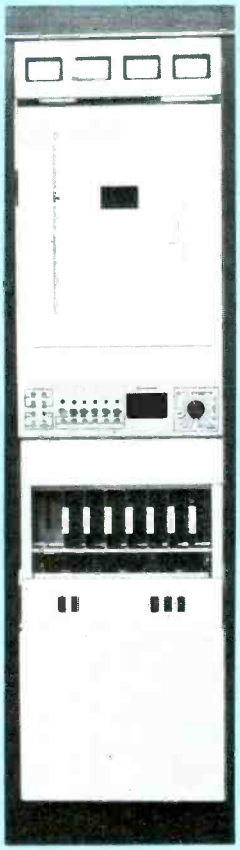
US JVC

CR-8200U—The CR-8200U VTR has direct-drive head drum and capstan as well as direct-drive reel motors on the reel servo system. When used with the RM-70U remote control unit or either edit controllers in the RM series, the CR-8200U also has continuously variable playback speeds from zero to 5X normal.

S-100 single tube Saticon camera with zoom microphone. Pattern of mic changes electrically as lens is zoomed.

VM-1200 LU disc recorder for slow motion or random access storage up to 600 frames. Available with either type of controller. □

Circle (210) on Reply Card



On page 133 of the June issue the side-by-side pictures for Sony and Sintronic got interchanged. For added clarification, the picture above is of the Sony booth with Roger Pryor, general manager, Sony Digital Audio demonstrating one of the Sony PCM systems at NAB. On the wall is shown the schematic circuit for simulcasting digital/audio signals, users of digital audio processors, and records mastered on the Sony digital audio system.

On the left is the SI-A1T AM broadcast transmitter highlighted by Sintronic in its booth at NAB. This new entry has a 1200W output capability and is complete solid-state up the high level RF amplifier and modulator stages.

Introducing the Ramko a new cart machine, but

Finally you can get your hands on a cart system with reel-to-reel performance.

A cart system that eliminates phase shift error once and for all. That sets new standards for low wow-and-flutter. That provides signal-to-noise, distortion and frequency response that are better than anything else in the industry.

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PhaseMaster: the cart machine, redefined.

The new Ramko PhaseMaster has all the features you want, and some that never existed before.

It's built to take the pounding you're going to give it, hit after hit, commercial after commercial, day after day.

The deck is a 5/8" casting for stability, with a stainless steel cover plate for wear resistance. The crystal-controlled dc servo motor ensures greater speed accuracy and lower heat

PhaseMaster™ not just a whole new concept.

generation (15 ips, 7½ ips, 3¾ ips motor speeds field-selectable). The machined head stack is rock-stable, and we've included internal illumination for your periodic head inspections and cleaning. There are no micro-switches 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. And the cart hold-down presses on the edges for greater stability and exacting alignment, pressing with roller contact for velvet smooth insertion and withdrawal.

lower track. On playback, the left channel signals from both tracks are compared, and any phase shift difference is corrected automatically by a continuously tracking electronic time delay.

Simple.

And it works—no more holes in your sound, and no more side-to-side spectrum shift.

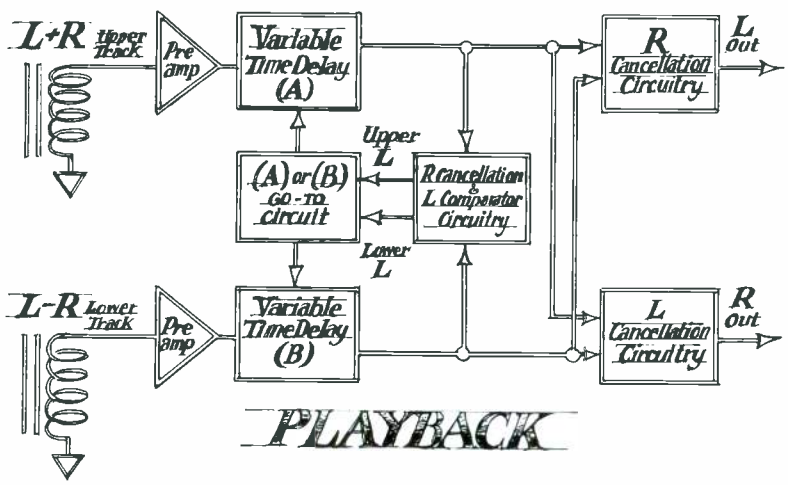
The ultimate cart system, mono and stereo

The Ramko PhaseMaster System, in mono and stereo, is available as a playback unit or a record/playback deck.

It also comes as a complete reproduction center which duplicates—as well as plays and records—your mono and stereo carts and cassettes. This consists of four modules: an electronic control center; two A and B cart decks; and a cassette deck.

To record, you switch-select any of three inputs to record on any or all of the decks. When you play back, the control center determines whether your tape is mono or stereo, coded or uncoded, and automatically reproduces the correct outputs.

To dupe, you simply load tape (cart or cassette) and one or two blanks, then hit Record/Play and the control center puts the signal where it's supposed to be.



And no more stereo phase shift error

Phase shift doesn't much matter in mono, so when you're recording stereo, the PhaseMaster encodes a mono L + R signal on the upper track, L − R on the

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Get the brochure. It covers the PhaseMaster System's convenience and ease of operation; the left, right and phase meters; the 4-digit timer; the three cue tones; the integral testing facilities; and everything that you were hoping would be in it.

Write Ramko Research, 11355 Folsom Blvd., Rancho Cordova, CA 95670. Or if you can't wait for the mail, contact your nearest rep or call (916) 635-3600 collect and arrange for a 2 week free trial.

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Circle (39) on Reply Card

Worldwide Color TV Standards: Similarities and Differences

By D. H. Pritchard and J. J. Gibson, RCA Laboratories, Princeton, NJ

This 2-part presentation summarizes the NTSC, PAL and SECAM color television system standards, pointing out the basic similarities as well as main differences in areas such as bandwidths, field and frame rates, synchronizing approaches, and color encoding techniques. The intent of this material is not to compare system performances but rather to review the technical standardization characteristics pertinent to the topic of international exchange of images. Part II will be presented in the September issue.

Introduction

A simple, concise, summary of the similarities and differences in the ever-changing color television system techniques and standards employed throughout the world is difficult to achieve as evidenced by the efforts of the International Radio Consultative Committee (CCIR) in attempting to establish the elusive *universal* system. Nevertheless, it is hoped that this tutorial review and update may be useful for those who want a conceptual overview of the technical situation.

The picture performance of a motion picture system in one location in the world is generally the same as in any other location. Thus, international exchange of film programming is comparatively straightforward.

Not so in the case of broadcast color television systems. The lack of compatibility has its origins in many factors, such as constraints in communications channel allocations and techniques, differences in power sources, network requirements, pick-up and display technology and political considerations relating to international telecommunications agreements.

This paper provides a tutorial review of the technical standardization characteristics pertinent to the problem of international exchange of images.

Background

The most outstanding as well as controversial effort of the XIth Plenary Assembly of the CCIR held in Oslo in 1966 was an attempt at standardization of color television systems by the contributing countries of the world. The discussions pertaining to the possibility of a universal system proved inconclusive. Therefore, the CCIR, instead of issuing a unanimous recommendation for a single system, was forced to only issue a report describing the characteristics and recommendations for a variety of proposed systems. It was, therefore, left to the controlling organizations of the individual countries to make their own choice as to which standard to adopt.

This outcome was not totally surprising since one of the primary requirements for any color television system is compatibility with a co-existing monochrome system. In many cases, the monochrome standards already existed and were dictated by such factors as local power line frequencies—relevant to field and frame rates—as well as radio frequency channel allocations and pertinent telecommunications agreements.

Thus, such technical factors as line number, field rate, video bandwidth, modulation technique and sound carrier frequencies were predetermined and varied in many regions of the world. The ease by which international exchange of program material may be accomplished is thereby hampered and is accomplished at present by means of standards conversion techniques, or *transcoders*, with varying degrees of loss in quality.

On the other hand, these techniques have provided surprisingly good service in more recent years with the growing use of satellite relays coupled with the advances in digital signal processing technology in both video and audio domains. In view of this rapidly expanding situation, and recognizing that even more countries are arriving at the decision point every year, particularly in Latin America (Region II), it becomes apparent that a clear understanding of the implications of system variations has a high order of priority for those involved in international live television broadcast and film/videotape programming exchange.

The data quoted herein are referenced to the recent recommendations of the XIVth Plenary Assembly of the CCIR held in Kyoto, Japan in 1978. It should be recognized that the situation is of a continually shifting nature, and future decisions can, and no doubt will, alter some of the details.

Monochrome-compatible color TV systems

To achieve success in the introduction of a color television system, it is essential that the color system be fully compatible with the existing black-and-white system. That is, monochrome receivers must be able to produce high-quality black-and-white images from a color broadcast, and color receivers must produce high-quality black-and-white images from monochrome broadcasts. The first such color television system to be placed into commercial broadcast service was developed in the US. On December 17, 1953, the Federal Communications Commission (FCC) approved transmission standards and authorized broadcasters, as of January 23, 1954, to provide regular service to the public under these standards. This decision was the culmination of the work of the National Television System Committee (NTSC) upon whose recommendation the FCC action was based.[1] Subsequently, this system, now referred to as the NTSC system, was adopted by Canada, Japan, Mexico and others.

In 1980, 26 years later, these standards are still providing color television service of good quality that testifies to the validity and applicability of the fundamental principles underlying the choice of specific techniques and numerical standards.

The previous existence of monochrome television standards provided a foundation upon which to build the necessary innovative techniques while simultaneously imposing the requirement of compatibility. Within this framework, an underlying theme—that which the eye does not see does not need to be transmitted nor reproduced—set the stage for a variety of fascinating developments in what has been characterized as an "economy of representation."[1]

The countries of Europe delayed the adoption of a color television system, and in the years between 1953 and 1967, a number of alternative systems that were compatible with the 625-line, 50-field existing monochrome systems were devised. The development of these systems was, to some extent, influenced by the fact that the technology necessary to implement some of the NTSC requirements was still in its infancy. Thus, many of the differences between the NTSC and other systems are due to technological rather than theoretical considerations.

Most of the basic techniques of NTSC are incorporated into the other system approaches. For example, the use of wideband luminance and relatively narrowband chrominance, following the teachings of the principle of *mixed highs*, is involved in all systems. Similarly, the concept of providing horizontal interlace for reducing the visibility of the color subcarrier(s) is followed in all approaches. This feature is required to reduce the visibility of color information carrying signals contained within the same frequency range as the coexisting monochrome signal, thus maintaining a high order of compatibility.

An early system that received approval was proposed by Henri de France of the Compagnie Francaise de Télévision of Paris. It was argued that if color could be relatively band-limited in the horizontal direction, it could also be band-limited in the vertical direction. Thus, the necessary two pieces of coloring information could be transmitted as subcarrier modulation that is sequentially transmitted on alternate lines—thereby avoiding the possibility of unwanted crosstalk between color signal components. Thus, at the receiver, a one-line memory (commonly referred to as a *1-H delay element*) must be employed to store one line to then be concurrent with the following line. Then a linear matrix of the *Red* (R) and *Blue* (B) signal components is used to produce the third *Green* (G) component. Of course this necessitates the addition of a line-switching identification technique.

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Such an approach, designated as SEquential Couleur Aver Mémoire, sequential color signals plus a memory (SECAM), was developed and adopted by France and the USSR, and broadcast service began in France in 1967.

The implementation technique of a 1-H delay element led to the development, largely through the efforts of Walter von Bruch of Telefunken Company, of the *Phase Alternation Line system* referred to as PAL. This approach was aimed at overcoming an implementation problem of NTSC that requires a high order of phase and amplitude integrity (skew-symmetry) of the transmission path characteristics around the color subcarrier to prevent color quadrature distortion. The line-by-line alternation of the phase of one of the color signal components averages any colorimetric distortions to the observer's eye to that of the correct value. The system in its simplest form (simple PAL), however, results in line flicker (*Hanover bars*). The use of a 1-H delay device in the receiver greatly alleviates this problem (standard PAL). PAL systems also require a line identification technique.

The standard PAL system has been adopted by numerous countries in continental Europe as well as a version in the UK. Public broadcasting began in 1967 in Germany and the UK using two slightly different PAL systems.

NTSC, PAL, SECAM systems overview

To better understand the equalities and differences in systems used today, a familiarization with the basic principles of NTSC, PAL and SECAM is required. As previously stated, because many NTSC basic techniques are involved in PAL and SECAM, a thorough knowledge of NTSC is necessary in order to understand PAL and SECAM.

The same R, G and B pick-up devices and the same three primary color display devices are used in all systems. The basic camera function is to analyze the spectral distribution of the light from the scene in terms of its R, G and B components on a point-by-point basis as determined by the scanning rates. The three resulting electrical signals must then be transmitted over a band-limited communications channel to control the three-color display device to make the *perceived* color at the receiver appear essentially the same as the *perceived* color at the scene.

It is useful to introduce the definition of color as being a psychophysical property of light—specifically, the combination of those characteristics of light that produces the sensations of *brightness*, *hue*, and *saturation* as shown in Fig. 1. *Brightness* refers to the relative intensity; *hue* refers to that attribute of color that allows separation into spectral groups perceived as red, green, yellow, etc. (the dominant wavelength in scientific terms); and *saturation* is the degree to which a color deviates from a neutral gray of the same brightness—called purity, pastel, vividness, etc. These three characteristics represent the total information necessary to define and/or re-create a specific color stimulus.

This concept is useful to communication engineers in developing encoding and decoding techniques to efficiently compress the required information within a given channel bandwidth and to subsequently recombine the specific color signal values in the proper proportions at the reproducer. The NTSC color standards define the first commercially broadcast process for achieving this result.

A preferred signal arrangement was developed that resulted in reciprocal compatibility with monochrome pictures and is transmitted within the existing monochrome channel as shown in Fig. 2. Thus, one signal (luminance) is chosen in all approaches to occupy the wideband portion of the channel and to convey the *brightness* as well as the detail information content. A second signal, termed *chrominance* signal, representative of the chromatic attributes of hue and *saturation*, is assigned less channel width in accord with the attributes of human vision that do not require full three-color reproduction over its entire range of resolution, commonly referred to as the *mixed-highs principle*.

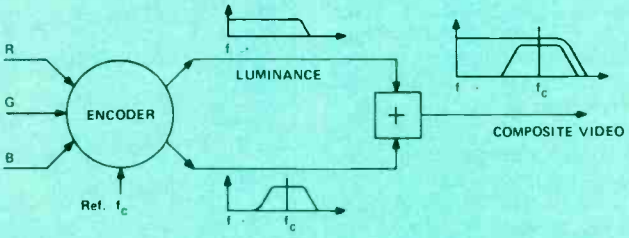
Another principle employed in all systems involves arranging the chrominance and luminance signals within the same frequency band without excessive mutual interference. Recognition that the scanning process, being equivalent to sampled-data techniques, produces signal components largely concentrated in uniformly spaced groups across the channel width led to introduction of the concept of horizontal frequency interlace (dot interlace). The color subcarrier frequency is so chosen as to be an odd multiple of one-half line rate (in the case of NTSC) such that the phase of the subcarrier is exactly opposite on successive scanning lines. This substantially reduces the subjective visibility of the color signal dot pattern components.

Thus, the major differences between

- BRIGHTNESS (Luminance):
  RELATIVE INTENSITY OF THE COLOR
- HUE
  THE ATTRIBUTE THAT ALLOWS DESIGNATION IN TERMS OF RED, YELLOW, BLUE etc (Dominant wavelength)
- SATURATION
  DEGREE TO WHICH A COLOR DEVIATES FROM A NEUTRAL GRAY OF THE SAME BRIGHTNESS – PURITY, PASTEL, VIVIDNESS, etc.

Fig. 1. Basic Definition of *Color*.

- COMPATIBILITY WITH CO-EXISTING MONOCHROME SYSTEM.
- ENCODE WIDEBAND R, G, B COLOR PRIMARY SIGNALS.
  - WIDEBAND LUMINANCE (BRIGHTNESS)
  - NARROW-BAND MODULATION OF A COLOR SUBCARRIER (Hue and Saturation)



- SUBCARRIER FREQUENCY INTERLACE
  ODD MULTIPLE OF ½H TO REDUCE VISIBILITY OF CHROMINANCE INFORMATION SUBCARRIER.

Fig. 2. Basic Communications Channel Principles Applied to Color TV.

- ALL SYSTEMS:
  - THREE-PRIMARY ADDITIVE COLORIMETRIC PRINCIPLES
  - SIMILAR CAMERA PICK UP AND RECEIVER DISPLAY TECHNOLOGY
  - WIDEBAND LUMINANCE AND NARROW-BAND COLOR
- COMPATIBILITY WITH CO-EXISTING MONOCHROME SYSTEM:
  INTROOUCES FIRST ORDER DIFFERENCES
  - LINE NUMBER
  - FIELD/FRAME RATES
  - BANDWIDTH
  - FREQUENCY ALLOCATION
- MAJOR DIFFERENCES IN COLOR TECHNIQUES
  - NTSC – PHASE AND AMPLITUDE QUADRATURE MODULATION OF INTERLACED SUBCARRIER
  - PAL – SIMILAR TO NTSC BUT WITH LINE ALTERNATION OF "V" COMPONENT
  - SECAM – FREQUENCY MODULATION OF LINE SEQUENTIAL COLOR SUBCARRIERS

Fig. 3. General Comparison of Worldwide TV Systems.

the three main systems of NTSC, PAL, and SECAM are in the specific modulating processes used for encoding and transmitting the chrominance information. A summary is indicated in Fig. 3.

The following four sections discuss the basic television systems in technical detail, including some never implemented. A summary and comparisons of system standards and specifications appear in a later section.

NTSC color system

The importance of the colorimetric concept of brightness, hue, and saturation comprising the three pieces of information necessary to analyze or re-create a specific color value becomes evident in the formation of the composite color television NTSC format.

The luminance, or monochrome, signal is formed by addition of specific proportions of the R, G, B signals and occupies the total available video bandwidth of 0-4.2MHz. The NTSC, PAL, and SECAM systems all use the same luminance (Y) signal formation, differing only in available bandwidths.

The Y-signal components have relative voltage values representative of the brightness sensation in the human eye. Therefore, the red (E'_R), green (E'_G), and blue (E'_B) components are tailored in proportion to the standard luminosity curve at the particular values of the dominant wavelengths of the three color primaries chosen for color TV. Thus, the luminance signal make-up for all systems, as normalized to white, is as follows:

$$E'_Y = 0.299\,E'_R + 0.587\,E'_G + 0.114\,E'_B. \quad (1)$$

The equations for the chrominance signal components are given in Fig. 4. Signals representative of the chromaticity information (hue and saturation) that relate to the difference between the luminance signal and the basic R, G, B signals are generated in a linear matrix. This new set of signals is termed *color-difference* signals and is designated as R-Y, G-Y and B-Y. These signals modulate a subcarrier that is combined with the luminance component and passed through a common communications channel. At the receiver, the color difference signals are detected, separated, and individually added to the luminance signal in three separate paths to re-create the original R, G and B signals according to:

$$E'_Y + E'_{(R-Y)} = E'_Y + E'_R - E'_Y = E'_R$$
$$E'_Y + E'_{(G-Y)} = E'_Y + E'_G - E'_Y = E'_G \quad (2)$$
$$E'_Y + E'_{(B-Y)} = E'_Y + E'_B - E'_Y = E'_B.$$

In the case of NTSC, two other color-difference signals, designated *I* and *Q*, are formed at the transmitter and used to modulate the color subcarrier, indicated in Fig. 4. (The reason for the choice of I and Q signals is discussed later). It may be noted that the B-Y, R-Y, and G-Y color signal modulation components are the same in NTSC, PAL and SECAM.

Another reason for the choice of signal values in the NTSC system is that the eye is more responsive to spatial and temporal variations in luminance than it is to variations in chrominance. Therefore, the visibility of luminosity changes due to random noise and interference effects may be reduced by properly proportioning the relative chrominance gain and encoding angle values with respect to the luminance values. Thus, the *principles of constant luminance*† is incorporated into the system standards.[1,2]

The voltage outputs from the three camera tubes are adjusted to be equal when a scene reference white or neutral gray object is being scanned for the color temperature of the scene ambient. Under this condition, the color subcarrier also automatically becomes zero. The colorimetric values have been formulated by assuming that the reproducer will be adjusted for *Illuminent C*, representing the color of average daylight.

A CIE (Commission Internationale de l'Eclairage) chromaticity diagram indicating the primary color coordinates for NTSC, PAL, and SECAM is shown in Fig. 5. It is interesting to compare the television available color gamut relative to that of all color paint, pigment, film, and dye processes.

(Part 2 in September issue.)

References

1. J. W. Herbstreit and H. Pouliquen, "International Standards for Color Television," *IEE Spectrum*, March 1967.
2. Donald G. Fink (Ed.), *Color Television Standards*, McGraw-Hill Book Co., New York, 1955.

*The signal of Eq. 1 would be exactly equal to the output of a linear monochrome camera tube with ideal spectral sensitivity if the red, green, and blue camera tubes were also linear devices with theoretically correct spectral-sensitivity curves. In practice, the red, green, and primary signals are deliberately made nonlinear to accomplish gamma correction (adjust the slope of the input/output transfer characteristic). The prime mark (2) denotes a gamma-corrected signal.

+The IEEE Standard Dictionary of Electrical and Electronics Terms notes that in constant-luminance transmission the sole control of luminance is provided by the luminance signal and no control of luminance is provided by the chrominance signal. Noise signals falling within the bandwidth of the chrominance channel produce only chromaticity variations which, if coarse-structured, are subjectively less objectionable than correspondingly coarse-structured luminance variations.

LUMINANCE

$E'_Y = 0.299\,E'_R + 0.587\,E'_G + 0.114\,E'_B$

(Common for all systems)

CHROMINANCE:

NTSC

$E'_I = -0.274\,E'_G + 0.596\,E'_R - 0.322\,E'_B$

$E'_Q = -0.532\,E'_G + 0.211\,E'_R + 0.311\,E'_B$

$B\text{-}Y = 0.493\,(E'_B - E'_Y)$

$R\text{-}Y = 0.877\,(E'_R - E'_Y)$

$G\text{-}Y = 1.413\,(E'_G - E'_Y)$

PAL

$E'_U = 0.493\,(E'_B - E'_Y)$

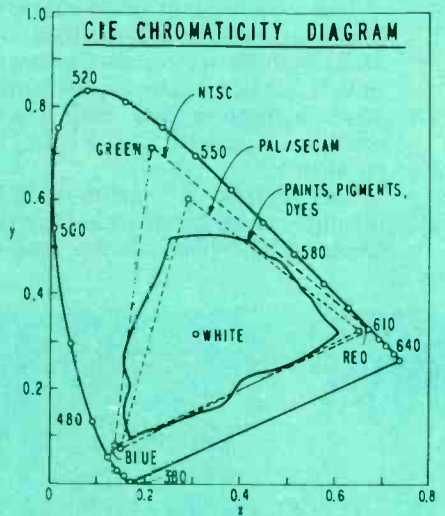
$\pm E'_V = \pm 0.877\,(E'_R - E'_Y)$

SECAM

$D'_R = -1.9\,(E'_R - E'_Y)$

$D'_B = 1.5\,(E'_B - E'_Y)$

Fig. 4. Color Signal Values for NTSC, PAL, and SECAM.



		x	y
NTSC	R	0.67	0.33
	G	0.21	0.71
	B	0.14	0.08
PAL/SECAM	R	0.64	0.33
	G	0.29	0.60
	B	0.15	0.06
WHITE:	NTSC(ILL C)	0.310	0.316
	PAL/SECAM(D6500)	0.313	0.329

Fig. 5. CIE Chromaticity Diagram System Comparison. (See cover for color spectrum.)

International Broadcasting Convention Notes

By Bill Rhodes, editorial director

- **September 20-23, 1980**
- **46,280 sq. ft. exhibit space**
- **Exhibit space sell-out**

The upcoming International Broadcasting Convention (IBC) is to be held at the Metropole Conference and Exhibition Centre, Brighton, 20-23 September 1980, with a press preview planned for Friday 19 September.

This will be the eighth of these biennial conventions, which are now firmly established on the international scene as one of the few that meet the specific requirements of those with interests in the wide technical field of broadcasting and allied services.

The primary aim of the IBC continues to be to provide a forum for the exchange of information and views on the latest trends and developments in broadcasting technology and an exhibition at which the latest broadcasting equipment and services can be displayed and demonstrated by leading world manufacturers and broadcasting organizations.

The move of the IBC this year from its traditional home in London to Brighton is to ensure that the conference facilities and the exhibition areas are adequate to meet the continued growth of the IBC. The Metropole Conference and Exhibition Centre, a modern purpose-built complex with multiple conference rooms, provides some 70% more exhibition space than IBC 78 had.

As an indicator of the IBC popularity all exhibition space has been taken up. The accompanying table lists the current exhibitors, but changes are still anticipated. The floor plans included show locations for most exhibitors to help plan IBC exhibit visits, but these plans are still subject to change.

The technical sessions at IBC cover a broad range of topics.

CONVENTION PROGRAM

	FRIDAY 19 SEPTEMBER	SATURDAY 20 SEPTEMBER	SUNDAY 21 SEPTEMBER	MONDAY 22 SEPTEMBER	TUESDAY 23 SEPTEMBER
08.30 hrs		Registration Opens	Registration Opens	Registration Opens	Registration Opens
09.30 hrs		Exhibition Opens	Exhibition Opens	Exhibition Opens Ladies' Program Visit – LP3	Exhibition Opens Ladies' Program Visit – LP4
10.00 hrs			Technical Session: *Signal origination – Part 1*	Technical Sessions: *Teletext* *Transmitters and transposers*	Technical Sessions: *Recording and storage* *Satellites*
11.00 hrs		Ladies' Program Opens – LP1			
14.00 hrs	Registration Opens	Technical Session: *Broadcasting technology in the 80s*	Technical Sessions: *Signal origination – Part 2* *Digital television coding standards* Ladies' Program Visit – LP2	Technical Sessions: *Signal processing* *Antennas and propagation* *Training and maintenance*	Technical Sessions: *Transmission and distribution* *Measurements* *Receivers*
18.00 hrs		Technical Session Closes	Technical Sessions Close	Technical Sessions Close	Technical Sessions Close
		Exhibition Closes	Exhibition Closes	Exhibition Closes	Exhibition Closes
19.00 hrs	Registration Closes	Registration Closes	Registration Closes	Registration Closes	Registration Closes
18.45 hrs		Civic Reception at Brighton Centre			
19.15 hrs			Champagne Reception at Brighton Corn Exchange		

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Major sessions are devoted to: broadcasting technology in the '80s, signal origination, digital TV coding standards, teletext, transmitters and transponders, signal processing, multi-channel sound, recording and storage, signal distribution, satellites in broadcasting, and measurement techniques. Although the digital sessions, multi-channel sound, and satellite topics can involve radio/audio portions of broadcasting, IBC is almost entirely devoted to television broadcasting. A complete listing of the papers, as scheduled at press time, is presented in an accompanying table. However, as with the exhibitor registrations, IBC notes that this is still a provisional program, subject to change as IBC approaches its meeting date.

For more details

For further information on the technical program and/or exhibits at IBC, contact: IBC Secretariat, c/o IEE, Savoy Place, London WC2R OBL, England; telephone: 01-240-1871 (Ext. 337); telex: 261176.

For travel and hotel accommodations, contact: World View Vacations, 65 East 55 Street, New York, NY 10022; telephone: (212) 486 9790; telex: W VLTD 428330.

IBC-80 TECHNICAL SESSIONS
(Subject to amendment)

Saturday, September 20

BROADCASTING TECHNOLOGY IN THE '80s
(Chairman: J.A. Flaherty)

- The coming crisis in television technology
- How will broadcast programs reach the home in the future?
- Wideband transmission by optical fibre systems
- The future of home viewing
- High-definition television system—signal standards and transmission

Sunday, September 21

SIGNAL ORIGINATION I
(Chairman: D.H. Mills)

- A 385 x 576 picture element CCD image sensor for 625-line solid-state TV cameras
- The performance of solid state telecine
- Recent advances in broadcast camera design
- Automated set-up system for high sensitive handy camera
- A TV camera with fibre-optical transmission
- An ENG color camera using a

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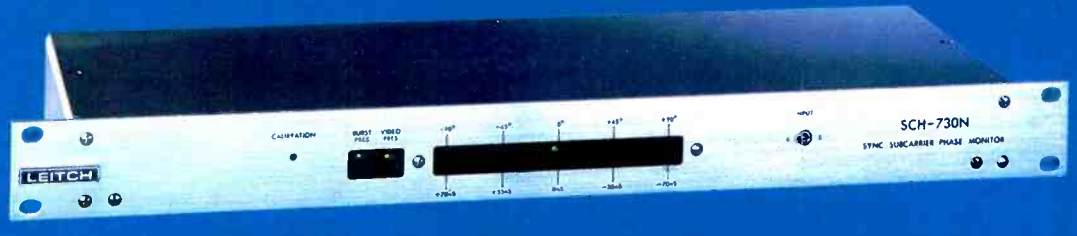

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single pick-up tube
- Editing systems for single camera videotape production
- ENG—3 years later
- A roving eye outside broadcast vehicle

SIGNAL ORIGINATION II
(Chairman: P. Hansen)
- Some unusual aspects of the SABC's second television channel
- The third television network of the RAI—production facilities in the regional stations
- Practical computer graphics for television
- Computer graphics in BBC television
- A computer assisted dubbing system for modern television and film post production
- Television lighting—a review of changes in equipment and techniques

DIGITAL TELEVISION CODING STANDARDS
(Chairman: P. Rainger
- Digital television standards
- SMPTE study group on digital television tape recording progress report
- Digital coding standards for television studios

Panel Discussion—
- R. F. Appleton, London Weekend Television
- K. Barratt, Sony Broadcast
- C. P. Ginsburg, Ampex
- H. R. Groll, Robert Bosch GmbH
- R. J. Taylor, Quantel

Monday, September 22

TELETEXT
(Chairman: L. Free)
- The economic preparation of teletext subtitles
- The possibility of teletext usage in multi-lingual medium
- Teletext subtitles for the deaf—problems in linguistics and psychology
- A teletext system for ideographic information
- Teletext—the potential of an extended system
- Introduction of an auxiliary speech channel in the TV lines
- Transmission techniques for picture viewdata

TRANSMITTERS AND TRANSPOSERS. I
(Chairman: R. Hills)
- Engineering for the fourth UHF TV channel in the UK
- A new generation of medium power UHF television transmitters
- Development of operational efficiency and broad tuning range techniques for UHF-television klystrons
- A range of UHF television transmitters designed for the 1980s
- Programmable transmitting station control system
- High power filters in UHF television transmitters

SIGNAL PROCESSING' I
(Chairman: Y. Guinet)
- A single field 625 line synchronizer
- An alternative approach to frame store synchroniters for 625 line systems
- A digital television standards converter with random access memory storing four fields
- Distributing digital video
- Digital PAL decoding using line-locked sampling
- A 28MB/S NTSC color television system for ENG applications

TRANSMITTERS AND TRANSPOSERS' II
(Chairman: C. Terzani)
- A 3kW MOS power unit for 10-to-

20kW medium-wave transmitters
- Providing and controlling power supplies at transmitting stations—recent developments and future prospects
- Tandem television transposer chains
- Automatic ghost image reduction equipment for a television transposer
- Multipath effects in ENG/EJ systems
- The planning and design of two high power MF stations in the Middle East including ground conductivity studies

SIGNAL PROCESSING. II
(Chairman: Y. Guinet)
- Study of digital television standards when codecs are used in tandem
- Primary signal component coding
- VIMACS—A vertical interval machine control systems

MULTI-CHANNEL SOUND
(Chairman: C. P. Sandbank)
- Stereophonic sound and 2 languages in TV—the double-sound-carrier method
- A two-channel sound system for television
- HiFi-sound in television receivers
- Stereo sound in television studio productions
- "Kunstkopf" Sterophy: Results of recent investigations and development of a new Kunstkopf-System
- A stereo-compatible surround-sound system for broadcasting

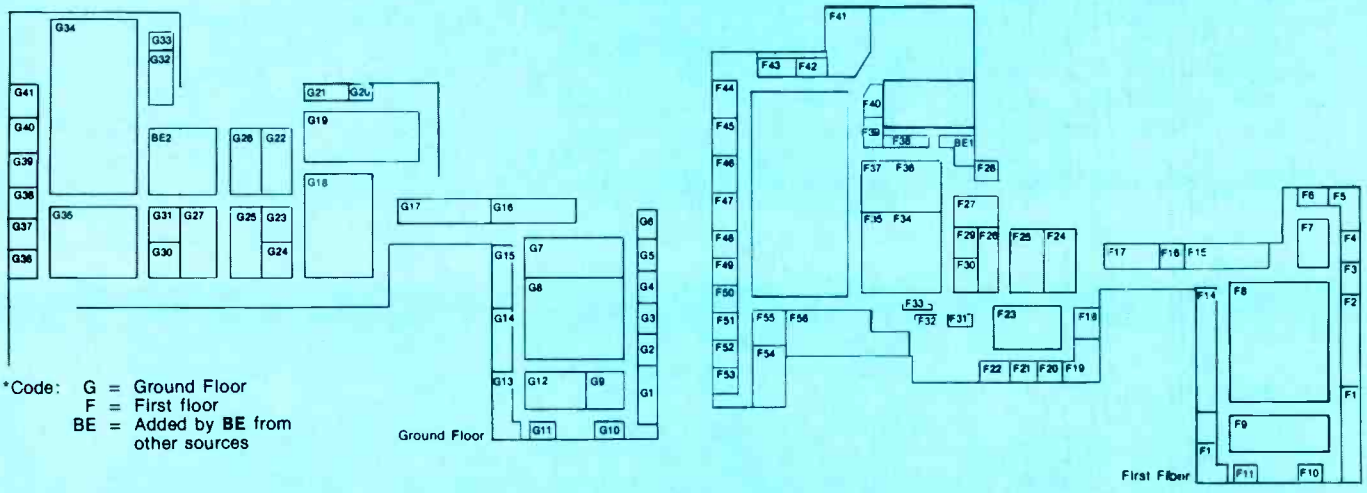
Tuesday, September 23

RECORDING AND STORAGE
(Chairman: J. A. Roizen)
- User requirements of digital video tape recorders
- Formats for digital video tape recorders
- Digital video tape recorders—formats and standards
- Digital VTR error characteristics and a proposed protection scheme
- Audio recording for DVTR
- A digital storage system for an electronic rostrum colour camera
- Fixed head sound PCM (pulse code Modulation) tape recorder for broadcasting
- Audio post-production for VTR—the second generation

SIGNAL DISTRIBUTION
(Chairman: R. Gressmann)
- A contribution network for ILR
- Digital stereo sound transmission for outside broadcasts
- NICAN 3: a companded system for the transmission of high quality sound-programmes
- Digital sound in blanking
- Program LINCOMPEX

SATELLITES IN BROADCASTING
(Chairman: A. Baldry)
- Low-power direct broadcasting satellite trials in Canada
- CBC-2—Starting a second television network using satellite and cable TV technology
- Crosspolarization in the antenna feed for individual reception from broadcast satellites
- Television signals via satellite: the digital approach
- A digital codec for satellite TV
- Energy dispersal for TV satellite up-links

MEASUREMENT TECHNIQUES
(Chairman: J. J. Geluk)
- The electronic zone plate and related test patterns
- Automatic measuring—process, tone and colour rendition in film and television
- NEMESIS—Numerical eye measuring equipment for surveillance of insertion signals
- A supervision system for the RTVE broadcasting network
- Electromagnetic compatibility within a broadcast studio complex



IBC 80

IBC 80

IBC-80/Brighton Exhibitor Sign-up

(Booth* - Exhibitor)

F20 - Acron Video
F54 - AEG Telefunken
F45 - Agfa-Gavaert AG
G34 - Ampex International
F13 - Aston Electronic Developments
F18 - Audix
G1 - Autocue Products
F44 - Aveley Electric
F46 - Avitel Electronics

F36 - Barco Electronic NV
F2 - BASF Aktiengesellschaft
G28 - F W O Bauch
F35 - Bell & Howell A-V
G43 - (awaiting confirmation)
F56 - Bosch Fernseh/TeleMation Int'l
F11 - Boston Insulated Wire
G25 - Brabury Electronics
F38 - British Aerospace Dynamics
G12 - British Broadcasting Corp.
F30 - Broadcast Electronics
BE1 - C.C.A.
F3 - Canda Television Equipment
G41 - Canon Business Machines (UK)
F37 - (awaiting confirmation)
F6 - Cinefocus Ltd
F16 - CMC Technology Corporation
G33 - (awaiting confirmation)
F24 - Continental Microwave
G38 - Convergence
G24 - Michael Cox Electronics
F41 - Crow of Reading

F43 - Delta Electronics
G40 - Alan Dick & Co
G16 - Digital Video Systems
F21 - Digivision
F52 - Dolby Laboratories
F47 - Philip Drake Electronics
F31 - J Dunton Cameras
G29 - Dynamic Technology

G11 - EDS/Portaprompt
F49 - Electrocraft Consultants
G10 - Electronic Visuals
F12 - SPU "Heavy Radioelectronics"
F1 - Elektroimpex
F5 - Enertec Schlumberger
G32 - English Electric Valve
F25 - Evershed Power-Optics

G14 - Fuji Photo Optical
F29 - Future Film Developments

F22 - Gowrings Engineering MVC
BE2 - Harris
G19 - Hitachi Denshi

G9 - Ikegami Tsushinki
F23 - IBA/ITCA/AIRC
G13 - Inter Electronics Antilles
F9 - International Video Corp.

F10 - Le Blanc & Royle Comm Towers
F26 - Lee Engineering
F42 - Leevers-Rich Equipment
G31 - Link Electronics
F50 - Logica
F28 - L-W International

F15 - 3M (UK)
G35 - Marconi Communication Sys.
F32 - Martello Sound
F27 - McMartin Industries
G15 - Microtime Int'l

F7 - Microwave Associates
G21 - Mullard

F55 - NEC Telecommunications
F51 - Neve Electronics Int'l
G5 - Norsk Elektrisk Kabelfabrik A/S
G20 - NTP Elektronics A/S
F48 - Nurad

F14 - Optical & Textile

G39 - (PAG Group) PAG Power
G22 - Paltex
F19 - Pro-Bel
G8 - Pye TVT

G27 - Quantel Ltd

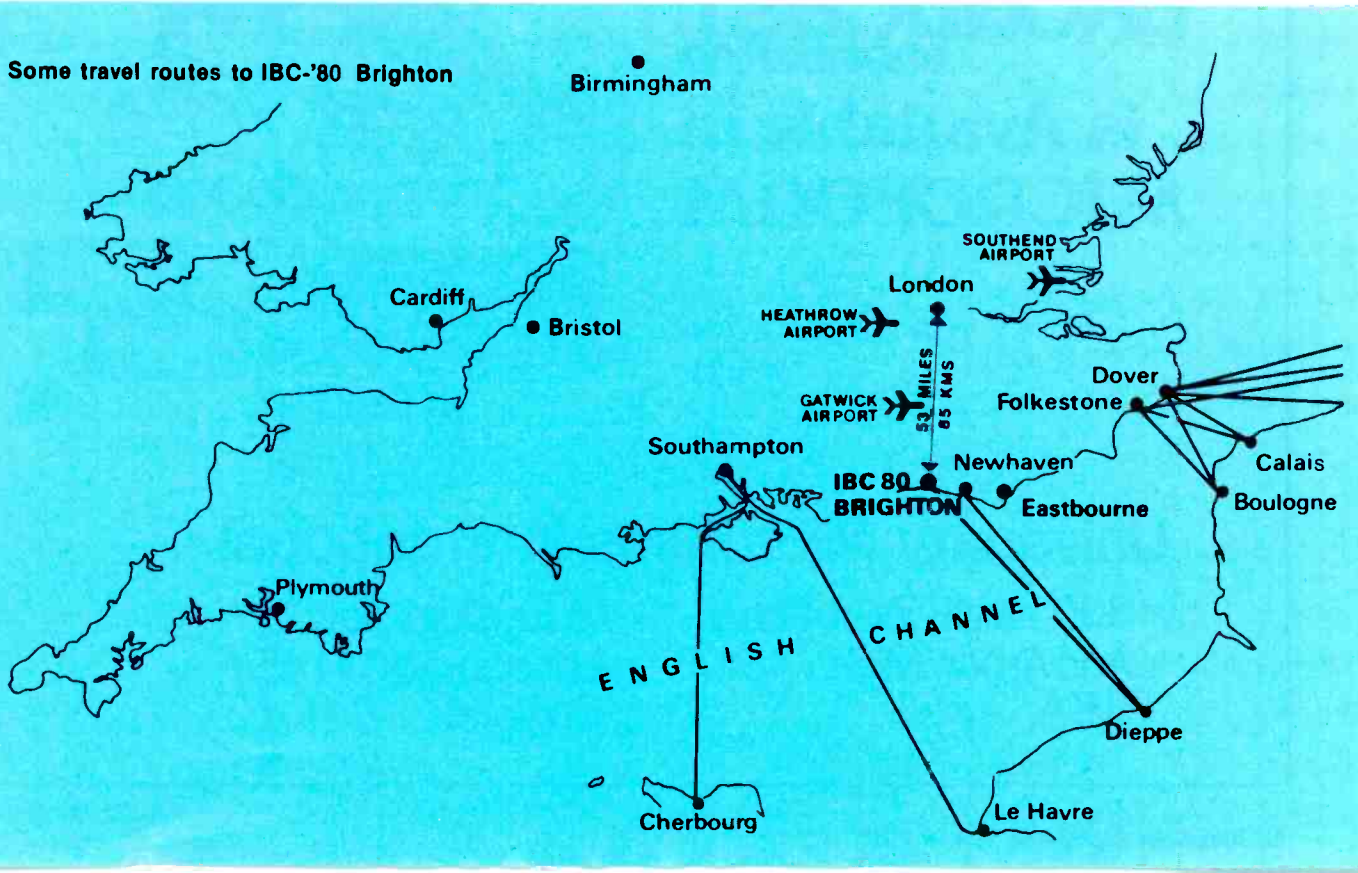
G7 - Rank Cintel Film Equipment

G4 - Sandar Electronics A/S
F39 - Screen Electronics
G17 - Seltech Equipment
F53 - Shibasoku/Asaca
F40 - Shintron Co
F4 - Shure Electronics
F8 - Sony Broadcast
G30 - Spin Physics
F33 - Surrey Electronics
G23 - System Video

F34 - Tektronix Int'l/Grass Valley
G26 - Thomson CSF Components
G18 - Thomson CSF Equipment
G3 - Tore Seem A/S

G6 - Unitel
G36 - Utah Scientific

G37 - Varian A G
G2 - V G Electronics
F17 - W Vinten



business news

Telecom component manufacturing formed

Four former managers of a leading West Coast microwave manufacturer have formed a new company to volume manufacture a line of RF components for the satellite and telecommunications industry. The formation of Magnum Microwave Corporation was announced jointly by its President, Harry E. McGrath Jr.; Vice President of Manufacturing, Harry R. Soza; Engineering Director, Joseph T. Lee; and Marketing Director, David N. Fealkoff.

The four men were formerly employed by the Watkins-Johnson Company of Palo Alto, CA. McGrath, who will head the company, was formerly head of international sales. Harry Soza was mixer production manager. Lee was head of mixer development, and David Fealkoff worked in European sales at Watkins-Johnson.

Exclusive representative

Singer Products announced its exclusive international representation of IGM, manufacturer of program automation equipment for the broadcast industry.

Acquisition

Lyle Bailey, vice president of marketing for Tri-Tronics, announced the acquisition of three new video equipment franchises for the diversified company located in Burbank, CA. Newly signed for representation are Instrument Systems, Digital Video Systems and 4-A Video Systems.

This makes a total of 120 separate video equipment lines represented by Tri-Tronics for sales and distribution.

Sony to distribute CBS Mastersound recordings

Sony Industries' Hi Fi Division will distribute CBS Mastersound recordings through its nationwide network of audio dealers. The marketing effort began at the Summer Consumer Electronics Show held in Chicago June 15-18.

The recently announced CBS Mas-

tersound series makes extensive use of digital and half-speed mastered recordings for its comprehensive line of audiophile products covering the pop, classical and jazz music areas. Seven of the eight digital releases introduced were recorded and edited with Sony PCM equipment.

AKG

The AKG Division of Philips Audio Video Systems has become AKG Acoustics.

As of August 1, 1980, the new address for AKG Acoustics, Inc., is 77 Selleck Street, Stamford, CT 06902, telephone (203) 348-2121.

Videodisc program library

RCA Corporation, under an agreement with NFL Films, Inc., will release highlights of Super Bowls and other National Football League games on its *SelectaVision* Videodisc system. The agreement permits RCA to offer pro football videodiscs from the NFL Films Library, including Super Bowls and other games, both past and future. Each football videodisc will be approximately two hours in length.

Hitachi expansion

Hitachi has opened two new offices.

The office in Lanham, MD, services the Washington, DC, Virginia, West Virginia and Maryland markets. The Cincinnati office covers Indiana, Michigan, Kentucky and Ohio.

Sales office

International Microwave announced the opening of its western regional sales, service and engineering office in Austin, TX, on July 1, 1980. Marvin M. Baron will head the new office at 8201 Texas Plume Road, Austin, TX 78759, phone (512) 258-9275. □

new products

Rack Mounting

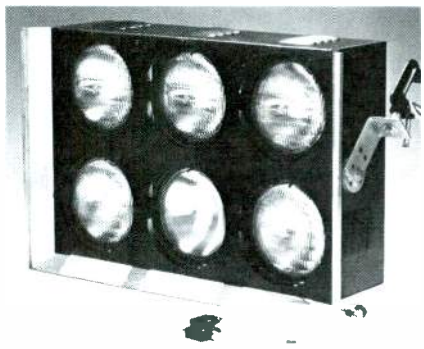
Television Equipment Associates has introduced low-cost rack mounting for Matthey boxed video and pulse delays.

The boxed delay lines are available on pre-drilled and punched panels for mounting in 19-inch rack frames. They have built-in equalization to 5.5MHZ—75 Ω.

Circle (80) on Reply Card

Cine Par

Panoak Lighting Systems has introduced its lightweight Cine Par designed for fill application. It operates at 120Vac/dc, providing

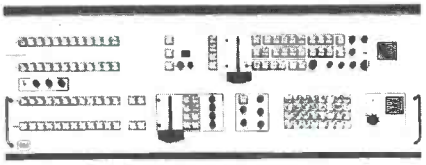


high intensity fill for daylight shooting. Each lamp is easily adjustable providing positive control of beam spread. Lamps are easily accessible for replacement.

Circle (81) on Reply Card

Vision mixers

ISI has announced the introduction of its 1200 series vision mixers in the PAL format. The 1200 series features from 12 to 20 source inputs and may be ordered with one, two, or three mix/effects amplifiers. Every 1200 series also has an additional mixer/downstream keyer or program bus and downstream keyer. The mix/effects amplifier uses a two-level processor allowing



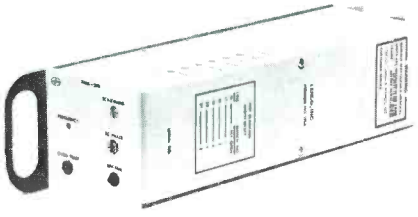
a colorized title key with border edging to be inserted over a mix, wipe, or key in every m/e.

Circle (82) on Reply Card

RS-170A sync generator

A master sync generator designed to exceed broadcast and teleproduction specifications is available from **Lenco.** The PMG-312 features stable chrominance subcarrier to an accuracy of 3.5Hz drift over a 10 year period. An ovenized crystal oscillator provides the master frequency from which all pulses including subcarrier are derived.

Circle (83) on Reply Card



Cartridge eraser/splice locator

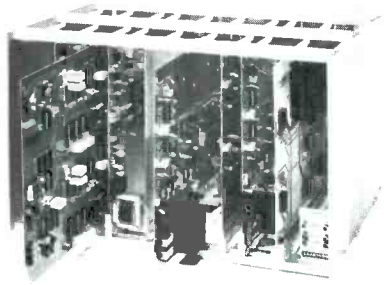
The ESL-IV from **International Tapetronics** is a high speed system designed to operate in production and news studios. The unit features a direct drive capstan motor operating at 25-29 IPS, with cartridge sensing that allows intermittent operation of the motor. Cartridge erasure is accomplished with a specially designed erase coil located beneath the ½-inch aluminum deck plate.

Circle (84) on Reply Card

Stereophonic FDM program terminal

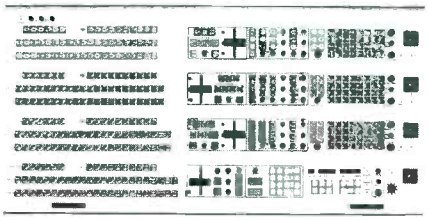
COASTCOM's model 523 frequency division multiplex program terminal uses frequency, phase, and amplitude compensation with the FDM technique to provide high-quality long distance network distribution of stereophonic or dual channel audio. The 523 terminal will accept alternate group band inputs and provide multiple isolated outputs without additional outboard equipment. Dual cueing channels and a fully alarmed redundant power supply are available. A complete duplex 523 terminal is housed in a compact 10.5-inch standard equipment shelf.

Circle (85) on Reply Card



Video production switchers

ISI has announced introduction of its 200 series video production switchers featuring the PolyKey Effects (PKE) System. The series



may be ordered with from one to three PKE units, each with the following standard features: four input busses; manual or auto transitions; internal RGB chroma key and quad split; title key over/under; video key; key edging with black/white/color edges; and rotary and spin wipes.

Circle (86) on Reply Card

Tape degausser

Garner Industries has introduced model 1100 bulk tape degausser to its line of endless belt erasers. The degausser is designed especially for 1-inch high-coercivity videotapes, and can also be used on high-density videocassettes and audiotapes. It will erase up to 13 per minute and can handle reels up to 10½ inches in diameter.

Circle (87) on Reply Card

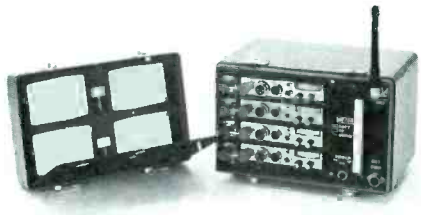
Graphics generator

Software for creating logos, symbols and characters for television broadcast has been introduced for the 3M D-8800 Graphics Generator by **3M's Mincom Division**. Developed as a standard addition for all current and new D-8800 customers, the new *Logo Compose* software package does not require an additional hardware purchase. Calibrated grid sheets supplied with the package allow the creation of logos from one to 400 TV scan lines in height. Logos can be drawn by hand or traced with various projection techniques available. Multiple and large character logos can be accommodated.

Circle (88) on Reply Card

Case/antenna system

Cetec Vega has developed a convenient portable system for multi-channel applications, the model 151 quad case. The 151 case houses four complete model 66 portable receivers, and has a built-in antenna splitter (multi-coupler) that feeds all four receivers from one detachable antenna. The removable front cover has storage compartments for



four model 77 pocket-size transmiters and four spare 9V batteries. Power for the receivers and the splitter is provided by standard alkaline D cells or an external dc source. Packed up, the compact system measures 7"x9-¾"x11" and weighs less than 20 pounds including batteries.

Circle (89) on Reply Card

Cassette cleaner and evaluator

The model U-1A cleaner and evaluator from **Chyron** is completely self-contained, doesn't alter the recorded signal, has selectable erase and selectable oeprating modes. □

Circle (90) on Reply Card

Circle (63) on Reply Card

Circle (64) on Reply Card

new literature

Teletext and Viewdata: Special Issue
Institution of Electrical Engineers—A special issue provides excellent coverage of many aspects of TV information systems.

Circle (100) on Reply Card

1980 EIA market data book
Electronic Industries Association—US factory sales of electronic equipment, systems and components totalled $80.6 billion in 1979, representing an increase of 14.3% over last year's total of $70.5 billion, according to the 1980 Electronic Market Data Book.

Circle (101) on Reply Card

Brochure for GCE product line
LNR Communications—A newly revised Ground Communications Equipment Brochure describes LNR's line of specifications, photos and diagrams.

Circle (102) on Reply Card

Brochure
RCA Americom—A booklet outlining the operation and advantages of its Audio Digital Distribution Service (ADDS) via satellite is available. This new service, makes it possible to distribute radio programming, wire services or specialty programming to a large number of affiliates equipped with small receive-only earth stations. Signal-to-noise quality of 75 dB or better for 15 KHz, 7.5 KHz and 5 KHz channels can be achieved.

Circle (103) on Reply Card

Price list
Wireworks—An illustrated price list is available. This 12-page list details Wireworks' wide range of cabling products and accessories including: the microphone multicable components group, hardwired microphone multicables, professional microphone cables and the new TE-2 Mic Cable Tester.

Circle (104) on Reply Card

Technical specifications
MBI Broadcast Systems—Detailed information on the Series 24A stereo broadcast/production mixer is available.

Circle (105) on Reply Card

Coaxial connector
Hi-G—A 12-page engineering catalog on rf coaxial connectors is now available. The catalog presents complete engineering data on company's crimp and twist-on BNC plugs and BNC bulkhead receptacles, crimp and twist-on UHF plugs, crimp and twist-on UHF jacks, UHF panel receptacles, a line of "F" fittings, and the associated tools. □

Circle (106) on Reply Card

professional services

advertisers' index

Professional Services (Cont.)

BROADCAST engineering

Advertising Sales Offices

NEW YORK, NEW YORK
Joe Concert, 4 West 58th St.
New York, NY 10019;
Phone: (212) 888-1977

KANSAS CITY, MISSOURI
Jan Winters, P.O. Box 12901,
Overland Park, KS 66212;
Phone: (913) 888-4664

LOS ANGELES, CALIFORNIA
Herbert A. Schiff
3055 Wilshire Blvd., Suite 630
Los Angeles, CA 90010
Phone (213) 387-0639

LONDON, ENGLAND
John Ashcraft & Co., 12 Bear St.,
Leicester Square, London, WC2H 7AS,
England;
Phone: 930-0525
Telex: 895-2387

AMSTERDAM, HOLLAND
John Ashcraft & Co., John J. Lucassen,
Akerdijk 150A, 1171 PV-Badhoevedorp
Holland;
Phone: 2968-6225

TOKYO, JAPAN
International Media Representatives, Ltd.,
2-29. Toranomon 1-chome, Minato-ku,
Tokyo 105, Japan;
Phone: 502-0656

classified

Advertising rates in Classified Section are 50 cents per word, each insertion, and must be accompanied by cash to insure publication.

Each initial or abbreviation counts a full word. Minimum classified charge, $4.00.

For ads on which replies are sent to us for forwarding (blind ads), there is an additional charge of $5.00 per insertion, to cover department number, processing of replies, and mailing costs.

Classified columns are not open to advertising of any products regularly produced by manufacturers unless used and no longer owned by the manufacturer or a distributor.

TRAINING

ELECTRONICS DEGREE by correspondence. Earn A.S.E.T., then B.S.E.T. Free brochure. Grantham College, 2550 South La Cienega, Los Angeles, California 90034. 2-79-tfn

FIRST PHONE through cassette recorded lessons at home plus one week seminar in Boston, Philadelphia, Detroit, Atlanta or Seattle. Our twentieth year teaching FCC license courses. Bob Johnson Radio License Preparation, 1201 Ninth, Manhattan Beach, Calif. 90266. Telephone 213-379-4461. 8-78-tf

SERVICES

ONE STOP FOR ALL YOUR PROFESSIONAL AUDIO REQUIREMENTS. Bottom line oriented. F.T.C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32505. 7-71-tf

HELIAX-STYROFLEX. Large stock—bargain prices—tested and certified. Write for price and stock lists. Sierra Western Electric. Box 23872, Oakland, Calif. 94623. Telephone (415) 832-3527. 1-73-tf

TRANSMITTER TUBES REPROCESSED—Save 40 to 50%. 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS CO., 3233 Conti St., N.O., La. 70119, (504) 822-9222. 6-79-tfn

ANDREW LINE & CONNECTORS READY FOR EMERGENCY SHIPMENT ANYWHERE BY AIR. Broadcast Consultants Corp., (703) 777-8660, Box 590, Leesburg, VA 22075. 10-79-tfn

EQUIPMENT FOR SALE

COPPER STRAP, Ground Screens and #10 wire, BCA, (404) 487-9559. 1-80-tfn

40' TV VIDEOTAPING PRODUCTION UNIT. Latest network & engr. maintenance equipment, etc. (213) 397-5922. 6-80-tfn

FOR SALE, NORELCO PC-70, studio camera (never on mobile) $14,990.00, financing available for qualified principals, North American Video, (212) 369-2552. 6-80-3t

EQUIPMENT FOR SALE: Ampex RA-4000 editing systems, Ampex HS-100 Slo-Mo disc recorders, Ampex VR-2000 videotape machines, Ampex VR-1200 videotape machines, mobile unit—1969 Reliance 40 feet complete with 6 PC-70 cameras, excellent operating condition. For more detailed information and inventory list contact: Jim Richards/ABC, 40 West 66 Street, NYC 10023, (212) 887-4906. 7-80-2t

2 IGM (SMC) CAROUSELS—1 mono 20A, 1 stereo 22A. Contact Wayne Clonts, Borger Broadcasting Corporation, P.O. Box 1478, Borger, TX 79007, (806) 273-7575. 7-80-2t

BROADCAST CRYSTALS for AM, FM or TV transmitters, frequency change, repair or replacement of oven types. Also vacuum types for RCA, Gates, Collins etc. transmitters. Quality products, reasonable prices and better delivery! Don't be without a spare crystal. Frequency change and service for AM and FM monitors. Over 30 years in the business. Eidson Electronic Co., Box 96, Temple, Texas 76501. Phone (817) 773-3901. 7-80-tf

DRIVE THE CHIEF CRAZY! Humorous color registration charts. Specify **Fuzzy,** or **Curved Lines,** at $4.95 each. $8 for pair. Add $1 for handling. California add 6% tax. Send check or M.O. to Aarlo Enterprises, 109 Minna Street, Suite 254, S.F., CA 94105. 8-80-1t

TECHNICS SP-10 MK II turntable, S.M.E. arm, and obsideon base, $650.00. Arnold Chase, WTIC-FM, (203) 522-1080. 8-80-1t

400' 7/8" (FOAM) PHELPS-DODGE cable with "N" connectors. Perfect condition, $700.00. (203) 521-5252. 8-80-1t

FOR SALE—EQUIPMENT: 5 Norelco PC 70's, 2 **PCP 90's,** 1 Op Amp audio board, 2 DMI Slo/Mo's, 1 Central Dynamics VS-10 switcher. Contact: Clair Higgins, Video Tape Enterprises, 8610 Sunset Blvd., Hollywood, California 90069, (213) 659-4801. 8-80-1t

TRANSISTOR TESTER, 2 Philco 219B, in/out of circuit. EICO VTVM, #232, less probe. AM Carrier-current transmitter, **LPB #RC-6A.** Air Alert Monitor, Ball Brothers Regulated Power Supply, Unireg, 1 amp, 0-15v Gates "Yard" console, mono, 4-mic, 2-line inputs Standard-Rocket ditto machine, needs work, audio function generator, 3 function, H-P #202A Gates limiter, #MO-2996A, mono, tube, Ampex #300, mono R-R recorder, Royal Manual typewriter. Send bids to KUOI FM: bids, SUB, Moscow, ID 83843. 8-80-1t

EQUIPMENT FOR SALE (CONT.)

(3) IVC 500A COLOR CAMERAS. 10-1 zoom lens, tubes, encoder, image enhancer, cables with 200 foot extension. Good condition. $5,000 each or all (3) for $13,500. Contact Harry Kramer, WJWJ-TV, Beaufort, SC. (803) 524-0808. 8-80-1t

REMANUFACTURED AMPEX 1200B VTR, Amtec, Colortec, Mark II Editec, overhead bridge, spare head, compressor, Venturi vacuum system, manuals, and extenders. Less than 125 hrs. use since AFA rebuild. Mint condition. Call Bob Chetrick, 1-800-253-9239. 8-80-2t

AMPEX 1" Type A m7950, $4000, (213) 934-8836. 8-80-2t

ALTEC 9300 ACD series audio console with 8 input channels and 4 output channels with complete compression and E.Q. **TELEMATION SYNC GENERATOR TSG 3000GL** with gen lock. **COHU 2617-767 SYNC GENERATOR** with gen lock. **DYNAIR SERIES X** 6x6 Audio/Video router. Contact Dick Reed or Bob Kloc, (517) 636-1100. 8-80-1t

SCHAFFER 903-E automation system. This complete system includes two 48 tray Instacarts, two 78 tray random access Go Carts, five ITC 750 tape decks, two ITC SP-0004 cart decks, two studio/network IO cards, Extel logger, TI data cassette encode center, two 25 hertz makeup units, and much more. All equipment is stereo. Technical and programming assistance is available. Asking $50,000.00 for this well maintained system. We'll pay the shipping within the U.S. Contact Jerry Westerberg, Technical Director, KPPL and KLAK, (303) 985-8771. 8-80-1t

FM OPTIMOD. Less than two years old. Excellent condition. $2,500.00. Contact Jerry Westerberg, Technical Director, KLAK and KPPL, (303) 985-8771. 8-80-1t

HELP WANTED

CHIEF ENGINEER needed to do supervision and installation of New Public TV Studio and 60 KW transmitter. Salary low 20's, first class phone required, deadline—August 20. Reply to: Kenneth Gardner, KSMH-TV/Ch. 14, 1011 Fort Street, Hays, Kansas 67601. 8-80-1t

CHIEF ENGINEER IN DULUTH, MN. Take charge type person looking to move up. Group radio ownership. EOE. Send resume and salary requirements to Steve Terhaar, Box 2983, Fargo, ND 58108. 8-80-1t

MAINTENANCE ENGINEER for Seattle network affiliate. Must have good digital background as well as broad practical experience in TV broadcast maintenance. EOE. Contact Jack Shawcroft, P.O. Box 24525, Seattle, WA 98124. Phone: 206/223-5141. 8-80-1t

VIDEO OPERATOR/ENGINEER with maintenance background. RCA cameras and related terminal equipment. Minimum 2 years experience in broadcast or production. Salary competitive and excellent benefits. Must be willing to relocate. Send resume and references to: Dept. 510, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. We are an equal opportunity employer. 8-80-1t

HELP WANTED (CONT.)

VIDEO ENGINEER-OPERATOR: Job emphasis on maintenance of professional video studio equipment. Some operations involved. Experience required. Resume to Byron Motion Pictures, Inc., 65 K St., N.E., Washington, DC 20002, Attn: Video Mgr. EEO. 8-80-2t

APPLICATIONS from qualified remote engineers and videotape editors are being accepted by JEFFERSON PRODUCTIONS, a full service production facility. State-of-the-art LDK-5 and TK-47 cameras, Sony 1" tape, and computer editing facilities. A major equipment installation is underway. Apply in confidence to PERSONNEL DEPARTMENT, Jefferson Pilot Broadcasting Company, Charlotte, N.C. 28208, (704) 374-3603. **An Equal Opportunity Employer.** 8-80-1t

SENIOR OPERATIONS ENGINEER. Responsibilities include operation and maintenance of all technical equipment in university television facility as well as supervision of engineering staff and assistance in administration of day-to-day activities of the facility. New broadcast quality equipment. B.S.E.E. or B.S. with equivalent combination of technical education and experience. First class radio-telephone license. Experience in broadcast studio operations desired. Send application letter, resume, and three letters of recommendation to Dennis B. Webster, TLRC Television Manager, Southern Station Box 5082, University of Southern Mississippi, Hattiesburg, MS 39401. (601) 266-7306. The University of Southern Mississippi is an equal opportunity/affirmative action employer. 8-80-1t

MAINTENANCE WIZARD WANTED: You've been reading want ads over and over and now—here's what you've been looking for! Maintenance Engineers imagine this: a sleek modern videotape production facility that produces national spots for major agencies as well as non-broadcast projects for large corporations. Staffed with young, energetic, dedicated personnel. If you qualify in the maintenance of RCA and Norelco cameras, Ampex 2" and 1" type C videotape, CVS EPIC computer tape editing, Vital production switchers, Vital Squeezoom, and would like to work in the Chicago market, call or write: John Gebhard - Chief Engineer, Telemation Productions, 3204 W. West Lake Avenue, Glenview, Illinois 60025, (312) 729-5215. 8-80-2t

MAINTENANCE ENGINEER/TAPE: For mobile television facilities company. Familiarity with following equipment a must - Ampex 1200, VPR-1/A format, HS-100 Disc, VPR-2/C format, Sony BVH 500, 1000 and 1100 and ¾" cassette. We are looking for someone who can initiate a strong program of regular and preventive maintenance. Send resumes to: Video Tape Enterprises, 8610 Sunset Blvd., Hollywood, California 90069, Attn: Roland Maynard, (213) 659-4801. 8-80-1t

FAST GROWING PRODUCTION COMPANY in South Florida, needs engineers to install, maintain and interface latest state of the art equipment: Both Vital's Squeezoom and Quantels DPE-5000 digital effects, Datatron Vanguard editors, Ampex VPR-2B's, RCA-TK 28B's, etc. The positions are heavy technical, no operating required. Call: Michael Orsburn, Director of Engineering, (305) 587-9477, or send resume and salary requirements to: Video Tape Associates, 2351 SW 34th Street, Ft. Lauderdale, FL 33312. 8-80-1t

VIDEO ENGINEER—Media Production Center, a non-broadcast facility used for production and training of students seeks an individual with excellent credentials in complete maintenance and operation of a color video studio. FCC first class license preferred. Required to assist students with projects. Send resumes to Professor Morton Goldenberg, Audio Visual Department, Rockland Community College, 145 College Road, Suffern, New York 10901. An equal Opportunity/Affirmative Action Employer. 8-80-1t

CHIEF ENGINEER: WJTN/WWSE, Jamestown, N.Y. seeks First Class engineer with automation, STL knowledge. EOE. Send resume, including salary requirements, to: Merrill Rosen, Vice President/General Manager, Goldman Group, Box 1139, Jamestown, NY 14701. 8-80-1t

VIDEO MAINTENANCE ENGINEER: Experienced in quads, electronic editing equipment and color cameras. Salary, OT and benefits. Call collect 313-882-9166, ask for G. Guerin. 8-80-1t

HELP WANTED (CONT.)

IMMEDIATE OPENINGS. First class VHF Network affiliate operation needs engineer, TV maintenance (studio), radio maintenance (transmitter and studio). Must have 3 years previous experience and 1st phone license. Equal opportunity employer. Contact: Henry B. Ruh, Director of Engineering, WTHI AM-FM-TV, 918 Ohio Street, Terre Haute, Indiana 47808, (812) 232-9481. 8-80-2t

TV MAINTENANCE ENGINEER for TV Production Company. Need to be experienced and able to maintain AVR-2, VR-2000 VTRs, Norelco and RCA Cameras, and Grass Valley Switchers. Contact: Jimmie Fortner, MCI Productions, 2500 Farrington, Dallas, TX 75207, (214) 630-1262. 8-80-2t

VIDEO ENGINEER: Employment opportunity in the country's growing sunbelt. Expanding southeastern video production company seeks video engineer. Work in professional environment with state of the art equipment. Atlanta, Ga. and Hilton Head, S.C. locations. Possibility of chief engineers' position. Reply in confidence. Include salary requirements. DENNY FUSSELL, TRI-COMM PRODUCTIONS, P.O. BOX 5242, HILTON HEAD, S.C. 29928. 8-80-1t

Help Wanted Technical

IF you are a small market Chief Engineer or a medium/large market Staff Engineer, we have some great reasons for why you should leave your present job and come to work for Greater Media. We are looking for an energetic self-motivated, communicative first-class engineer experienced at all aspects of AM and FM broadcasting. If you are ready for a challenging job in the suburban NYC area, please send a complete resume and salary requirements today to

Dennis R. Ciapura
Technical Director
Greater Media, Inc.
P.O. Box 859, Turnpike Plaza
197 Highway 18
East Brunswick, N.J. 08816

HELP WANTED (CONT.)

CHIEF ENGINEER

A major group owned UHF Network Affiliate located in a sunbelt top 100 city is seeking an experienced Chief Engineer. The ideal candidate will have a BSEE or at least 7 years of applicable T.V. experience. In addition, the individual will possess a desire to take charge of a technical operation from transmitter to time code generator while maintaining the management skills required of a department head. This is an outstanding opportunity with a growth oriented organization. All replies will, of course, be held in strictest confidence. An equal opportunity employer. Send resumes to Dept. 511. P.O. Box 12901, Overland Park, KS 66212.

TECHNICAL DIRECTOR (TELECOMMUNICATIONS). Starting salary $16,309 to $22,833. Minimum qualifications include experience in a full color TV facility, cable casting, 1st phone and experience in maintenance of TBC's ¾ inch, VTR's, audio equipment, color cameras, lighting systems, and automation systems. To obtain an application write to: Personnel Dept., BURLINGTON COUNTY COLLEGE, Pemberton, N.J. 08068. Completed applications must be received or postmarked no later than Sept. 5, 1980 in order to receive consideration. EOE/M/F. 8-80-1t

SOUTHEAST TELEVISION STATION has an opening for Studio Supervisor. FCC First Class License required. Studio equipped with RCA tape, Philips and RCA camera, Grass Valley switcher, ¾" Sony, etd. Send inquiries to Dept. 504, Broadcast Engineering, P.O. Box 12904, Overland Park, Kansas 66212. We are an Equal Opportunity/Affirmative Action employer. 6-80-4t

MAINTENANCE ENGINEER: Minimum requirements—FCC 1st phone, 3-5 years TV maintenance experience, preferably with some R-F, for group owned VHF independent. Send resume to Bill Strube, KPHO TV, Box 20100, Phoenix, AZ 85036. 6-80-3t

HELP WANTED (CONT.)

ENGINEERING POSITIONS

We specialize in the placement of TV and Radio Engineers with Broadcast Stations, Manufacturers, Industrial TV, Production Facilities and Dealers; all levels, positions and locations nationwide. Professional, confidential - no fee. Best Industry reputation - over 1000 client contacts. To discuss your employment possibilities phone Alan Kornish at (717)287-9635 or send your resume' now. Employer inquiries invited.

KEY systems

NEW BRIDGE CENTER, KINGSTON, PA. 18704

LOOKING FOR GOOD ASSISTANT chief engineer, familiar with RCA transmitter—TR 600, TK 630 Sony, Phillips engineer. Contact: Jim Robinson/WECA-TV, 904-893-3127. 6-80-tfn

TAPE EDITORS—Position now open for person with CMX, CVS EPIC, or Datatron computer assisted editing system experience. Send reel and resume to: Broadcast Engineering, Dept. 509, P.O. Box 12901, Overland Park, KS 66212. 7-80-2t

STUDIO MAINTENANCE ENGINEER: Immediate opening, must have 1st Phone, experience with TCR-100, reel-to-reel quad tape, studio cameras, and associated equipment. Minimum of 2 years broadcast studio equipment maintenance experience. Excellent salary, benefits, and growth potential for qualified person. Young progressive staff. Send resume to: Tom Mikkelsen C.E., WQAD-TV, 3003 Park 16th St., Moline, IL 61265. AA/EOE employer. .7-80-3t

HELP WANTED (CONT.)

CHIEF ENGINEER— For University telecommunications center. To manage technical operations of TV, FM and CCTV facility, including a major facilities upgrade project. Requires BS in related field, FCC first, two to five years' experience in engineering management, and demonstrated leadership ability. Salary to $25,000 depending on qualifications and experience. Send application to Broadcast Engineering, Dept. 507, P.O. Box 12901, Overland Park, KS 66212. An Affirmative Action/Equal Opportunity Employer. 7-80-3t

DIRECTIONAL AM PLUS FM needs high quality Chief Engineer. 18M, vehicle. Benefits, great location. Good, new equipment. Write Broadcast Engineering, Dept. 506, P.O. Box 12901, Overland Park, KS 66212. 7-80-2t

VIDEO ENGINEER—MEDIA PRODUCTION CENTER, a non-broadcast facility used for production and training of students seeks an individual with excellent credentials in complete maintenance and operation of a color video studio. FCC first class license preferred. Required to assist students with projects. Send resumes to Professor Morton Goldenberg, Audio Visual Department, Rockland Community College, 145 College Road, Suffern, New York 10901. An Equal Opportunity/Affirmative Action Employer. 8-80-1t

WANTED: BROADCAST CHIEF ENGINEER. To be responsible for the total supervision and operation of a Public Broadcasting television and radio system in southern Minnesota. Station just received new grant to construct total new TV and radio operation that will serve some 240,000 persons in southern Minnesota. Must have minimum of two years of formal schooling in electronics, strong working knowledge of digital electronics, five years maintenance experience in broadcast systems, must be able to grasp and apply good managerial policies. First Class FCC license essential. Experience in building new broadcast facilities helpful. Will manage staff of four full-time engineers and two part-time operators. Salary $20,000 plus strong benefit package. Send resume and references to Barry G. Baker, General Manager KAVT-TV, Austin, Minnesota, 55912. KAVT, owned and operated by I.S.D. #492, is an equal opportunity employer. 8-80-1t

HELP WANTED (CONT.)

IMMEDIATE OPENING for TV studio maintenance engineer with two years of technical training, including digital and two years experience. First Class FCC license required. Resume to: Gene Rader, Director of Engineering, KBIM-TV, P.O. Box 910, Roswell, NM 88201. An equal opportunity employer. 7-80-3t

WANTED

WANTED: Pre-1926 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, Ca. 92054, (714) 722-6162. 3-76-tf

WANTED: RADIO TRANSCRIPTIONS 16" "Eddy Arnold Purina Shows" by Brown Transcription Service. Would purchase all or tapes made from same. Want other 16" and 12" transcriptions and Radio Station Library's of Records, 78's, 45's, L.P.'s, etc. Boyd Robeson, 2425 W. Maple St., Wichita, Kansas 67213, (316) 942-3673, 722-7765 nites. 6-80-tfn

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Ontario, Canada, M4H 1H2. 416-421-5631. 2-79-tfn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (In Georgia call 404-324-1271). 6-79-tfn

WANTED: Good used Sparta tape cartridge machines, Model 4510 and 4610. KXEM Radio, Box 326. McFarland, CA 93250. 7-80-2t

PRE-1946 TELEVISION sets wanted for historical collection, will pay well for rare or unusual models, R.C.A. CTC-100, C.B.S. spinning wheel sets also wanted. Call collect (203) 521-5280. 8-80-1t

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TRAINING SPECIALISTS:

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FIELD PROJECT ENGINEERS WORLD WIDE ASSIGNMENTS

Direct technical projects in a field that extends around the world! You should be willing to travel WORLD WIDE 50% of the time. To qualify you must have understanding of the latest generation of T.V. Broadcast equipment.

PRODUCT MANAGEMENT/ TRANSMITTERS

Assist in planning new equipment, marketing strategy and work closely with advertising and sales organizations. Prefer BSEE with knowledge of UHF/VHF television transmitters.

Excellent compensation packages and relocation programs if needed. If you are interested in any of these positions or are qualified in other Broadcast equipment areas, we are waiting to hear from you. Call COLLECT, 215-968-0707 or send resume to:

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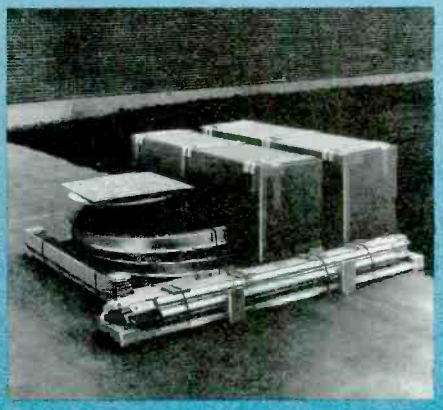

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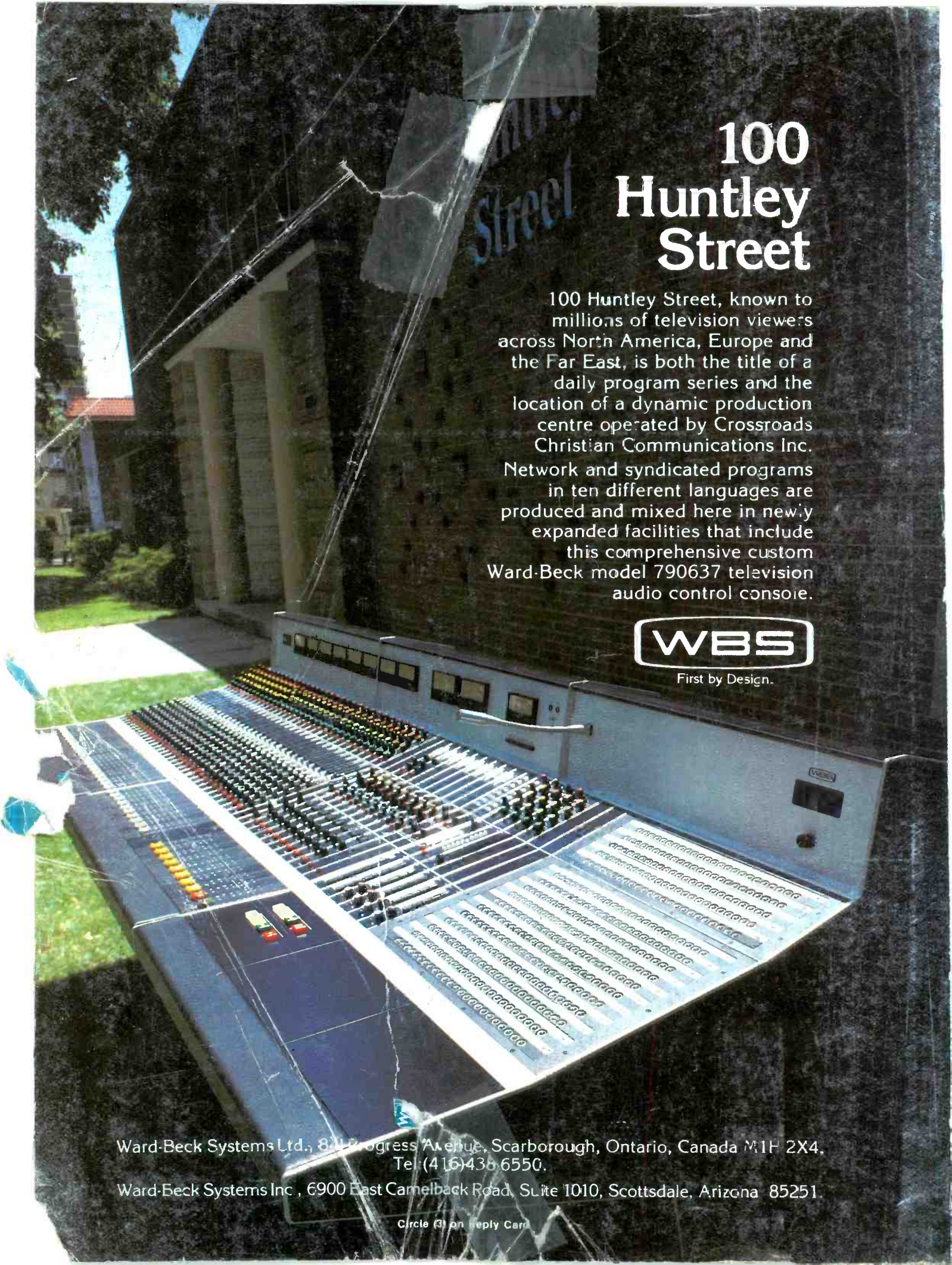

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