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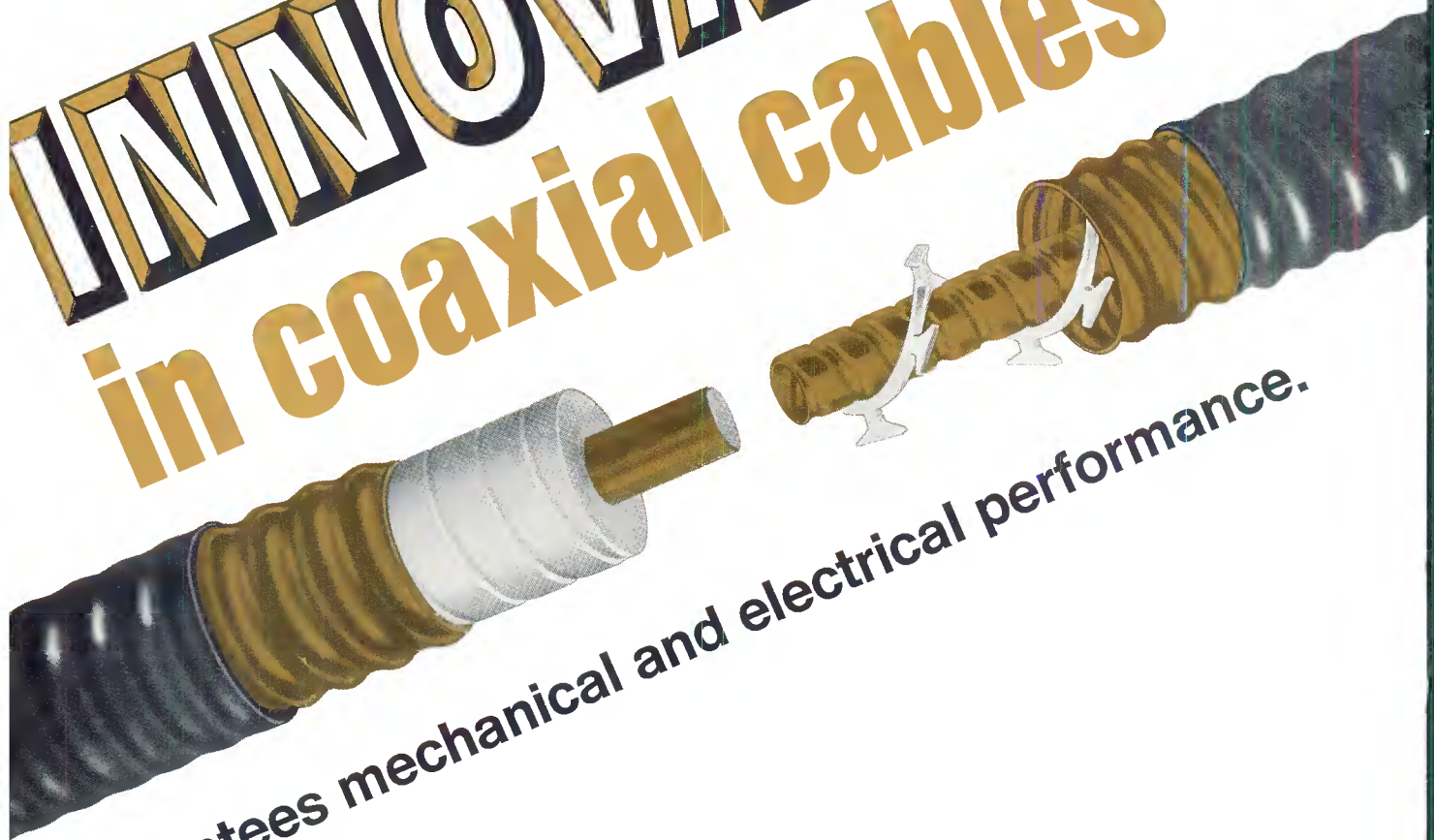
VIDEO EDITING

page 18

Parallel FM Transmitters

Keeping RF Out of Audio

INNOVATIONS in coaxial cables

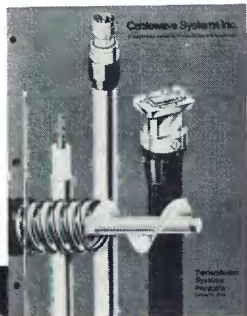


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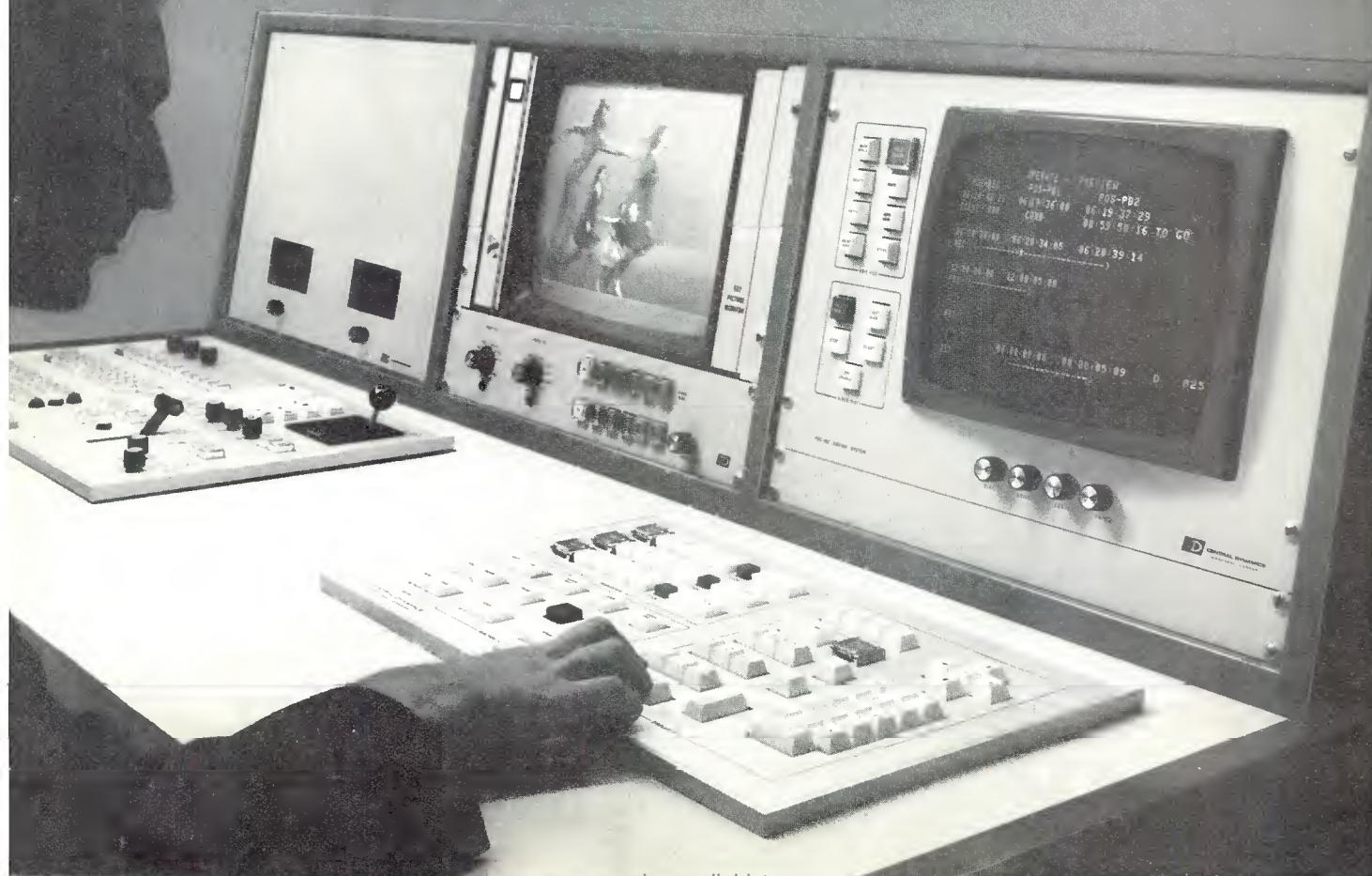
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- 18 Video Editing: From Shackles To Liberation.** A review of where video editing has been (razor blades) and where it is going (electronic editing). Includes details of what the SMPTE time code is and how it's used today. *Joe Roizen.*
- 26 Group W Productions: From Mike Douglas to Mickey Mouse.** An interview with Westinghouse Productions that looks inside their 24 hours a day, 7 days per week operation. Includes tips on how to solve everyday problems and improve your efficiency.
- 36 Razor Blades Are For Shaving.** A Hollywood video tape editorial supervisor talks about problems and progress in editing, including a description of how Consolidated Film Industries uses computers for editing. *Art Schneider.*
- 40 Parallel FM Transmitters: The Built-in Backup.** Part 2 of a 2-part series on options and peripheral equipment that help keep downtime to a minimum. *Glen Clark.*
- 43 How To Keep RF Out Of Your Audio Circuits.** BE's maintenance editor covers basic RF problems and suggests methods of eliminating this kind of interference. *Pat Finnegan.*

About the cover

Here we are on the set of the Mike Douglas Show. Which leads us to video editing, beginning on page 18. The picture appears here due to the courtesy of Group W and staff and through the efforts of Bob Hueffed of Central Dynamics.

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EDITORIAL

Ronald N. Merrell, *Director*
Carl Babcoke, *Technical*
Pat Finnegan, *Maintenance*
Howard T. Head, *FCC Rules*
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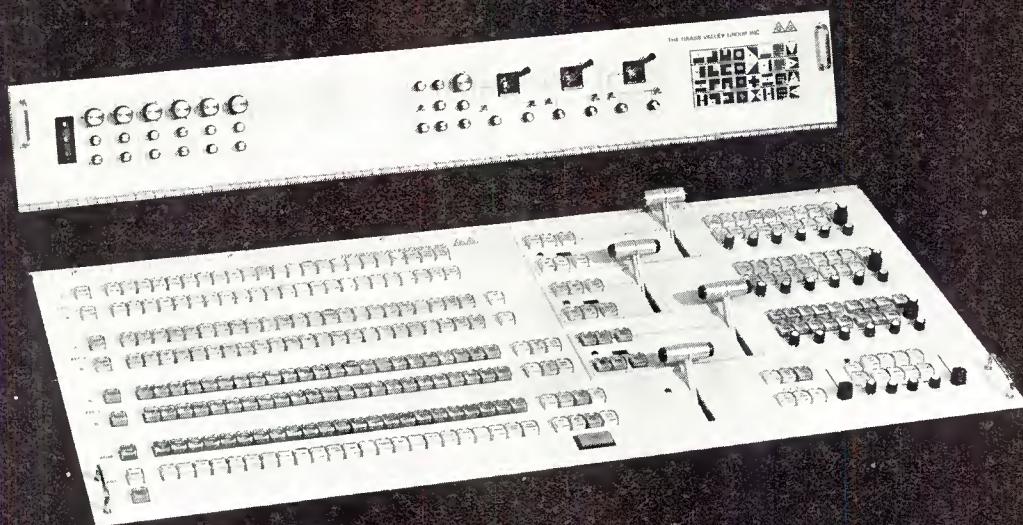


Robert E. Hertel, *Publisher*

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June, 1975/By Howard T. Head and Harold L. Kassens

Commission Finds New Source of RFI

The "newest and most novel source of interference to radio reception" has just been detected by the FCC--thermostats on fish aquarium heaters. Undesirable radiation appears to be emitted at the thermostat or from power lines. The FCC has said that the age of the thermostats does not appear to be a factor, as some newer units radiate more than old ones. Particularly disturbing is the FCC finding that commercially available power line filters have not eliminated thermostat interference.

The Commission has alerted manufacturers and sellers that incidental radiation devices, such as thermostats, electric shavers, vacuum cleaners, electric mixers, etc., are subject to Section 15.15 of the rules relating to incidental radiation devices. The Commission has warned that it expects manufacturers to take the measures necessary to eliminate or substantially reduce the level of such interfering radiation. If voluntary compliance is not forthcoming, it may be forced to adopt formal rules to control interference.

Commission Holds Interference to TV No Bar to EFM Grant

The Commission has granted an application of an educational FM station for a substantial increase in power over the objection of a Channel 6 (82-88 MHz) TV station on the grounds of interference. Although the FM station will be required to install suitable filters in affected receivers, the Commission noted that the FM applicant had proposed to alleviate the interference problem by mounting the FM antenna on the same supporting structure as the Channel 6 TV antenna, but the TV station refused. The Commission said that eliminating interference to TV signals is a two-way street, and that both services should cooperate. It went on to say that if an FM station was willing to use the same supporting structure and the FM antenna could be accommodated, a TV station on Ch. 6 should be willing to accommodate the FM station. Otherwise, "it has no grounds for lamenting the consequences."

(Continued on page 6)

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(Continued from page 4)

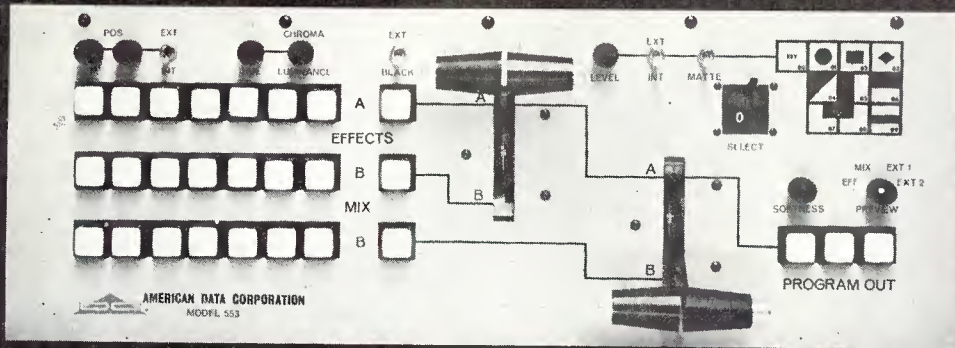
Closer Cooperation With Commission Field Offices

At the recent NAB Convention, Chairman Wiley was asked about "uncooperative field offices". He promised improvement and indicated that the Engineers in Charge of all the field offices and monitoring stations will be brought to Washington in June for a week to concentrate on inspection procedures. The Association of Federal Communications Consulting Engineers (AFCCE) is organizing a delegation to meet with them. A joint government-industry meeting would certainly be helpful in ferreting out some examples of problems.

Short Circuits

A telephone company has been fined \$500 for disconnecting a subscriber's service without cause, \$500 for disconnecting service without prior notification and \$25 per day for the ten days the illegal discontinuance continued...The Commission has issued its proposed revision of the broadcast renewal Form 303 (Docket No. 20419), proposing for the first time, to require filing the transmitter operating logs of FM and TV stations for the composite week...FCC meetings for the months of May, June and July of particular interest to engineers: May 21 briefing by the Cable Television Advisory Committee (CTAC) on cable technical standards; June 16-20: Conference of Engineers-in-Charge of District Offices; June 25: Discussion of relaxation of AM processing rules; June 26: Discussion of AM clear channel allocations policy...The Commission has extended for a second year an experimental authority to the Public Broadcasting Service (PBS) to transmit captioned or subtitled television programming on 20 stations using line 21 of the vertical interval...In assessing a forfeiture to an AM station for operating with excessive power, the Commission's order quoted portions of General Order No. 115 of the Federal Radio Commission adopted May 25, 1931, and noted that the permissible power variation of 5 percent above and 10 percent below licensed power are the same limits as those adopted 44 years ago.

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The special effects generator provides nine wipes, including a circle, square, diamond, diagonal, H&V splits and corner inserts. In key mode, the special effects generator provides a choice of self or matte key on internal or external sources, and an external chroma keyer may be used on the external input. True SOFT WIPES are provided, with control for degree of softness. The keying system is LINEAR in nature so that edge crawl and key breakup are minimized.

The Model 553 is self-contained and designed to mount in a standard 19 inch console or rack housing. Input selector buttons are momentary contact, illuminated with relegendable lens caps. A blackburst and color background generator is included in the switcher to provide fades or wipes to any color or black, and in conjunction with the matte keyer, will provide colored insert keying.



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NAB workshops scheduled

The six 1975 Fall Conferences of the National Association of Broadcasters will have separate, special workshops designed for radio program personnel.

Burns Nugent, NAB executive vice president for station relations, said the workshops will be conducted by Bob Henabery Associates of New York City, and will be presented at each conference.

Nugent said the sessions will deal with actual programming problems and solutions.

Program participants will explore a wide range of topics including How To Best Program to Today's Different Audiences; How To Test Whether or Not You're Positioned Properly in Your Market; Identifying the Hit Elements in Any Kind of Format; What Makes Your Listeners Tune In and Out; How To Make Your Morning Man a Bigger Personality; Identifying the Only Sure Way of Getting the Most Out of Every Member of Your Staff; How To Improve Your News; How To Spot the Creative Ego Trip; Helping Talent Get It Together; Pinpointing the Duties of Your Disc-jockeys; Orchestrating Your On-air Promotion and Outside Advertising; How To Manage Your Commercial Inventory Properly to Increase Ratings and Profits.

Nugent said the goal of the

how-to sessions is to provide station programmers and managers with information of the most up-to-date and innovative radio program developments for all formats—contemporary and album rock, middle-of-the-road, easy listening, country and western, news and information, and general services.

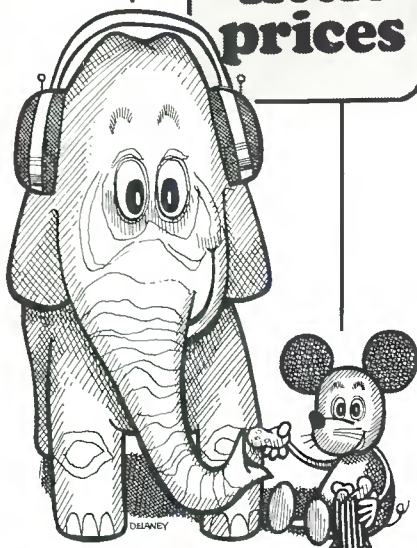
Prior to organizing his own company in mid-1974, Henabery was director of program development for the ABC owned AM stations where he supervised the seven individual radio formats which helped advance the stations to the position of the most listened-to group in the country.

During his six years with ABC, he also helped develop the successful Rock 'n Stereo format for the owned FM Group. Previously, he was director of operations, WRKO and WRKO-FM, Boston, and before the call letter changes of those stations he held the same position with WNAC and RKO's Yankee Network. From 1954 to 1964, he was program director of WWJ and WWJ-FM, owned and operated by The Detroit News, the nation's fourth ranking newspaper.

The Fall Conferences will be held Oct. 12-14 (Atlanta), Oct. 15-17 (Boston), Nov. 9-11 (New Orleans), Nov. 12-14 (Chicago), Nov. 16-18 (Denver) and Nov. 19-21 (San Francisco).

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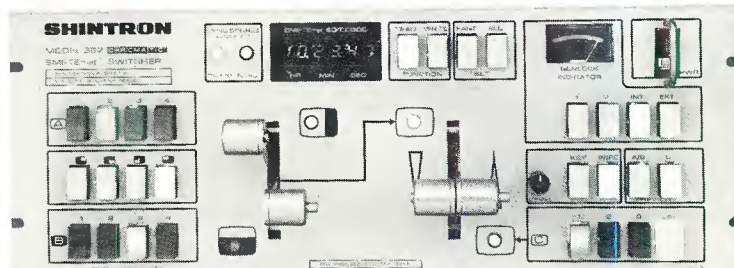
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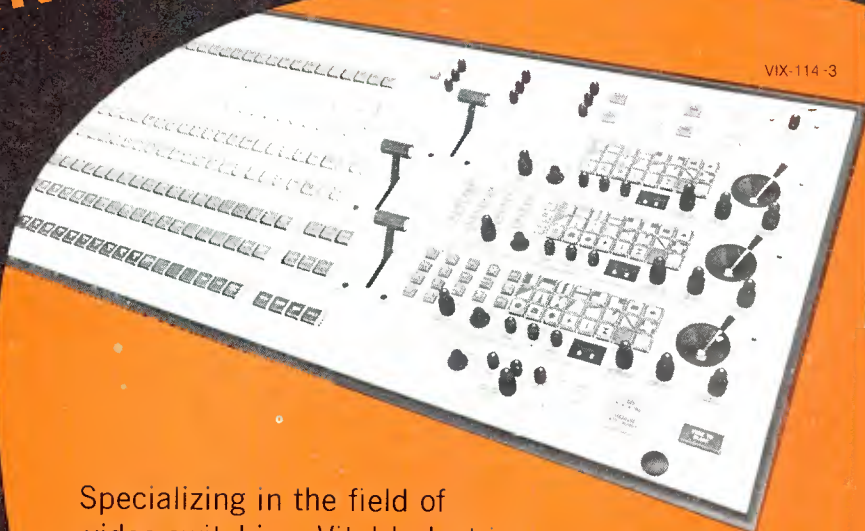
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Miratel changes division name

William Sadler, vice-president and general manager of the Miratel Division of Ball Brothers Research Corporation, has announced a new name for the division—the Electronic Display Division.

Miratel, a name recognized in both the broadcast and electronic data processing industries, will be retained as a brand identification for the Electronic Display Division.

The division will celebrate its 20th anniversary this year. As Miratel, the firm introduced some of the first solid-state CRT monitors in the industry.

Tell it like it is

In one of the Commission's more lenient actions, an \$800 fine has been assessed against a New Mexico station for operator and logging violations.

As a result of two station inspections, the FCC notified the station late in 1973 that it had violated the Rules and could be liable for a \$1,000 forfeiture. These inspections indicated that the station had been operated by two unlicensed employees who also had maintained the operating logs. These were violations of Sections 73.93(a) and (f) and 73.113(a).

Going even further back, the FCC also cited the station for failure to file its financial report for 1971 and 1972.

Station officials said the violations were not willful acts. They further stated that the 1971 report had been mailed but was lost, and it submitted a copy of the report showing the original had been certified on February 10, 1972. As for the 1972 report, it apparently was made out but not mailed. At least the FCC never received it. Upon receiving the FCC notice, a copy of the 1972 statement was mailed.

While it always can be argued that someone down the line didn't do the job, management accepts the responsibility along with the license. The two keys that seem to help most are being candid and cooperative.

NCTA blackout protest

The cable television industry has formally protested proposed blackout restrictions which would deprive millions of cable TV subscribers of sports programming.

In a resolution adopted at the National Cable Television Association's annual convention, cable TV operators cited the vast numbers of viewers who would be affected by sports blackout rules proposed by the Federal Communications Commission.

The FCC is considering a rule which would bar cable TV operators from importing professional games of the same sport on the day a local team is playing at home—unless the event were available on local TV.

The resolution called on the FCC to halt implementation of the proposals. It pointed out that Congress in its studies and actions on sports

blackouts has moved toward expanding the American public's access to televised sports, not limiting it. The resolution noted that FCC's own recent study of television blackouts shows no adverse impact to sports teams from removing blackout restrictions.

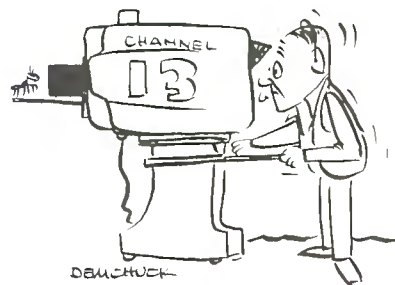
NCTA disclosed that it planned to file a document with the FCC next week which describes the massive effect sports blackouts would have on cable TV subscribers. Statistical analyses of cable TV systems and sports leagues show that the FCC's proposed rule would result in blacking out substantial numbers of sports telecasts in more than 3 million American homes served by cable television, and would drastically impact the future development of CATV in the nation's cities, NCTA said.

In Pennsylvania alone, nearly

three quarter million cable subscribing homes would be affected, NCTA's study shows.

The effect of blackouts is most distinct in the 50 largest metropolitan areas—where more than half of the nation's TV homes are and where cable TV growth is just beginning. Thirty-four of those markets are "home" to one or more major league sports team (baseball, basketball, football or hockey).

The cable TV industry in endorsing the NCTA Resolution is asking the FCC not to deny sports programming to CATV subscribers.



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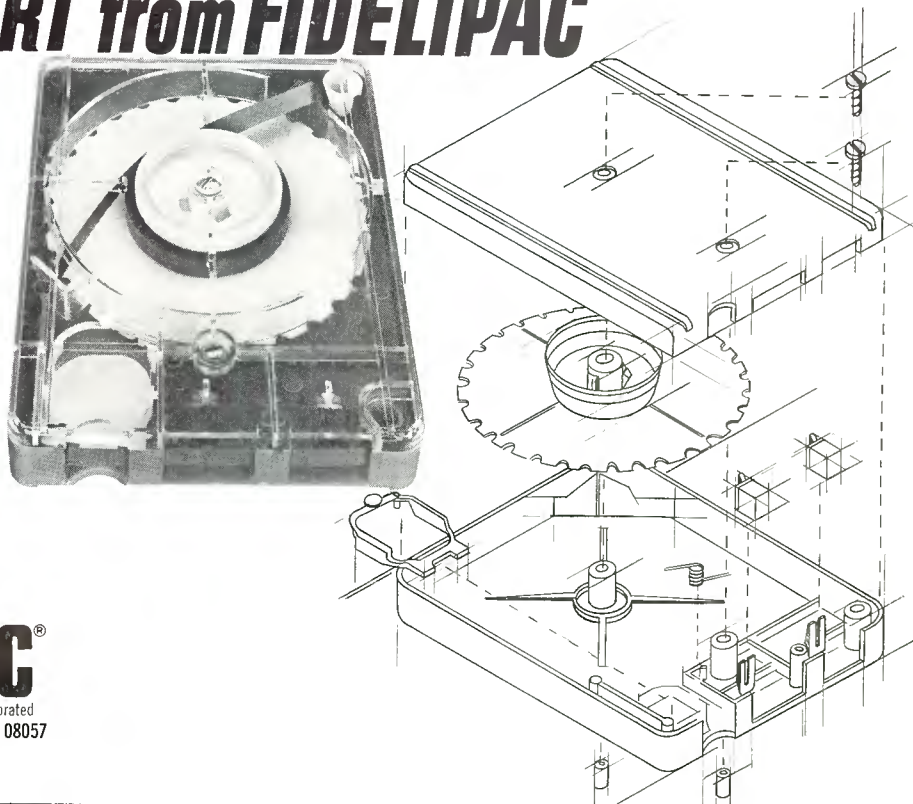
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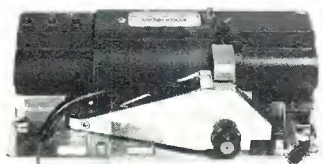
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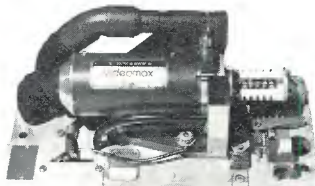
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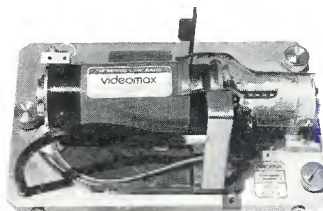
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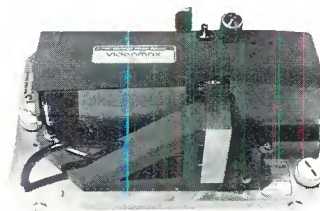
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Director of
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SOCIETY OF BROADCAST ENGINEERS, INC.
P O Box 88123 Indianapolis, Indiana 46208

to share a common interest, it has lately undertaken to enhance the professional status of its members. To this end, a Certification Committee was formed, whose function it would be to award various certificates to qualifying members, either through "grandfathering" or

certificate would not be a requirement for employment (particularly since a First-Class license is the only prerequisite for a Senior Broadcast Engineer), but it is the Society's belief that with the ever-increasing technological progress of our industry, the broadcaster may well benefit from an SBE Engineering Certification, in addition to his First-Class license.

The essential points of this new program will be detailed in the forthcoming June newsletter, so that all members may have the chance to assess their own qualifications.

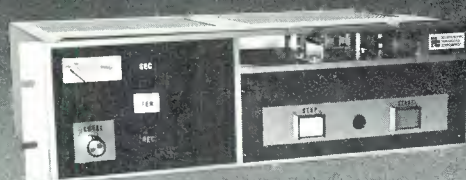
Certification program is on target

Although SBE was originally organized to provide broadcast engineers with an opportunity to regularly get together in local areas

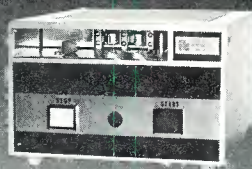
through examination. The highest-level certificate would be Senior Broadcast Engineer.

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what other broadcasters
already know.**



RP Series Recorder/Reproducer



SP Series Reproducer

Hundreds of broadcasters are using ITC tape cartridge equipment daily and find it delivers outstanding performance . . . such as the compact SP Series reproducer and the RP Series master recorder/reproducer shown here. And this experience has brought our attention to an interesting fact. Our tape cartridge equipment does an excellent job of selling itself. So, the problem was how to get the equipment into your studios where you could test it fully under actual broadcast conditions. The answer is our **30 day guarantee of satisfaction**. Just issue an order and we'll send the equipment you want. If for any reason it fails to perform up to your expectations, send it back within 30 days and you don't owe us a cent. It's a sure, painless, no-risk way to prove to yourself what other broadcasters already know . . . ITC tape cartridge equipment is the answer to a broadcaster's prayers. To put things in motion, call us **collect** at 309-828-1381.



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SBE newsletter goes to press

Meanwhile, at the SBE editorial office in Washington, D.C., ideas and encouragement for future issues of **The SBE Signal** are arriving from all over the country. Such universal response is taken to mean that **The Signal** is expected to provide a successful vehicle for a strongly expressed eagerness to share information.

If any SBE member has not received his first issue of the newsletter, we want to know about it. The problem may be no more than an outdated mailing address, or it may be as serious as an omission in our computer program. Please advise Assistant Secretary Virginia Doss, P.O. Box 88123, Indianapolis, Indiana 46202.

Chapter Meetings

Some of you may notice that the format of the chapter news is a little different. This section will try, whenever possible, to feature meetings scheduled in the future, in time for those of you reading the current issue to note the program and perhaps plan on attending. Past meetings will be covered briefly—just enough to cite speaker and topic. However, this effort will succeed only if the SBE editorial office is kept informed of your plans. Please call or write about any upcoming events to: Jeanne Smith, SBE Editor, 2000 N. Street, N.W., Suite 210, Washington, D.C. 20036, (202)293-7742.

continued on page 16

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BROADCAST ENGINEERING

Our new E series audio equipment will improve your sound and cut your costs . . . or your money back!



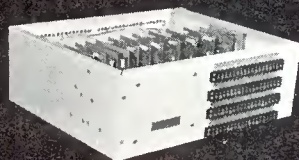
**TURNTABLE
PREAMPS**



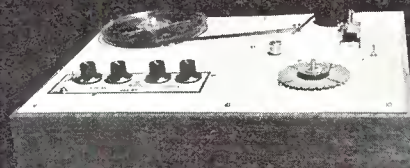
**MIC & LINE
AMPLIFIERS**



AUDIO DISTRIBUTION AMPLIFIERS



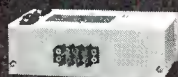
AUDIO CONSOLES & CONTROLLERS



**AUTOMATIC TAPE CARTRIDGE
& CASSETTE LOADERS**



**STUDIO MONITOR
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**REMOTE POWER
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Preamps costing almost 3 times more will not compare with these units. RIAA/NA8 equalized $\pm 1\text{db}$, 0.5MV sensitivity at 1KHz for $+4\text{dbm}$ out, balanced outputs, -75db s/n at 10mv in, 0.05% distortion, $+21\text{dbm}$ max. out. Internal power supply.

MP-8E Mono \$86 5P-8E Stereo \$137

MIC & LINE AMPLIFIERS

Dual function and superb performance. Inputs for mic and line, $\pm 0.5\text{db}$ response 10Hz-20KHz, 67db gain on mic channel(s) $\pm 26\text{db}$ gain on line inputs. Balanced inputs & outputs, $+21\text{dbm}$ out max, 0.1% distortion. Internal power supply.

MLA-1E Mono \$98
MLA-2E Dual Mono/Stereo \$139

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DA-6/E Table top. 1 in/6 out. \$131
DA-6R/E Rack mount. 1 in/6 out. \$149
DA-68R/E Rack mount. 1 in/6 out. Individual level controls for each output. \$165
DA-6RS/E Rack mount. 1 in/6 out stereo or 2 in/12 out mono. \$229
DA-168R/E Rack mount. 1 in/8 out stereo or 2 in/16 out mono. Individual output level controls, selectable metering & headphone monitoring. \$287
DA-2080/E Rack mount main frame with protected

power supply, metering & headphone monitor. Will accept up to 10 slide in modules. Each module has 2 inputs & 8 outputs. Individual output level controls & selectable meter switch. Up to 20 in/80 out.

DA-2080/E Main Frame \$150
DA-2080/E Modules 2 in/8 out \$135 ea.

AUDIO CONSOLES & CONTROLLERS

Our new series 35 audio controller introduces a new concept in audio mixing. Allows separation of controls from the audio functions. Controls can be placed in any convenient location in the studio, while electronics may be mounted anywhere for easy maintenance & hookup. Remote DC control for completely unaffected audio.

This versatility gives you a custom designed console at a standard production model cost.

Features include; 8 channels, mono, dual channel mono, stereo, dual channel stereo, or combinations; paralleling 2 units for quad, fail safe power supply & plug in interchangeable cards.

Performance specifications are; 0.3% or less distortion, 124dbm equivalent noise on low level channels, approximately 25w power consumption, -70db crosstalk, balanced bridging/matching inputs & response within $\pm 2\text{db}$ 20Hz-20KHz. Series 35 audio controllers start at \$1200.

AUTOMATIC TAPE CARTRIDGE AND CASSETTE LOADERS

So easy to use & accurate that our largest winder competitor has been using one of these to load their own carts.

Eliminates guesswork. Set the dials to the length desired. The exact amount of tape is fed onto the cart or cassette hub and then shuts off automatically. Also has exclusive torque control for proper tape pack on different size hubs. Winds at 30 IPS.

ACL-25/E \$185

Winders also come in higher speed models (ACL-60 series). Same operation as above but winds at 60 IPS. Accepts 14" pancakes.

ACL-60T/E (tone stop only) \$266
ACL-608/E (blank tape loader) \$331
ACL-608T/E (for both prerecorded and blank tape) \$375

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Distortion less than 0.25% at less than 20w out, 1% or less at 20w. Works into 4-16ohms. Balanced bridging inputs, variable bass contour, internal overload & short circuit protection.

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SMA-500/E Rack mount (mono) \$142
SMA-1000/E Rack mount (stereo-40w) \$196

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Basic Reasoning Presented to Management in Favor of STL over "Telco"

1. No "lost air" time due to cut, wet or electrically charged telephone lines.
2. Better Sound Quality Than a Class AAA telephone line.
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4. Complete control of entire broadcast system.

Basic Reasoning Presented to Management in Favor of "DUAL-CHANNEL" over Composite for Stereo.

1. A Dual-Channel costs less than a Composite.
2. Better Reliability than a Composite. "Built in Backup."
3. Greater Channel Separation than a Composite.
4. Less Signal Drive Required to Receivers means additional system Fade Margin.
5. Less Test Equipment Necessary and more Positive System Diagnosis.
6. Stereo Generator is away from Studio and Unauthorized Tampering.
7. Stereo Generator and Broadcast Transmitter Compatibility without Interface.
8. Having a Dual-Channel STL is like having a Spare Link.
9. Two Remote Control and Two Sub-Carrier Capability.

Basic Reasoning Presented to Management in Favor of MARTI.

1. Channel Separation more than 65 db.
2. Channel Response matched to 0.25 db.
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4. All Solid State.
5. A Simple, True Direct FM Plug-in Modulator.
6. Complete accessibility to Modules without removal from rack.
7. The Marti System Delivers Top Performance with Transmitter manufacturer's Stereo Generator.
8. Marti STL Systems Log over TWO MILLION (2,000,000) Broadcast Hours each Year.
9. AVAILABLE FROM STOCK.

A DUAL-CHANNEL SYSTEM FOR \$4160.00.

(Does not include cost of Antennas or Transmission lines).

MARTI Electronics, Inc.
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continued from page 14

Chapter 1: Binghamton, New York

Bill Sitzman, Jr.
Independent Broadcast Consultants, Inc.

Box R
Freeville, New York 13068
(607)273-2970

Chapter 1 met with Chapters 2 and 22 for their joint annual meeting on May 13th. Guest speaker was Martin Firestone, a Washington, D.C., attorney, and Ashton Communications from Binghamton who displayed their video tape equipment. On June 10th, during its annual picnic, the chapter will hold its election of officers.

Chapter 2: Northeastern Penn.

JOHN KOWALCHIK
RCA Semiconductor Plant
Mountaintop, Pennsylvania
(717)474-6761

Chapter 2's April 14th meeting was well attended to hear chapter chairman John Kowalchik speak on COS MOS devices, circuits, and applications. The May 5th program, held at the Lackawanna Area Vocational Technical School, featured Robert Muzzi, the vocational director, who discussed vocational-technical education. The evening included a tour of the Vo-Tech labs and the electronics/radio-TV/audio-visual facilities.

Chapter 9: Phoenix, Arizona

Leon Anglin
SBE
P.O. Box 615
Phoenix, Arizona 85001
(602)258-7333

Chapter 11: Boston Mass.

Ross Kauffman
WCVB-TV
5 TV Place
Needham, Massachusetts 02192
(617)449-0400

Chapter 11 met April 29th to discuss the proposed certification program. Their May meeting was conducted by a representative from Westinghouse Electric, who spoke on Solid State AM Transmitters.

Chapter 15: New York, New York

John Lyons
WWRL
41-30 58th Street
Woodside, New York 11377
(212)335-1600

The May 8th meeting of this chapter was held at WNEW-TV to introduce the station's new master-control computer automation system. The presentation was given by Mr. William Kelly, of WNEW-TV, and Mr. Robert Huffed and Mr. Howard Shephard of Central Dynamics Corp.

Chapter 16: Seattle, Wash.

Harry Lewis
10352 Sandpoint Way, N.E.
Seattle, Washington 98109
(206)523-9117

April 16's meeting provided an opportunity for those members who were not able to go to the NAB Convention to hear reports from those who had attended.

Chapter 17: Minneapolis-St. Paul

Joel Clark Humke
KSTP Radio
3415 University Avenue
St. Paul, Minnesota 55114
(612)645-2724

continued on page 52

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The STE-100 STEREO PHASE ENHANCER...
can minimize "Phase nulling" in "Mono-sum" signals,
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With our equipment you can do the same. You can sync two multi-channel audio recorders together to act as a single recorder with twice the number of channels.

You can sync audio and video tapes for precise sweetening—better audio, dialog replacement, special effects, applause, etc.

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And you can develop new audio in perfect sync with your original quad recording.

It's all made possible by our Dual Cue Controller and our Wide Range Synchronizer, using the SMPTE code for frame-by-frame search and synchronization.

Together they can give your studio new capabilities, and make your life easier at the same time. To discover how, write for our new brochure. Or for instant action, telephone George Swetland, and charge the reverses.

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VIDEO

EDITING:

from shackles to liberation By Joe Roizen

It was not long after the first quadruplex VTR was introduced at the NAB in 1956 that the lack of an editing capability for such a machine began to be criticized. If video tape recording was to be anything more than just a delay device to accommodate the time zones across North America, there had to be a method of splicing tapes so

that composite programs could be edited together from separate recordings.

The first approach to editing was mechanical, intended to copy the techniques already existent in film editing, viz., to cut at an appropriate point and to join the ends through the use of some adhesive technique.

There were three basic requirements to achieve successful mechanical edits and to lay the groundwork for eventual electronic editing:

1. Laying down a reference signal on the tape so that the specific editing area could be easily located.
2. Visualizing the magnetic tracks and editing marks so that cutting the tapes at the proper place was facilitated.
3. Cutting and splicing the tape with sufficient precision to avoid picture disturbances during playback.

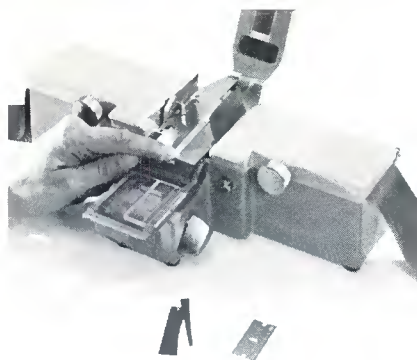
Edit Pulses

The first parameter led to the development of edit pulses, magnetic markers superimposed on the control track at discrete intervals related to the video information. Early VTR's did not operate in synchronous modes, consequently 60 edit pulses per second (one every field) gave the maximum number of splicing points and seemed the most desirable. As servo systems became more sophisticated, their ability to detect even and odd fields required that edit pulses be at frame intervals defining a specific field.

As color recording became widespread and editing color tapes a necessity, there was a further need to reduce the edit pulse rate to 15 Hz so that the four field cycle of the NTSC color signal could be accommodated. The edit pulse now defined a specific field at a fixed subcarrier phase so as to avoid ambiguity of color continuity at the splice point. Edit pulses for color are at 15 pulses per second or more accurately $\frac{59.94}{4}$ p.p.s. The present SMPTE recommended practice



This was the earliest form of video tape editing using Edivue solution to locate the video tracks. The magnifying glass permitted easier viewing of the 10 mil tracks and the 5 mil guard band. After cutting with a razor, splicing tape was applied to the back of the tape.



A somewhat more sophisticated mechanical splicing device with built-in glass cutting guide and splicing cartridge, 1958 style.

for edit pulses on quadruplex VTR's is 30 p.p.s. for monochrome recordings. Color recordings must be made with 15 p.p.s. edit pulses, particularly where tight editing or frame by frame animation is to be done.

Visualization

Both the recorded tracks and the edit pulses required some simple visualization technique in order to permit mechanical splicers to function. As splicers became more sophisticated only the control track edge of the tape along the bottom containing the discrete edit pulses needed to be made visible.

The solution used is a mixture of a rapidly evaporative fluid* mixed with fine carbonyl iron particles. There are a number of trade names such as "Visimag", "Edivue", etc. for this product, but they all work essentially the same way.

As the liquid carrier is spread on the recorded tape, the carbonyl iron particles are attracted toward the magnetically recorded tracks and away from the guard bands. Along the recorded tracks, the particles accumulate in approximate proportion to the intensity of the varying magnetic moment. As the solution dries quickly, the residue of carbonyl powder leaves a differential visual readout of the magnetic impulses on the tape. This serves to identify the high intensity edit pulses very clearly and also to show the video signal variations along the recorded tracks.

Mechanical Splicers

The first splicer supplied with early VR-1000 recorders (circa

1958) consisted of a milled aluminum block that held the tape in a manner permitting a small metal straightedge and a razor blade to be used to cut the tape at the proper place and angle. After two ends of the tape were cut, they were turned over in the jig, butted together and a patch splice was applied. Special splicing tapes of less than .5 mil thickness and 1/8 inch widths were developed for this purpose as the video head wheel stability was momentarily affected by the discontinuity in the smooth passage of tape through the female guide produced by the splice. As editing requirements increased in both number and complexity, new splicers were developed to meet the challenge. Successive splicers added simultaneous dual handling of both tape ends, built-in splicing tape cartridges, and attached microscopes for precision location of edit pulses.

Electronic Editing

By 1960, it became obvious that the VTR as a production tool would far outstrip its role as a delay device. Precision editing by an electronic push button would be essential if proliferation of video recorders was to continue and even accelerate. Making suitable electronic edits required the following:

1. Precise initiation and termination of video recording at selected edit points.
2. Precise start and stop of video erasure to match the new recording requirements.
3. Separate erasure of video and control track recordings to accommodate two modes of operation.
4. Maintaining servo stability through the splices to avoid tracking errors or video displacements.

There are two basic operational modes for electronic editing: "assemble" and "insert". The assemble mode permits consecutive segments to be recorded on clean tape in sequences that appear as camera cuts at each junction. In this mode, only the "start" point is critical since it must begin precisely at the end of the previous scene already recorded. The end may overrun as the subsequent sequence will wipe out the undesired segment. The insert mode covers the

addition of new segments into an already recorded tape to replace or update previous program material. In this mode, the original control track is not erased and only the video signal is inserted. Many editors prefer to prerecord a black signal and a continuous control track on a blank tape, then do the program editing in the "insert" mode, even when assembling a new program. This method gives a more stable end result as there are no control track phase shifts at the video splices, the original control track providing tracking information.

Electronic editing also solves the sound displacement problem. Addition or rerecorded audio is synchronous with the image as it is in original recordings; in the "audio only" mode, the sound alone may be altered; in "video only", the program audio is untouched while the image is edited. The latter feature is most useful in television commercial production where a prerecorded music track is used to key image changes.

Electronic editing is accomplished by the use of a special erase head located ahead of the video recorder's rotary head and precise timing circuitry controlling all functions. The erase head is split into two sections for separate video and control track erasure. It is also canted at the transverse video track angle. The timing circuitry controls initiation and termination of both erasure and recording so as to accommodate the 18 frame displacement between the erase head and the video head. Timing is adjusted so that there is neither a gap nor overlap in the video recording, thereby producing a clean splice in the vertical interval.

Electronic editing was introduced in 1961 and considerably enhanced program production on video tape recorders, but operators soon began feeling its limitations. Primarily it depended on operator reaction time and digital dexterity. There was no preview possibility, so that once the record mode was initiated, errors were hard to correct. Only crude animation was possible as short segments were difficult to achieve manually.

Concurrent with the development

*Freon TF

of electronic editing, the demands for an additional audio track had produced a limited quality sound track along the upper edge of the control track. This was called a "cue" track and was used for peripheral audio, second language, or editing instructions. Here was the answer to the need for precise programming of the electronic editor.

Programmed Editing

Electronic editing to frame by frame accuracy is accomplished by the use of cueing signals recorded in the cue track. These signals control the editor's functions with micro-second precision. Counting and logic circuits permit manipulation of the edit points in both time and operational sequencing. Two kinds of cues are recorded on the cue track: a pair of well separated audio frequencies serve as "edit" cues for controlling the electronic editor and "remote" cues to start external equipment such as associated VTR's or telecine machines.

The programmed editor may now

be set up to record a series of cues, the cue points may be previewed on a monitor without affecting the recording on the tape and cues may be shifted in single frame increments in either direction. A series of cues may start, stop, or alternate the record function by a preset control, even automatic frame assembly of animated sequences with selectable frame numbers is possible. The permutations and combinations of this system are too numerous to be described here.

The basic principle that permits programmed editing is the use of an extra cue head placed on the erase head stack and preceding the regular cue head by 36 frames. Cues laid down by the normal cue head can be read by the advance cue head and provide an 18 frame lead on the picture material. Frame counters can then advance or retard reaction to the cue marks by incremental adjustment of appropriate knobs. Manually selected cue points could be electronically shifted, previewed and rerecorded at the exact editing point desired. The corrected cues could now turn on a slave VTR set up for a 10 second roll and transfer edit at the picture cue automatically, producing a perfect electronic splice.

Programmed electronic editing did almost everything imaginable in the hands of a creative editor assembling a television program. It was introduced in 1963 and seemed to be the ultimate in sophisticated editing of video tapes, but it lacked a major feature that program producers are accustomed to. There was no means of counting frames from beginning to end of a tape and repeatedly defining every recorded segment by a numerical address. The more engineering-oriented production houses began to develop and attach custom-built address identification accessories to their own VTR's.

It is at this point in time that various manufacturers began proposing frame addressing systems which used a variety of techniques to achieve the same end result. It became obvious that a proliferation of editing hardware would confront the user with great problems because of the incompatibility between address codes.

The Ad Hoc Committee

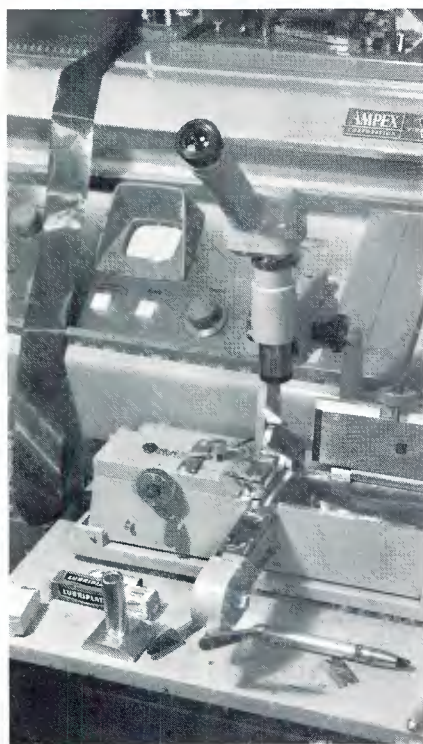
Recognizing the severe operational hardships that a variety of non-interchangeable codes could produce, the broadcast industry, through the engineering departments of the major networks, formed an Ad Hoc Committee which in 1970 defined an address code that would satisfy all precision editing requirements, while maintaining compatibility between all quadruplex recordings. In addition, the code could be as easily applied to helical recorders or multiple audio track machines, if that was desirable or necessary.

The address code proposal was subsequently reviewed and refined by the SMPTE Video Recording Standards Committee and by the IEC/SC60B VTR Group and since has been adopted as a standard operating practice in all television magnetic recording. As a result of this effort in standardization, the manufacturers of VTR editing equipment now produce a variety of time and control code equipment, all of which are compatible with each other.

Helical Recorders

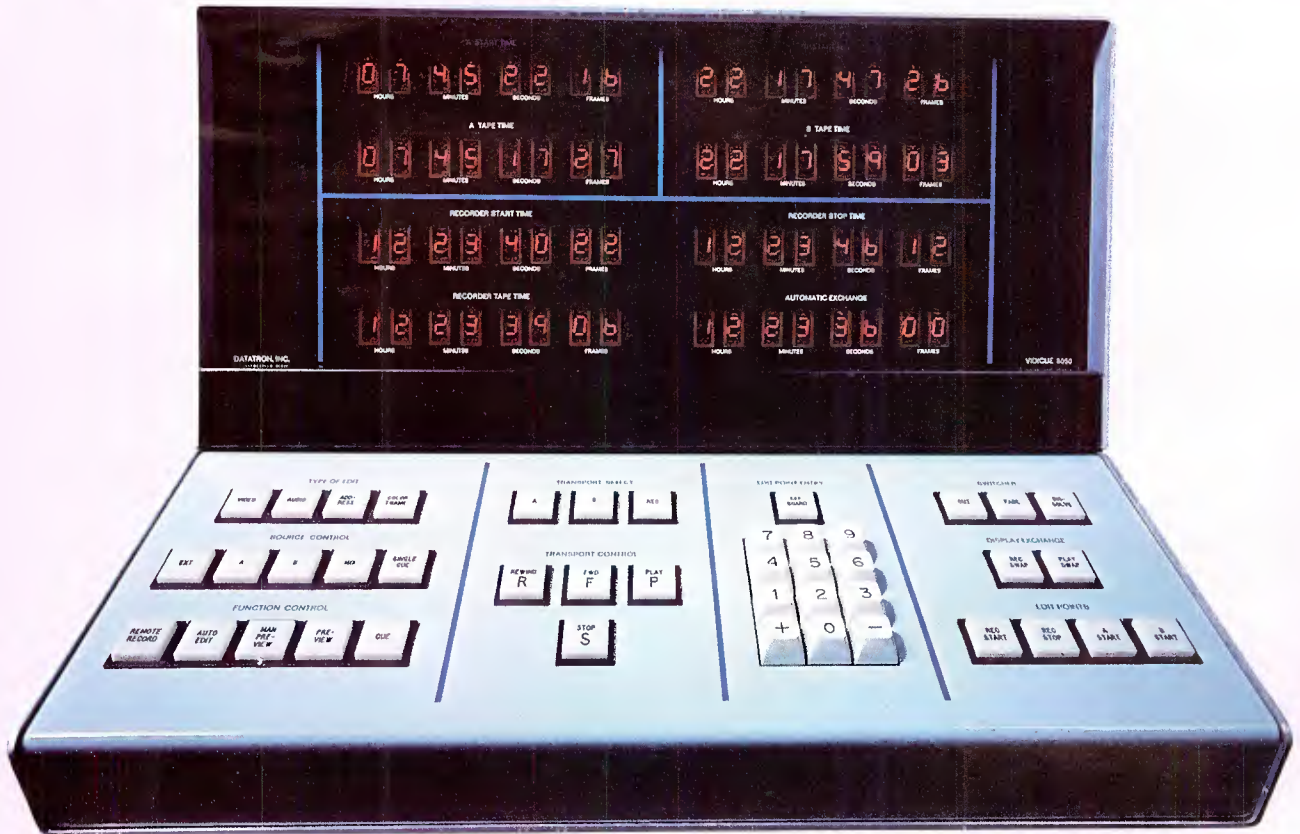
The introduction and proliferation of helical scan recorders brought with it a new set of problems for video tape editing. The geometry of the long, single field track on a helical tape is such to preclude the practicality of mechanical splicing and no serious attempts have been made to build or market such splicers. Even on segmented helical recorders, where track length is only a few times that of a transverse recorder, it has not been found commercially useful to attempt mechanical editing. It is also not convenient to use full width erasure on helical tapes for any editing purpose.

The practical solution is, of course, flying erase heads which are on the head drum and which can be gated to selectively erase from a specific track onward. Of course, non-segmented helical recorders have the unique advantage of still framing images for accurate selection of cue points and of some degree of slow, forward and reverse motion during editing sequences. While an address code may be



To improve the precision and utility of editing, this splicer included a microscope for precisely locating the cutting point (1959).

The Editor-in-Chief



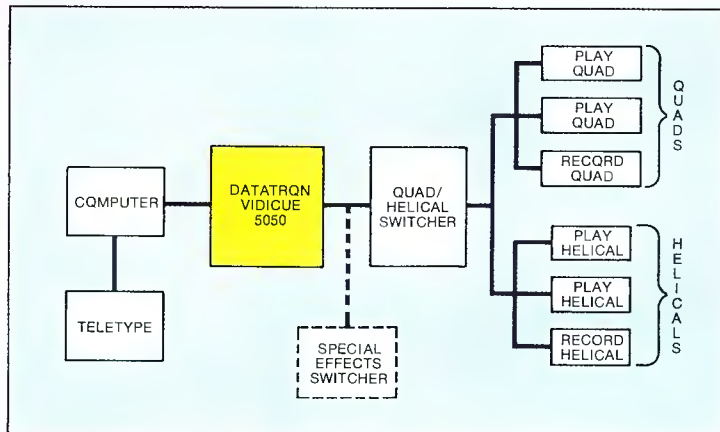
Now you can economically edit on helicals and automatically transfer in minutes to quads

The editing system you've been waiting for. Meet the Editor-In-Chief. Our thrifty new Vidicue 5050.

It defies obsolescence. You can expand from two to three machines at will. Or move up in logical steps to a completely automatic on-line, off-line system where editing is done on low cost helicals and transferred in minutes to quads.

Easy to learn, and to operate too. Simple keyboard entry. Visual display of tape position and all edit points. Exclusive jam sync, eliminating forever the need to pre-record SMPTE edit code on tape. A/B rolls, color framing, special effects switching, time base correction. The works!

Yet this remarkable video tape editing system is priced far below competition. In fact, there is none.



The importance of Jam-Sync.

Our exclusive jam-sync eliminates the need to pre-lay-down the SMPTE edit code on an entire length of fresh tape being used to assemble a show from other tapes. Instead, during pre-roll, the system time code generator is automatically set and sync'd so that time picks up exactly where it left off — to

the frame. This saves quad head wear. Tape wear, too. And is also a great time saver on stop-and-go live production by generating a continuous uninterrupted elapsed time on the tape.

Save your expensive quads for other jobs.

The block diagram tells the story. You can edit on-line or off-line. Do time consuming edits on low cost helicals. Edit event times are stored in the computer and a punched tape prepared. Using this tape, a precisely edited show can be automatically transferred to quads in minutes.

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datatron, inc. EDITING SYSTEMS DIVISION

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recorded in the cue track of a helical VTR and can be used for editing in the same way as it is used on a quad, there are many users who feel that it is too complex a mechanism for the simpler editing operations that can be performed with such machines. As a result, the manufacturers have developed a variety of non-time code editors which depend upon counting of control track pulses or other timing marks in order to achieve adequate precision for program editing.

Editing systems may now be divided into two basic categories: viz., the SMPTE Time and Control Code, or the non-coded pulse counting arrangements.

The SMPTE Time & Control Code

The code is referred to officially as the SMPTE Time and Control Code for Video and Audio Tape, and is generally called an Address Code since it addresses each frame with a unique number consisting of

hours, minutes, seconds and frames. Here are a few major points that might be useful in understanding how the code works:

1. The SMPTE Time and Control Code is a phase modulated serial code usually referred to as Bi-Phase Mark. It contains binary coded decimal (BCD) information and uses 80 bits, which include fixed information and spare bits for potential use not yet defined.

2. There are two modes of operation: (a) zero start in which the code is initiated from zero at the start of a recording and indicates elapsed time along the length of the recording, and (b) real time in which the code generator is running synchronously with a master clock and indicates actual hour of day, minutes, and seconds during the recording.

3. There is a further modification to the code which is known as the drop frame mode in which NTSC time is matched with real time by eliminating one count per thousand. For purposes of clarity,

the definition of real time and color time is as follows:

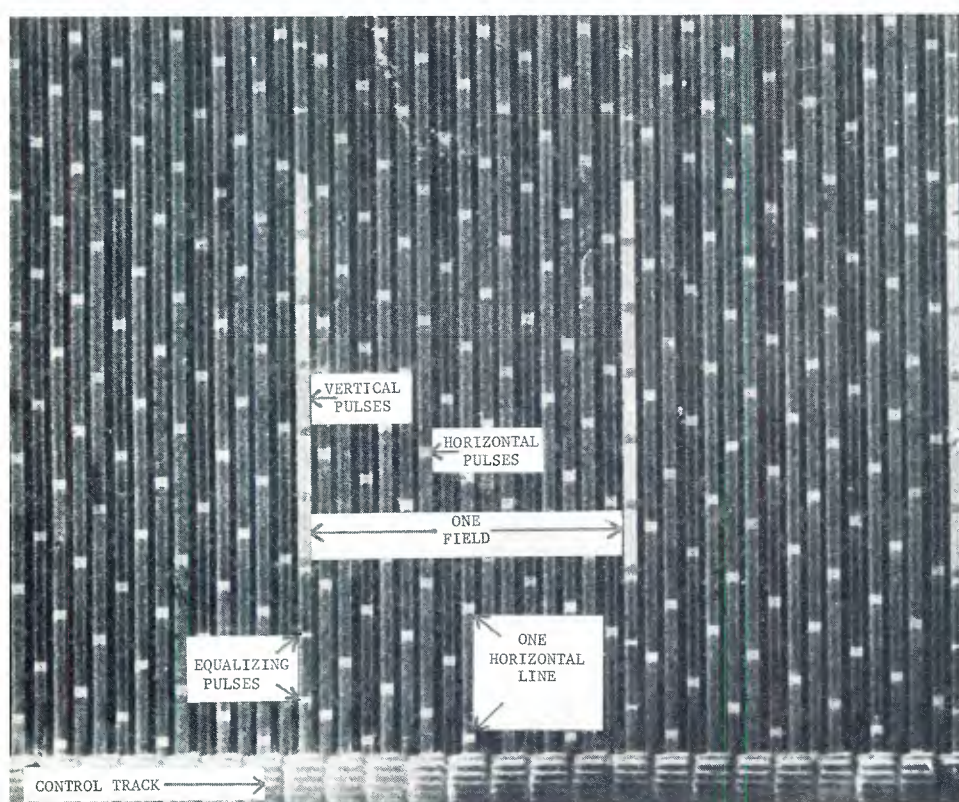
(a) Real time is the time elapsed during 60 fields (or any multiple) where the vertical rate is exactly 60 fields and matches clock time.

(b) Color time is the time elapsed scanning a color television system where the vertical field rate is 59.94 fields per second as in the NTSC system.

(c) Since the vertical field rate for NTSC is slightly slower than clock time, there will be a cumulative error at the end of an hour of 3.6 seconds if no correction is made. For this reason, the code includes a drop frame bit which eliminates most of this error by deleting one count per thousand.

4. **User Bits**—The code allows for potential independent use of at least 32 bits for the local insertion of information pertinent to the recording which the user may wish to include. This could accommodate day, date, location, scene, or take identification or it could be used for technical information that would permit automatic adjustment of playback characteristics of the VTR. User bits are not normally part of a standard code generator and accessory equipment is required in order to activate their use.

5. **Off Line Editing**—Many large VTR operations find that the cost of running quadruplex machines for the search and preview mode of video tape editing is substantial. In order to reduce this cost and minimize machine time, they have begun to use off line editing as a standard operational technique. To do this, they either record the original program material on helical machines in parallel with the quad recording or transfer the information from the quad to the helical when necessary. The editing function is then performed by reviewing the helical tapes and logging the edit points by specific frame numbers. The log is then used to direct the quad recorders to produce the edited master copy. There are a number of variations to this approach which may include simple manual control from a written log to computer assisted



This photo shows the earliest visualization of a transverse video tape prior to the development of either cue track or edit pulses. This photo was taken in 1957.

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and these performance characteristics:

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- **60 dB signal-to-hum ratio from dc to 10 kHz**
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- **1 watt RF output from 6.875 to 13.25 GHz;**
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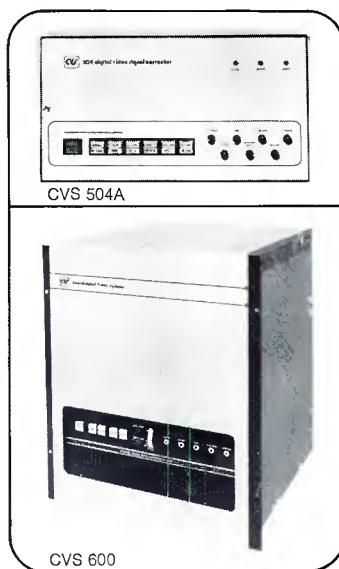
Need information about what digital video signal processing can do for you? Check the leader. CVS.

Here are three digital video signal processing products which have set the pace in the television industry. There's more to come from CVS.

CVS 504A Digital Video Time Base

Corrector: Fully equipped including EIA Gen Lock generator for complex systems interfacing. This "universal" TBC works with $\frac{1}{4}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and 2" nonsegmented helical VTR's. The CVS 504A processes direct or heterodyne color to broadcast standards. Total velocity correction for direct and heterodyne VTR's is now available as an option.

CVS 600 Digital Video Synchronizer: A synchronizer designed to automatically lock a nonsynchronous NTSC broadcast television signal to station sync from any remote source. The CVS 600 has many capabilities, including special effects of local sources mixed with nonsynchronous



remote sources, live remote news story integration and elimination of satellite-transmission Doppler effects. Functional controls are designed to accommodate total system integration.

CVS 600-2 Electronic Video Compression

Option: As an option to the CVS 600, it can affect real time reduction of an external signal to one-fourth its normal size and locate that picture in any position on the CRT. Remote control panel is included allowing operation with push-button ease.

Need more information? Contact CVS for informative literature and/or a personal demonstration.

Look to the Leader



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automatic control using memory banks or punched tapes for the log and automatic assembly which is performed by external editing consoles.

6. Time Code Generator—Time code generators are available in several formats and with multiple modes of operation. Basically, the generator produces the 80 bit code with the standard assigned information and displays the code on a visible LED readout. The generator can operate independently with no reference to an external source or it can be synchronized to an external clock so that it displays and produces real time related coding. It may also be initiated to produce the drop frame format or to delete the drop frame feature. Surprisingly, some objections to the drop frame concept have already been noted on the part of editors and even computers that have not been programmed correctly, since they seem to want contiguous numbers when editing.

The latest addition to time code generators is the ability of the generator to lock itself to a play-

back code so that it may provide continuity of address codes when the VTR is put in the record mode. This is particularly useful where segments are assembled at different times to form a complete program, but should have a serial code throughout the tape.

7. Single or Multiple Time Code Generators—It is possible to use a single generator to feed any number of video tape recorders through normal pulse distribution systems in a TV studio. However, the use of a single remote generator running on clock time may limit the flexibility that such a system is capable of since manipulation of the code generator for a given VTR might affect the others. Where maximum flexibility is desired, the number of code generators is usually based upon the number of editing bays and the generators can all be synchronized to a master source when necessary or operated independently where required.

8. Time Code Readers—In-house and external tapes containing the time code can be read and displayed by a variety of means. A

direct code reader will usually show the address code in an electronic display form using nixie lights or LED's. An additional method is to insert the digital readout in the image by superimposing it on the VTR monitor in such a way that it does not affect the recording of the picture itself. This is usually done by additive matrixing on the monitor associated with the VTR in use.

9. Editing Control Systems—VTR editing control systems span a tremendous range of price and complexity. While using the same basic code, systems may be designed to control one, two, or three (or more) machines with computer storage of multiple edit points and automatic sequential control of program assembly. For practical purposes, however, the systems most commonly used range between \$20,000 and \$40,000 and have relatively short memories which accept limited sequences of edit points that are entered manually. The brochures covering various types of equipment generally give good detailed explanations of the scope and utility of such systems.

An incredible breakthrough: 3/4-inch videocassette teleproduction.

Yes, incredible to all those people who thought it would never happen.

And there were a lot of them.

Because the popular myth had it that truly professional electronic editing on videocassettes was technically impossible.

Well, that's another myth exploded. By the Sony VO-2850 U-matic® Mastering Recorder and Editor.

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See it for yourself. Then you won't even have to read on.

Broadcasters are already using it.

The advantages of the VO-2850 U-matic system have been recognized by the broadcast industry.

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But for you, maybe the best is yet to come.

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The entire VO-2850 system consists of two editors and their Remote Automatic Editing Controller (RM-400).

But you can also use just one editor. (Buy the rest of the VO-2850

system whenever you're ready.)

With one unit, you have a mastering recorder that gives you complete teleproduction capability with full electronic editing.

Rotary erase heads, capstan servo, vertical interval switcher for noise and roll free edits. Editing flexibility for all channels (video and two audio) separately, all together, or in any combination.

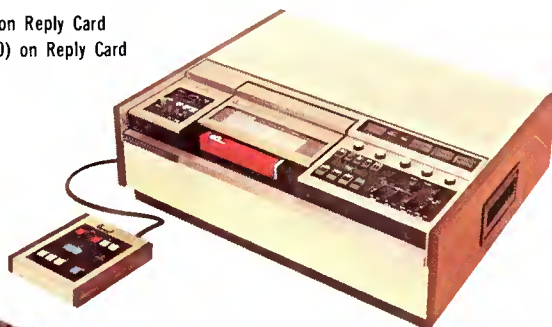
Still-frame. Slow motion with optional RM-400. Feather-touch, solenoid push button operation. Full auto rewind. U-format interchangeability, reliability, and economy.

S/N ratio for audio and video is a guaranteed 45 dB. *Guaranteed*, because we know you'll get better.

Incredible. But true. The Sony VO-2850. It has ended the generation gap, very professionally.

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For Demonstration Only Circle (20) on Reply Card



**Sony U-matic® Color
Videocassette System.**

All TV reception simulated.



Group W Productions: From Mike Douglas to Mickey Mouse

There are not many production and syndication companies today that can claim over 3000 90-minute shows of a single top talent. If there is more than one, then the others probably cannot claim to have used vacuum tube quad video tape machines for original production and syndication work.

Group W. Productions, Inc. can make those claims and many more.

Mike Douglas, star of "The Mike Douglas Show", has a natural charm and wit and lilting way with a song that have earned him international fame. His program is the most successful variety-talk show in the history of television syndication, and to date more than 3,200 90-minute shows have been produced and syndicated. Presently there are 130 stations telecasting his shows.

Westinghouse Broadcasting Company has always been a leader in television programming, as well as a pioneer.

When they started with the PM East & West talk show, one of their first endeavors was to give the television public contemporary and alternate programming to the 11:30 movies.

In 1961, when KYW-TV was located in Cleveland, Ohio, Westinghouse offered a new 90-minute daily television program to Mike Douglas. At the time he was on the West Coast. Within one year four other Westinghouse stations were programming "The Mike Douglas Show", and by 1963, the show was in national syndication.

Group W Productions also has many more successes to their credit. A few of the shows that they produced and/or syndicated include: "The Steve Allen Show"; "The Merv Griffin Show"; and "The David Frost Show".

There are also a number of other shows that include: "Call It Macaroni"; "The Hilarious House of

Frightenstein"; "Earth Lab"; and "Doctor in the House". And a number of Documentaries and Specials (approaching 100) that include: the multi-award-winning "Urban America Series"; "Eartha Kitt in Europe"; "Lady Bird Johnson: On Her Own"; Jack London's story, "To Build a Fire"; "Commune"; and "Vibrations for a New People".

And now after six years of total color production and syndication, they are once again in black & white with the 30-minute "Mickey Mouse Club" show that is presently being syndicated by Walt Disney Productions to stations throughout the country.

Broadcast Engineering dug deeper into the technical operations of Group W Productions knowing that there must be an important technical story to match that on the TV screen.

Located in Pittsburgh, Pa. at 1 Gateway Center (also the home of Westinghouse's KDKA broadcasting stations) we found talent, facts and a beehive of activity.

Production Developments

- (a) Operations started in 1961 on a 7 day/week schedule.
- (b) RCA TRT1A's & 1B's were the first tape machines used in syndication. (These were vacuum tube quad B&W machines).
- (c) RCA TR-22 was purchased for a master playback.
- (d) All editing was with razor blades.
- (e) Fall of 1966; went into a 24 hour/day 7 day week schedule.
- (f) Dec. 1966; received Ampex VR-2000 Hi band tape machines.
- (g) March 1967; "Mike Douglas Show" syndication was offered color.
- (h) 1968; all production and syndication went to color (there were still a few B&W dubs made from color masters).

- (i) 1969-1975; full color operation.
- (j) 1975; "Mickey Mouse Club", monochrome makes comeback.
- (k) Feb. 1975; more than 30 tons of tape dubs were shipped and distributed to all parts of the country and Canada.

Schedules are tight and allow little or no room for error.

The Mike Douglas Show

The "Mike Douglas Show" is a good example to illustrate the precision required to keep things moving.

Although the majority of Mike's shows are taped and edited at KYW in Philadelphia, he also journeys to Hawaii, San Francisco, Cypress Gardens, Moscow, Nashville, and many other cities.

Five shows were taped in Moscow with Russian equipment and crews. Within 1½ to 2 weeks the tapes were converted to NTSC standards in England, flown to Pittsburgh, dubbed and distributed to over 40 stations. (There are an average of 40 dubs made of "The Mike Douglas Show" that are bicycled to cover all 130 stations telecasting the show.)

That is just one situation that can further complicate producing and syndicating five 90-minute shows per week.

Mike taped his show in Nashville's Opryland April 28 to May 1 this year. By May 5 editing and dubbing was complete, distributed, and the first show was on the air. Timing is also crowded by the fact that syndicated stations will run PROMO's which are on the heads of the reels prior to telecasting the show, and many times they screen shows before they are "aired".

Many of the syndicated tapes only require insertions of commercials; however, some shows do require extensive editing with full effects.

Westinghouse's show "The Hilar-

If you're editing just one half-hour show a week, our off-line System/50 will cut your costs in half.

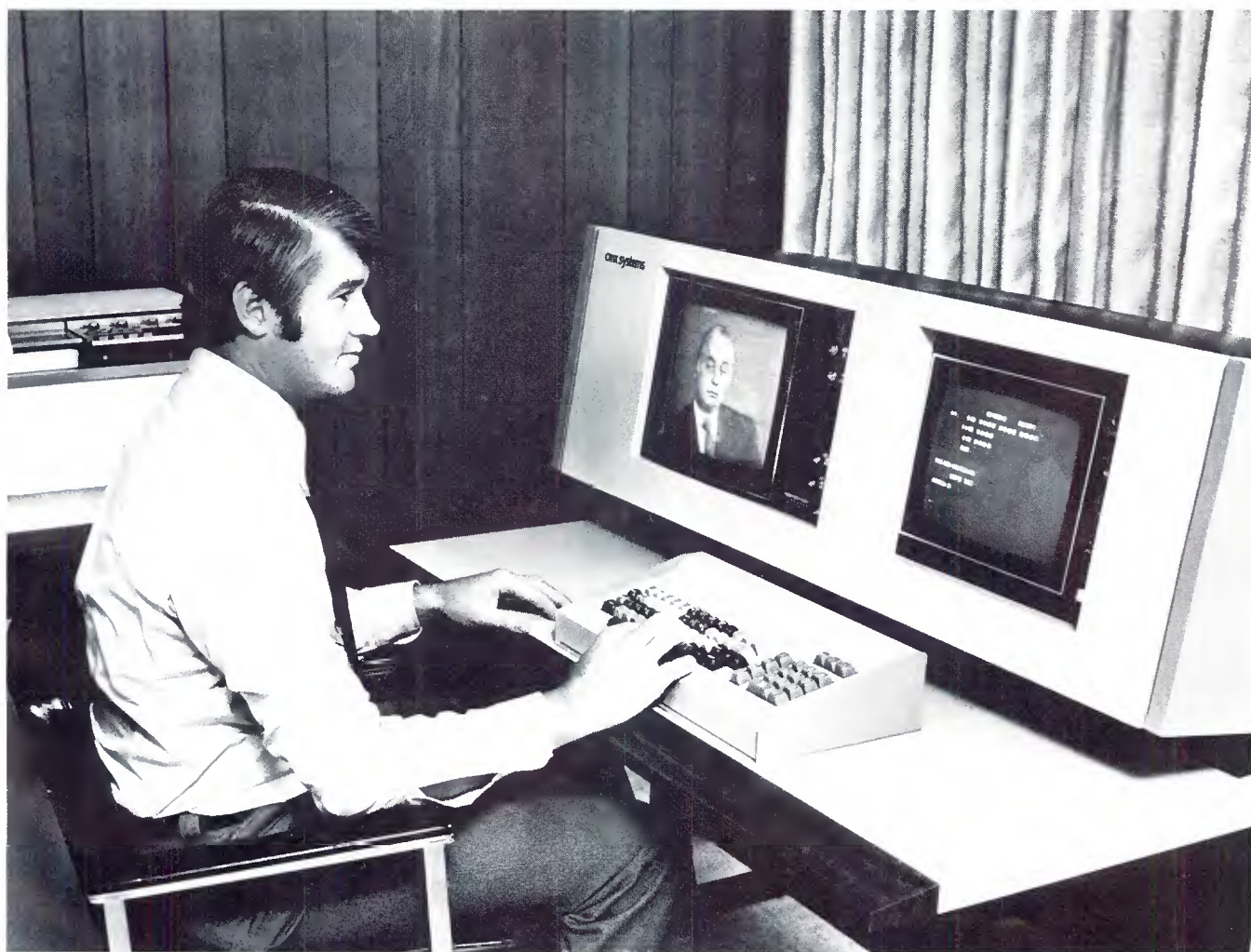
Many System/50 video editing systems are installed at the networks, teleproduction houses and television stations in Hollywood, Burbank, New York and elsewhere.

Their performance is *now* a matter of record. Their cost effectiveness/efficiency is also a matter of record. It's impressive.

As an example, the average half-hour show requires about 16 hours of on-line editing at a cost of \$300 per hour. That's \$4,800. Our CMX System/50 off-line editing system will accomplish the same job averaging 18 hours per show at \$100 per hour plus \$600 for auto assembly. The total: \$2,400... a 50% reduction.

Another interesting fact. These savings for a year's production would more than pay for the total cost of a System/50.

Applicable to electronic journalism? Naturally.



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cmx systems

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Another Mike Douglas show comes to an end, but the schedule seldom eases up on production at Group W Productions.

ious House of Frightenstein" is a ½ hour show that is edited from 1 hour shows. They produced 10 shows per week and a total of 130 episodes. While all that action took place, they produced and syndicated their own "Call It Macaroni" to 103 stations; plus the "Dinah" show for 20th Century Fox was edited and dubbed into 60 and 90-minute shows; and "Mickey Mouse Club" for Walt Disney Productions, and many others. When it is all added up, Group W Productions produces 2,500 reels of tape for airing each week.

The output has been increasing steadily, but quality and schedules have not been sacrificed. New and reliable equipment, better tape and new editing equipment and techniques have significantly contributed to maintaining schedules and standards.

Computer Editing

In 1974 Central Dynamics' computer editing system, PEC-102, was installed and is considered a valuable tool in the technical operations.

Manual editing, particularly for insert edits, made it difficult to maintain schedules. Time and qual-

ity could suffer and more people and machines were not necessarily the answer to higher production requirements.

The PEC-102 is interfaced to a VR-2000 record machine and two AVR-2000's for playback machines. The computer editor automatically controls all video and audio effects through the Central Dynamics' VSP-1246 video/audio switcher. Plans already are underway to add two AVR-2's (for interfacing with the PEC-102).

Oftentimes a "rough shot list" is created from a ¾" video cassette. (The cassette is recorded simultaneously with the original quad tape and SMPTE time code is inserted into video.) This shot list is then manipulated in turn and is automatically assembled with A/B rolls, cuts, keys, etc.

The turn-around time using this type of off-line editing and on-line computer editing is illustrated by a case history:

- (a) Film transfer made to quad and ¾" cassette on Monday.
- (b) "Rough Shot List" edit addresses obtained from cassette were loaded into PEC-102 Edit File 10:30 A.M. Tuesday.

(c) Necessary On-Line editing performed on PEC-102 including A/B rolls, trimming scenes, inserts, credits and closing and completed at 1:30 P.M. Tuesday.

(d) Nine dubs were made and the show was "aired" Wednesday.

This was a 30-minute show!

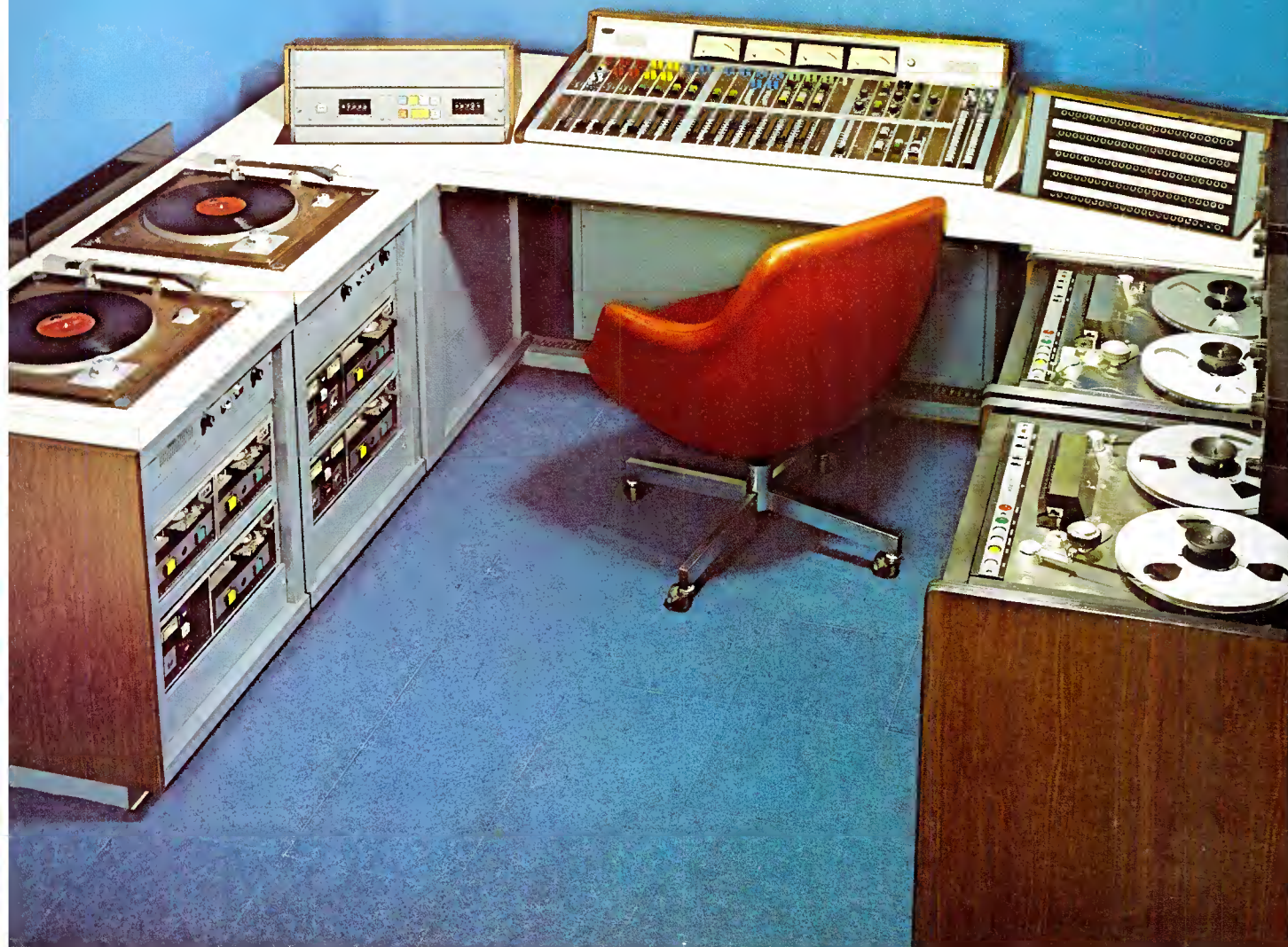
It becomes obvious that technical and creative talent is as plentiful as tape at Group W Productions.

Technically, Group W Productions has a record that is difficult to match. As mentioned before, they have pioneering experience with vacuum tube quad machines, Lo Band tape machines, Hi Band machines, razor blade editing, and they have also had their share of experimentation with video tape.

It is difficult to select one particular factor that contributes most to maintaining schedules and quality. There are so many, it is only fair to state that all areas of the technical operation are interdependent and are generally classified as:

- Inventory control
- Tape
- Tape machines
- Environmental Control
- Standards

"Standards" really should head



THE ULTIMATE IN TURNKEY CONSTRUCTION

The new McCurdy approach to the engineering and construction of a packaged system allows the user to easily locate his new equipment without the added burden of wiring to auxiliary equipment.

All aspects of the broadcast function, from news booth to music production center, can be assembled into a unique and functional package.

Each system is fully pretested as a total functional unit and will meet or exceed all broadcast specifications.

FEATURES OF THE SYSTEM SHOWN ABOVE

- All inputs and outputs to the system are normalled through jacks and wired to blue ribbon connectors, (for convenience of service and transportation).
- Audio and D.C. interface to an automation system.
- Remote control of reel, turntable and cartridge machines.
- Program routing switcher to delegate audio from two production centers and automation racks to telco lines.
- Switchable A.G.C. control on all microphone mixers.
- Equalization can be delegated to any mixer or program channel.
- Included in the package are tone and digital information generators which are used in the production of tape and cartridges for playback in automation systems.

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this list, because the entire operation follows well established and proven operating "Standards".

Inventory Control

Inventory Control appears to be innocent, but consider the fact that Group W Productions has over 9500 dubs plus masters that have to be labeled, classified, shipped and received, and continually checked for quality. They shipped 30 tons of tape in one month and have 10 scheduled pick-ups a day from the airlines. Standards and tight operating procedures have to be maintained, otherwise they would become a warehouse and not ship anything.

Tape

Tape is a subject that always creates a discussion or argument within any user's premises. Also, regardless of a user's volume, it represents a significant expense to the total operation.

Over the years Group W Productions has suffered and shared the slippery color tape, drop out, oxide shedding and edge damage problems. The introduction of standard operating procedures years ago has generated sufficient empirical data that now they can establish standards statically.

1. Recent experience has proven that evaluating every piece of tape for drop outs is a luxury, **Provided** frequent quality checks are made when recording.

2. Tape reliability has improved over the years to where many new tapes have 1 drop out per minute.

3. Every piece of tape is cleaned before it is placed on a machine.

4. Age is not necessarily the criteria for scrapping a tape. Some tapes are discarded after 1 recording; others after 25 or more

recordings.

5. Criteria for discarding a tape are: Edge damage, drum loading, abrasiveness, scratches, drop outs, oxide shedding, and poor signal to noise ratio.

Edge damage leads the list as the major reason for scrapping tape. It is the most difficult quality criteria to control. Bent reels and poor transport alignment are obvious reasons for edge damage, but in-transit handling and shipping cases are major contributing factors to edge damage. However, these two factors are sometimes the symptoms rather than the problem. The problem very often is "steps in the pack." This can be virtually eliminated if the **entire** reel is re-wound rather than only that section "Played". To do this necessitates putting the tape into forward wind to the very end of the tape, and then initiating the rewind mode.

The rewind mode produces a uniform "pack" which helps reduce edge damage during transit or handling within a facility. This appears to be a polite way of asking all **users** of syndicated tape to consider the originator.

Tape Machines

A subject for a text book plus a novel, but the rule is, always follow prescribed and established procedures. Group W Productions firmly believes that interchangeability of tapes, machines and operators is essential for an efficient and quality "house". And this objective is only attained by rigid adherence to standards and procedures. "If you deviate you are only kidding yourself."

The prescribed test procedures require setting-up on a vectorscope, and frequent tests for parameters such as:

- Record levels
- Frequency response & measuring roll off
- Guide height
- Audio levels
- Video levels
- Check demod Out
- Chroma response
- **and** Head penetration

Head Considerations

Head wear is another argumentative topic. Everyone is always seeking the maximum, but it is difficult for anyone to state what

the maximum is. With all the experience at Group W Productions, they do not believe they can state what the maximum is. They, like everyone else, have some good days and bad days. They do offer some suggestions for improving head life.

1. A video head optimizer is a standard accessory purchased, or "kitted", on every machine. It permits rapid optimization of the head; therefore, can be performed often without disrupting operations. This procedure is a significant factor for maintaining a "standard" operation.

2. New heads should be optimized **frequently**.

3. Proper head penetration is the major criteria for maintaining a reasonable head life or improving head life.

4. Alignment tapes should be used once a day, **but** only after the guides are **hot**. Getting up to temperature requires ½ to 1 hour in the Record mode. Alignment tapes run through cold guides can give misleading information.

5. Another precaution is...don't be fooled into using more head penetration to obtain more RF envelope and hopefully a better picture. Deviating from the prescribed standard reduces your chances of good interchangeability of tapes and machines and increases head wear in both record and playback machines.

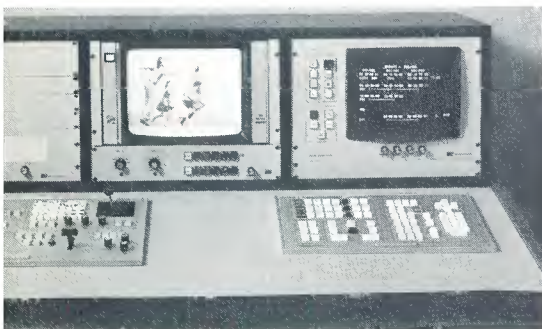
Environmental Control

An Environmental Control System is more than air conditioning. It should be designed to control air temperature, moisture content (humidity), and airborne particle content.

Unfortunately the majority of heating and air conditioning contractors are mainly concerned with maintaining **us** at a subjective comfort level. Fortunately this is the same comfort zone that is ideal for video tape...72°F and 50% Relative Humidity.

Head life of a VTR is affected more by humidity than temperature. Lower humidity increases head life, particularly around 25% Relative Humidity. A very low R.H. also aggravates static electricity discharge problems (particularly troublesome when working with 5V

(continued on page 33)



The PEC-102 computer editing system can be interfaced with 8 machines and control any three simultaneously.

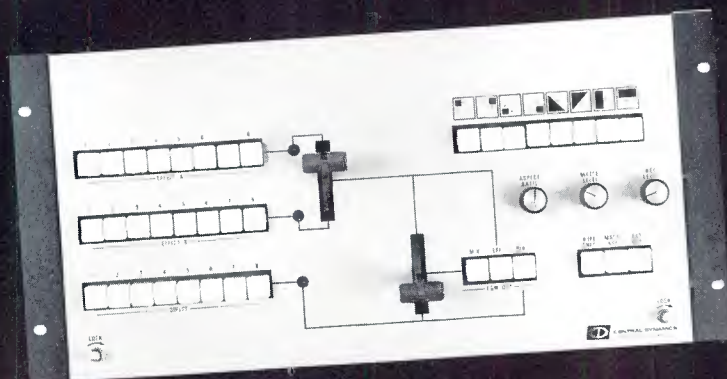
small... is sometimes BIG ENOUGH!

**Central Dynamics Introduces
the New VS-10
TV Color Production Switcher
for Mobile, CATV, Industrial
and Educational Applications**

**Priced at Only \$3350,
we believe it represents
a major value break-
through for professional
programming with true
broadcast quality**

You don't always have to be *big* and sophisticated to make it as a TV Color Production Switcher. The low cost VS-10 is an 8-input, 3-bus, compact, self contained, vertical interval, solid state switcher with ample sophistication for professional programming with *true broadcast quality*. Impressive special effects, mix amplifier, wipe/key amplifier, output selector and broad operational capabilities provide real production talent. A unique automatic special effects preview allows presetting keys and wipes for smooth, dramatic transitions to effects. The VS-10 lets you chroma key, matte key, wipe or dissolve to keys, dissolve or wipe between program sources, dissolve to special effects, or insert titles. Other standard features include a Cut Bus and true On-Air tally system. The VS-10 is compatible with NTSC, PAL-M and PAL color systems. All this... plus the proven reliability of the largest and most sophisticated Central Dynamics Production Switchers.

**Sometimes...
SMALL is Big Enough!**



Control Features

- Wipe** - Fader positions A & B signals. Aspect Ratio. Control varies configuration of 4 corner patterns.
- Keys** - Wipe Keys on or off. Key Level Control adjusts slicing level of key signals. Matte Level Control adjusts luminance value
- Mix** - Fader proportionally controls output signals from the Direct Bus and the Key/Wipe Amplifier.
- Switches** - Crosspoint and Output Selection switched in vertical interval with illuminated momentary pushbuttons. Wipe, Key Mode & Pattern switches are mechanically interlocked pushbuttons. Tally lights on each input bus indicate "on-air" signal.

Specifications

- Video** - 8 loop through inputs (BNC) externally terminated.
1 V p-p composite or 0.7 V p-p non-composite synchronous signals.
1 External/Chroma Key input terminated internally. (CDL Chroma Keyer Module is optional)
- Pulse** - 1 Sync input (BNC) externally terminated, 2 to 6 V p-p.
- Tally** - Relay interface with 14-pin Amphenol connector with mating connector.

Power - 115 VAC $\pm 10\%$ 60 Hz or 230 VAC $\pm 10\%$ 50 Hz (switchable). 50 VA.

Mounting - Rack frame mountable with hinged front panel. 19" (483 mm) W x 8-3/4" (22 mm) H x 7" (178 mm) D. All external connections are on rear of frame. 18 lbs. (8.5 Kg.)

Unit includes module extender, Operating & Maintenance Manual.

Central Dynamics has earned a reputation as one of the unquestioned leaders in TV Broadcast Equipment. Our standard line of production switchers are priced from \$11,000 to \$70,000.

The VS-10 is the first of a series to be *engineered and priced* to fill the gap between inexpensive, inadequate switchers and the more sophisticated, expensive ones.

Solid-state technology, and volume production techniques allow the VS-10 to be offered at this remarkable price.

However, you purchase the VS-10 with complete confidence that it is backed by the engineering experience, integrity and reputation of Central Dynamics.

We are convinced, as you will be, that the VS-10 *Broadcast Quality*, TV Color Production Switcher is the best value available on the market. We're delivering production units now.

Order yours today... at only \$3350.



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(continued from page 30)

logic circuits). Relative Humidity over 55% causes excessive head wear and aggravates clog problems.

Therefore, to satisfy or establish a status quo among tape, heads, electrostatic discharge, and people, the 72°F and 45-50% RH appears to be the best compromise.

Precautions should be taken to compensate for cold dry winter days. An air conditioning system is usually designed to dissipate sensible heat (body or electronic apparatus heat) and latent heat (water vapor). If the system is designed to maintain reasonable temperature and humidity levels with a 95°F and 90% RH outside environment, it also has the capability of pulling down the RH level below acceptable levels on a cold winter day. Proper refrigeration controls and moisture injection can compensate for this infrequent ambient condition.

Contaminated Air

Under this topic of Environmental Control we mentioned air contaminants. This has been an interesting study at Group W

Productions.

Carpeting has established itself as an absolute necessity.

- First...The proper type of carpeting has to be installed. The proper type is referred to as "computer center" or "aircraft" carpeting. Woven into the carpet are metallic threads that **help** eliminate the static discharge problems. Note: The word **help**. When the RH gets down to 25% or so, you'll probably have to use some anti-static spray.

- Carpeting has another benefit over tile that is undoubtedly overlooked by many, but statically proven by Group W Productions. After carpeting was installed, the tape machine filters were effective 3 times longer than with a tiled floor. The reasoning is...carpeting is vacuumed, and tile swept, washed and polished...or dirt is removed permanently from carpeting and only displaced when tile is washed and polished. The displaced dirt can quickly become airborne in a 72°F and 50% RH environment and contribute significantly to head wear and tape dropouts. Note: Another good reason for cleaning

all tapes before they are placed on a tape machine.)

Fade To Black

The seemingly impossible schedule can be met, and it is met at Group W. Of course, individual station schedules may never be so demanding, but we can all learn something from the demands of a rigorous schedule. If the critical factors covered in this article are keys to the success of Group W, they also can be keys to your success.

Certainly, a note of thanks is in order to Charlie Johns, Joe D'Amico, Ralph Cunningham and Owen Simon for helping us produce under the gun, and to Bob Hueffed to Central Dynamics without whose help we would have never been to press on time.

Central Dynamics has a pamphlet available on editing basics called "The Computer Evolution in VTR Editing". It is available without charge by writing to: Central Dynamics Ltd., 230 Livingston Street, Dept. BE/E, Northvale, N.J. 07647.

OFF-LINE, ON-LINE...What's the difference

This article on Group W Productions was designed to give readers a better insight into how a large established productions and syndicating company operates, backed with good technical information that anybody can use.

We didn't concentrate on the details and various methods of editing because that is a subject worthy of an entire publication. However, there is much discussion about "Off-Line" and "On-Line" editing that has generated a lot of confusion. Also, there are many of us who would like a better definition of the various steps taken during production and post production when editing with computer editing systems.

Let's try and clear the air on "Off-Line" vs. "On-Line" editing.

"Off-Line" Editing—"Off-Line" editing is working with helical scan machines in the producer/director's office and manually compiling a rough shot list.

"On-Line" Editing—"On-Line" editing is making preliminary or final editing decisions using automatic editing equipment, and regardless of the type of VTR used; i.e., cassettes, helical-scan machines, or quad.

Group W Productions many times uses Off-Line and On-Line editing. We referred to this in one of their case histories. To expand on this we have included the following brief discussion on today's

editing techniques and a step by step build-up of the production process.

New developments in camera equipment, recorders, and particularly in automatic process control equipment (computer editing), have now essentially eliminated the technical barriers. The producer can have the best of television's immediacy, high image quality and low-cost, and combine with it the sophisticated and proven production techniques of the film medium.

First, a brief review of the production process.

Shooting the Original Scene—The original recording is made with a single camera in short, single-scene segments onto high-quality audio and video recorders, with each scene identified frame-by-frame using time-code.

Preparation of the Work Tape—Completed master tapes are copied to a low-cost reel or cartridge format for use by the post-production editor, and the master tapes are stored. Frame identifications are transferred to the work-copy in the additional form of characters keyed into the video to allow frame-by-frame stop motion operation.

Scene Location—From the work-copy, a rough shot list is made up for the video, audio or both, by the filing of scene data (tape number, in and out address,

transitions, effects, and location in the final production). The work can proceed with simple low-cost equipment handled by production staff, as there is little or no technical involvement.

Review the Rough Cut—Once the shot list is completed, the basic scene information can be used to generate or simulate an assembled version with the scenes correctly positioned and most of the transitions and effects properly located.

The resulting program is used as the basis for further polishing of scene lengths, locations, effects and the like, and may be re-assembled several times before a final version is acceptable.

Assemble the Video Master—The final version is then assembled using the established scene file onto a new program master tape, using a similar set-up employing high-quality video equipment. Great care must be taken at this time to ensure accuracy of levels, color matching, and freedom from timing or color framing errors at the edit points.

Audio Assembly—From the recorded dialogue track and the data in the file for the production, an audio track is built up from the original audio recording with music, commentary and sound effects added on other tracks as necessary.

The production process described should be considered as typical of a major program or commercial production and it is recognized that some produc-

tions, such as news, sports or other relatively simple ones, will likely short-cut some steps in the interest of saving time.

Technical Requirements—In all cases, the technical requirements, however, remain the same-

- Reliable scene identification through the time-code signal.
- Control of recorders, mixers and other devices to allow production to proceed in realtime with a minimum of technical constraint.
- Automatic synchronization of recorders to frame accuracy and elimination of color frame errors.
- Flexible entry, storage and editing of scene data.
- Simple communication with the operator.

The computer editing system is a Central Dynamics PEC-102. At Group W Productions it can be used for Review the Rough Cut, Assemble the Video Master, and Audio Assembly.

It accurately edits to a single frame and includes color framing, and four different CRT display formats that use simple and logical language, permitting fast response. Its edit file capability permits storing up to 600 scenes that can be recalled and manipulated easily.

It also automatically controls the audio/video switcher with full effects capability, interfaces to many different types of VTR's and audio machines, and by a "flip of a switch" can be controlling quad machines one minute and helical machines the next. It also produces a hard copy printout of all decisions.

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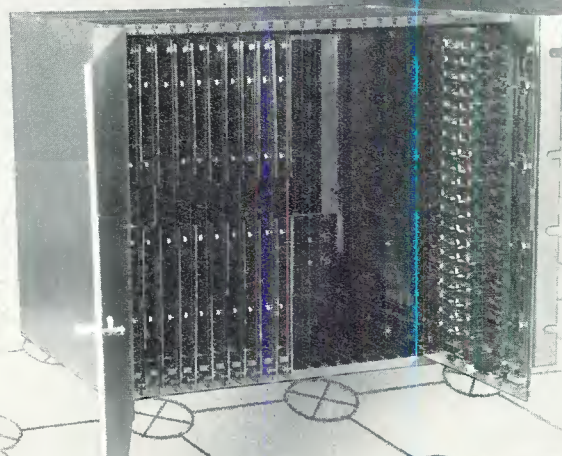
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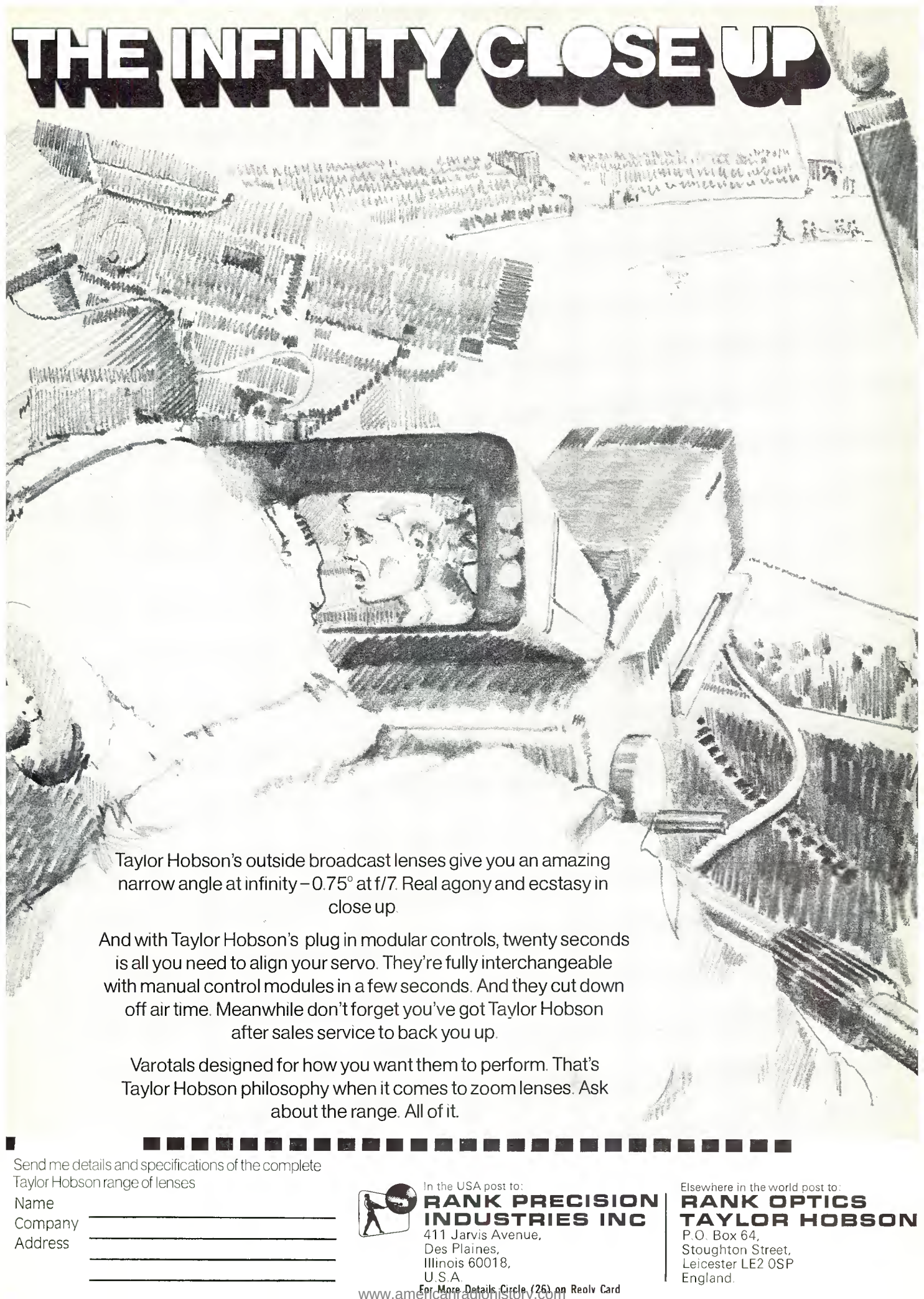


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Fortunately, editing isn't what it used to be. Here we see precise edits being made electronically.

RAZOR BLADES ARE FOR SHAVING

By Art Schneider, Video Tape Editor for
Consolidated Film Industries, Hollywood, Calif.

More than a half a century ago when classic films such as *Birth Of A Nation* and *The Great Train Robbery* were made, editing was in its infancy. The technique of editing is one of the most creative arts in the communications field. It has been said that editing can make or break a film, which may be true; but up until the middle nineteen fifties there was no other way to edit images except on motion picture film.

Even though television was beginning to flourish the only way to edit TV pictures was to transfer them to kinescope motion picture film and edit using conventional film editing equipment and techniques.

Videotape editing began in 1958. Two years prior to that the first broadcast videotape recorders were installed. Almost immediately the question arose, "Can we edit videotape?" Obviously, the first attempts were very crude. The first splicing block was just that...it consisted of an aluminum block, a steel ruler and a sharp razor blade. A very fine carbonyl iron powder in solution was brushed on the oxide of the videotape. This "developed" the electronic pattern on the tape and enabled the editor to "see" the television frame line which is known as the edit pulse.

Initially, there were two edit pulses per television frame and there was a 50-50 chance of making an edit that did not roll or whip. It was similar to splicing the film in the middle of the frame.

Shortly thereafter the standard of using one edit pulse per frame was then established, which at least insured that the edit point was at the end of a television frame and not in the middle.

Double System Method

In the year 1958 at the NBC Studios in Burbank, I was involved in the development of what is known as the "double system method of editing video-tape". Basically, a copy of the videotape original was made on 16mm film using a direct positive picture and single system optical track composite. However, the optical track did not carry the program sound

associated with the picture. Instead the sound track was used as an electronic edge number to later correlate the videotape original with the edited 16mm kinescope film work print.

In addition to the 16mm picture, a 16mm magnetic sound track was made having two sound tracks. The prime or edge track carried the program sound and a second or "cue" channel, adjacent to the sprocket holes, was used to record the electronic edge numbers. This electronic edge number is a voice track, one a man's...and one a woman's, with audible low frequency beeps every 24 frames synchronously recorded. The voices alternately give the minutes and seconds between beeps. The frame count was derived from measuring the number of frames from the beep nearest the splice to the physical splice in the work print. This edge number code is called "ESG" or edit sync guide. The editor does not normally concern himself with this ESG until he has completed his editing.

Standard 16mm motion picture film editing equipment and techniques were used to edit literally hundreds of television specials, series, and commercials. The Bob Hope Comedy Specials and the Laugh-In series were some of the shows edited in this manner.

Once the film has been edited, a log or a "count" sheet of all the physical edits in the work print was made.

The sound of the ESG cue track was found by using an optical reader. The operator wrote the time code information on a log as a frame-accurate guide for the videotape editor.

The original unedited videotape scenes are cut apart and placed onto smaller reels for ease of handling. All the videotape editing is done on an editing bench using a custom-made audio reader for the videotape that allows the editor to read either the program audio for scene identification or the cue channel for the ESG time code. This time code is then matched by listening for the code, then the beep; developing the beep on the

tape with the iron powder in solution and, using a special ruler, measuring down the number of frames called for on the log. The scenes are then spliced in conformity with the log.

The 24-frame editing system just described had a number of inherent technical problems because of the 24-frame per second rate of film as opposed to the 30-frame per second rate of videotape. These problems were overcome by various ingenious techniques and equipment too complex to mention. Suffice it to say that it worked well for some dozen years. Many award winning shows were edited using this method.

The system was in general use at NBC Burbank until some time in 1971, at which time they switched from the 24-frame per second system to a 30-frame per second system which made the film editing process more compatible with videotape since they are now on a frame-for-frame basis. The Bob Hope Comedy Specials still use the work print method of tape editing today.

In early 1963, Ampex developed an electronic method of tape editing. One of the first systems was installed at NBC in Burbank. The first Ampex electronic editor had no precision control of the edit point. At the point where the editor tried to make an edit, he would push the record button "on the fly"; in other words, as the tape played through the machine at normal speed. There was no preview mode.

Since there is an 18-frame delay built into the system between the video erase turn-on and the record head, he had to anticipate each edit by 18 frames, or a little more than half a second, in order for the cut not to be late. If you were late on the edit, you could redo it and push record a fraction of a second earlier, or if you did as many of us did, pushed record too early. Then you had to re-record the scene you just wiped out or start all over again.

The next step was for Ampex to install a programmer for their editor which gave the operator considerably more control. By playing the tape you could mark your edit

point precisely, both in and out, or shift the edit point forward or backward, and the suicide factor in electronic editing was neatly eliminated. Now you could preview each edit, make a video only or audio and video edits, and even animate frame by frame. This was all accomplished by an audio beep applied manually by the operator to the cue track of the videotape.

I thought to myself, well, maybe I will put my splicer aside, but not yet in mothballs.

Several years after the introduction of Editec by Ampex a firm called Electronics Engineering Company, or as it is known in the industry as EECO, developed a revolutionary new editing system that used a binary computer time code which was recorded in the cue channel of the videotape. This code would cause the videotape to start or stop on cue, or make any combination of audio or video edits. This approach to editing also eliminated a good percentage of mechanical hang ups that slowed down the electronic editing process in the past.

During the editing process, the tape operator pushed a time-hold button on the VTR panel at the instant he wished to designate an edit point, which froze the numbers in the little window. The time code numbers are seen as numerical readouts in hours, minutes, seconds and frames. The operator then dials in these numbers to start and/or stop an edit or it will start a second playback VTR remotely.

This function, of course, allows an edit to be previewed many times and then recorded. The EECO system, I would estimate, speeded up the editing process by about 30% over Editec. It was the first of what I call the semi-automatic editing systems.

Using The CMX 600

There are also a number of very good electronic editing systems in use today; each designed to control videotape machines, search, cue, preview and edit; each designed for a certain type of budget. In this article, however, I intend to describe the CMX editing systems,

since I am most familiar with their operation.

In 1971 one of the first CMX 600 systems was installed at Consolidated Film Industries, Video Tape Division. This is also known as the light pen editing system. Basically, picture and sound information along with time code references are all loaded segment by segment or scene by scene onto magnetically coded spinning disks which rotate continuously at 1800 revolutions per minute. Scenes are accessed by scanning these disks with special pick-up heads. These disk drive units are, incidentally, almost identical to those used in banks, and other institutions where information is stored and must be retrieved instantly. Instead of digital information, the CMX disks store black and white pictures and sound information. Each drive holds up to 4½ minutes of material and the system is designed to operate with six such drive units or "6 packs" giving a total working capacity of about 27 minutes.

My first impression was that 27 minutes of working material would never fulfill my needs. However, the one hour TV documentary special known as "Julie", a special on Julie Andrews, was edited on the CMX 600 system. It allowed me to work with 5 hours of raw material ending up with a one hour show time, accurate to the frame program. It was done by breaking up the raw material into various 27 minute "packs"; in other words, 27 minutes of various material would give me about 5 or 6 minutes of editing material. This could be called a reel. There were 12 such 27 minute packs loaded with raw material and 12 - 5 minute edited segments or reels which were electronically spliced together to form the one hour show.

Prior to loading the disk packs, all the raw material is transferred to an inexpensive half-inch slant track color video tape work print with the time code information visually impressed over the picture in the bottom of the frame. The client is provided with a viewing room, a color monitor and a half-inch tape player. He notes the start and stop times of each scene or segment, and this is the log and

a load list is built from this log. The 2-inch color master is played back and the selected scenes are loaded into the disk as mentioned earlier.

Now the editing begins. With light pen in hand, the editor starts building an edited work print. He selects the raw material from the right hand monitor by touching the scene asked for. Instantly, the first frame of the scene appears on the right hand monitor. He touches play, and the picture moves forward until he stops it. He has complete control over the speed of the picture from up to 10 times faster than normal forward or reverse, to normal forward or reverse, thru slow speed which gives you as slow as one frame per second. A final mode gives jog or single frame advance in either direction.

In stop frame mode, the audio associated with the picture is still framed and the amazing thing about this is that when you listen to the audio from still frame, thru 10 times faster than normal, the audio retains the correct pitch. This is great for music editing because it allows you to move frame by frame until you select the correct musical note on which to make an edit. An "A" note is an A at any speed even still frame, for example. You pick a start edit point on the right monitor, splice to the left monitor, which becomes your edited take up reel, then play down the left monitor until you find an out point. Again, you go to the right monitor, select a new scene and repeat the process. The CMX allows you to make dissolves, fades and 23 program wipes, in any increment from one to 255 frames, which is equivalent to 8 ½ seconds maximum length.

Another feature is that video only, audio only, or audio video dissolves or fades, may be indicated. An edit, once it has been made, may be re-spliced at any time as many times as necessary. It takes only a matter of ten seconds or so to re-splice a scene. This same procedure on film would take anywhere from 5 to 10 minutes.

The final output edit list is a computer punch tape that corresponds to all the edits in the splice list. This tape is then programmed

into a companion computer which controls 3 VTRs and the program tape calls for the edits to be made in conformity automatically with the edit decisions done earlier on the light pen console. This automatic assembly can make an average of 30 edits per hour depending on the number of reel changes and the search time of the VTRs to find the correct pieces.

An offshoot of the light pen system is known as the Edipro 300. This is what is known as an on-line editing system. The 600 just described is known as an off-line system. Off-line meaning a device that built a work print, actually, a means to an end. On-line in effect indicates that you are building a master directly.

Film Techniques For Tape

There are many analogies between film and tape and some things that may seem strange to you, but basically many of the editorial techniques used in tape came from film. Many film editors have made the transition into videotape from film with relative ease because of their background. In my discussions with clients which deal with their needs in post-production, I try to find out what their needs are, whether or not the job should be completed on tape or film, and also help them with their storyboard concept of program or commercial, which cuts down their total post-production time.

Videotape today provides speed, economy and quality, provided that people take advantage of our pre-post-production meetings to go over storyboards and discuss needs and schedules.

The cost of editing on an off-line system such as the System 50 is about ⅓ of that on the more sophisticated 2-inch quad machines. Therefore, the decision-making should be done on a 50 system and the edits conformed on a quad system such as the 300.

Computerized editing is here today. It is sophisticated, fast, extremely accurate and economical. And, oh yes, one last thought, I still won't put my splicer away in mothballs. It will make a great door stop!

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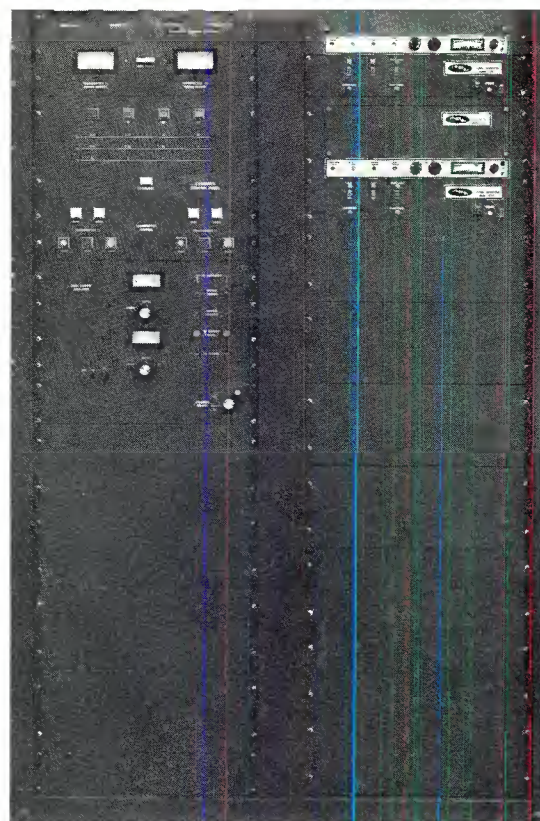
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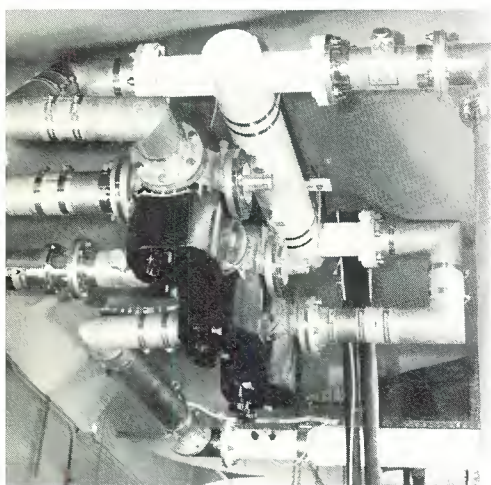
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A typical center control cubicle. This one is equipped with dual exciters and antenna mode switching. Also of note is the variable phase delay in left center.



Parallel FM transmitters: **The Built-in Backup**

Part 2 of a 3-part series / By Glen Clark



Motor-driven coaxial switch to allow output mode switching. Partially obscured are the hybrid combiner (above) and one of the two harmonic filters (rear).

Concurrent with FM's new stature and market influence comes a sense of acute technical awareness on the part of higher management which may feel unfamiliar to some, temporarily. As air time becomes more valuable, likewise down time becomes more costly; not only in terms of lost revenues, but lost listeners as well. Consequently, new emphasis is placed upon keeping down time to a minimum.

The problem has already been aided to a very large degree by redundancy of the most problem-lively link in the chain: the transmitter with its inherent high-voltage circuits. In addition there are a number of options available for the redundant transmitter to further increase reliability and versatility.

Redundant Exciters

The first such option is the back-up exciter package. Under normal operation, the second exciter is terminated in a 50 Ohm load and is unused. The operator may, at the touch of a button (or closure of a remote control contact), switch the on-air exciter into the load, and the standby exciter to feed the transmitters. At the same time, program and SCA audio (if used) are trans-

ferred to the back-up exciter, all without interruption to the program.

Carrying this line of reasoning one step further, one may order the automatic exciter switching option. This unit continuously monitors the RF output of both exciters. If the output of the on-air exciter drops below a predetermined level, this unit will automatically initiate an exciter transfer and register the condition with the operator (see Figure 1).

Output Switching

You will recall that total failure of one transmitter causes power delivered to the antenna to drop to 25% of its normal value due to unbalancing of the hybrid. Meanwhile, another 25% is dissipated in the reject load. Adding the output switching option allows the operator to bypass the hybrid and feed the operable transmitter directly to the antenna, increasing the power delivered to the antenna to 50% of normal. This option also is available in a number of sophistication levels, depending on how much automation the buyer wishes to pay for.

The basic package consists of three motor-driven coax switches

and controls as shown in Figure 2. Different combinations of switch positions yield four switching **modes**: Mode 1 - both transmitters combined to the antenna; Mode 2 - both transmitters combined to the dummy load; Mode 3 - transmitter 1 to the antenna, transmitter 2 to the dummy load; and Mode 4 - transmitter 1 to the dummy load, transmitter 2 to the antenna. Positions 3 and 4 offer the added ability to test and troubleshoot a faulty transmitter in the dummy load, while the program continues unaffected.

There are four additional possible combinations of switch positions which perform useless functions and hence are undefined. Position-indicating micro-switches inside each coax switch control an interlock network which momentarily shuts off both transmitters any time a coax switch moves or is in other than a "homed" position. In addition, the interlock prevents any transmitter(s) switched to the dummy load from being activated unless there is proper coolant flow in the load.

It is of passing interest to note that while both transmitters are fed to the dummy load in mode 2, the antenna is connected to the unused port on coax switch #1. This permits convenient access to the antenna for test equipment in the event of antenna problems. An admittance bridge or TDR (time domain reflectometer) may be connected here, negating the need to disassemble cumbersome transmission line.

In the basic version of the switching option, the coax switches are controlled by pushbuttons, as in Figure 3. The operator determines the proper combination of switch positions for the desired mode; and enters them, pushing three buttons to define a mode (one for each switch).

The intermediate version reduces the number of pushbuttons to four - one for each mode. Each button operates a multi-pole relay which in turn directs the coax switches to their proper positions (see Figure 4). It is now necessary to push only one button to define each mode.

Management Highlights

You can expect to see a growing use of tandem FM transmitters in the coming year. This series has been presented to fill the need for more information on why to use tandem transmitters and how they are not only built-in backups but also they can help you get to higher reliability and versatility.

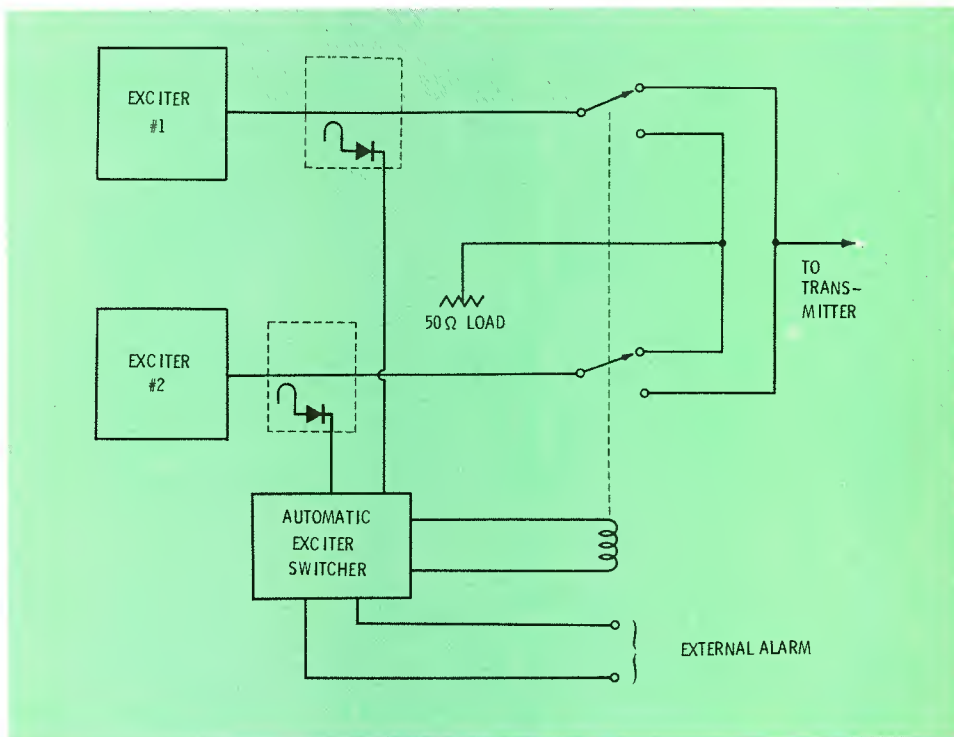


Figure 1

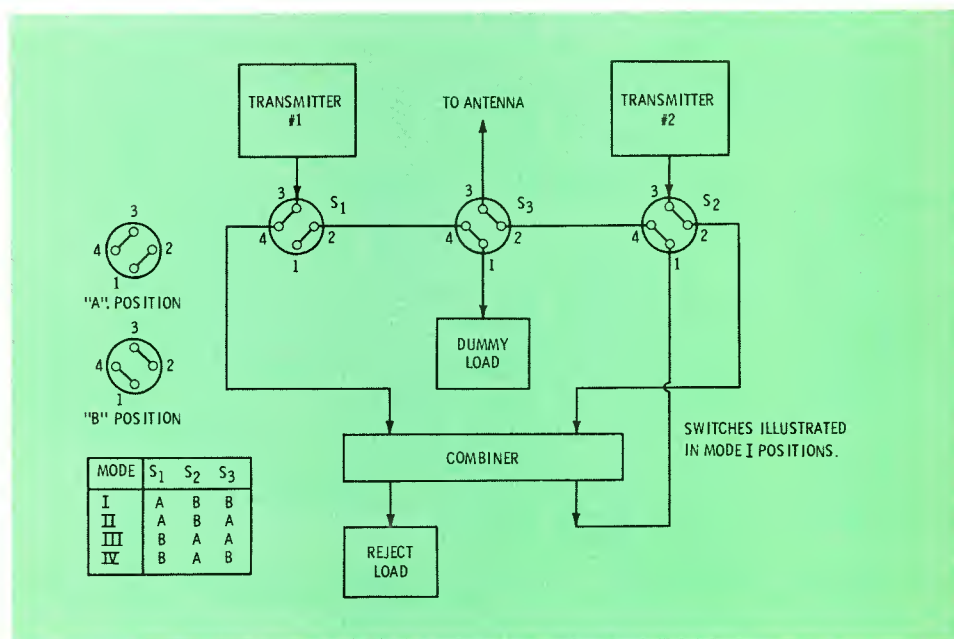


Figure 2

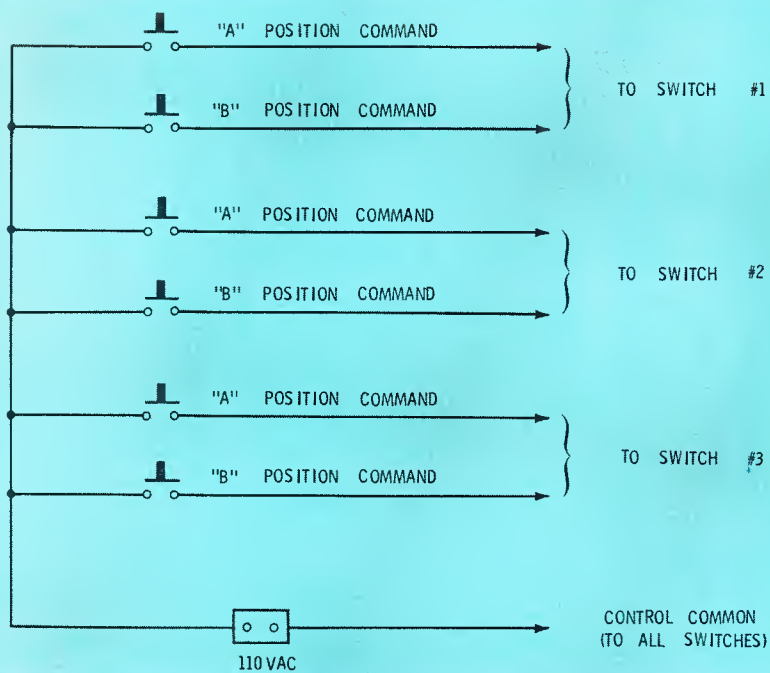


Figure 3

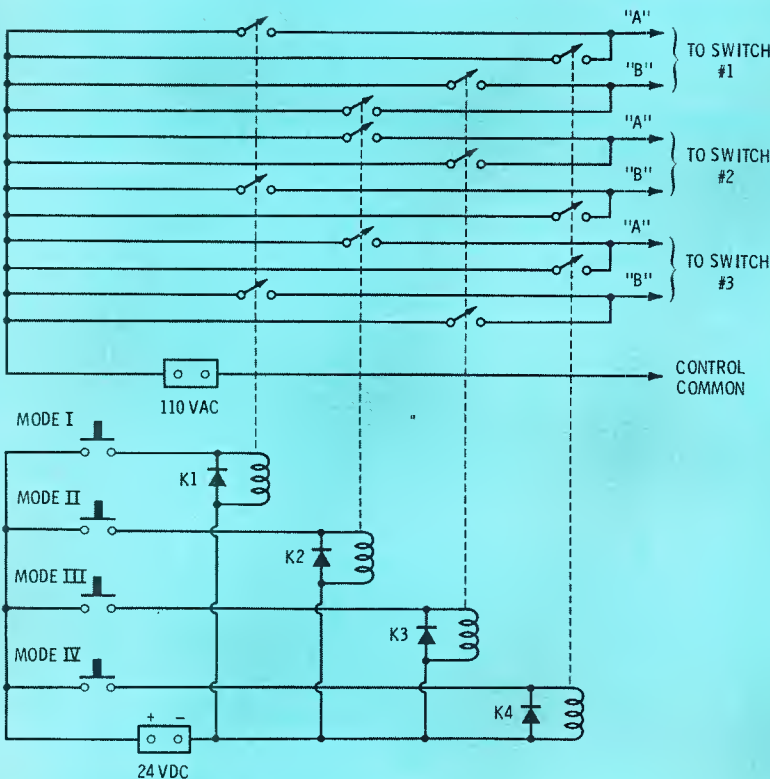


Figure 4

Lastly, in the switchers most advanced form, a controller monitors the output powers of the two transmitters. If one transmitter shuts down, a solid-state time-delay is activated. If at the end of a predetermined amount of time (typically one minute) the fault has not cleared, the controller will initiate a Mode 2 or Mode 3 command; switching the functional transmitter directly to the antenna and the inoperative one to the dummy.

External Reliability

Despite the inherent reliability of a fully equipped tandem, there are still a few "Achilles' heels" where, if not taken into account, a single external fault could deadline both transmitters. The first one which comes to mind is control circuit power for the transmitters. In addition to the heavy three-phase service, some transmitters require an additional feed of 110 Volts single-phase for control circuits. Each transmitter should have its own separate feed from the breaker box. This prevents any problems in one transmitter from backing up into the second one via the AC power lines. The same reasoning also applies to AC power for the exciters.

Conclusion

Parallel transmitter operation is by no means a newcomer to broadcasting. The necessary technology has been available for some time. In fact, several tandems have been in use for over ten years. Each was custom built to fill a customer's specific application and had to be individually type approved. However, it has not been until recently that increased performance requirements for higher power and total reliability have made it profitable for manufacturers to offer parallel transmitters as a stock item. While still a small minority by comparison to the sheer number of single transmitters in operation, you can expect to see a substantial increase in the number of tandems in the next few years as the needs of FM continue to grow.

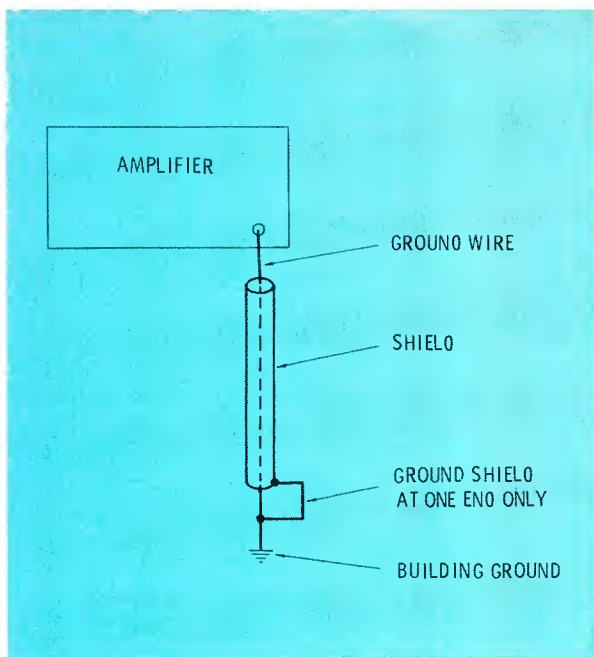


Fig. 1 When a ground lead must be more than a few feet long, shield the ground wire.

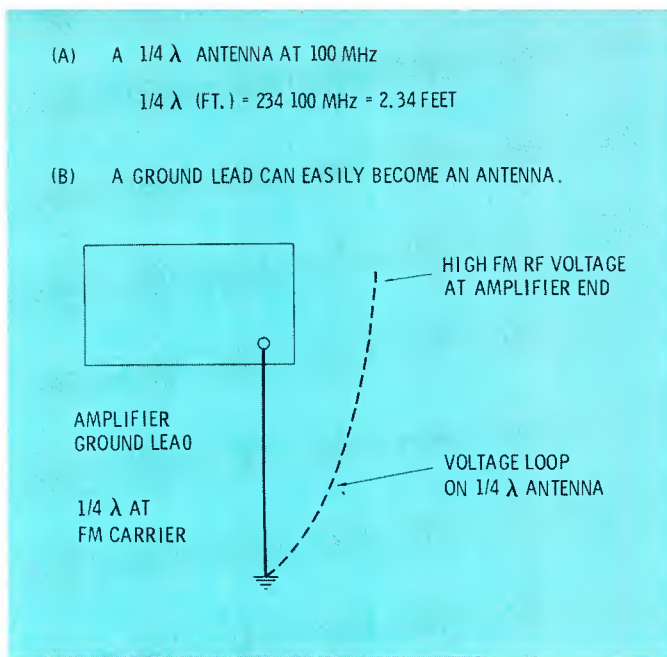


Fig. 2 At FM carrier frequencies, the wavelengths are short. Thus, a ground lead can become an antenna.

How to keep RF out of Your audio circuits

By Pat Finnegan

Now that the audio equipment in the broadcast industry has been converted to solid state, there is an ever present enemy in the form of R F Interference (RFI) that must be combated. Solid state equipment has many other enemies, but this article will confine itself to RF problems from the station's own

transmitters or the transmitters of a neighbor station.

There will be no sure-fire method or solutions expounded here, for the author has learned from experience that there is no such thing. A technique that will work in one situation will fail miserably in another similar situation. Some

general methods will be discussed that can help isolate your equipment from the enemy, and some specific cases and solutions that did work in those cases. Hopefully, you may find something here that will help with a problem at your station.

How it Happens

There are many, many ways that RF can get to the components inside the amplifier. This may be by direct radiation to components on an open chassis, or carried on the audio signal lines, shields, DC control circuits or AC power circuits. The basic reaction takes place at one or more transistors

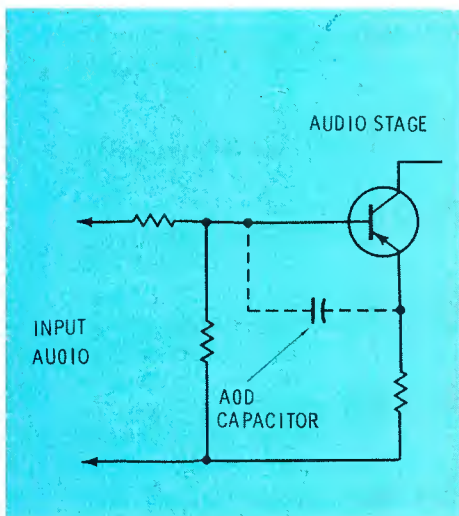


Fig. 3 Bypass right at the transistor, if it can be done without upsetting the audio or otherwise affecting the circuit.

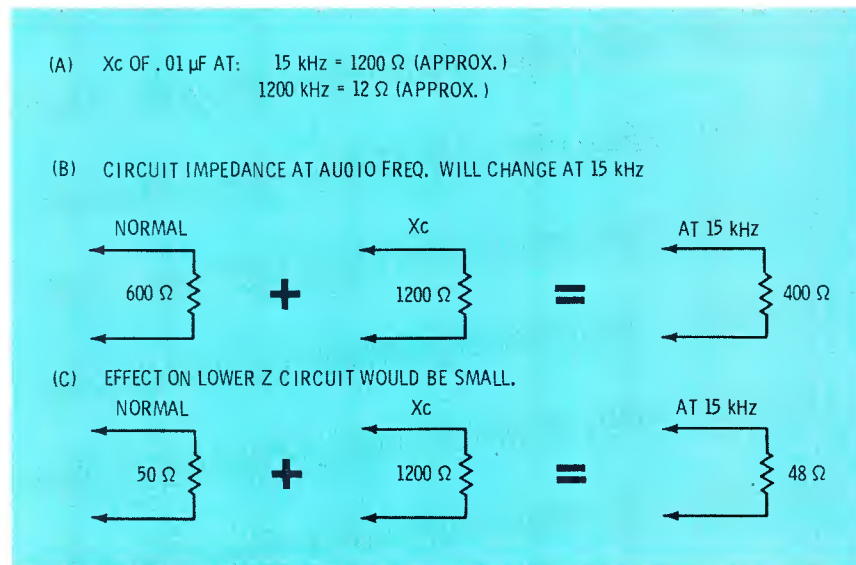


Fig. 4 Always determine the reactance of the capacitor at audio and RF frequencies.

A New Concept in Differential Phase & Gain Measuring.

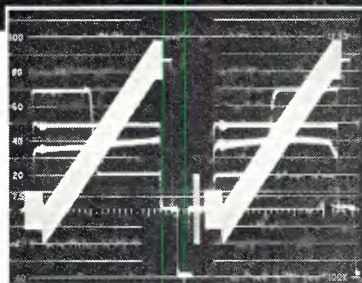


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Left (from top)

Color linearity test signal
 $10^\circ \Delta\Phi$ Calibration Pulse
 $\Delta\Phi$ of test signal (0.05°)
 $\Delta\Phi$ of item under test (1°)

Right (from top)

Color linearity test signal
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 ΔG of test signal (0.05%)
 ΔG of item under test (1%)

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too low for the scope's sensitivity.

Once the offending transistor has been identified, by-pass the base to emitter with a capacitor directly at the transistor socket or terminals. But take care that the value capacitor used does not upset the circuit or cause a rolloff of the upper audio frequencies.

When by-passing is used as a defensive technique, regardless of the circuit, always determine the reactance value of the capacitor at both the RF signal and at the highest audio frequency you wish to preserve. The capacitor should be one of the better ceramic or silver mica types, and the leads should be short and direct to the effected circuit at the components. The by-passing as envisioned here, is that which is directly across the circuit so as to provide a short circuit to the RF. (By-passing to ground has different reactions on the circuit.) By-passing can cause a rolloff of the upper audio frequencies, and it is for this reason that the technique can not always be used. Ferrite beads can also be added to signal lead to detune the lead to RF by adding inductance to the circuit. These are the same beads that have been used in high gain video amplifiers to prevent parasitic oscillations from occurring. The bead is donut shaped and slipped over the wire and soldered to the wire at some point.

When the RF is coming in over balanced signal lines, switching over to unbalanced lines for that circuit will sometimes cure that problem. However, when circuit patching is done with this circuit, the unbalanced circuit can cause other problems with the balanced circuit it is patched into.

Power lines often carry RF into a rack or a chassis. Each side of the power line can be by-passed to ground, and further, a series RF choke can be added in each line. When using chokes, make sure the current rating is adequate for the current drawn by the amplifier. Both sides of the power line must be treated even though the neutral wire is grounded back at the power panel. As far as the RF is concerned, that wire is ungrounded.

Specific Cases

For sponsor approval of a spot, a monitor amplifier is connected to

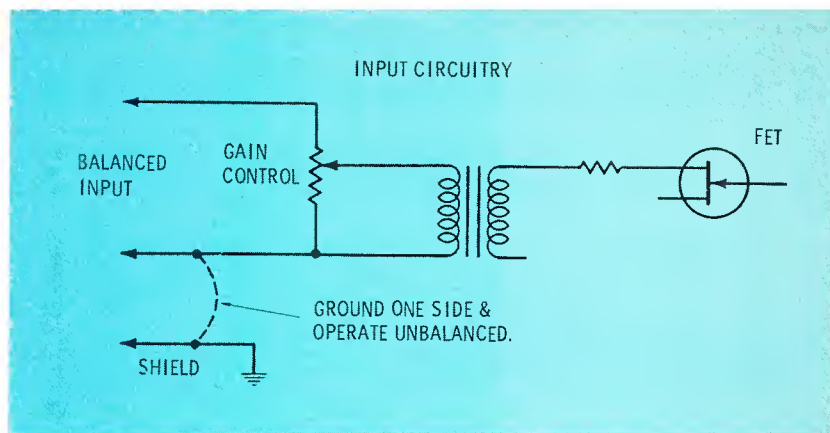


Fig. 5 Be careful of amplifiers that have the audio gain ahead of the input transformer. It may be necessary to run unbalanced.

the telephone circuit directly to feed the audio over the telephone. AM radio pickup was very severe and a number of techniques were tried for a cure. A 0.1 UF capacitor shunted directly across the line at the amplifier terminals eliminated the RF, but also caused some rolloff of audio. But, since the line would only pass 3 kHz at the upper limit, this was tolerated.

Mobile base station transmitter, with a remote control unit 25 ft. away: the AM pickup was loud as the microphone audio on the remote control, but absent if the

local mike was used and the remote control disconnected. All methods failed, so the preamp input transistor was by-passed (emitter to base) directly at the transistor. This was with a ceramic .01 UF capacitor. The RF was eliminated, and there was no noticeable effect on the audio as received on the mobile units.

New solid state AGC/limiting amplifiers were installed in a rack and operated with a recording booth 50 feet away. All wiring was in conduit and shielded wire. But the AM radio was picked up in an

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amount to provide a background to the recordings. This unit had input and output transformers and a balanced circuit, but the gain control was **ahead** of the transformer. The only solution that would work was running the input circuit unbalanced. This was a problem with the unit design themselves, as 4 units were installed and for different applications, and each one had the same RF problem and had to be cured the same way.

One microphone channel on the main console had a low level FM pickup that seemed to defy solution. The mike circuits ran through a patch board (two studios were switchable to the channel) and both studios had the FM pickup. This seemed to indicate a console problem. But, by accident the problem area was discovered (as are most solutions) to be an erratic contact in the jack field itself. After pulling out a shorting plug (one of many times) the RF did not reappear. Wiggling the plug the RF came and went. A thorough cleaning of the jack cured the problem.

A monaural recording booth turntable preamp was blessed with

a good dose of both FM and AM pickup—not always at the same time. This was an older stereo preamp strapped at the output for monaural. But it was the same set-up that two others were operating in the main control room without problem. After many days of frustration, we threw in the sponge and bought a new preamp. The newer model had many RFI proofing techniques built into it and it worked in that location without problem, but our previous attempted cures were left in place—just in case!

Summary

RFI is one of those phenomena that can't be pinned down to a simple theory. Perhaps a theory can be derived for a particular case if all the given elements are known or can be accounted for. And that, perhaps, is the nub of the whole problem—identifying the elements that are peculiar to a specific case. If these are known, solutions can be derived. But they are not easy to identify, so it is mostly a cut and try process until one workable technique is found.

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PEOPLE IN THE NEWS

John A. Moseley, President of Moseley Associates, Inc., Goleta, California, has announced the promotion of three members of the staff to Vice Presidents. **John E. Leonard, Jr.** has been elected Vice-President of Marketing; **T. Arthur Kvaas** has been made Vice President; and **Gary B. Foote** has been elevated to Vice-President of Manufacturing.

New Vice-Presidents of Orrox Corporation are **Allan J. Behr**, General Manager of Videomax and **Donald E. Prather**, General Manager of CMX Systems.

At International Video Corporation, Sunnyvale, **Dick Reilly**, Western Region, has been named Salesman of the Year. Also at IVC: **Bert Dann** has been named Vice President, Engineering; **Donald Morgan**, Director, Product Management; **Hugh Gillogly**, Chicago office, Direct Manager, Central Region; and **Carter Elliot** promoted to Director, Corporate Communications.

From Salt Lake City through Telemation, Inc. comes the appointment of **Collin C. Chamberlain** as Advertising/Public Relations Manager. Also, from Telemation, Inc. is the appointment of **Donald F. Smith** as National Broadcast Marketing Manager.

Joining the staff of Automated Processes, Inc., Melville, N.Y., as a Broadcast Sales Engineer is **Richard W. Burden** who will be manning an office in Canoga Park, California....**Roger A. Grover** has been appointed as Sales Manager of Walther M. A. Andersen & Associates, Inc., Tariffville, Connecticut**Larry L. Hayes** has joined Coastcom, Concord, California, as senior research and development engineer where he will be responsible for new product development and design.

The position of Vice President—Marketing, Harris Broadcast Products Division, is now held by **Gene Edwards** who will be responsible for all marketing functions and all sales of the Division for the Domestic, Export and Government Markets.

Cablewave Systems Inc., North Haven, Connecticut, has appointed **Don Winn** as Sales Manager of Miniature Products....Appointed as Technical Representative for Cinema Products Corporation, Los Angeles, is **Lt. Commander Gary B. Gross** (U.S. Navy, retired)....Serving now as Chairman of the Engineering Committee, East Coast Division, of the National Academy of Television Arts and Sciences is **John J. Leay**, Manager, Technical Systems, of Imero Fiorentino Associates.

Having created a new corporate office of industrial relations, Belden Corporation has named **A. Glenn Boyd**, corporate director, and **R. Clifford Mrazek**, assistant corporate director....Newly appointed as manager of marketing and marketing services at General Cable Corporation's Power and Control Products Operation in Union, N.J. is **Richard A. Rinaldi**.

Announced recently was the formation of a new consulting firm by **Joseph L. Stern**, formerly Vice

Continued on next page

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PEOPLE IN THE NEWS

President and Director of Engineering of Goldmark Communications Corporation. The new firm is to provide communication system and product design services....Elected a Vice President of ITT World Communications Inc., a subsidiary of International Telephone and Telegraph Corporation was **William C. Taylor**.

CATV

Wayne R. Hauser has been appointed Vice President and General Manager of Community Cablevision, Inc., a 9,200-subscriber system covering the City of Irvine and parts of Newport Beach and Tustin in California....Two new appointments from Sun Oil Co's Products Group include **Richard W. Brown** as manager, Industrial TV Studio and **Charles S. Fitch** as chief engineer of Sun's Industrial TV Studio.

In addition to his present position as Director of Engineering, **Richard C. Hickman** has been named Vice President of Cox Cable Communications, Inc., Atlanta, Georgia....Calvert Electronics Inc., New York City, announced the appointment of **Fred M. Samuel** to head the new Broadcast/CATV/CCTV Division where his initial efforts will be to develop a tube product line of Broadcast/CATV and CCTV tube requirements.

For the Central Region of Warner Cable Corporation, **Michael J. O'Sullivan** has been named as director of operations. Also at Warner Cable is the appointment of **George L. Mild** as manager of its cable television system in Akron, Ohio.

With regret, it is noted that **Charles D. Snider**, Chief Engineer for Cablevision of Oyster Bay in New York has died.

Radio/TV

I. H. Rusty Gold, who has been serving as Station Manager of KKYK since January, 1974, has been elected Vice President of Snider Corporation, licensee of KKYK and KARN in Little Rock....Named Production Sales Representative for the Olympic Broadcasting subsidiary of Olympic Savings and Loan Association is **C. Ronald Gunther**. He has experience in television as Production Manager for WBBM-TV for 5 years and as Production Manager of the American Broadcasting Company's WLS-TV station in Chicago.

Klee C. Dobra has been named Station Manager and **Donald K. Wiese** has been appointed General Sales Manager of KLIF, a 50-thousand Watt AM station serving the Dallas-Ft. Worth market. Also at KLIF is **David Paul McNamee** who has become Operations Manager.

From Atlanta comes word that **Michael S. Kievman**, Vice President of programming, Cox Broadcasting Corporation has been named President of the Atlanta Broadcasting Executives Club (ABEC). Other officers' names include Vice President, **Ms. Lee Sheinman**; Secretary, **Dan Haight**; and Treasurer, **Al Strada**.

For More Details Circle (36) on Reply Card

bookreview

The application of the IC op amp to the field of audio signal processing has been somewhat slow in developing. However, this book, **Audio IC Op-Amp Applications** by Walter G. Jung, examines the various pitfalls in detail and discusses methods for realizing the full potential of the op amp in a variety of audio circuits.

The book, organized into six chapters, begins by introducing and discussing the IC types under consideration as well as covering general operating procedures and precautions to be observed in using the various devices.

Chapter 2 discusses IC op-amp parameters that are important in audio applications, while Chapter 3 deals with the basic op-amp configurations as they are applied to audio use.

The next chapter covers a variety of practical audio amplifier circuits in which specific IC types are used including standard voltage amplifiers with optimized frequency and gain performance; power amplifiers; and microphone, phono, and tape preamplifiers. Chapter 5 deals with equalized amplifiers and active filters.

The concluding chapter has a miscellaneous assortment of special-purpose audio circuits, such as mixing amplifiers, load-matching circuits, linear-feedback gain-controlled stages, sine-wave oscillators, function generators, etc.

This book is available through Howard W. Sams & Co., Inc. of Indianapolis, Indiana.

For More Details Circle (71) on Reply Card

Solid-State Circuits for Hobbyists & Experimenters by Jon L. Turino provides the serious electronics hobbyist or experimenter with enough information to allow him to design the circuitry for many useful projects. It should supply him with enough knowledge to be able to adapt and modify existing circuit designs to suit his specific purposes.

The first chapter begins by covering in detail the creation of a system block diagram. This is followed by a review of practical semiconductor device theory and descriptions of bias polarities for each device in Chapter 2.

Next, single- and multiple-stage analog amplifiers are developed and later used as signal sources and detectors. Special purpose circuits and digital logic are also discussed, followed by a chapter on the use of analog ICs. The concluding chapter describes the design of several types of power supplies.

This book, available from Howard W. Sams & Co., Inc. of Indianapolis, Indiana, intends to show the "why" in addition to the "how to" of solid-state circuit design.

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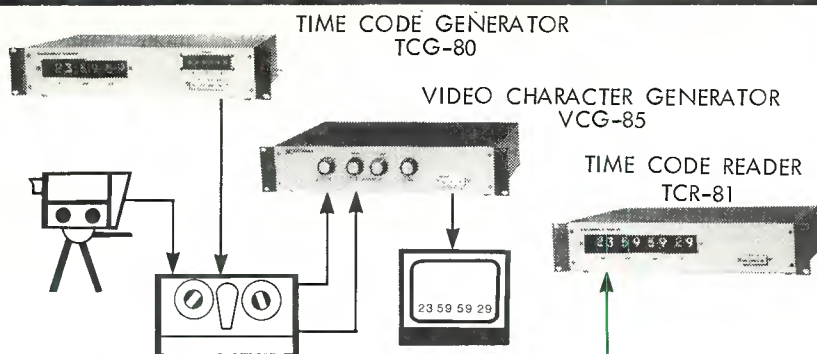
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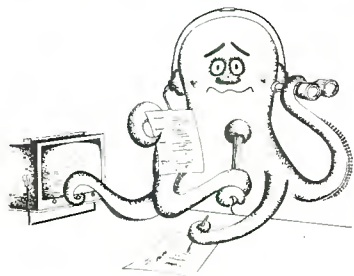
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Chapter 20: Pittsburgh, Penn.

Jim Hurley

WTEA-TV

400 Ardmore Boulevard

Pittsburgh, Pennsylvania 15230

(412)242-4300

Chapter 20's April 17th meeting scheduled Mr. Bob Faulkner of Central Dynamics, discussing digital technology for broadcast engineers. May 22nd featured a Tektronics representative demonstrating spectrum analyzers.

Chapter 22: Central New York

Mort Miller

WNYS-TV

P.O. Box 9

Syracuse, New York 13214

(315)446-4780

Chapter 22's April 17th program was given by Ed Mullin, vice-president of engineering, Ampro Corporation, on "New Directions in Audio Cartridge Tape Equipment Design." Mr. Harry Larkin, Ampro's vice-president of marketing was also on hand to help answer questions. On May 13th the chapter joined with Chapters 1 and 2 for their yearly combined meeting in Owego.

Chapter 25: Indianapolis, In.

Donald Morgan

WTTV

3490 South Bluff Road

Indianapolis, Indiana 46217

(317)787-2211

Chapter 25's May meeting was held at the Indiana Bell Telephone facilities and centered on radio and TV remotes.

Chapter 26: Chicago, Illinois

Bob Churchill

121 West Wacker Drive

Chicago, Illinois 60601

(312)729-5210

Wednesday, April 30th, Chapter 26 met at Advanced Systems, Inc., where IVC demonstrated their 9000 VTR and 7000 Camera. The June program will be held on Thursday, the 19th, at Streeterville Recording. The topic will be "The Care and Feeding of Tape Recorders."

Station to Station

In my article "Radio and the Sports Remote" (April, 1975), there are several points which need clarification.

The discussion of noise reduction systems was printed as follows: "...if there would be a line failure requiring a re-dial, calibration of the noise reduction circuits would have to be checked again. This time is available in the middle of play-by-play." The last sentence is in error and should read: "This time is **NOT** available in the middle of play-by-play." When your station's product, the on-air program, is interrupted, it is most important to your station, your sponsors and the audience to restore that program as quickly as possible. Re-calibrating a noise reduction system during play-by-play is taking that time away from the audience.

Since writing the article, I have learned that at the present time, at least in large metro areas, no telephone company has automatic disconnect based on length of telephone call. There may be some telephone service areas which still have automatic disconnect after a period of time with no signal, so I would suggest that some type of program signal be sent from the remote site at all times after the voice coupler link has been established. Feeding crowd noise at all times should be adequate. If the call must be placed through an operator, the operator should be made aware that your circuit will be in use for an extended period of time.

Todd A. Boettcher
WTMJ
Milwaukee

Editor's Note: Certainly should be pointed out that more than micro-wave can be used for remotes. Only those frequencies outlined under 74.402 of the Rules are available to radio stations for remote pickup service. Keep in mind that if micro-

wave multiplexing with a second sound channel (for quality stereo pickups) is considered, the bandwidths allowable for remote pickup stations (under Part 74, Subpart D) barely allow 15 kHz audio response.

Parts Information

Needed At WTSC-FM

Apparently Premier Electronics Laboratories, a New York based firm, is no longer in business. At

least the Department of Commerce for the State of New York has no forwarding address listed as of March, 1975.

However, WTSC-FM is still searching for the firm and/or replacement parts for Premier magnetic tape recorders. If anyone has any information about the company or parts available, please contact David Bernhardt, CE, WTSC-FM, Clarkson College, Potsdam, New York 13676 or call 315-265-7180.

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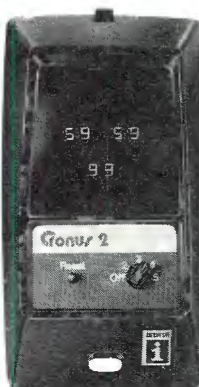
PERFECT TIMING

The World's Finest Stopwatch:



Cronus

The world's finest most versatile hand held stopwatch because Cronus is actually four stopwatches in one! With Standard Start/Stop, Taylor/Sequential, Split and Event/Time-Out functions. All with 1/100 of a second timing resolution and 0.001% Quartz Crystal timebase accuracy. Dependable Solid State C/MOS Circuitry backed by a 2 year warranty. Your choice of timing ranges: 24 hours with the Cronus 1 and 60 minutes with the Cronus 2. And there's more...



Bright easy to read red LED's with Anti-reflective filter for high ambient light. Plus, the Low Battery Indicator lights when it's time to recharge the nickel cadmium Cronus 1 batteries or replace the AA disposable Cronus 2 batteries. Perfect timing under nearly any conditions with a temperature drift of $\pm 0.0025\%$ from -40° to $+150^{\circ}\text{F}$. All this in a compact, $4\frac{1}{2} \times 2\frac{1}{4} \times 1\frac{3}{4}$ inches, 6 ounces, water resistant, unbreakable plastic case. Want more? The Cronus 1 is available with an optional desk base which transforms it into either a desktop or portable 24 hour clock. Cronus. CRONUS 1\$185.00 CRONUS 2\$125.00

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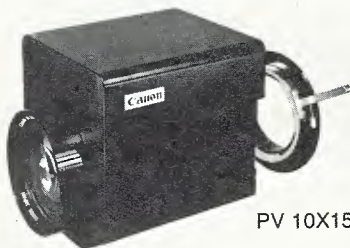
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15 mm to 150mm; f/2.0

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Zoom in!

TAKE 1...ASTVC-ABC at the New York Hilton

There are not very many times when people in this business can all get together at the same time. That is to say, if the ASTVC staff schedules a meeting for any given day (or night), we consider ourselves lucky if 80% of the people can make it. Conflicting work schedules, days off, out-of-town assignments, last minute "specials", etc., etc., etc. make 100% attendance well-nigh impossible. When an opportunity presents itself whereby we can meet with some of our members who are usually "on-the-road" (or otherwise unavailable) we hasten to take advantage of it...

The evenings of the 17th and 18th of April were two of those rare occasions! We were, by coincidence, having dinner in the coffee-shop when we learned that ABC was covering the Academy's "Tribute to Lew Grade". Furiously finishing our meal, we rushed up to the Ballroom.

Up to this time, we had no idea how many (if any) of the crew were members of the ASTVC. We soon learned...eighty per cent of the camera crew were IN! **Andrew Armentani** covering left-center auditorium from the balcony...**Drew De Rosa** covering main floor center from an improvised platform...**Jack Dorfman** covering stage center from the main floor guest section...**Bob Wolff** covering stage right from the main floor "guest of honor" section. There they were, after a 12-hour (plus) day...clothes a little rumpled, eyes slightly bleary, a little stubble on the chin. But, that was Thursday evening.

When we returned the following night for the taping, those guys were nowhere in sight. At least they didn't look like the same cameramen we were talking with the night before. Behind each camera was an immaculate, well-groomed, wrapped-in-tuxedo Cavalier of the camera. This was the image the audience (composed of some of the biggest names of show biz) saw that night.

NEW PRODUCTS

Video Edit System

The **Kaitronics** Video Editing System, VES-800, is an integral video editing system, operating on the SMPTE edit code. Designed with state-of-the-art integrated circuits and microprocessor techniques, it requires only a few pushbutton control switches to operate essential functions. Such simplicity of operation enables use by persons ordinarily not associated with video tape editing.

The standard VES-800 is basically a 2-machine editing system with a built-in SMPTE Time Code Generator for recording the necessary edit code for editing. A simple calculator type keyboard is provided to preset real or elapsed time for edit code recording and entry of edit points on tape for editing purposes. The transport functions of the two video tape recorders are remotely to the equipment for easy centralized control.

VES-800 is a total editing system that also provides the basic system for custom-built electronic editing system to suit individual custom requirements.

The system is available in both NTSC and PAL versions.

For More Details Circle (73) on Reply Card

Recorder/Reproducer And Time Delay

International Tapetronics Corporation's new RP Delay unit combines all the features of ITC's RP Series Master Recorder/Reproducer with the additional capability of program delay.

The RP Delay was designed for dependable operation and optimum performance in both normal and delay applications including continuous program delay, network program delay, normal recording, and normal playback. The use of a totally separate third head and amplifier for the delay playback means that the heads never alternate between record and play functions. No longer are there any compromises due to head switching.

The RPD fills the need for a standard cartridge record/playback unit, yet with the turn of a switch is ready to act as a delay machine and provide the protection of a time lapse.

For More Details Circle (74) on Reply Card

SMPTE Standard Code Synchronizer

A new SMPTE Standard Time and Control Code Synchronizer/Code Generator, named **Minimag II**, is being marketed by **Automated Processes**. The new unit is said by the company to be less than half the cost of comparable SMPTE Standard Time and Control Code synchronizers.

The SMPTE Standard Time and Control Code generated by **Minimag II** is recorded on both the master and the slave units. This can be done

before, or at the same time as, program material is recorded. The synchronizer will then automatically compare the code played back from the slave tape with the code on the master tape, and issue a capstan control signal to lock both tapes in perfect sync. Tape machines designed for DC servo operation are controlled directly; synchronous motor machines are controlled through an optional capstan drive amplifier.

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POWERLINE PROTECTORS USING THE TII 3-ELECTRODE

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- Includes instant-acting TII 3-Electrode Gas Tube, thermal cut-out and fuse
- Available in many convenient packages



Model TII-412 for in-equipment use.



Model TII-410, standard. Cover included.



Model TII-425 for standard 3-prong 117 vac receptacle.

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Mono and Stereo Consoles

The 3000 series of audio consoles is the latest addition to the ever-growing list of professional audio products from Sparta.

The series 3000 has 10 mixers. Step type attenuators are standard, each with cue detent position. They also have noiseless optically-coupled audio switching on both program and monitor circuits. Another interesting feature is the Remote Mixer Turn On.

With this capability, newsmen or studio announcers can have completely noiseless on/off control of their microphones. In TV application, the video switcher can control the console for "audio-follow-video".

Another feature is a five-source Bridging Input for connecting up to five cartridge playbacks, without interaction, to a single mixer. The multiple input will, of course, also accommodate a single audio source.

For More Details Circle (76) on Reply Card

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Alpha brings ten years of experience with tone equipment in the two-way radio industry to broadcasting with better performance and a realistic price in EBS two-tone monitor/generator systems.

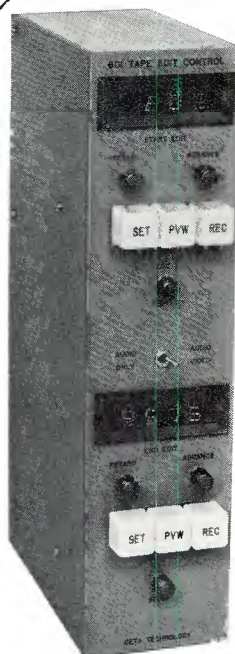
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Model 601



Model 602

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With the Model AM-19D (210) Digital Antenna Monitor, accuracy is assured and operating cost savings are realized. Now antenna phase angle and loop current ratio readings can be taken by lesser grade operators. The easy-to-read numeric readout provides exact readings and eliminates interpretation errors common with conventional meters. Resolution is 0.1° for phase angle and 0.1% for current ratio.

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Radio Automation

Schafer Electronics Corporation, Goleta, California, introduced an expanded equipment line at the NAB Convention this year.

Two new models of the Schafer AUDIOFILE were introduced: the sequential model, which boasts three different modes of operation; and the DJ-control model, with complete random-access manual control unit for "live" stations. The DJ-control unit will automatically sequence cart-ridges if desired. The random-access AUDIOFILE was featured for the second time this year.

Schafer also showed the model 750 computer control system with seven-day programming capability, one of four different full-computer units offered by the Company, as well as the Schafer 902 with up to 2048 events, and the time-base model 903 system, with 24 hours or more of program storage. Two new additions to the model 903 were introduced: a manual control box for studio use, and a Cathode Ray Tube keyboard/display for loading and listing stored information.

For More Details Circle (77) on Reply Card

Broadcast

Studio Furniture

Micro-Trak's series L studio furni-

ture is a complete system of cabinets, racks, tables, and equipment cabinets color keyed for looks and efficiency in the modern broadcast facility.

The series has several options that include single and dual turntable cabinets, console cabinets that have either square or angled corners and equipment cabinets. The turntable cabinets can be ordered with a roll around base. The furniture comes with Formica brand laminates that are heat and stain resistant.

For More Details Circle (78) on Reply Card

Sync Cassette Recorder

A portable sync cassette tape recorder for motion picture sync sound recording has been announced by **Super8 Sound, Inc.** The XSD (Xtal-Sync-Dolby) Recorder is compatible with any 16mm or 35mm, crystal-controlled or pilotone camera.

A built-in quartz crystal records a 60Hz industry-standard pilotone on one cassette track. The XSD Recorder is also compatible with two Super 8 pilotone cameras - the Beaulieu 4008ZM2 and the Nizo Professional, and any one of nine Super 8 cameras equipped with a Crystal Camera Control.

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Accurate Field Strength Measurements Can Be Easy

With the Model FIM-21, electromagnetic field strengths can be measured to within 2% across the entire 535 to 1605 KHz AM band. And to intensity levels as low as $10 \mu\text{V/m}$. Its integral shielded antenna in the cover, front panel speaker, large illuminated mirrored meter, and ganged oscillator/receiver tuning, make it easy to operate in the field. An optional telescoping stand adds convenience. It's also a versatile instrument - use it as a tuned voltmeter for RF bridge measurements.

Contact us now for complete details on our line of field strength meters.



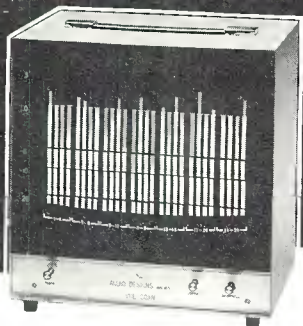
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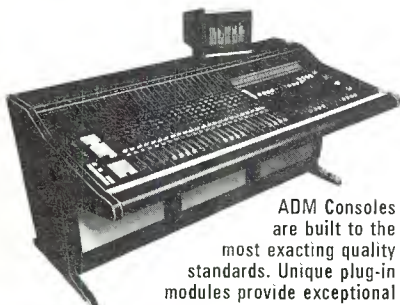
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Eliminates "head-swiveling" — replaces up to 28 VU meters

You keep your eyes on a single TV-type screen instead of eyeballing a whole string of VU meters. VUE-SCAN displays each analog channel as an easily-read illuminated bar. The bars are always present as a background reference. As the voltage level of a channel increases, the bar representing it increases in height and color intensity. Blue represents a normal operating condition—red immediately signals an overmodulated condition. VUE-SCAN can be used as a self-contained accessory with any Audio Designs or competitive console. Write us for details.



ADM Consoles are built to the most exacting quality standards. Unique plug-in modules provide exceptional flexibility for expansion.

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Wire Service Alarm

The Audio Services Incorporated Tel-alert wire service alarm was designed to meet the needs of station-operating personnel who need to be aware of special incoming news, but who do not work close enough to the wire machines to keep constant tabs on it.

Instead of relays, the Tel-alert uses digital integrated circuits. The unit is capable of powering or controlling a variety of high and low voltage indicating devices.

The basic alert system has two separate open collector outputs for remote Bulletin or EBS indication. The model 202 has two separate sets of high voltage/high current contacts instead of open collector circuits.

For More Details Circle (80) on Reply Card

Quad Video Tape

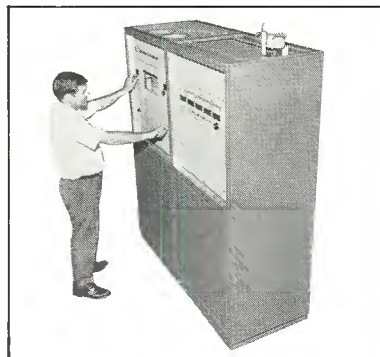
A new quadruplex video tape that offers substantial improvements in video noise reduction has been introduced by 3M Company.

Called Scotch brand 420 video tape, the premium product for high quality mastering requirements exhibits a 2dB improvement in color noise and 3dB improvement in signal-to-noise in comparison with the firm's No. 400 video tape.

For More Details Circle (81) on Reply Card

QUALITY TALKS FOR KWTO

Springfield, Missouri



Continental's new 5/10 kW AM transmitter is setting records for acceptance. It has performance and efficiency, with the cleanest sound around. Listen to Continental: quality talks.

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Distant signals reject

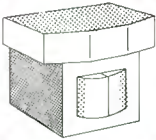
The National Association of Broadcasters has urged the Federal Communications Commission to reject a rules change sought by cable interests that would permit cable systems to pick up from a distant station that they do not normally carry, network programs that are delayed by stations they normally carry.

It said in comments opposing the suggested amendment that it would penalize a television station that pre-empts and delays a network offering in order to substitute programming of special interest to the local community.

NAB said the Commission "should not involve itself even indirectly in such basic licensee programming decisions" and "should not adopt a rule which penalizes a licensee for exercising its discretion and responsibility to program as to best serve its local community."

The association said licensees would "suffer a double audience loss" if the proposed amendment goes through.

"First, cable carriage of the network program opposite the station's substitute program would fragment the audience for the station's substitute program," it said. "Second, cable prerelease of the network program would reduce the audience for the delayed broadcast of the network program."

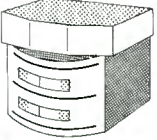


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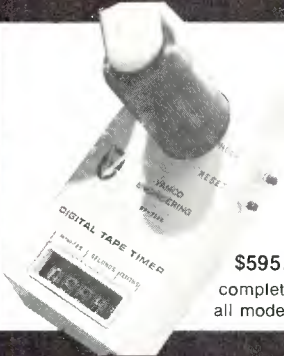
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Our application engineering group is at your prompt service to review your video editing problem and to offer our optimum solution. Request Bulletin SMPTE.

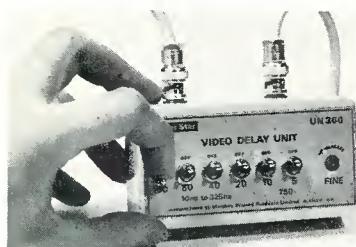
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In every TV station, remote truck, or audio/visual department the video engineer has video timing problems. When he has a Matthey "UN360" in his tool bag he can deal with video timing up to and beyond 360° of phase at color sub-carrier.

It's fast to plug into cables. It's quick to switch to the required delay and a screw-driver vernier gives ± 4 ns of fine trim.

The performance is suitable for full color timing and can be inserted directly into the video path without any extras. The equalizers are built inside the "UN360."

The "UN360" is in use by ABC, NBC and CBS and many TV engineers across the nation. Put one in YOUR tool bag — it's a real aid.

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For More Details Circle (64) on Reply Card

Expandable Video Editor

A new expandable model of video editor, designated the model 5050-200/300, has been announced by **Datatron, Inc.** The basic unit is capable of operating with two tape machines and can be expanded in logical steps up to any desired configuration, including a computer-controlled, completely automatic on-line, off-line system.

The new model incorporates a visual display of tape position and all edit points, and retains the ease-of-operation and exclusive "Jam-Sync" features of Datatron's previous video editors. Jam-Sync automatically sets and syncs the system's time code generator during pre-roll so that time always picks up exactly where it left off—to the frame.

With the new system, time consuming edits can be accomplished on low cost helicals and later automatically transferred to quads, thus minimizing tapehead wear and quad operating time.

Bob Ricci, manager of sales for Datatron's Editing Systems Division said, "Expandability was the overriding requirement imposed on design of the new model 5050.

For More Details Circle (82) on Reply Card

Studio/Control Room Monitor System

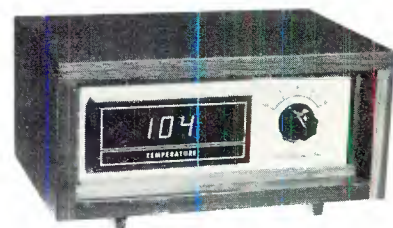
Orange County Corp. is offering a low distortion, flat response, and high efficiency monitor system in a cabinet that can be oriented either vertically or horizontally.

The OC 315-3 monitor system includes crossover controls which allow the high frequency response to be contoured individually in terms of

Digital Air Temperature



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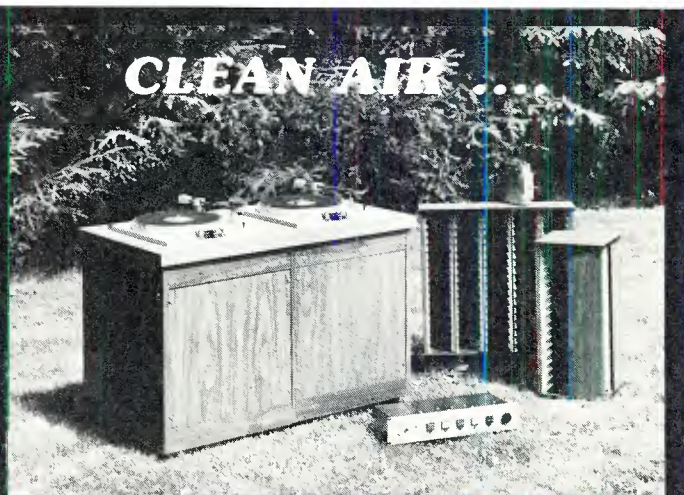
level and roll-off point.

This is a 60 Watt (RMS) 8 Ohm system, based on a 12-inch coaxial speaker and an infinite baffle enclosure (17" high, 31" wide, 14" deep). Each unit weighs 80 pounds. The speaker uses a 7.5 pound Alcomax magnet. Frequency response: within 3dB - 45 Hz to 20 kHz.

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**TONE ARMS
TURNTABLES
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STUDIO FURNITURE
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ANTENNA HEATER
CONTROLS**

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For More Details Circle (58) on Reply Card

AMST elects new officers to board

The Association of Maximum Service Telecasters, Inc., at its annual membership meeting elected members of the Board of Directors who will govern the Association during the next year. The new Board will be composed of the following telecasters: **Norman P. Bagwell**, WKY Television System, Inc., Oklahoma City, Oklahoma; **A. James Ebel**, KOLN-TV, Lincoln, Nebraska; **Jack Harris**, KPRC-TV, Houston, Texas; **Ralph S. Jackson**, Orion Broadcasting Co., Louisville, Kentucky; **Wallace J. Jorgenson**, Jefferson-Pilot Broadcasting Co., Charlotte, North Carolina.

Also, **C. Howard Lane**, KOIN-TV, Portland, Oregon; **Terry H. Lee**, Storer Broadcasting Co., Miami Beach, Florida; **Lester W. Lindow**, AMST, Washington, D.C.; **Arch L. Madsen**, Bonneville Communications Corp., Salt Lake City, Utah; **August C. Meyer**, WCIA, Champaign, Illinois; **James M. Moroney, Jr.**, Belo Broadcasting Co., Dallas, Texas; **John T. Murphy**, AVCO Broadcasting Corp., Cincinnati, Ohio; **Fred Paxton**, WPSD-TV, Paducah, Kentucky; **C. Wrede Petersmeyer**, Corinthian Broadcasting Corp., New York, New York; **A. Louis Read**, WDSU-TV, New Orleans, Louisiana; **Lawrence H. Rogers II**, Taft Broadcasting Co., Cincinnati, Ohio; **Willard Schroeder**, WOTV, Grand Rapids, Michigan; **Franklin C. Snyder**, The Hearst Corp., Pittsburgh, Pennsylvania; **Willard E. Walbridge**, Capital Cities Communications, Inc., Houston, Texas; **Mort C. Watters**, Scripps-Howard Broadcasting Co., Cincinnati, Ohio; **Robert F. Wright**, WTOK-TV, Meridian, Mississippi; **Directors Emeritus: Charles H. Crutchfield**, Jefferson-Pilot Broadcasting Co., Charlotte, North Carolina; **Joseph B. Epperson**, Scripps-Howard Broadcasting Co., Cleveland, Ohio; and **A. M. Herman**, Brown, Herman, Scott, Young, and Dean, Fort Worth, Texas.

Following the membership meeting, the newly elected Board met and elected its officers. The Officers are: President, **Arch L. Madsen**; First Vice President, **Franklin C. Snyder**; Second Vice President, **Robert F. Wright**; Secretary-Treasurer, **Ralph S. Jackson**; Assistant Secretary-Treasurer, **Lester W. Lindow**.

President Arch L. Madsen announced the appointment of an Engineering Committee. Members will be: **Clyde G. Haehnle**, Chairman, AVCO Broadcasting Corp., Cincinnati, Ohio; **Albert H. Chismark**, WHEN-TV, Syracuse, New York; **A. James Ebel**, KOLN-TV, Lincoln, Nebraska; **Joseph B. Epperson**, Scripps-Howard Broadcasting Co., Cleveland, Ohio; **Ralph L. Hucaby**, WLAC-TV, Nashville, Tennessee; **Carl G. Nopper**, WMAR-TV, Baltimore, Maryland; **Daniel H. Smith**, Capital Cities Communications, Inc., Philadelphia, Pennsylvania; and **Leonard A. Spragg**, Storer Broadcasting Co., Miami Beach, Florida.

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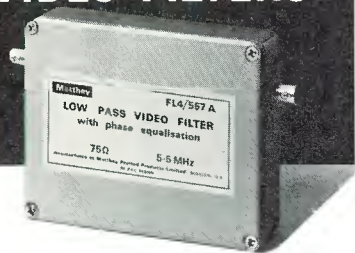
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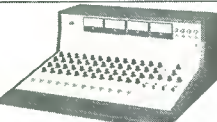


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3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123	131	139	147	155	163	171	179	187	195	203	211
4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124	132	140	148	156	164	172	180	188	196	204	212
5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125	133	141	149	157	165	173	181	189	197	205	213
6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126	134	142	150	158	166	174	182	190	198	206	214
7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127	135	143	151	159	167	175	183	191	199	207	215
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208	216

Please check every
section which applies to you.

BUSINESS OR OCCUPATION

- ☐ A. AM Radio Station
- ☐ B. FM Radio Station
- ☐ C. TV Station
- ☐ D. ETV Station
- ☐ E. CATV Facility
- ☐ F. CCTV Facility
- ☐ G. Consulting Engineer
- ☐ H. Educational Radio
- ☐ I. Recording Studio
- ☐ J. Distributor
- ☐ K. Government Agency
- ☐ L. Corporate Officer
- ☐ M. Technical Management/Engineering
- ☐ N. Other Management
- ☐ O. Other (specify) _____

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1(a). My company is:

- ☐ TV & AM & FM Station
- ☐ TV & AM STATION
- ☐ TV & FM Station
- ☐ AM & FM Radio Station
- ☐ AM Radio Station
- ☐ FM Radio Station
- ☐ TV Station, Commercial
- ☐ TV Station, Educational
- ☐ Campus limited Radio Station
- ☐ CATV with studio facility
- ☐ ITFS, Microwave
- ☐ Recording Studio
- ☐ Production Studio, Film
- ☐ Production Studio, Video
- ☐ Consulting Firm (Engineering or Technical)
- ☐ Government Agency
- ☐ Distributor of Broadcast Equipment
- ☐ CCTV (If you check this category,
please answer details listed in 1(b) below.)

1(b). Check your CCTV Applications:

- ☐ Business or Commercial
(for personnel & sales training)
- ☐ Industrial (for monitoring
production & control applications)
- ☐ Security (surveillance)
- ☐ Educational or Instructional
(academic or vocational institutions)
- ☐ Medical/Hospital
- ☐ Other: specify

2. Check the category that best describes your occupation, title or job responsibility:

- ☐ **Corporate Management.** This includes Board Chairman, President, Owner, Partner, other corporate management title, administrative official or corporate director, general manager (administration).
- ☐ **Technical Management & Engineering.** This includes technical director, chief engineer, engineering supervisor or director, engineer/technician or other engineering and technical job responsibilities.
- ☐ **Operations Management.** This includes station manager, production manager, program manager, general manager of operations (not administrative).

3. Does your occupational responsibility extend to more than one station or facility?

Yes ☐ No ☐

4. If none of the foregoing businesses or occupational categories fits your situations, please describe specifically your occupation or interest in BROADCAST ENGINEERING magazine:

5(a). Check the statement that best describes your role in the purchase of major communications equipment, components and accessories:

- Make final decision to buy a specific make or model
- Recommend make or model to be purchased
- Have no part in specifying or buying

5(b). Is specifying and buying major equipment, components and accessories a group or committee activity in your facility?

Yes ☐ No ☐

5(c). If the response to the foregoing question is yes, indicate whether you are an active member of the committee or group.

Yes ☐ No ☐

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Nothing could make us happier. Because we take great pains to insure the absolute reliability of these tiny microphones. And frankly, no other type of microphone poses a bigger design problem. The lavalier gets dropped, stepped on, swung by its cord, smashed and banged—not once, but often during its life. Most of the abuse is accidental—but inevitable.

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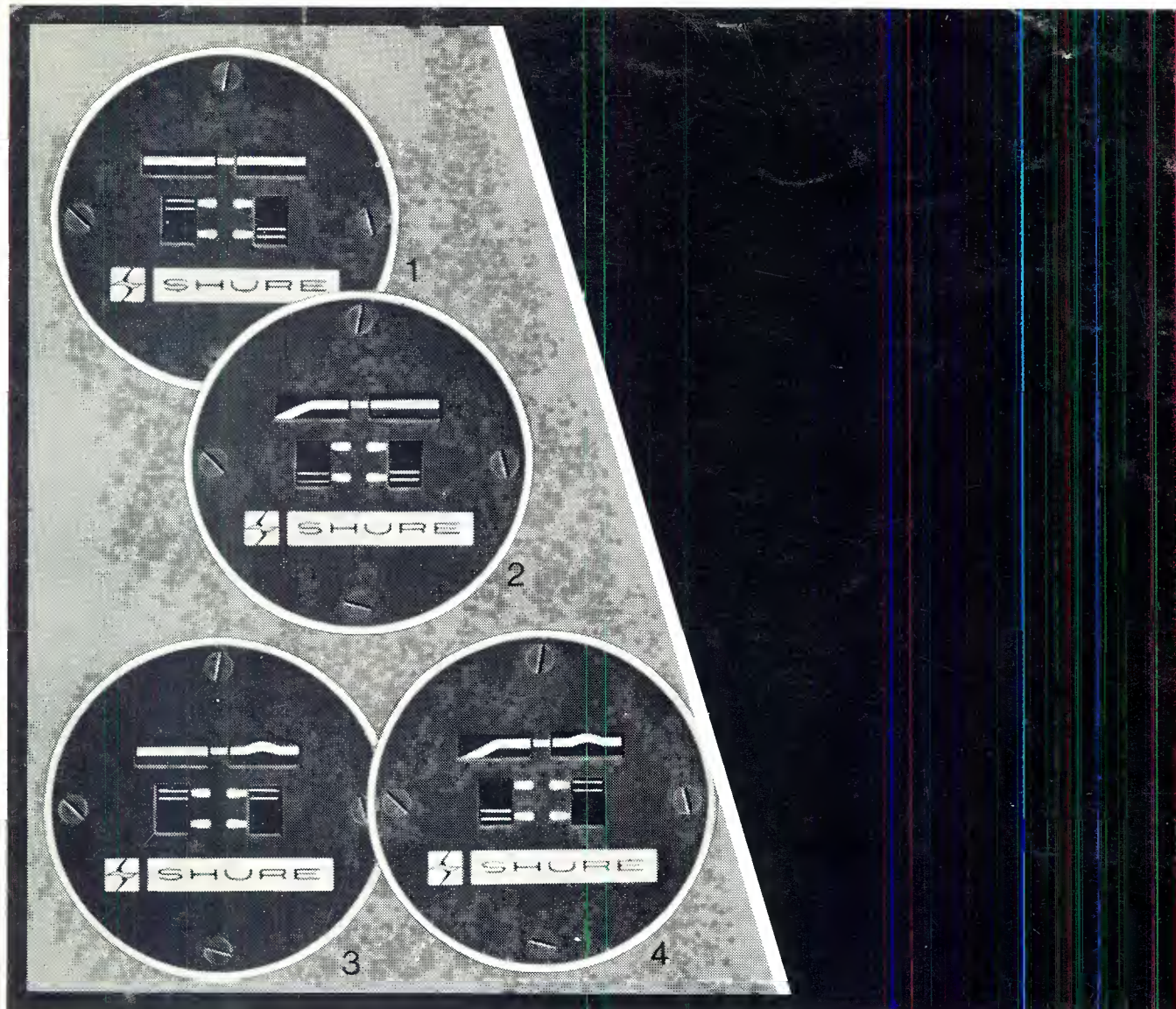
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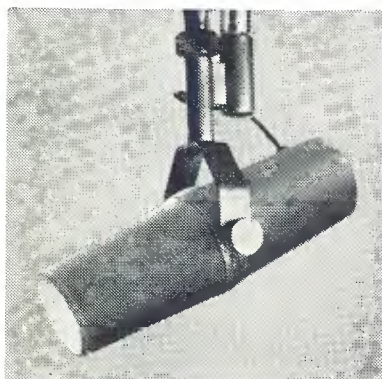
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