June, 1970/75 cents

# Broadcast Engineering

the technical journal of the broadcast-communication's industry

A HOWARD W. SAMS PUBLICATION




## A new day in cablecasting

page 26

Cablecasting guidelines
Cablecasting equipment
Broadcast buyers guide

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Three plug-in circuit boards make up the system, which occupies just 1¾ inches of vertical space in a standard 19-inch rack. All active circuitry is solid state with integrated circuit construction for maximum reliability.

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To prevent jitter between separately locked burst and sync, the master oscillator is locked to the incoming burst and the sync is phased into coincidence. Automatic phase locking is returned to the sync gen when switching from network or remote telecasting or in the event of a signal failure.

Timing is money, and Cohu's got the clock that keeps it that way. For more details contact your nearest Cohu representative or the TV Product Line Manager direct at 714-277-6700, Box 623, San Diego, California 92112, TWX 910-335-1244.

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June, 1970 • Volume 12, No. 6

# Broadcast Engineering

The technical journal of the broadcast-communications industry

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### ABOUT THE COVER

The cover for this CATV origination issue was taken in the studio at Midway Cable Television Company in Kansas City, Kansas. They may have one of the only women camera operators. See page 26 for origination introduction.

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Robert E. Hertel, Publisher

Intertec Publishing Corp.
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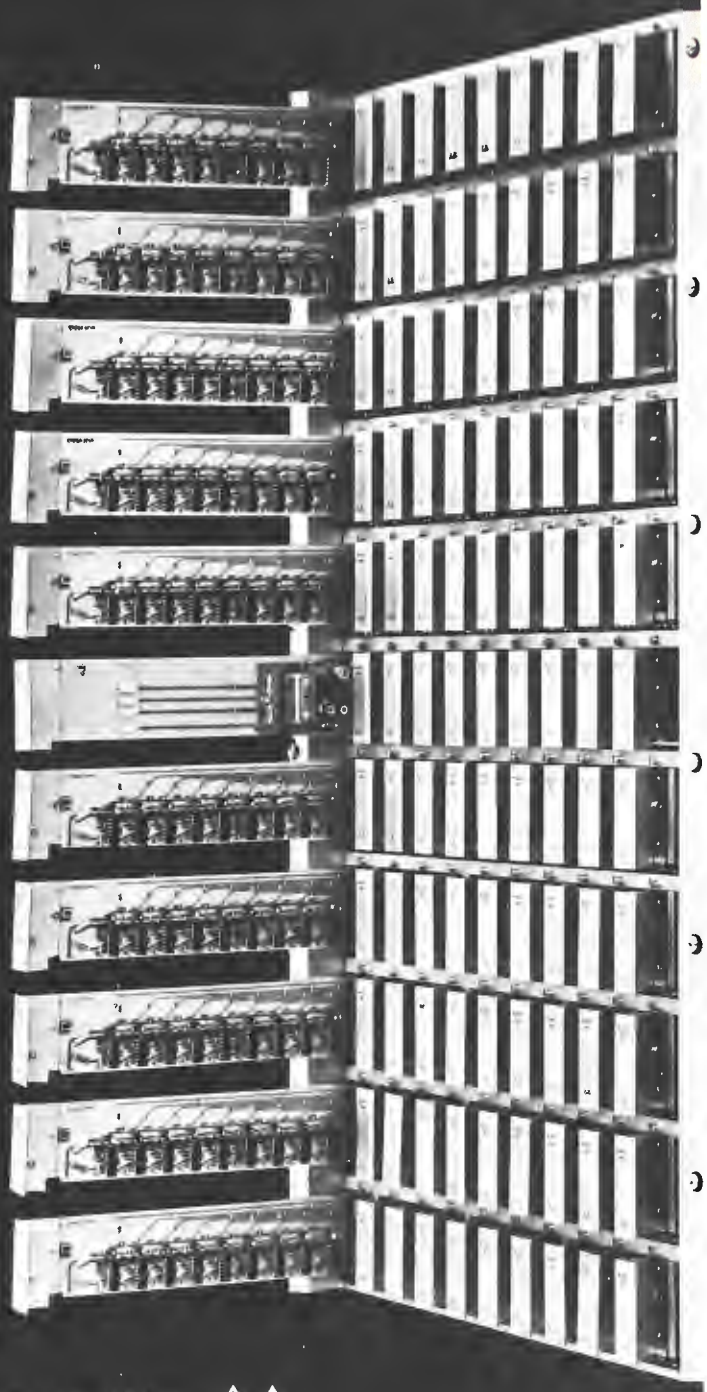
# GVG ROUTING SWITCHERS



The illustration shows a 100 X 10 video switching system. The eleven modules partially withdrawn comprise a complete 100 X 1 portion of the matrix and serve to illustrate how The Grass Valley Group has designed its system to allow servicing of one bus without affecting adjacent buses.

If your plans call for video, audio, or machine control switching equipment, we will show you how the 1800 Series equipment solves other problems previously inherent in switching systems.

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# DIRECT CURRENT FROM D. C.

June, 1970

By Howard T. Head

Commission to Crack Down on AM Overmodulation

The Commission's engineers are becoming increasingly disturbed by recent instances where AM stations have installed new transmitters rated at 5 kW RF power output but having 10 kW modulation capability. These transmitters are being sold by at least two of the major AM transmitter manufacturers.

The principal selling point of these transmitters is that they permit positive modulation levels will in excess of 100 percent, with one manufacturer claiming the capability of achieving 170 percent positive modulation. The present AM Technical Standards place no limit on positive modulation peaks, although modulation may not exceed 100 percent in the negative direction.

The Commission's engineers are concerned with the audio distortion and carrier shift, as well as interference to other stations, which occur under overmodulation conditions. The transmitter manufacturers insist, however, that these can be held within limits for very high modulation percentages, a nice trick if it can be done without repealing some fundamental physical laws.

The Commission is convinced that the only way to solve the problem is to reimpose an upper limit on positive modulation peaks, and a proposal to this effect is expected from the Commission shortly. Such a requirement was in effect until 1953 when it was eliminated to permit small amounts of overmodulation, but the present trend to excessive modulation levels has brought about the current re-examination of the problem.

Requirements Relaxed for AM Changes

As predicted (April '70 D.C.), the Commission has relaxed the requirements of the AM "freeze" to expedite the processing of applications for improvement and relocation of existing AM transmitting facilities. Under the new Rules, the Commission is treating as a "minor" change any application, such as a request for a new transmitter site, which does not involve changes in frequency, power, station location, or an increase in hours of operation. Under the new ruling, "minor" changes will also include such things as changes in directional antenna patterns and changes from directional to non-directional operation.

In addition to providing for the processing of applications for these changes, the new ruling also provides for expedited consideration of receipt, ordinarily avoiding the long delays which for many years have been associated with applications for "major" changes.

In other respects, the AM "freeze" continues to be solid. The Commission is returning without acceptance large numbers of applications

*(Continued on page 6)*

# HELIAX COAXIAL CABLE...

## the ultimate in high power performance

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The one cable that has all the advantages for transmission of high power RF. One piece connects transmitter to antenna. Eliminates the numerous flanges and bullets of rigid systems. HELIAX is easiest to plan. Easiest to install. Most reliable. Corrugated conductors eliminate the differential expansion problems. Cable can be clamped directly to tower, buried directly in earth. Standard types and sizes up to 8". Communicate with Andrew.

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*(Continued from page 4)*

for new stations, power increases, and frequency changes which request a waiver of the current freeze rules.

EIA to Test New Color Reference Signal

A Subcommittee of the Electronic Industries Association (EIA) is planning field tests of a new color vertical interval reference (VIR) signal to aid in maintaining color uniformity in network signal transmissions, and in determining sources of color distortion between the network feedpoint and the individual stations' transmitter outputs. The proposed new signal, which will appear in line 20, will contain chrominance, luminance, black, and blanking reference levels, together with 24 usec of the 3.58 MHz color subcarrier at zero phase.

The signal is to be first tested on the New York City stations, including tests to determine the relative utility of including the reference signal in both fields of the picture or in Field 1 alone. If the New York tests are successful, the signal will then be supplied to all network affiliates with instructions for its use. A special article in the July issue of BROADCAST ENGINEERING will supply full details for our readers.

Because line 20 is technically in the vertical blanking interval, the blanking interval, the test signal would not be passed by some makes of processing amplifiers. However, tests of a wide variety of processing amplifiers have shown that they may be readily modified to pass the reference signal in line 20 as part of the picture signal, which does not begin until line 22.

Short Circuits

The Commission has once again criticized a CATV system in the San Diego, California area for inadequate efforts to eliminate signal degradation . . . ITFS stations have been authorized to use data transmission on response stations for such purposes as testing and scoring of tests . . . CATV systems in Frankfort, Kentucky have been denied requests for program exclusivity waivers, provided the television stations install 100 watt translators to fill in areas of inadequate service from the main stations . . . As predicted last month, the Commission has refused to grant further waivers of the local oscillator radiation requirement for UHF television tuners--deadline date for the new 350 uv/m requirement remains July 31, 1970 . . . The Commission's Field Engineering Bureau is stepping up efforts to minimize cheating among candidates for first-class operator examinations . . . Annual directional proofs of performance for AM remote-control renewal applications must now include non-directional as well as directional measurements--five points minimum per radial.

The Commission has authorized two one-watt VHF translators to operate from the same site on adjacent channels (10 and 11), multiplexing into a common antenna . . . The Commission has declined to permit renewals of provisional third-class operator certificates, now valid for a period of twelve months only . . . The Commission has confirmed its establishment of a Local Distribution Service (LDS) for CATV systems and has proposed to expand both the LDS and the CARS to include a new modulation technique known as Filtered Pulse Width Modulation (FPWM).

# THE CARTRIDGE KILLER.

Scott Muni
WNEW-FM, New York

This man doesn't have time to baby the tools of his trade. Not with a commercial, a traffic report and time check breathing down his neck. He's got to keep those records spinning fast and furious. And, if he kills a cartridge or two along the way, well—that's how it goes.

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| Cartridge Weight | 5 grams |
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For complete information and specifications write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I., New York 11803

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# LETTERS TO THE EDITOR

## NAB Gives Citation To Gulf Coast Broadcasters

Our thanks must go to the NAB committee that chose to honor WLOX and a host of other Gulf Coast broadcasters for their service in the public interest before, during and after hurricane Camille hurled itself inland last fall.

After his speech on emergency broadcasting, Ray Butterfield of WLOX was presented a special citation of recognition for the broadcasters of the Gulf Coast. The citation reads:

**For their outstanding service in a time of great tragedy to the citizens of their states . . . .**

**For their operation of the emergency broadcast system during the hurricane Camille at the risk of their lives . . . .**

**These dedicated broadcasters served the public by sounding the alarm, broadcasting emergency messages, and they helped bring order out of chaos.**

**This citation is presented with admiration and respect by the members of the National Association of Broadcasters.**

In the July issue of Broadcast Engineering, we will bring to our readers the suggestions that Ray Butterfield has presented on emergency broadcasting.


Vince Wasilewski (left) presents citation to Ray Butterfield.

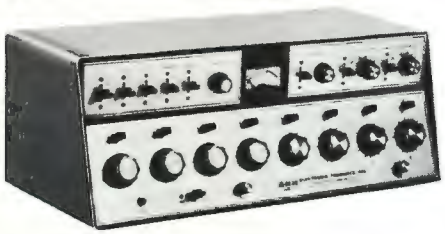
# QRK *Announces a Breakthrough*

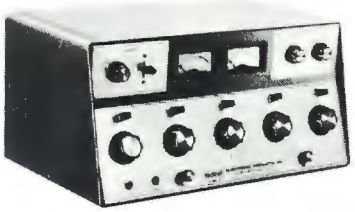
# QUALITY CONSOLES AT REALISTIC PRICES!

**QRK-5 MONO PRE-WIRED SYSTEM $1995**

**QRK-5/5S Prewired Systems** — Reflects the epitome of quality to produce either a mono or stereo system capable of serving as either a local or remote studio or production facility. Incorporates the QRK-5 (Mono) or QRK-5S (Stereo) console; (2) QRK-12C Turntables with synchronous motors; (2) Rek-O-Kut S-320 Stereo Tone Arms; (2) QRK F3 stereo cartridges; QRK Ultimate Preamplifiers; and substantial, prewired transportable furniture.

**QRK-5S STEREO PRE-WIRED SYSTEM $2995**





**QRK-8 — 8 CHANNEL MONO .... $1695**
**QRK-8S — 8 CHANNEL STEREO .. $2495**

**QRK-8/8S — 8 Channel Console** — QRK offers a professional console with Altec faders; plug-in modules (3) pre-amplifiers; built-in power supply; 10 watt monitor amplifiers; independent audition and program channels; muting relays; cue amplifiers; built-in speaker; substantial capacity and ultimate access.

**QRK-5 — 5 CHANNEL MONO ..... $995**
**QRK-5S — 5 CHANNEL STEREO .. $1595**

**QRK-5/5S — 5 Channel Console** — Both mono and stereo units incorporate Altec attenuators with cue switches in every fader, 10 watt monitoring amplifiers, plug-in modules, muting relays, and self-contained power supply. The stereo unit, QRK-5S contains independent audition and program channels as well as a cue amplifier. Both consoles have substantial capacity and total access.

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# LETTERS TO THE EDITOR

## Engineer Steamed Over FCC Exam

**Dear Editor:**

In recent months (BE February 1970) there have been some discussion on preparation of new exams for the FCC first class radio-telephone operators license. Having recently passed the exams now existing, I'd like to offer a comment or two on their quality.

The present system does not adequately test an applicant for the qualifications necessary in day-to-day operations in a modern broadcast plant, particularly TV. This is quite obvious since very few of the questions I answered on the exam pertain to my everyday duties as a TV engineer. There was a total of only 5 or 6 questions on TV, and not one on color, the most technically complicated requirement! To cite further, the transistor theory questions are hopelessly inadequate, since they do not reflect modern design practice. Of course, there are no questions on IC's as IC's were not even conceived when these tests were written. The circuits which do predominate are tube circuits, nowadays found only in transmitters. It's nice to understand these circuits, but they're really not that hard, and the level of the design concepts can hardly hold a candle to a state of the art video-proc-amp or color encoder.

There have been numerous complaints against the "90-day-wonder" schools and courses geared to rote memorization of test questions. I won't argue the pro's and con's of these schools. Their products speak for themselves. The real truth is that these practices will never be curbed and 90-day wonders will not disappear until some appropriate taxpayer's employees in DC get with it and put some real teeth into these tests. And while they're at it, why not require periodic re-examination for our older license holders who have fallen behind the times. Times change, and awareness must follow to stave off obsolescence. Proficiency must be maintained and should be able to be demonstrated. There are many problems in today's world, and it may be said by some that the above gripes are relatively minor. But that doesn't make them unimportant, or justify their continuing existance. The American citizen has to tolerate too much mediocrity these days, and it's about time someone set out to eliminate it. Cleaning up this "soft" license joke will be one step in that direction.

***Walter Jung***
***Station WMPB***
***Owings Mills, Md.***

## KULE Keeps It Clean

**Dear Editor:**

In your March, 1970 issue, I think Roy Carter points out some very wise facts to take into consideration.

If I may, I would like to add this suggestion to those announcers who don't like to get their hands full of ink when changing the teletype ribbon: Invest in a pair of rubber gloves. They are flexible enough to allow the ribbon to be changed without the mess. One thing to keep in mind, though, we rely heavily upon our sense of touch while performing this task, so it may take a little practice to get good at it.

***Terry DeLeo***
***Chief Engineer***
***KULE Radio***
***Ephrata, Wash.***

## To Fine Or Criticize — Who Needs It?

**Dear Editor:**

In response to your recent editorial on fines for engineers I would like to make a few statements in behalf of the chief engineer or engineers.

In the first place most engineers work at least a 50-hour—6 day week. Not counted is the 18-hour a day—7 days a week standby time and field measurements, etc. on his day off.

After 22 years in Broadcasting, of which 12 years as chief AM-FM-

*(Continued on page 12)*

# Look what we did to the world's finest tape cartridge system...


# we made it better!

We took the rugged deck and tape drive assembly from the proven Criterion and added the latest in silicon transistors, plug-in printed circuit boards and independent gain controls for cue amplifiers.

Next, we RFI proofed individual circuits to make them impervious to strong RF fields. Made the PC cards easily accessible for maintenance – and the output gain controls accessible from the front panel.

Then, we added latching connectors for all external cables and came up with new and improved push-button switches. Plus automatic audio muting and transient suppression. And a +10 dBm output capability.

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For a closer look at the Criterion 80, write Gates, 123 Hampshire Street, Quincy, Illinois 62301.

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DA, I am ready to retire and sell pencils on the street corner. Most station owners won't pay a living wage, and will not supply the necessary equipment for proof measurements or parts.

As you know, it generally takes two people to run a proof, unless the person running the proof has four arms and four eyes. Management will not supply the extra help necessary to run proofs or anything else. The paper hangers they hire are not generally used in a technical sense.

So, fine the people who are responsible not the poor chief engineer.

***Name Withheld***
***By Request***

**Dear Engineer:**

I think **Broadcast Engineering** has made it clear in its editorial columns during recent months that: (1) the Rules do not allow engineering fines; (2) that engineers and technicians will make honest mistakes (especially when engineering is understaffed and overworked); (3) that indiscriminate fining is insupportable in any case; and (4) that station fines indicate a lack of communications and an understanding of the Rules.

As recently as an editorial item added to the end of the NAB convention roundup (May issue), Broadcast Engineering made this statement; "But the best (50 years of broadcasting. The best is yet to come.) might mean that we offer more association sponsored seminars, listen to their (engineers) problems, and actively work to attract new blood and provide whatever it takes to keep them."

The fact that you did not choose to have your name printed indicates the condition of communications within your station. Others, for various reasons, have made similar comments and signed their names.

Most of the engineers I know continually seek to raise the technical standards of their staff. But there are those who detract from the general excellence of the broadcast engineering ranks. And it is for this negligent minority that such suggestions as fines are made.

Doubtless, there are managers and owners who have been stung by fines through engineering negligence when there was no good reason for it. You can imagine their reaction toward subsequent chief engineers at their stations.

The ominous shadow that always follows the loaded fining question is made up of (1) who would levy the fine, (2) under what engineering categories would it apply, and (3) how could "fairness" and implied assurances be employed?

Most people would rather avoid the subject because a satisfactory system might never be developed. The questions that keep coming to mind are, why aren't more associations dealing with this is the open at convention time? Is the subject really too explosive? Are communications people failing at their own art?

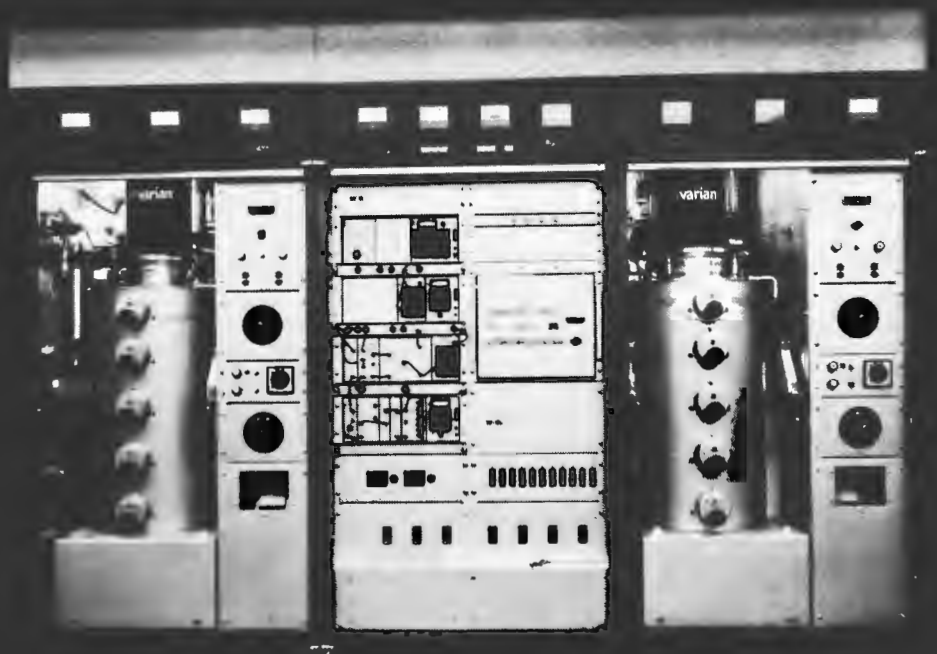
Staff loyalty and individual dedication to quality are the hallmarks of a healthy station environment.

## One For The Book

***Credit Telemation***

Much of the material in our modern day technical journals and trade magazines would not appear if it

# England's ITA took our integral cavity klystrons.




# And left them alone.

The extra reliability essential for unattended transmitter operation. That's what the Independent Television Authority (London) saw in Varian's high gain 5-cavity klystrons.

That's why our integral cavity tubes were selected to power ITA's twenty-four transmitters directly from solid state drivers. (Since launching its pioneer UHF color telecasting throughout the UK last November, ITA's network has grown to twelve stations.)

Not that Varian was any stranger to the business. Since building the first UHF TV klystron in 1955, Varian has made more of them—over 1500 in all—than anybody else, anywhere. In doing so, our product has provided more than 1½ million operating hours for over 90% of all UHF TV stations in the United States. We've backed it with an exclusive 24-hour service capability anywhere in the U.S., and service availability throughout the free world.

And with the strongest, longest guarantee in the business.

The Varian integral cavity klystron makes sense anytime. But especially where it has to go it alone. Why not get what you need in UHF TV klystrons from more than 30 Electron Tube and Device Group Sales Offices around the world? Or talk to the Palo Alto Tube Division, 611 Hansen Way, Palo Alto, California 94303. In Great Britain, contact EMI-Varian, Ltd., Surrey, England.

varian
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Circle Reader Service Number 41

weren't for the cooperation of equipment manufacturers. While most of the articles appearing in **Broadcast Engineering** are written by station engineers and consulting engineers, we do accept articles from design engineers. In some cases, they are the best source for information.

In the April, 1970 issue of **BE,** we ran an article "Vertical Interval Signal Applications" without giving credit to Telemation for supplying much of the information we needed to put this one together. We appreciate their help and take this time to say "Thanks, Telemation".

---

If there are problems plaguing your operation, drop us a line and we'll pass it along to the manufacturers or on to our readers through this column. Write to: The Editor, **Broadcast Engineering,** 1014 Wyandotte, Kansas Ciy, Mo. 64105.

## Help Needed

**The following is a letter received by** Broadcast Engineering **just prior to press time. We think there are a great many suggestions our readers will want to pass along to Mr. Morales. Send your replies to Nuvue Cablevision, Inc., Room 24, Lopez Bldg. No. 1, Session Road, Baguio City B-202, Philipines; or you can send them to The Editor,** Broadcast Engineering, **1014 Wyandotte, Kansas City, Mo. 64105.**

***Dear Editor:***

This letter intends to inform you as well as to acquire some ideas or comments you may give to help CATV industry in the Philippines. Being the very first company to start this system in our country, there are still policies which we have initiated temporarily subject to change. We have encountered and still encountering problems in some aspects from our subscribers. Below are the outlines of terms and conditions re CATV installation and also some inquiries related to it:

1. Prior to the installation of our facilities, the one time initial connection charge of $6.50 shall be paid.
2. A monthly service charge of $3.25 will be paid in advance with-in the first seven days of every month.
3. Duly authorized representatives of the company shall be permitted to enter the premises for inspection purposed during reasonable hours on business days.
4. The company shall not be responsible for the interruption of service due to causes beyond its control.
5. The company reserves the right to discontinue service due to arrears (2 months) in the payment of charges or for failure to comply with these terms and conditions.

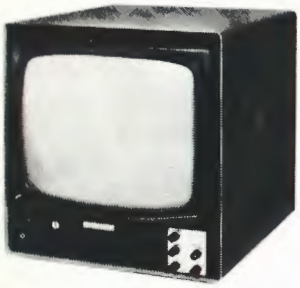
Lately we issued additional policies covering the following:

1. Subscribers requesting disconnection for some reasons and wishes to be re-connected after such time of absence are being charged with another installation fee of $6.50. In this particular case, the subscriber refuses to accept the terms. Could we get your comments about this?
2. Subscribers transferring to another location are being charged with a transfer fee of $2.17, corresponding to ⅓ of the initial installation charge covering the cost of labor and extra materials used.
3. For stolen TV sets, we are

# Conrac Steps Up The Pace

## With The Solid-State Color Standard

Well aware of industry demands for improved reliability, we brought out the high quality RHA series of stabilized monitors for rigid studio requirements. All solid-state. Controlled phosphor... for the first time, assured color match between all monitors in a series. Today, only a few months after introduction, the RHA models are the color standard of the broadcast industry.



## A Color-Matching Display Monitor

At the same time, Conrac introduced a companion series of KHA utility displays for less stringent audience and client room use. Also solid state, broadcast quality, but at lower cost. And, the same controlled color-matching phosphor. For the first time, assured color matching between monitors of different model series became possible.

## And a Color-Match Modernization Program

The Conrac CYA17 and CYB17 models, by far the most widely used color monitors in the field, will still out perform anything except the new RHA. But the kinescopes don't match the new ones. You could junk them and buy our new models. Maybe you should. But that might not necessarily serve you best. Conrac has a practical answer. Modernization. Now you can return your CYA17 or CYB17 to Conrac for a complete overhaul. Not only do you get a new 90-degree kinescope but it uses the same controlled color-matched phosphor as our RHA and KHA models. For only $800 total, you also get extensive mechanical and electronic modifications and a full one year warranty. Ask for a return authorization today.

## Stick Around. After 21 Years, We're Running Harder Than Ever.

CONRAC CORPORATION

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giving a subscriber 15 days to purchase a new one and start billing them again at the time of reconnection. Some subscribers refused to pay the months not consumed by him at the time when his/her TV set was stolen. Please give your honest suggestion and solution to this problem.

4. Some demanding subscribers asked for rebates on times when the system is undertaking minor repairs or even during city power failure. Last time a big fire hit the main commercial center of the city and damaged practically ½ of our subscribers by not receiving any signal. Is it advisable to deduct the unused days from customers upon demand?
5. Per individual connection we have appropriated 200 feet of cable. What are your normal charges if exceeding 200 feet of RG-59 cable is used? At present, we are charging $3.30 per 100 feet additional cable.
6. For an additional TV set a connection fee of $2.17 plus the monthly rate of $0.66 per TV set is charged to the customer. This privilege is extended only to immediate families of a certain subscriber. Can we extend the same benefit to others requesting the same?

We forgot to mention that we have printed a coupon book in 12 monthly subscriptions given to customers upon installation. This is to enable them to make their monthly payments direct to the office, so as not to utilize the services of collectors. Arrears of two months is subject for disconnection.

At present these are the running procedures observed in the company and so far we received good results except for the problems stated herein. We would appreciate your comments and solutions you may suggest to improve the CATV system in our city.

***Fernando C. Morales***
***Resident Manager***
***Philipines***

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# NAB Convention Report On Automation

**Broadcast Engineering's automation editor, Morris Courtright, made the rounds of the exhibit booths of the NAB convention in April. This is his report on the state of broadcast automation for the convention and the first half of 1970.**

Flying into Chicago for the NAB conference was not only a highly speculative experience for many, but also provided an apt demonstration of automation. The airlines automated reservation systems and computer generated flight schedule displays were functioning flawlessly, but actual air service was a bit uncertain. It seems that smoothly functioning computers can not, by themselves, keep aircraft flying. People are still needed! Similarly in broadcast automation, no matter how sophisticated or efficient the equipment, people "keep the program on the air". Automation may change the type of people needed, but it will not replace them.

The exhibit halls contained many examples of automation's growth and the proliferation of automation equipment. Ranging from a small $6,000 program automation system through the "total" station automation equipment with tags of many thousands of dollars to a time share computer network for automating a multitude of stations simultaneously, the paths to station automation are rapidly becoming more diverse and complex. They all promise wondrous improvement and the station that installs any one of the systems will note a tremendous change in their operation. Whether the change is for the good, or otherwise, depends on adequate planning, realistic expectations of system capability, and proper training of people to operate the system.

Among the many systems shown, perhaps the newest concept for general broadcast use were the time-sharing systems of Sarkes-Tarzian and General Electric. Both use a small process control computer, Honeywell 516 and GE PAC-30 respectively, at the station for local control while communicating with a remotely located large scale computer. The large central computer, which may be in a different city, handles the data processing tasks for a number of stations simultaneously.

Security is provided so that data files are confidential and can be accessed only by the proper station. In use, buy information is entered into a terminal device such as a CRT or teletype and the computer checks availabilities, adjacencies, rates, etc. and confirms the order. If acceptable, the station file is updated to produce a new log and customer transaction records.

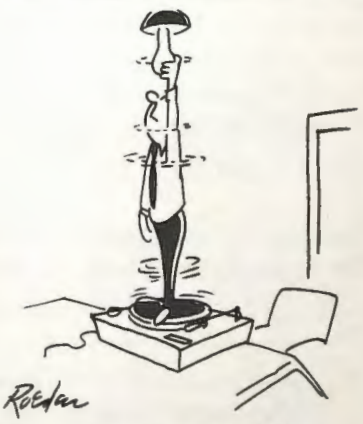
Periodically the local computer is updated with current log information to control the engineering switching. These systems provide a wide variety of reports such as availability listings, costs, ratings, demographics and sponsor adjacency. Both produce "verified" program logs, but, as in almost all automation systems, the only thing verified is what should have been aired, not what was actually aired if the wrong tape or film had been loaded. Systems of this size, complexity and cost are primarily aimed at, and considered only by, television stations.

Not to be overlooked on the automation scene is the video switchers and associated gear of Central Dynamics. While not directly in the "computer" business, Central Dynamics is a forerunner in television automation and their equipment is designed with complete automation in mind and will interface with most standard data processing equipment.

Gates Radio showed a relatively complete automation system for radio. This is one that uses codes on the cue track to actually verify what was aired and produce an accurate, verified program log automatically. The Moseley automatic transmitter logging system is part of the Gates system, and once programmed and started the system will handle all engineering switching, program logging and transmitter logging untouched by human hands. One apparent drawback is the use of cartridges so that a cue track is available for the coded information. Until a three track tape machine is available, many, many cartridges will be needed. ASCII code is used by Gates, which allows for direct data interchange with commercial data processing equipment for traffic and accounting purposes.

IGM came on strong with their punch card controlled system and the new Instacart and Random Select Memory. Forty-eight cartridges may be randomly programmed and four options of single spot, double spot, or spots with breakers assigned to each, also randomly. IGM is also in the process of breaking a software controlled automation system using a standard PDP-12 computer.

Schafer has changed the physical appearance of their broadcast computer by doing away with the desk-like console and placing the processing and memory units in a standard 19 inch rack. The CLEAR language used in the system uses terms more familiar to the broadcaster than the data processor. Use of software for information input and control creates a very flexible system. For example, the 48 event, 48 format capacity of the system



would require 2,304 thumbwheel switches to duplicate with hardware programming.

Less sophisticated systems (and priced accordingly) aimed only at the task of program automation are those of MaCarTa, AutoGram (Collins) and Broadcast Products. MaCarTa uses color coded metal plates for program control, Broadcast Products retains the thumbwheel switches and AutoGram uses a combination of pin matrix and rotating disk. Relatively simple, the program automation system makes no attempt to process data. They are designed to produce a consistent on-air sound while minimizing the dependency on air people and freeing them for more creative effort. These systems appeal strongly to the local market radio station.

The question faced by the individual station contemplating automation is not just a matter of which systems to buy, but primarily which concept of operations to pursue. The first decision is what to automate; the traffic and accounting functions, engineering switching, program logging, transmitter logging, or some combination of functions. Automating all of these functions may be quite desirable, but it can also be quite expensive.

Automating the engineering switching is a task for process control computer or simple program automation system. The data processing tasks of traffic and accounting can be performed by most standard commercial computer equipment. When the functions are combined, interface problems arise which rapidly escalate the complexity of the system, and its attendant cost.

The choice of method to accomplish the desired automation may or may not be compatible with automation of other functions at some later date, unless a wise choice is made at the beginning. Most of all, be realistic. Is it necessary to automate your entire operation, or just certain portions of it? The equipment is available, and the proper choice can be the best thing that ever happened to your station.

**Broadcast Buyer's Guide Begins On Page 52**

# INDUSTRY NEWS

*(Continued from page 19)*

## Commission Sets New Policy For AM Major, Minor Changes

The Commission has issued a new policy statement on the classification of standard broadcast applications for major and minor changes. These classifications appear in the Rules and in Section 309 of the Communications Act.

According to Section 309, a 30-day holding period is required for major change applications and for petitions against these applications. Moreover, major change applicants must submit proof of publication and, in some cases, are responsible for completing the programming portions of the application forms. These requirements generally do not apply to minor change applicants.

Section 1.571(a)(1) of the Rules defines major change applications as those involving changes in frequency, power, hours of operation, and station location. This section further provides that applications for other types of changes may, upon notification to the applicant, be treated as major change applications. Most applications treated as major under this proviso, have been proposals to change the radiation pattern. Changes in transmitter site, antenna height, and MEOV's have been consistently classified as minor.

Pattern change applications have been classified as major or minor on an ad hoc basis. With the advent of the AM application "freeze", these rulings became crucial. Because of interference and city coverage constraints in the AM band, the magnitude of change resulting from applications of this type is small, irrespective of how they are classified.

The position of the Commission is that, "After careful review of this matter, we have concluded that henceforth applications for changes in AM radiation patterns, including those for change from directional to non-directional operation and vice versa, will usually be considered as minor change proposals, unless associated with changes in frequency, power, hours of operation, or station location. In addition, and in keeping with the original intent of Section 1.571 of the rules, applications for changes in hours of operation not involving new nighttime propagation studies will also be considered as minor change proposals.

"It is recognized that proposed changes in site or radiation pattern might, in rare instances, involve a combination of factors which would prompt us to treat them as major change applications rather than minor change applications. We feel that the public interest requires that our present discretion be preseved in this regard. For this reason, the proviso language appearing in Section 1.571(a)(1) has been retained.

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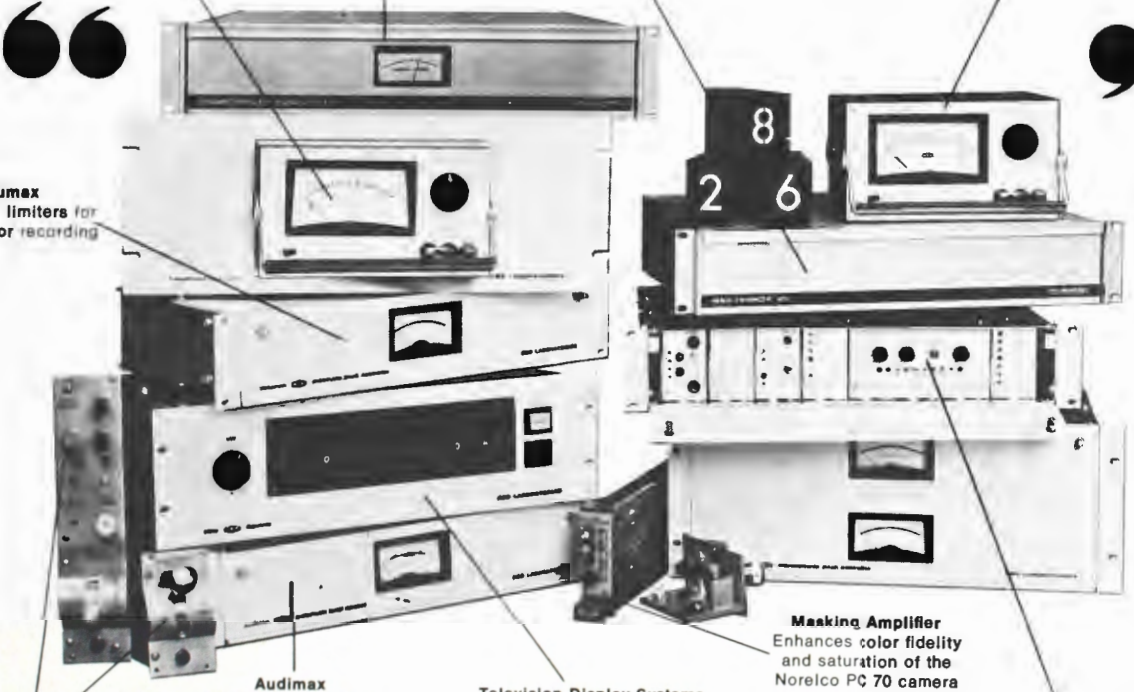


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# Network Coded Transmissions Approved By Commission

Late in April the Commission adopted a Report and Order in Docket 18605, which amended Part 73 of its rules and regulations to permit the inclusion in television picture transmissions of patterns containing coded information which, when intercepted and decoded by suitable apparatus, can be used for the electronic identification of a program segment including the code. They found that such a system would benefit many entries involved in television broadcasting, and that transmission of the coded patterns would not result in television picture degradation.

The comments in this proceeding have pointed up a matter that has been of concern to the Commission for some time—the use by networks of certain methods of signalling and cueing which, although intended for use only by networks and their affiliates, nevertheless affect to some extent the quality of broadcast service.

Thus, the Columbia Broadcasting System employs audio tones for signalling purposes, with no attempt to prevent their reception by the general public from its affiliated stations. The National Broadcasting Company momentarily displays a blank square or similar marker in the upper right hand corner of certain television programs to advise affiliates of upcoming intervals during which local announcements may be made. This device is clearly visible to the viewing audience.

While the American Broadcasting Company makes extensive use of signals in the audible range of frequencies, its technique is such that they are not heard by the public. However, the suppression of the tones is achieved by means which restrict, to some degree, the frequency range of aural program material.

Such signals have been employed without permission from the Commission, apparently on the assumption that no specific authorization is required, since the signals, even though they may be received by the general public, are not intended for its use, and their transmission is only incident to their internal employment by the network.

However, all of these signalling systems cause some degree of degradation of the broadcast signal. Their use is subject to regulation by the Commission under Section 303(e) of the Communications Act of 1934, as amended, which directs the Commission to "Regulate the kind of apparatus to be used with respect to its external effects and the purity and sharpness of emissions from each station and from the apparatus therein". Therefore, signals of the nature described cannot be employed without specific authorization by the Commission.

While the Commission recognizes that the use of signalling within a network is essential to its efficient operation, they are unconvinced at this time that the function cannot be performed practicably by means which will leave broadcast service to the public unimpaired. Accordingly, they expect that any request for an authorization to use such special signals will include a showing that it is infeasible to transmit signals within the network by means which have no detrimental effect on the broadcast service.

## Commission Amends Rule Section 1.955

To reflect certain amendments in the Technical Annex of the Agreemet Between the United States and Canada on the "Coordination and Use of Radio Frequencies Above 30 Megacycles per Second", the Commission has amended Section 1.955 of its rules. These amendments indicated the bands in which frequency assignment information and engineering comments on proposed assignments are exchanged.

Because the rule changes involve conformance with a bilateral international agreement and reflect agency procedure and practice, the Commission said Section 552 of the Administrative Procedure Act of 1946 relating to public notice is not applicable.

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# Commission Puts Engineering Record Retention At 3 Years

Licensees must now retain applications and other material in their public files for a period of seven years under terms of an amendment to Section 1.526 adopted by the FCC.

The Commission said the 7-year period will eliminate the public retention of unnecessary material, ease the task of broadcasters, while at the same time provide sufficient records available to the general public on which sound presentations can be made.

Provision was made for the disposal, after 3 years, of engineering material of a former mode of operation such as frequency, power, different directional pattern or transmitter location. This permits elimination of sometimes bulky material, the Commission noted. It also specified that "material having a substantial bearing" on claims against the licensee, or Commission investigation or complaints is to be retained until the licensee is notified in writing that it may be discarded, or in private matters, until the issue has been resolved. With regard to material voluntarily retained after required retention period, the rule requires that it be "kept in a form and place convenient to the licensee, and shall be made available to the inquiring party, in good faith and after written request, at a time and place convenient to both the party and the licensee." The changes were adopted in part as requested by CBS.

Section 1.526 was adopted by the Commission on March 31, 1965. It requires broadcast stations and applicants for new stations to keep "local inspection" files containing copies of applications and other material filed with the Commission, and to provide opportunity for public inspection in the local files to the extent it is available for inspection at the Commission's offices in Washington. There was no limitation on time the material should be kept.

Following a request by the National Association of Broadcasters for reassessment of the local file rule and a suggestion by the NAB for a 3-year retention period, the Commission on July 9, 1969, adopted a rule making notice proposing a 7-year retention period.

Doubleday said the files might well be eliminated and referred to "minimal use" of them. Most of the other parties urged that the retention period be reduced to cover only one license term—three years. RKO supported the 7-year period as a needed improvement over the present unlimited time. It said the public would have an opportunity to examine station activity over a reasonable period of time which is necessary for correct evaluation of trends in licensee's policies and practices. Time-Life said that while the 3-year period would be adequate, the 7-year period would cause no undue burden. CBS regarded a 7-year period as too long and suggested that a shorter period—3 years—be further considered.

A number of parties relying primarily on an NAB survey which showed that in 1967 only 50 of 1,286 stations reported requests for inspection of their public files, contended that the public does not have an interest in the public files.

Palmer said that there have been no requests to see the local files of its TV and radio stations in Des Moines and Cedar Rapids, Iowa, and only requests to see political advertising file (1968 election period) at its Naples, Florida, stations.

ABC and a number of commenting parties asserted the files are voluminous and burdensome. Each of the commenting parties, except from RKO, said the time for material to be kept in public files should be geared to one license renewal period, 3 years, since older material is irrevelant. NAB suggested a 39-month period in place of a 3-year period stating that the most public interest in local file material occurs during the 3-months between the filing of a given renewal application and expiration.

From an increasingly selective audience there will be a strong demand for talent on both ends of the camera. The challenge for cablecasters will be to meet that demand.

# A New Day in Cablecasting

By Ron Merrell

Black Friday and the CATV freeze came as a hard blow to cable operators and CATV equipment manufacturers on December 13, 1968. There were too many loose ends. The CATV industry had been snowballing and the Commission couldn't quite bring it into focus. Caught in the middle of angry broadcasters and demanding cable operators, the Commission sidetracked the industry until October, 1969.

It was on October 24th that CATV Task Force Chief Sol Schildhause sent a heatwave of excitement throughout the industry with his announcement of a rulemaking that would end the freeze and bring new meaning to local origination.

This rulemaking called for a new day in cablecasting. It officially begins on January 1, 1971 with an FCC command performance by system operators serving 3,500 or more subscribers, and it may end up as the first real step toward a national CATV network. What does this mean to operators now and in the years to come?

In the beginning, this decision will bring a higher dollars and cents commitment to the operator. In this issue of **Broadcast Engineering** there are articles that describe three levels of commitment to cablecasting through the choice of minimal to medium and sophisticated equipment.

While operators are experimenting with origination systems, the FCC will surely be looking over their shoulder in an effort to clarify the boundaries of the new requirement for originations "to a significant extent". Actions and reactions by the Commission to programming will be slow in coming. Even with logging requirements, how can they check what is on the line?

But the immediate impact of the program policy is that local municipalities cannot control program content. This means that program content, generally, is open to the imagination of the operators. However, the Commission has not left the door completely open.

Portents of the future are implied in the requirements that equal-time, sponsorship-identification, and the fairness doctrine apply to local originations.

Of course you can't talk about expansion without hitting on the common rough spot in the com-

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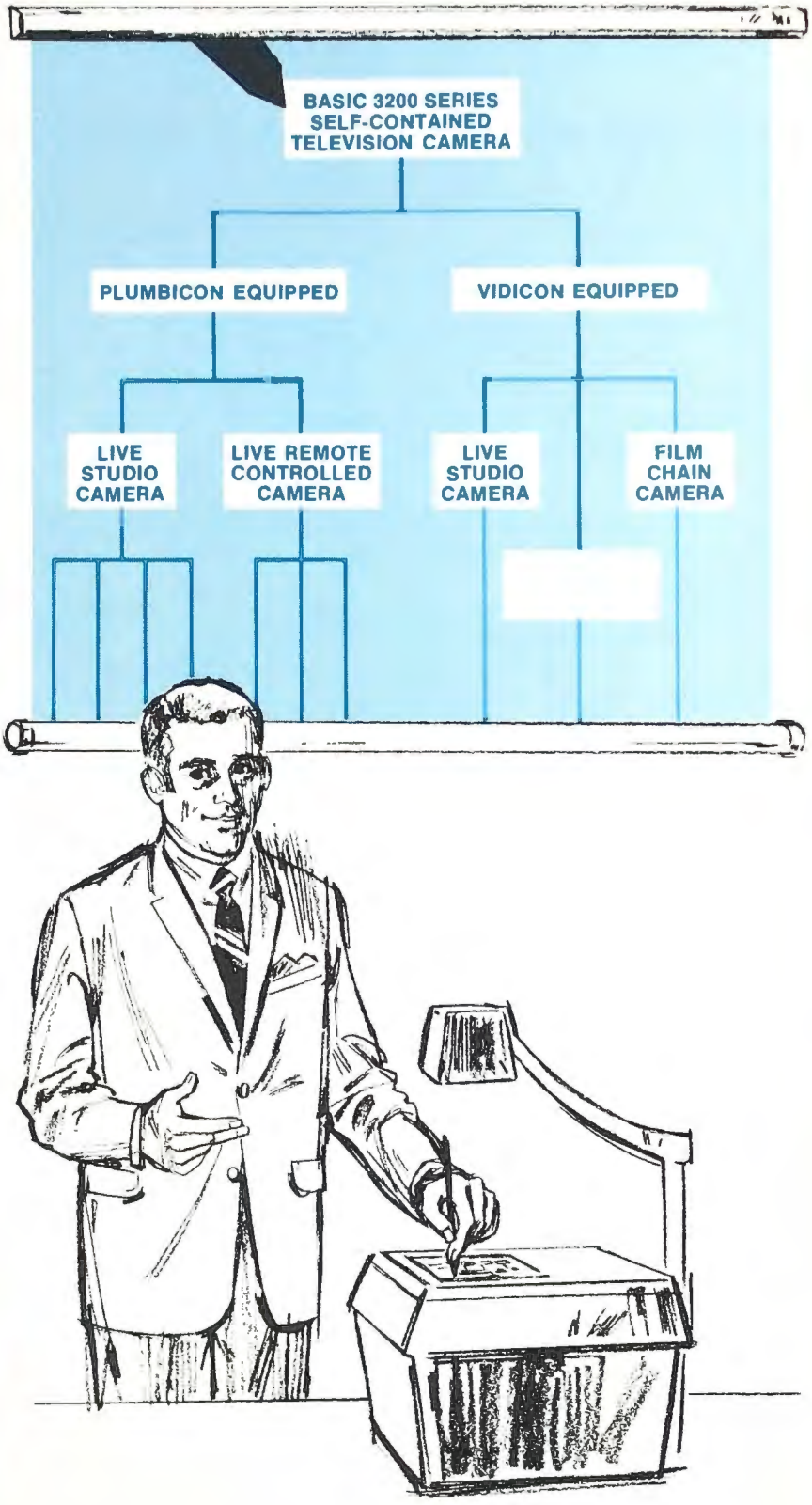


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munications industry — technical manpower. The "rob from Peter to pay Paul" theory of putting properly trained people in key positions will not work for very long. Caught in the middle of this tug-of-war, the engineers and technicians in some areas can expect pay increases as cablecasters and commercial licensees bargain for their talents. This would be to the advantage of no owner or operator.

What is needed by both interest groups is a more concerted effort to affect additions of engineering courses, to include seminars on operation and maintenance, and respect for engineers and technicians as something more than panic depressants or legal guardians.

### Commercials

The new day in cablecasting will include commercials at "natural breaks". As operators advance from ad cards to slides plus audio and on to film and videotape, these natural breaks will be stretched to the limits of their definitions.

There will be a host of technical areas for the systems to substantially improve. The local merchant who gets a poor initiation to cable advertising due to timing, visuals, down time, roll-overs between slides, tearing, may decide to wait for the system to add the equipment and technicians capable of presenting his (image) message. After all, he may see network and local commercial station ads as a standard.

It was fair for the Commission to permit advertising on the origination channel, but advertising in any medium has always involved additional investments. It would be unrealistic for system operators to assume that only studio equipment purchases are needed.

The cable system can offer new possibilities to a number of sources of untapped would-be advertisers. In this sense, some commercials may even be more effective on a cable system, because the advertiser is seeking to speak directly to people in the immediate vicinity.

### Subscriber Rates

At a time when increasing the gross income to pay for origination and support equipment, it seems likely that subscriber rates will get

Two small viewfinder cameras in use here offer flexibility, but don't expect them to compete with the big cameras and heavy dollies in the studio or on remotes.

the "twice-over". After all, original cable advertising time rates are substantially lower than commercial rates. In other words, it would take a long time to pay off the equipment needed for a truly comprehensive origination setup if commercials were the only answer.

For the larger systems, an additional 50 cents per month would be a great help. The danger is that as the subscriber rate goes up, the service may be more difficult to sell. Cable signal quality and programming techniques can be the keys to success or the sour notes of failure.

### System Links

Following up on its determination to encourage and even require local organizations, the Commission has moved to make microwave frequencies more freely available to cable systems.

The Commission has authorized the use of Community Antenna Relay Systems (CARS) for the purpose of carrying all types of program originations. These include links between studio and headend, remote pickup, and service from mobile units.

The service permitted by cable systems parallels that now authorized for television station broadcast use. CARS channels in the frequency band from 12.7 to 12.95 GHz are to be employed. Operators are limited to a maximum of three channels.

In addition to this type of operation, the Commission has established a local distribution service (LDS) operating in the same band as a substitute for trunk cable in underground conduits and on surface poles.

Systems proposing to substitute microwave service for existing cable links will be required to explain their reasons for changing to microwave before the change can be made.

### Looking Ahead

During the 1969 NCTA national convention there was considerable time devoted to initiating the idea of a six channel national hookup. In fact, industry spokesmen proposed a satellite system, thereby offering operators the ultimate challenge.

With CATV multiplex and two-way communications looming on the horizon, the possibilities become even greater.

Off in the wings there are a great many interested parties waiting to see how the NCTA and cable operators act on their commitments in the early 1970's. Among those looking on are the manufacturers. The prospects are healthy, but there are many who are not yet willing to declare themselves.

Meanwhile, if the FCC at any speed responds to control complaints, we may see actions that cut into multiple ownership and a division of interests. The history of the FCC reveals time and again that as they assume regulatory responsibility they weigh everything against the public interest. Sometimes the measures are amazing. The result could be a fourth network.

Despite the bitter arguments, the lobby groups, and the casual pro and con arguments of cross-ownership representatives, despite the prognostications of the industry and equipment manufacturers, the future falls mostly into the hands of the receiving public. There was a time when economists said that supply is based on demand. But there came an awareness in the 1960's that, in fact, supply often preceded demand. The market of the 1970's will make their own demands, and these must be interpreted as public interest.

Over-the-air broadcasters and cablecasters will move on to new and better days so long as public interest prevails over dollar signs.

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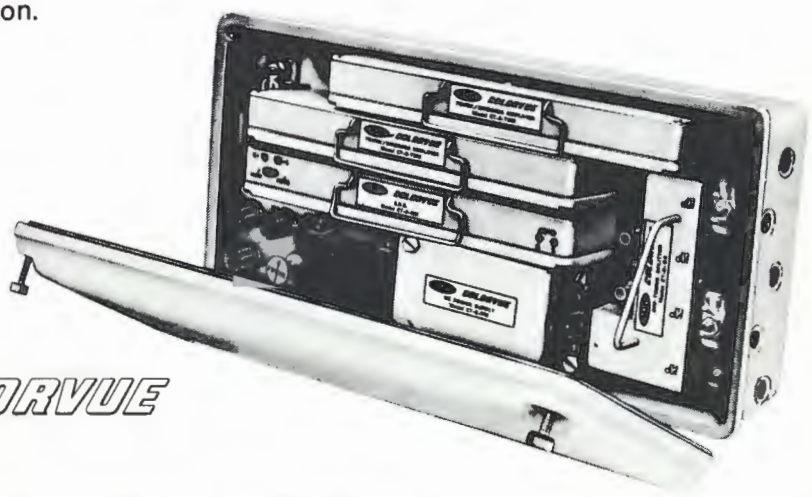

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# Cameras, Switchers, and Monitors for Local Origination

By Charles S. Harris

The author, Charles S. Harris, is technical editor of a group of consumer-oriented electronics magazines. He is also a consulting member of the engineering staff of Leo G. Sands Associates, Inc., where he participated in the design of a large-scale, bidirectional CATV-telecommunications system for serving a city with a population of almost one million. Previously, he held executive posts with Tele-Signal Corp., Metro-Tel Corp., Hammarlund Manufacturing Company and RCA. He is a specialist in the design and application of switching systems and tone signaling and control.

Except for a single viewfinder camera operation, means must be provided in the CATV local program origination studio for switching and monitoring video signals. Such facilities need not be anywhere nearly as elaborate as at network TV studios.

The video signal sources in a CATV local program origination studio can include two or more cameras and videotape recorders, a flying spot scanner, two or more film camera chains, the output of a microwave link, video pair or coaxial cable which feeds in remotes. pickups.

The studio may be at the head end where the selected or mixed video and audio signals are fed into the cablework through a TV modulator. Here, switching is handled manually when televising or taping a live program. When all programs are films, playbacks of tapes, views of weather instruments, programmed commercials, etc., switching can be automated or controlled from a remote location.

When the head end site is not at a convenient location for a studio, it is possible to locate the studio in town or at or near the point on the trunk line cable ahead of the first bridging amplifier. (See Figure 1). In the former case, the signals from the studio can be transmitted to the head end through a microwave link, or an independent coaxial cable run along the cable route back to the head end. A video pair and an audio program circuit can be leased from the telephone company, or installed by the CATV operator.

The switching and monitoring facilities are located at the studio in either event (Figure 2.) The need for a transmission path from the studio to the head end, when both are at different locations, is not needed if all programming is recorded on videotape and transmitted later from the head end.

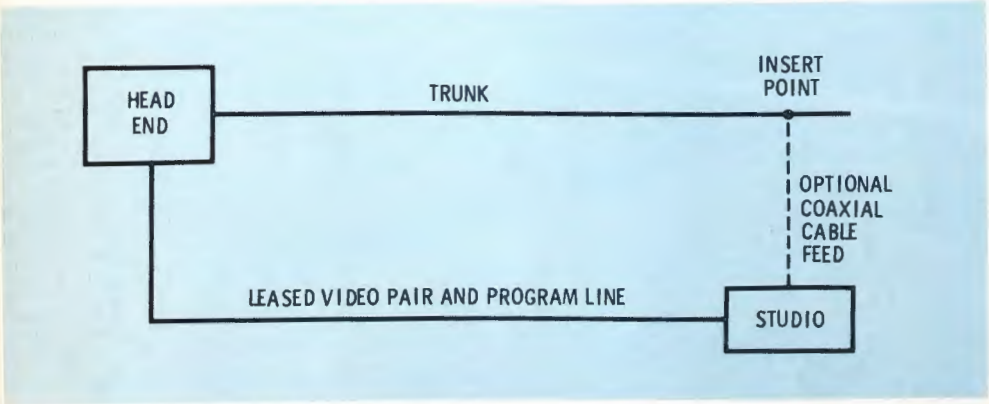


**Fig. 1** Tie-in of head end and local program studio.

### Cameras

Whereas TV network studios employ expensive image orthicon monochrome cameras and even more expensive color cameras, most CATV operators use vidicon cameras, for monochrome viewing and the new, lower cost color cameras. (Figure 3.)

The standard vidicon camera, designed initially for use in closed circuit TV systems, is also satisfactory for feeding monochrome local-origination programs over a CATV system. It is not necessary to have a professional cameraman to get good quality pictures. The vidicon camera has been developed to a high degree of efficiency by employing solid state components and integrated circuits and is compact and needs little power. It is relatively low in initial cost, requires a minimum of auxiliary equipment and is simple to operate.

One of the outstanding features of the vidicon camera is that its wide latitude of light sensitivity makes it possible to use it under normal room lighting conditions, even as low at 5 foot-candles, for passable picture quality. The 4000 to 1 ratio of the automatic light compensation circuit of some vidicon cameras permits rapid shifting of the camera (e.g. panning) from brightly lighted to dimly lighted scenes without loss of detail, with good grey scale balance, and without causing temporary or permanent damage to the vidicon tube.

The video output can be combined with any audio sources for modulation into any TV channel. In addition to the composite video

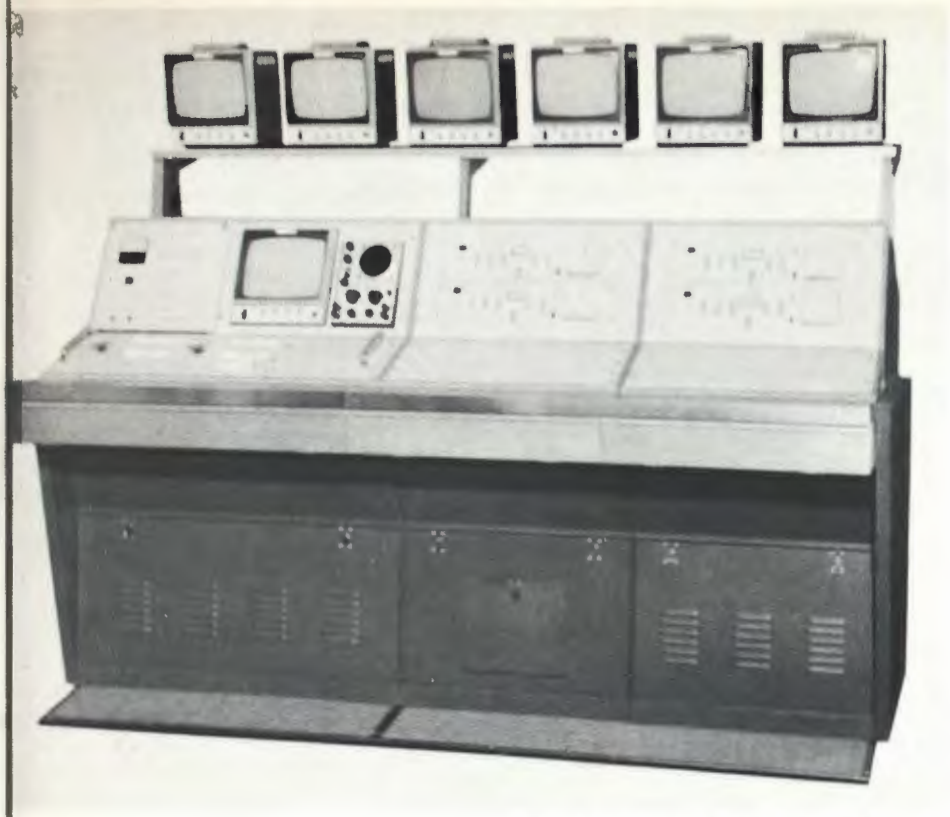

Fig. 2 Example of studio control center.

Fig. 3 Here is an example of one of the many new light weight cameras now available to the cablecaster.

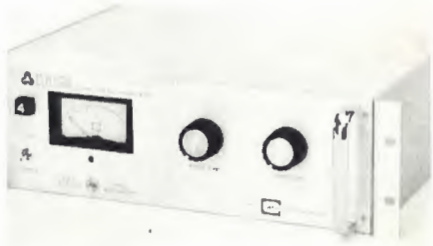

Fig. 4 Example of color TV modulator with audio and video level controls.

signal output of 1 to 1.5 volts (p-p), an RF signal output of over 30 mV (rms) usually is also available from these cameras. This RF signal can be tuned to any frequency from 54 to 88 MHz (channels 2 to 6) and can be fed directly on to the coax cable without requiring a separate TV modulator, when the next adjacent lower frequency channel is not occupied. However, in most CATV installations, the camera's video output and the audio system output are fed to a TV modulator whose output is the same as that of a TV transmitter.

The scanning system is random interlace, with vertical frequency of 50/60 Hz, locked to the power line, and horizontal frequency of 15.75 KHz, or, at the flick of a switch, the camera can be operated in conjunction with an external sync generator. This is necessary for multi-camera operation where switching must be effected without roll-overs following the switch.

Some vidicon cameras have a built-in viewfinder/monitor mounted directly above the control panel at the rear of the camera, employing a 5-inch picture tube that is protected by safety glass against mechanical damage or shock.

Comparable, simple to operate, vidicon color cameras are now available to the CATV system operator. They normally employ three vidicons, one each for red, blue, and green components of a scene. Some employ a fourth vidicon for better monochrome quality. Though not quite as sensitive as monochrome cameras, they still give good color rendition with low level lighting (40 to 50 foot candles). Another difference of color cameras is that the output is strictly video, and they require an audio/video (TV) modulator to feed the CATV system. Modulators are now available which are designed to handle color most effectively (Figure 4.)

### *Video Monitors*

Many types of video monitors are now available which are designed to accept the video output of a TV camera and other video signal sources. As the block diagram Figure 6 shows, a video moni-

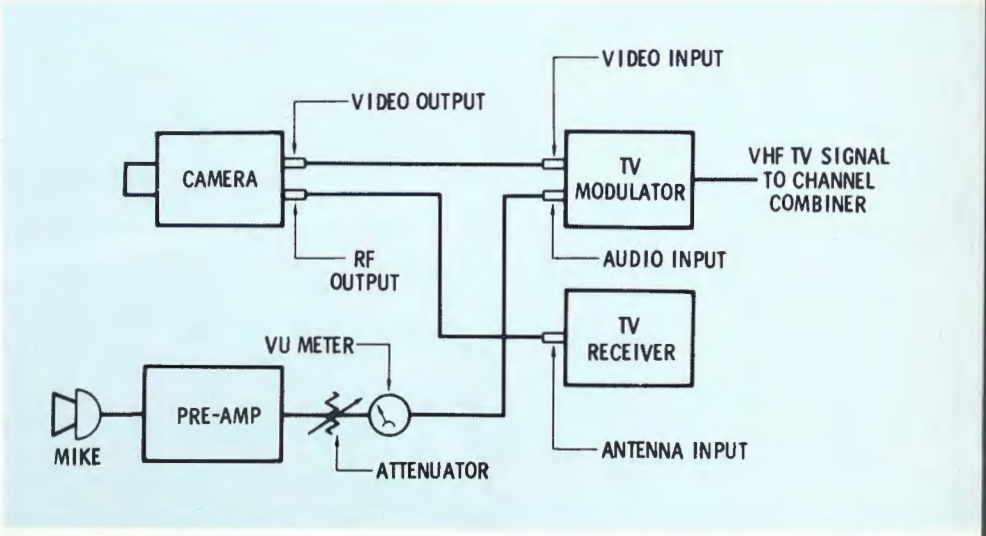


Fig. 5 Minimal non-switch program origination system.

tor of this type is a TV receiver minus the RF, IF and audio circuitry. Generally, however, the picture quality and reliability are superior to what can be expected of a conventional TV receiver.

Nevertheless, for CATV purposes conventional TV receivers with AFC make excellent monitors. A color TV receiver can be used for monitoring both monochrome and color programs.

Generally, a monitor is provided for each camera and other video sources. When the camera has both video and RF outputs, the video output is fed to the TV modulator, as shown in Figure 5, and the RF output can be fed to a conventional TV receiver type of monitor.

The actual program being fed into the CATV system can be monitored with a conventional TV receiver connected through a coupler to the input end of the trunk line cable, as illustrated in Figure 7. In a more elaborate set-up, all monitors can be of the video-only type.

### *Switchers*

There are various techniques used for switching video circuits. A switcher may run the gamut from simply on-off switches to solid state switching systems with complex timing, blanking and other capabilities. Switching of video signals can be dividend into two basic groups: (1) where one or more camera outputs

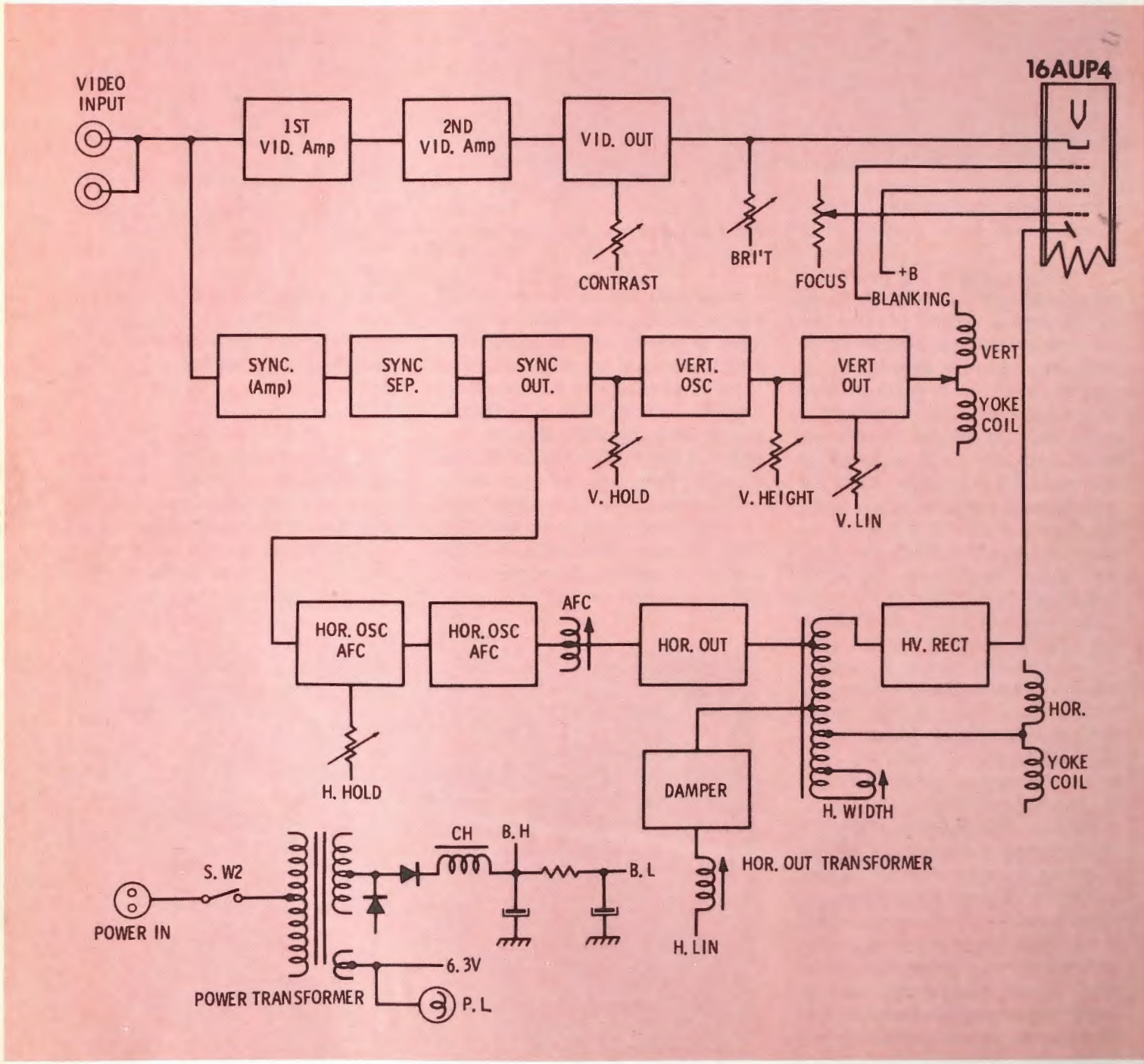


**Fig. 6** Block diagram of a typical video monitor.

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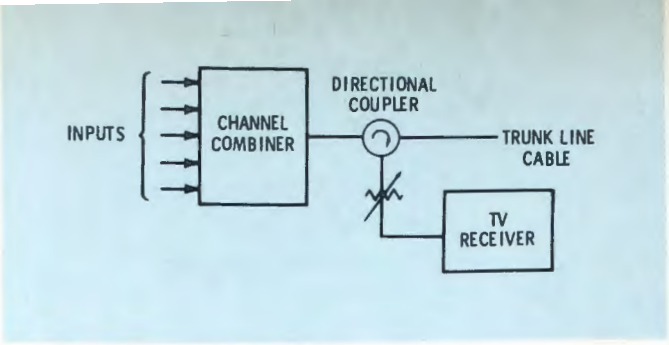


**Fig. 7** Program monitor off a directional coupler.

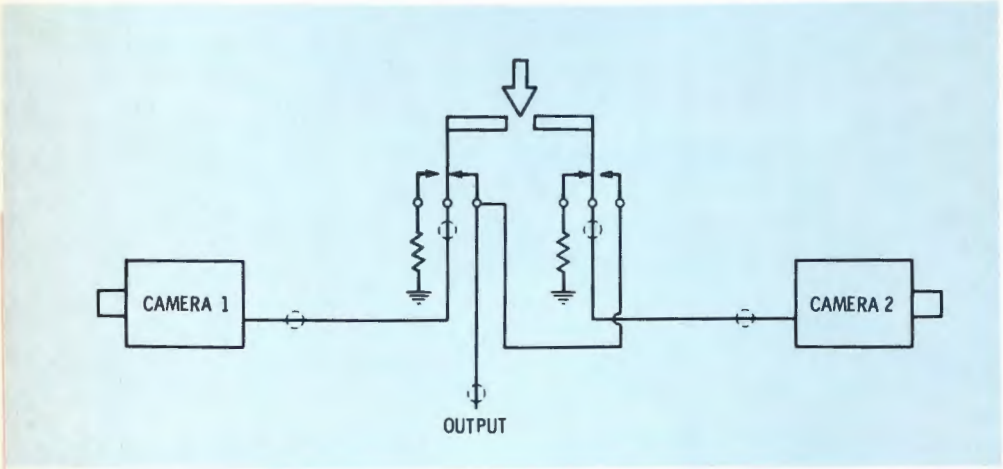


**Fig. 8** Gap switching using make-before-break switch. Camera 1 disconnects before camera 2 connects.

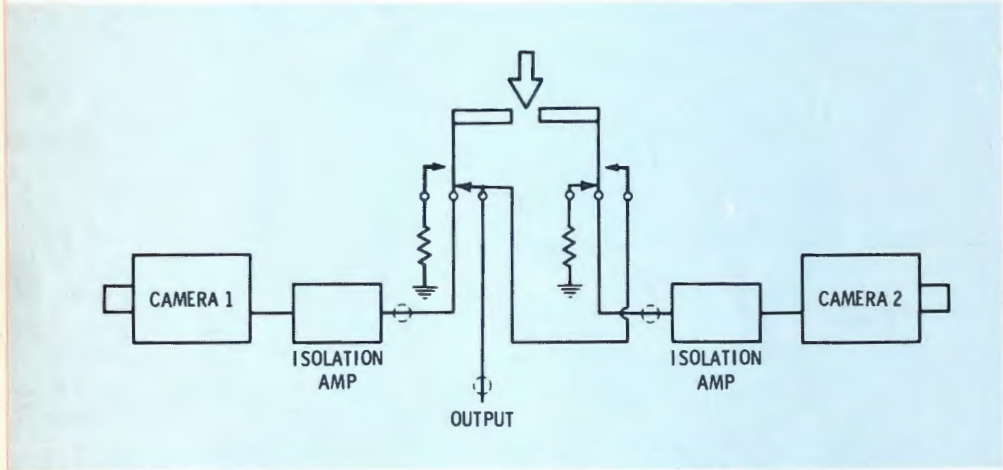


**Fig. 9** Lap switching using break-before-make switch. Camera 2 is connected before camera 1 is disconnected.

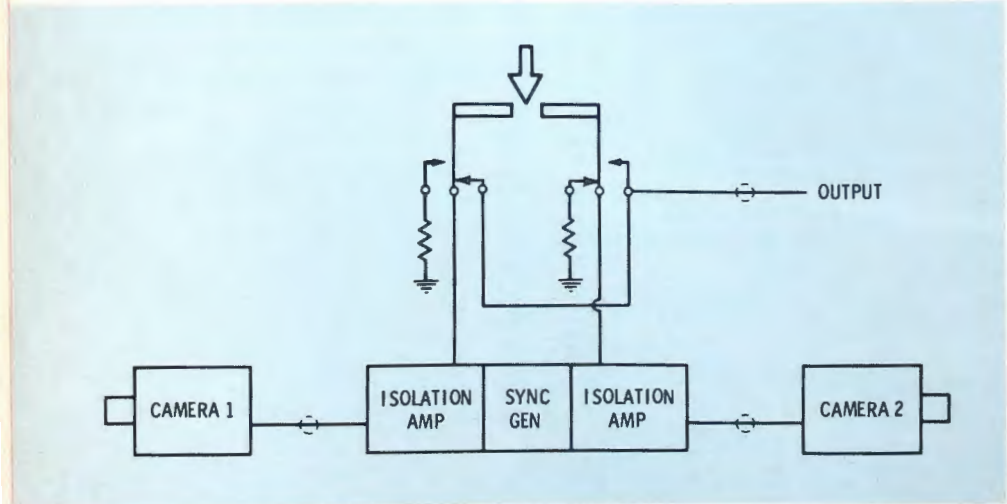


**Fig. 10** Vertical interval switching of synchronized cameras.

are switched to a single output buss; and (2) where one or more camera outputs are switched to one or more output busses. Each of these groups can be broken down further into several categories, depending on the quality of switching required, and where the switcher is located with respect to the actual control point.

Major factors are whether or not the video signals to be switched are synchronous or non-synchronous as well as the mode of switching and the time it takes to switch from one to another output. The switch non-synchronous signals requires, inherently, a break of the timing pulses, which cannot be corrected or blanked out by special switching techniques. On the other hand, it's possible to switch synchronous signals where a reasonable degree of continuity is maintained during the switch over from one to another signal.

Momentary loss of picture, roll-over streaking, or other picture deformities are the direct result of timing. It is possible to lose sync completely, which will produce a tear or rolling of the newly switched scene. There are three different types of switching available to overcome the timing aspect. These are often referred to as break-before-make, which is the simplest form of switching (also called gap switching), or make-before-break switching (also called lap switching) and vertical interval switching, which is by far the most complex.

Any DPDT, break-before-make switch, preferrably of the push-button variety, will perform the simple switching task of satisfactorily transferring non-synchronous signals, since there are no problems of continuity of picture involved. The only consideration is: how much time can be allowed for the transfer to be made before deterioration of the picture destroys the effectiveness of the transfer during the switching operation? In many cases the low cost of the simple switcher, versus the high cost of more sophisticated switching, may seem to offset the advantage gained by the more costly, quality switching (see Figure 8).

Another switching technique is to have both pictures feed the output buss for a very short period of time before dropping out the orig-

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inal scene. To do this, essentially the only change that is needed to convert the switcher from the simplest system to this more adaptable one is to change the DPDT switch from break-before-make to just the opposite operation, make-before break. With this type of operation both signals are present on the output leads or the switch until the break occurs. This is sometimes referred to as lap switching. Two specific advantages are achieved with this type of switching: (a) because there is always a signal on the output buss there is much less possibility of losing sync, and, (b) the transfer is not nearly as noticeable in the monitor. However, to prevent one signal from feeding back into the other, it is necessary to provide isolation between contacts.

The third, and most sophisticated switching system, is one in which the switching circuitry is turned on by the vertical sync component to effect the actual switching during the vertical interval. (Figures 9 and 10). This produces what appears on the monitor as an instantaneous change from one scene to another without an apparent lap or gap or other deterioration of the picture. This is the most costly and sophisticated system because it requires accurate timing. Since this sophistication is a must for distribution type switching, and is more expensive, for the reasons previously mentioned, it is used almost exclusively by broadcasters (see Figure 5).

One of the other conditions affecting the selection of the switcher is the switcher location. This was mentioned before in the introductory remarks. The location of the switcher complicates the selection of a switcher further and can be divided into two sub-categories: (1) the switcher is part of the local control unit, or: (2) the switcher is located remote from the controls, normally near the monitor, and is controlled remotely. The switches that control the direction of the path the picture is to take in a locally controlled switcher are often mechanically interlocked push-button switches (Figure 13).

To remotely control the switcher, relays, stepping switches, solid state switching or a combination of any of the three may be used to direct the path the picture(s) will take. Normally they are actuated by a simple normally open switch that closes a circuit to permit a control voltage to operate the remote switcher. Remote switchers are quite flexible and are usually adjacent to a monitor point that could be miles away from the switcher. It is possible also to use tone signals in lieu of voltages to effect the remote control of a switcher. Either a single tone for each remote function, or multiple tones in a coding arrangement can be used in remote control tone systems.

Up to this point we have discussed only the picture switching function and have purposely delayed mention of the possible need for simultaneously switching audio as well as the possibility of switching cueing lights and studio lights. Where different cameras are being switched as a common scene with just a single commentary or audio portion, it is not necessary to switch the audio. However, if the switching is to a completely different program, then audio switching is of equal importance to the video.

It is a relatively simple matter to handle audio switching simultaneously. Just double the number of circuits each switch controls. For example, in a simple system utilizing one or two cameras, feeding a single output buss type, the local switcher, instead of using a DPDT push-button switch, can use a 4PDT switch. One of the two pairs of contacts would be used as previously outlined to switch the video and the second pair of contacts would be used to switch the audio. To control a cueing lamp would, of course, require at least one additional SPDT pair of contacts ganged with the others to effect simultaneous switching of picture, audio and cueing. It may be preferrable, if available, to use another set of DPDT contacts for the cueing operation.

So far the discussion has been limited to a single local-origin program switching system. Obviously, some CATV system operators will provide more than one local-origin program at the same time (Figure 13). For example, there could be a film on one channel, a weather display on another, a taped show on another, etc.

Separate switching systems could be used for each channel. However, maximum utilization of cameras and other equipment can be made by using a multiple-output switcher. An example is shown in block diagram form in Figure 13.

Many techniques are used besides those discussed here, but the basic principles are the same. It can be expected that CATV switching systems will become more sophisticated and will include faders (Figure 14) and video effect devices, which already are available. ▲


**Fig. 11** Example of compact sync generator.


**Fig. 12** Simple, compact 4-input switcher.

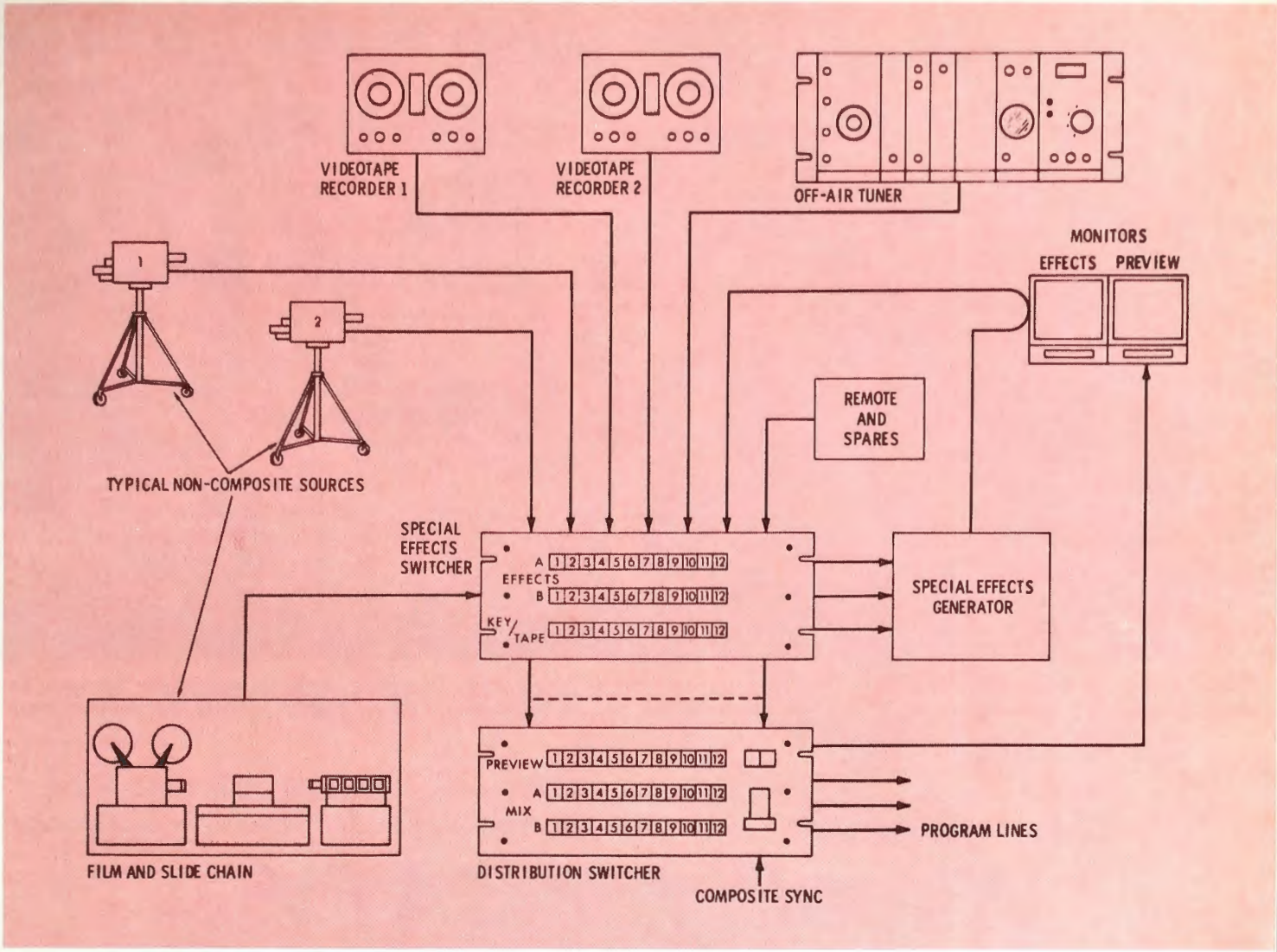



**Fig. 13** Six-input, triple-output switching system.

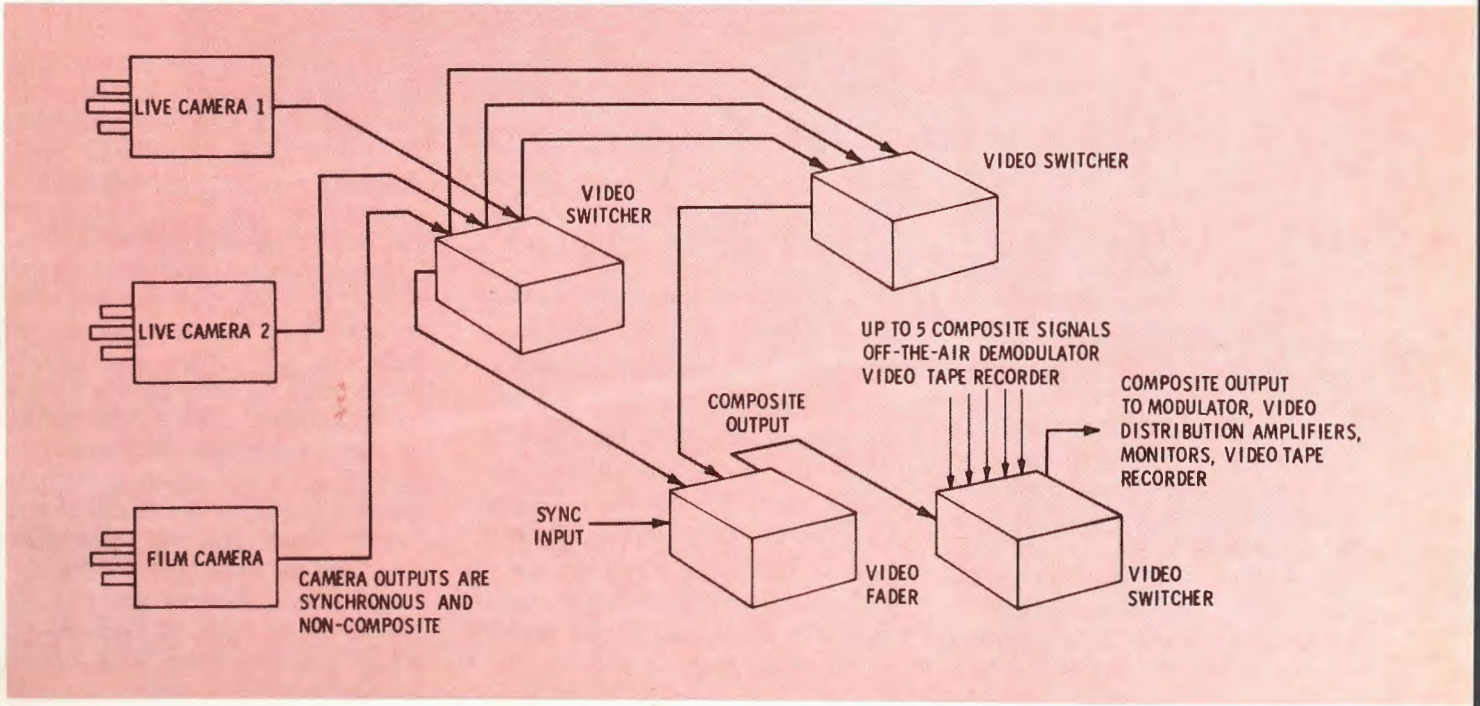
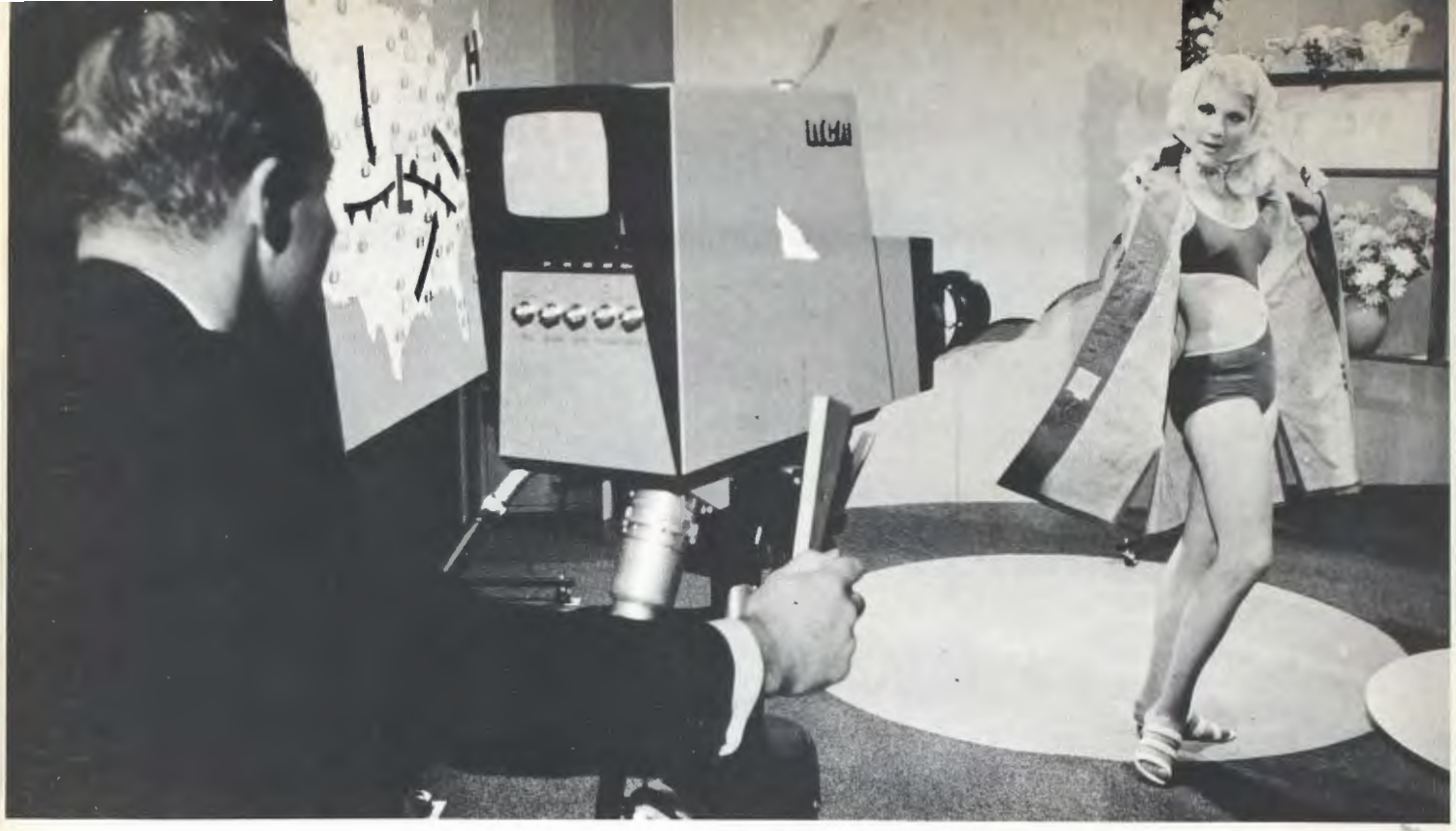



**Fig. 14** Eight-input switching-fading system.



Even in a small studio setup, more than one backdrop can be used daily. Convention booth arrangements are good examples of maximum use of small studio space. In this one, note the simple central background and the weather map at the left.

# Visuals for CATV

By Leo G. Sands

Extensive use of visuals—graphic art, photographs, slides and other still illustrations—can make programs much more interesting to the viewer. Show card paint, charcoal, India ink, felt-tip pens, vinyl tape and/or press-on type and symbols can be used to prepare graphs, charts and other graphic art in black or gray on off-white (non-shiny) art board for monochrome transmission. Pure white and pure black cannot be transmitted successfully when covering large areas. Instead, various shades of gray from off-white to near-black should be used. Acetate overlays (transparent or opaque) and pasted-on cut-outs can be used for special effects.

For viewing on a close-up stand, 8″ x 11″ cards can be used. The art should be prepared to conform with the TV screen and camera aspect ratio (4 units by 3). With a tripod-mounted camera, 11″ x 14″ or larger cards can be viewed and flipped easily by inserting them in the correct sequence in a ring binder. Each can be allowed to drop into the camera's view on cue. Large cards, of course, can be placed on an easel or they can be placed one at a time on a flannel board.

A flannel board can be made by

---

The author, Leo G. Sands, is president of both Leo G. Sands Associates, Inc., and Telecommunications Training Corp., both headquartered in New York City. Before founding Sands Associates in 1954, he held executive and engineering posts with Bendix, Philco-Ford, RCA and Curtiss-Wright. In addition to electronics engineering, he has had show business experience as a motion picture projectionist, lighting director and producer of stage shows. He is the author of 45 books, more than 1000 magazine articles. He has been a senior member of the IEEE for 20 years, and is executive secretary and a Fellow of The Radio Club of America, and a member of the Society of Broadcast Engineers.

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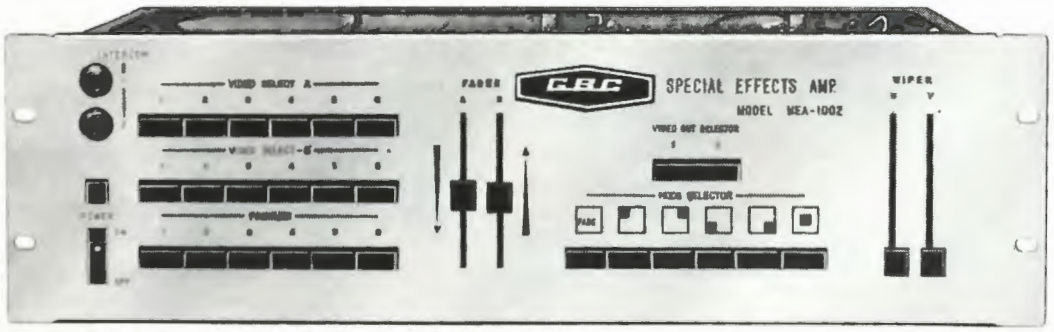


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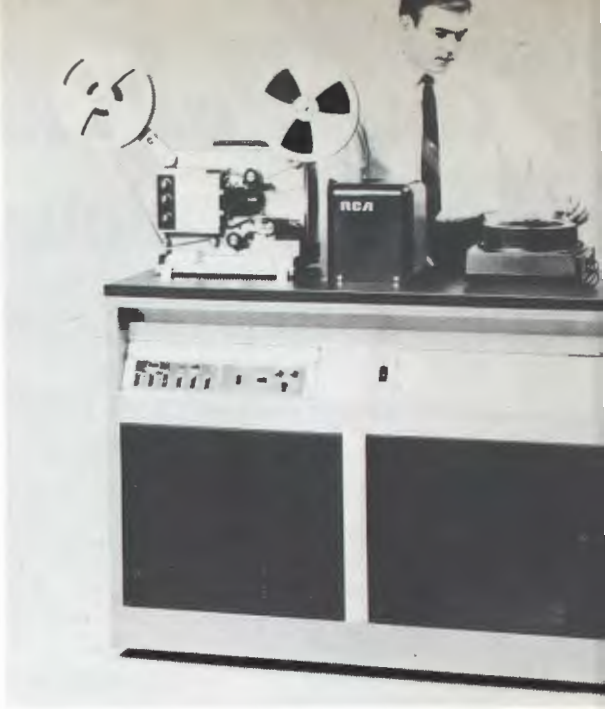


Setup for viewing films and slides.

applying flannel cloth to a sheet of plywood attached to a wall or supported by a stand. Rubber cement can be used to apply the unsanded side of a sheet of sandpaper to the back of each card. The sanded side will cling to the flannel board. Or, a small Alnico magnet can be affixed to the back of each card so it will adhere to a sheet of steel covered with a thin coat of paint or contact wall paper.

The size of the cards depends upon the camera technique. If a Teleopticon or Balopticon machine is to be installed, 4″ x 5″ cards or photostats of art reduced to that size from art originally prepared on larger cards can be used. If a Minicaster is used, 3″ x 5″ cards must be used. This machine is furnished with a vidicon camera in place.

Uniform lighting should be applied to vertically-mounted cards and the camera should be aimed head-on at the object in order to avoid geometric distortion. When using a blackboard, white chalk should be applied as heavily as practical to obtain adequate contrast. Off-white or gray pressure-sensitive tape or showcard paint, can be used and easily removed. Chalk can be used for material that is to be added or erased during the program.

To view photographs, it is preferable to use a close-up stand. Photo prints should be 8″ x 10″ or larger, although 4″ x 5″ prints are acceptable when a Balopticon or similar machine is used. To prevent curling, photographs should be mounted on cardboard using rubber cement or mounting tissue. When there is a choice, matte finish photographs should be used instead of glossy prints which have a highly reflective surface.

When using a tripod-mounted or suspended camera, matte finish 16″ x 20″ or larger photo prints are easier to televise. Enlargements up to 30″ x 40″ can be made from a 4″ x 5″ or larger negative or an 8″ x 10″ glossy print, by any of several photo-finishing firms in New York City, and other large cities, at a cost of about $5 each plus $1.50 for a copy negative, if the original negative is not available.

### *Lettering*

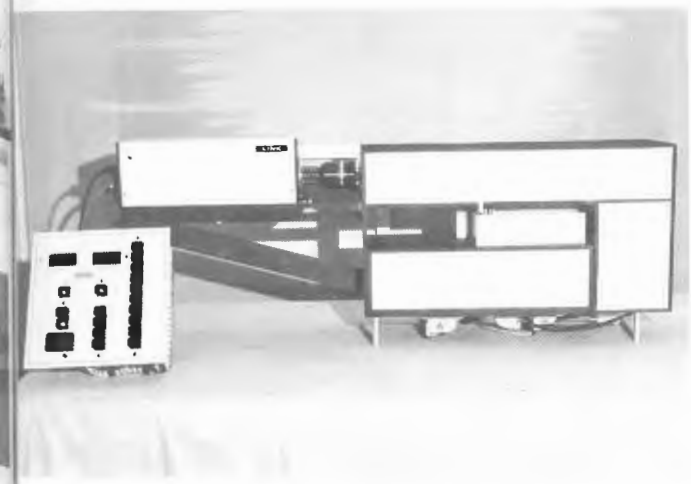
In the television broadcasting industry, all lettering and printed captions are referred to as titles. An ordinary typewriter can be used for preparing titles on clay coated or other smooth surfaced paper using a silk, nylon or carbon-paper ribbon. The typewritten copy can be enlarged photographically for viewing on a close-up stand. Balopticon or with a tripod-mounted or suspended camera. A typewriter with extra large letters, such as used for making convention badges can be used for preparing titles which do not have to be enlarged. For example, an Orator element can be installed in an IBM Selectric typewriter to produce titles which do not have to be enlarged.

For better quality titles, a local printer or typographer can set type and furnish reproduction proofs on non-coated paper. Type size should be 14-point or larger. (The text you are reading is 10-point type.) If the proofs are saved, words and letters can be re-used when making new paste-ups. When cost is an important factor, press-on type (art type) can be used, which is available in sheets and is transferred to paper by rubbing on the back of the selected character.

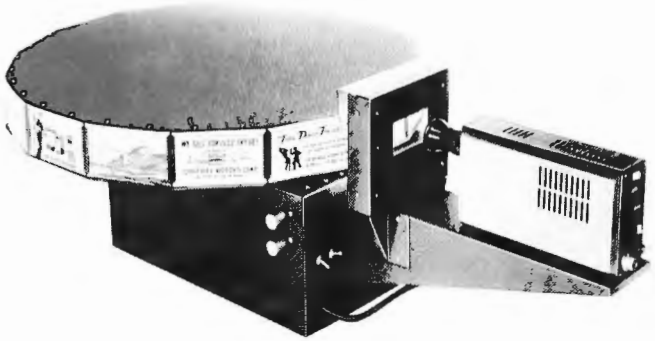
Titles can be prepared most quickly and at lowest cost by using home movie title boards and stick-on letters, which are available at camera stores. Since these title boards are small, they can be most effectively viewed on a close-up stand. By having several title boards available, new titles can be made up while one is being shown.

### *Using Slides*

When specially-taken photographic slides are not required, stock 35-mm slides which are available from camera stores, can be used to illustrate newscasts, lectures,



EDS random access slide projector with digital control.



Programmed viewer for 3 x 5 opaques, including camera.

etc., and for effects. Although they are in color, they will usually reproduce well in monochrome on a television screen.

To make your own slides, you can use a high quality 35-millimeter still camera and reversible black and white film. The exposed film can be sent to a professional photo processing laboratory for development into positive transparencies mounted in glass. Of course, color film such as Kodachrome, Ektachrome, etc., can be used. Slides mounted in glass will be better preserved and can be easily cleaned without damaging the film's emulsion.

In addition to photographing views and live scenes, pictures of graphic materials can be taken for televising through a slide projector. Slides can be stored more easily than original graphic material. To photograph small, flat graphic materials, a copying stand should be used to hold the camera securely above the subject.

Slides can be stored in metal or plastic slide files. Each slide should be numbered and a slide index should be prepared to make it easy to select slides for future use.

To eliminate the need for a slide projector operator, a magazine loading type projector, which can be programmed or operated by remote control, can be used. The slides can be loaded into the magazine in the correct sequence well in advance of the time the program is televised.

An automated program can be produced by using a remotely-controlled projector and an audio tape recorder. The narration is recorded on tape and, by means of a push button, a tone pulse can also be recorded on the tape as a cue to change slides. When the tape is played back, the tone pulse actuates the slide projector. But, the tone pulse is prevented from being transmitted by a band-stop filter which passes voice and music, but blocks passage of the tone.

In lieu of 35-mm slides, 2″ x 2″ color or black and white slides can be shown using a projector capable of handling slides of this size. If a lantern slide projector for showing 3½″ x 4″ lantern slides is available, it can be used in the same manner as a 35-mm slide projector but must be operated manually. You can make your own lantern slides for use as titles and illustrations. Use a 3¼″ x 4¼″ or 4″ x 5″ view camera or press camera. If you use 4″ x 5″ reversible film, crop the positive transparency to fit within the 3½″ x 4″ area and mount it between two glass plates to form a slide. If you use conventional film, send the negatives to a professional photo processing laboratory and have the positive images impressed directly on the glass, cropped or reduced photographically to fit.

Both 16-mm and 35-mm film strips can be viewed through a film strip projector. As in the case of slides, a remotely-controlled film strip projector can be controlled by tone pulses recorded on audio tape.

### *Film Camera Chain*

One of the important components of a CATV local program origination system is a 16-mm (millimeter) film camera chain which is used for viewing films originally produced on 16-mm film, kinescope recordings of TV programs and 16-mm prints of motion pictures originally photographed on 35-mm film. There are thousands of educational and documentary 16-mm films available on a loan or rental basis.

Motion picture film clips and taped sequences, used to illustrate lessons, are known as inserts and can be used when an appropriate film projector or videotape player is available. They are used extensively in TV broadcasting and can be easily utilized in CATV locally-originated programming.

For future use, a library of film clips can be built up by a photo processing laboratory. You can produce your film clips and even complete filmed programs. A high-grade 16-mm movie camera and black and white or color film can be used.

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"Our folks like the way the picture looks and the way the camera handles...We get requests to go on location...agencies from out of town come to us...We are doing a lot of this work."
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"We have been impressed with the construction, the dependability and the quality of pictures...The pictures are great and the lack of noise in the black is beyond belief."
—Vincent E. Clayton, Director of Engineering
Bonneville International Corporation
KSL-TV, Salt Lake City, Utah

"They have been used with as little as 25 foot candles of light...and give us noise free color pictures...We have worked with all other makes and models of cameras, but none compare to the TK-44A."
—Larry R. Eskridge, Chief Engineer
WTOG-TV, St. Petersburg, Florida

Thank you, gentlemen.

RCA

Three-way optical multiplexer.

For most purposes, synchronized sound is not required and a "silent" movie camera can be used. However, motion pictures with synchronized sound can be used, but a fairly expensive sound camera is required.

The 8-mm movie camera is extremely popular for taking amateur movies, but is not yet widely used on TV because of its past limitations. However, a new technique has recently been developed, using low-cost 8-mm film, which provides a larger picture and an improved magnetic sound track. This makes it possible to produce your own sound movies and film clips, at low cost for showing on CATV.

Inserts, including animated titles, as well as complete programs can be recorded on videotape in the studio. If a portable videotape recorder is available, it can be taken, along with a viewfinder camera to record events in areas away from the studio.

Drapes, photomurals, cycloramas, wall paper, curtains, backdrops, or flats can be used as backgrounds in a studio which the existing wall is not suitable for the occasion. The size of the background depends upon its distance from the camera and the lens. Photomurals can be prepared by firms that produce large photographic blow-ups. To prepare a wallpaper background, fasten plywood or wall board sheets to a frame to provide a flat surface for the wallpaper. To prepare a flat, stretch cloth over a wooden frame and paint it to depict a scene or design. A theater flat is usually 5'9" wide and 10' or 12' tall, but for CATV purposes, a flat can be any convenient size, The desired width is obtained by joining two or more flats with hinges which also permits storing flats in a minimum of space.

A drape is non-movable cloth that covers a wall or an object, whereas a curtain is movable. Drapery material or a curtain can be attached to an overhead traverse rod to form a traveler. To form a backdrop, a scene can be painted on the curtain.

When the existing background is a wall, drape or traveler, without a pattern, a slide or opaque projector can be used to project an illuminated pattern on the background surface. The projected background may be a photograph or a pattern. For example, a venetian blind pattern will produce the effect of sunshining through a window and casting shadows. Slides bearing various patterns can be purchased or readily made.

A method of providing background pictures without the necessity of the added space required for rear projection is a system that utilizes a highly reflective screen behind the performer. By projecting a 35-mm slide onto this screen the image is reflected back to the camera. Because of the high light level reflected the portions of the image which appear on the performer are not seen by the camera because the person does not reflect as much as the screen and therefore the camera is set to the brightest light which is the screen image. The only equipment needed for this is the camera, a 35-mm projector and the reflective screen.

Lack of showmanship in presentation can be blamed for less-than-expected interest in locally-originated programs. As the late Thomas Jaski stated in his guest editorial in the August 1965 issue of **Radio-Electronics,** "It takes the little factors in interpersonal interchange, humor, picturesque use of language, amusing and colorful illustrations and a bit of whimsy to make programs digestible to human minds."

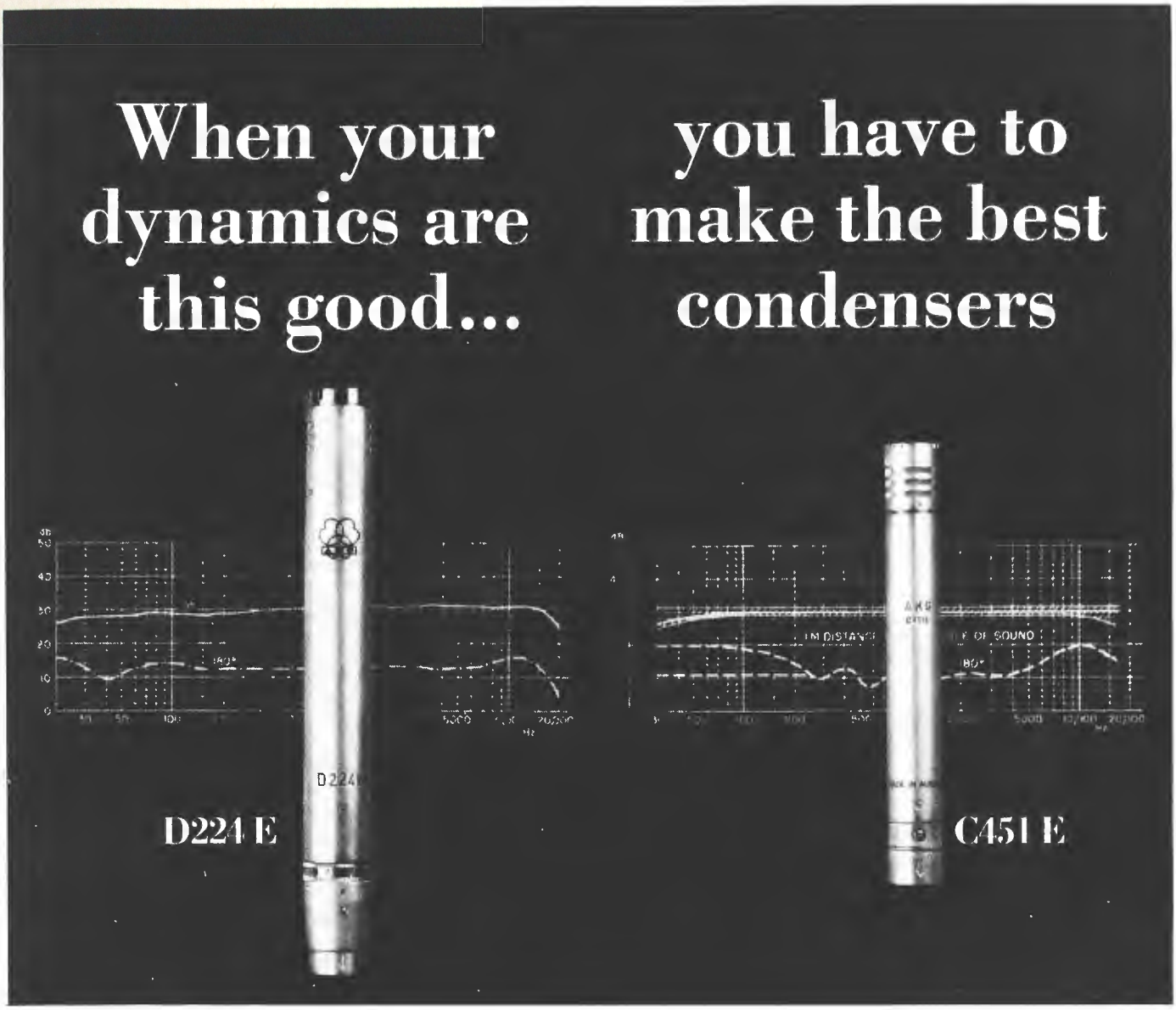
What the audience sees on the television screen must have pleasing esthetic qualities which induce the viewers to like what they see. Composition is determined by the cameraman who must compose the picture quickly upon the instruction of the director or as stipulated in the script.

For good composition, the viewer's attention should be attracted only to the essential element, action or interaction. The scene should be uncluttered. When elements other than the intended center of attraction must be in the scene and viewed at a distance, they should be arranged so they will not attract attention away from the principal elements when viewed close up. For example, a pointer should be viewed at such an angle that it will draw the eye to the object at which it is pointing.

When more than one camera is employed, each should be positioned and set for a different view so switching from one camera to another can be made without delay. For example, while viewing a moderator with one camera, have the other one focused and positioned for a shot of a guest. Switch from one camera to the other immediately (cut) or gradually dissolve (fade out, fade in), depending upon the effect desired. Use either transition technique for changing from a camera viewing a live scene to one on a close-up stand or viewing a slide, film or title card, or to videotape recorder or film chain.

When only one camera is used, and it is necessary to pan or tilt to switch from a live scene to graphic art, it should be done slowly to avoid streaking and interference with the train of thoughts. ▲

# When your dynamics are this good... you have to make the best condensers




With the invention of two-way microphones **AKG** improved the quality of cardioid dynamic microphones drastically in many areas: *Flat frequency response* over the entire audible range. *Linear off-axis response:* 90° off-axis is reproduced as natural as 0° on-axis response. *Uniform front-to-back discrimination* of 20 db, even in the critical low frequency response and upper mid-range area. And in addition: *No proximity effect.*

In fact, the two-way microphones are out-performing some condenser microphones.

The next **AKG** step was the development of a new condenser microphone capsule. It consists of a gold-vapored *ceramic* electrode and a permanently mounted *metallic* alloy diaphragm. Both materials have the same expansion coefficient, thereby increasing the *longevity* of the capsule. In addition it is impervious to a wide range of temperature and humidity fluctuations, and it is free of deterioration and hysteresis.

The preamplifier of the C-451E requires 7.5v operating voltage, which is supplied via phantom circuit. It permits central feeding via a two-conductor plus shield cable and *eliminates* the use of *power supplies.*

Of course, we also have AC and DC power supplies to operate the C-451E. Most important of all, it permits *interchanging of pick-up capsules* to CK-2 omni-directional, CK-6 variable pattern, and CK-9 shot gun (interference tube) attachment.

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approximately doubled when voltage is cut 4 percent and halved when voltage is raised 4 percent.

The color temperature of lamps differs among types of lamps. Some lamps are designed specifically to meet the requirements of TV and photographic studios, motion picture studios for color or black and white film, and amateur photographic use.

Quartz lamps are highly recommended, because they are more efficient than incandescent lamps, smaller, and their color temperature does not change with intensity. By installing quartz lamps initially, transition from monochrome to color will not require changing over to quartz lights.

Key lighting is shown in use while shooting a live scene.


Dark background with fill lighting provides appropriate contrast and emphasis on talent.

Before taping or transmitting a live program, use a light meter to measure the illumination reflected from the face of the performer or point of interest.

### Point Of Interest

When overhead incandescent or fluorescent lighting in a studio is adequate (100 foot candles or more) for illumination of the total scene, "key" lighting can be added by an overhead spot light aimed at the performer or other point of interest. The spot light should be suspended so that, when aimed at the subject, it will be pointed at a 20° to 40° vertical angle with respect to an imaginary horizontal line at the subject's eye level or point of interest.

When excessive contrast results, "fill" lighting can be provided by a Sun Gun or by scoops, mounted lower than the key lights so that they will be pointed downward at approximately a 15° angle with respect to an imaginary horizontal line at the subject's eye level.

When ambient lighting is inadequate, "back" lighting from spot lights suspended high enough behind the subject to allow the lamps to be pointed at a 45° vertical angle, when aimed at the head and shoulders of the subject, can be used.

To produce shadows to heighten interest, "modeling" light can be directed at the subject from the side, but in front of the subject, generally at a lower level than the fill light. To brighten the subject's eye and to provide additional illumination for close-ups, a small spot light, mounted on the camera, aimed at the subject, can be used.

When the background is important, it can be illuminated independently with "set" lights from the sides or overhead. When using a projected pattern as a background, it should not be much brighter than the fill light.

### Illumination

Using a light meter, the lighting

# Measure Vital Characteristics of Broadcasting Systems*

## VIDEO NOISE

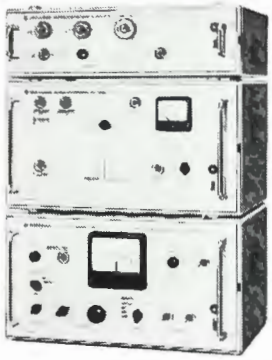
### UPSF VIDEO NOISE METER

Designed for noise voltage measurements on TV cameras, film scanners, video tape recorders, radio links, coaxial lines, TV transmitters, receivers and transposer, with synch. Signals.

- 40 Hz to 10 MHz
- 7 Measurement Ranges: 1/3/10/30/100/300/1000 mVpp
- True RMS or Peak-to-Peak Indications

## GROUP DELAY

### LFM TEST ASSEMBLY

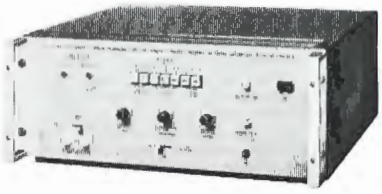


Determine group (envelope) delay of video and TV transmission systems.

- 0.1 - 10 MHz and 25-250 MHz (ext. to 1 GHz)
- ±10 to ±1000 nsec.
- Using Type SWOF sweep system group delay is instantaneously displayed on CRT.

## PHASE & GAIN

### PVF PHASE & GAIN METER



Simultaneously measure differential phase & gain; sensitivity here-to-fore unavailable; measures direct or via transmission link; self calibrating.

- Measure: △ Phase: 0.1° — 60°
  △ Gain: 0.5% — 50%
- Calibrating Signals: 1°, 10°, 1%, 10% f.s.d.
- Switch permits simultaneous display of △ Phase-Gain
- Takes Low Frequency Oscilloscope (250 KHz) as readout device
- AFC provides 500 Hz locking range to ext. color subcarrier

## VESTIGIAL SIDEBAND ANALYSIS

**In the presence of synch. signals**

### SWEEP GENERATOR/RECEIVER

**SWOF VIDEOSKOP** A video sweep generator tracking selective (3 kHz) receiver, and display unit. Range: Frequency, 20 kHz to 20 MHz, (1 GHz with sideband adapter); Sweep Width: 1 to 16 MHz, continuously variable; sweep duration 50 ms to 5.5 s.

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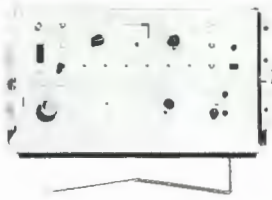
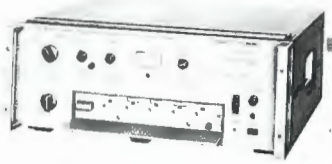


**SBTF VESTIGIAL SIDEBAND SIGNAL GENERATOR** Modulation of vision and sound signals is accomplished in the IF, thereby permitting use of plug-in heads for VHF & UHF. SBTF generates exceptionally high quality NTS signal for development and production testing of receivers, and as low power Xmitter.

### TV-DEMODULATOR



**AMF TV DEMODULATOR** A Nyquist demodulator as a ref. standard for TV Xmitter performance (B&W, color and sound). Video and audio frequency response, phase and group delay, intercarrier signal-to-noise ratio, etc. Models available for VHF and UHF.

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should be adjusted for a 10:1 to 20:1 contrast ratio. For a 10:1 contrast ratio, the brightest areas will reflect ten times as much light as the darkest areas. Excessive contrast should be avoided. Also, inadequate contrasts should be avoided, so that the televised scene will not be too flat and lacking in detail.

As a general rule, provide 100 foot-candles of lighting on cards, titles and contrasty graphic material, and from 200 to 300 foot-candles on scenes where movement takes place.

Strong illumination permits use of smaller lens openings which means that more of the scene (in terms of depth) will be in focus. This will allow greater front-to-back freedom of movement of performers without requiring refocusing of the camera. On the other hand, with less illumination the lens must operate at a wider opening, resulting in a reduction in the depth-of-field. For some purposes, reduced depth-of-field is used advantageously, when there is little movement, to concentrate attention on a subject in sharp focus with the rest of the scene intentionally blurred. The effect of more light on the performer's face can be achieved by simply reducing the intensity of the back lights.

The use of make-up is not essential. However, because of lighting, skin can look a little shiny on a TV screen, and the use of pancake make-up, available at drug stores, will reduce glare. Pancake make-up can also be used to subdue blemishes that might be accentuated by studio lights. Women should wear lipstick and eye make-up to avoid the chance of having their features washed out. The basic purpose of make-up is to make a performer look presentable.

White and pastel colored clothing should be avoided. White is especially objectionable because it has a tendency to "glare" on the TV screen. Men should wear light blue or gray shirts and women should wear dark-colored dresses. When a man wears a dark jacket over a white shirt, or a woman wears a white blouse and a dark skirt, a blurred line may appear where the dark and light fabrics meet. Because of the brightness of the lights, bright buttons and shiny jewelry should be avoided since they may cause reflections and distractions. Buttons and other shiny objects can be covered with liquid soap to reduce reflections.

Since studio lights can consume considerable electric power, an adequate electric service and numerous outlets should be provided. Also, since studio lights can generate considerable heat, it will be necessary to provide enough ventilation to carry away the heat or to air condition the studio.

Obviously, means should be provided for remote switching and dimming of studio lights. ▲


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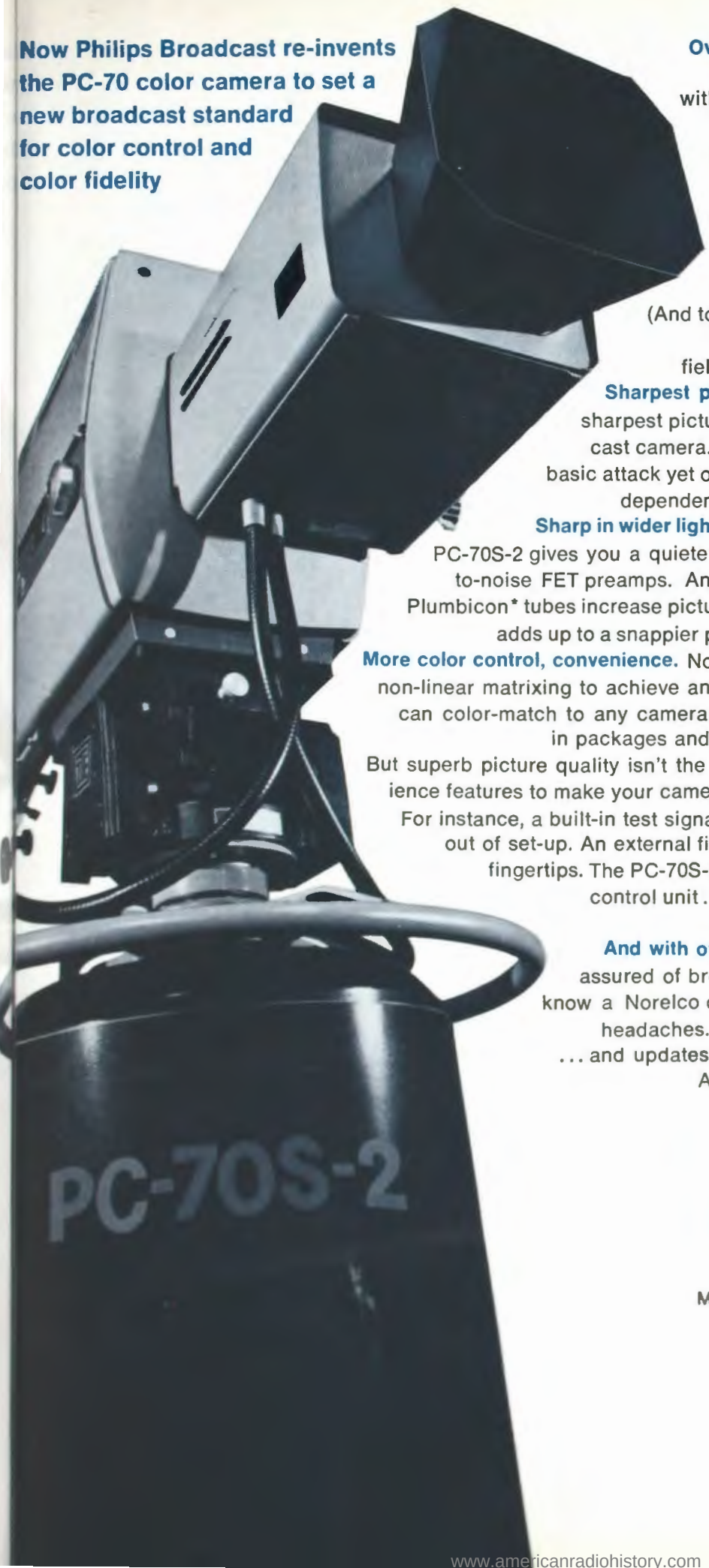


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# ORIGINATION SYSTEMS
## *for three budget ranges*

By Robert F. Burns

The author, Robert F. Burns, is vice president of Leo G. Sands Associates, Inc., a telecommunications systems engineering and market research firm, headquartered in New York City. He previously was president of Artic Communications and an engineering executive at Link Radio Corp., Budelman Electronics Corp., and Cardion Communications Corp. At Sands Associates he is responsible for the planning and design of facilties for CATV local program origination, cable television transmission and distribution systems, conversion of cable systems for bidirectional transmission, CCTV systems for hospitals and other large institutions, and microwave and mobile radio systems. His staff includes specialists in TV studio lighting and program production.

For less than $2000, a CATV operator can purchase the equipment required for minimal local program origination capabilities. One vidicon camera with both RF and video outputs, a conventional TV receiver for use as a monitor, a TV modulator and a photoflood lamp are all that would be required.

However, CATV originated programs must compete for viewers with network programs, particularly in regard to picture quality and so they must be almost as good as, or better than the network shows. Furthermore, they must sustain viewer interest. Local news and weather are community services that usually draw a large number of viewers.

One of the foremost TV studio facility experts, Jack R. Poppele, president of Tele-Measurements, Incorporated, advises CATV operators to buy the best available program origination equipment. He points out that on a long-term basis, good equipment costs less than the manpower required to operate and maintain cheap equipment. If the initial cost of equipment cost is only $70 per week, or $0.64 per hour if used 16 hours per day, 7 days a week, its cost could quickly be recovered by modest effort applied to selling commercial time.

### *Low Budget Systems*

A one-man television studio, which was designed for classroom and industrial training, can also be used for CATV local program origination. Using the new audio-visual equipment, one person can combine a live presentation with videotaped materials, films, slides, photographs, charts, and other graphic materials. The resulting program can be transmitted "live" or recorded on videotape for later use.

This unit, for example, combines two television cameras and standard audio-visual aids with up front controls. With a brief period practice, one person can operate the system proficiently and can concentrate on the program rather than operation of the equipment.

A companion audio-visual recorder, capable of recording video and as many as five different audio tracks, is also available for storing programs for later playback. In addition to feeding its output into a CATV system, the studio can be adapted to microwave transmission of programs to a distant head end.

Two caster-mounted cabinets and a tripod-mounted television camera comprise the system. It can accommodate 8-mm or 16-mm motion picture film, filmstrips, slides, overhead projection transparencies and audio or videotape. A fixed camera with a zoom lens is used for opaque materials such as writings, drawings, photographs, maps, and solid objects such as shells, specimens, and books. The tripod-mounted

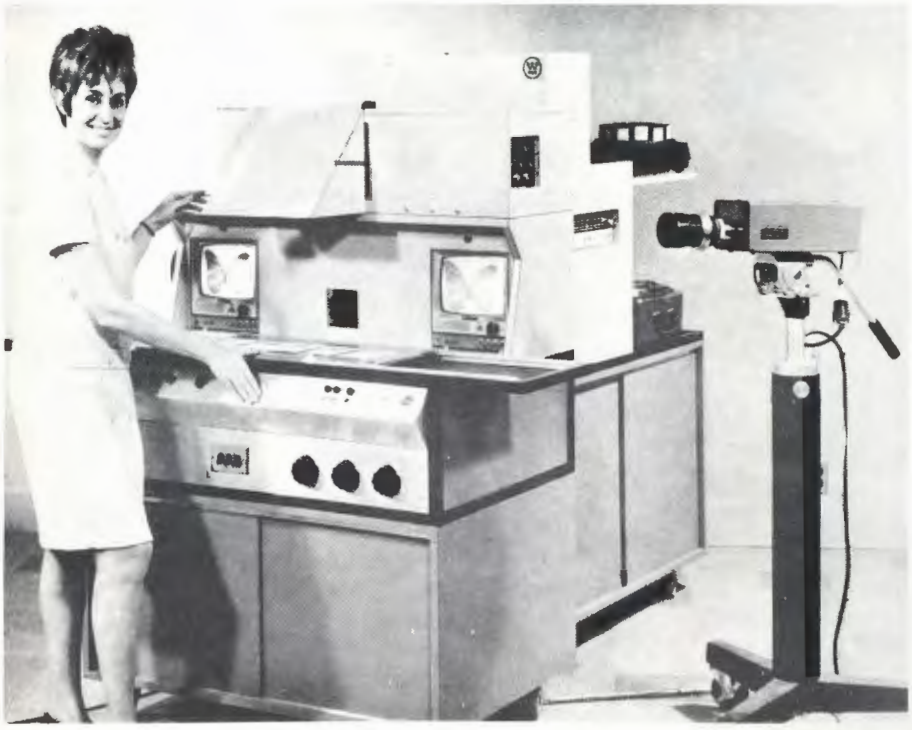

**Fig. 1** Single operator studio set-up including a camera for live scenes and a means for viewing opaques and slides. A videotape recorder can be added.

# Sony professional at work.

You're looking at Sony's new ECM-50 Tie-Tac/Lapel Electret Condenser Microphone. It's one of the new line of Sony Professionals—products specifically designed for special applications.

For example, TV announcers long burdened by the cumbersome lavalier version of the standard dynamic microphone, will welcome the miniaturized Sony ECM-50 Tie-Tac/Lapel condenser microphone. Employing the electret principle, it is so small it literally cannot be seen on camera. Yet its condenser performance with tailored frequency response and high sensitivity is vastly superior to any dynamic lavalier microphone.

The Sony ECM-50 is an excellent example of the new line of Sony/Superscope special application products that have a unique ability to solve difficult problems in modern communications.

The ECM-50 is available at select Sony/Superscope dealers. For their names, as well as complete details and specifications, please write Special Application Products Division, Sony/Superscope, 8150 Vineland Ave., Sun Valley, CA 91352.

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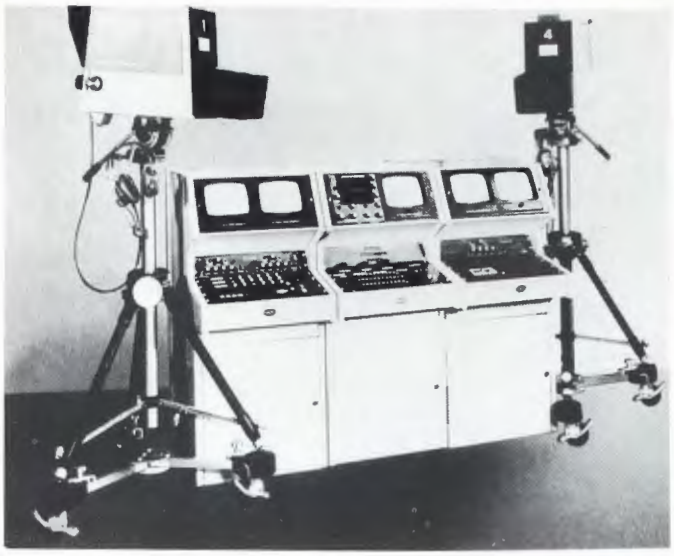


**Fig. 2** Packaged system with the console as the key unit. Emphasis is on live originations in the studio.

**Fig. 3** This basic system includes a camera, videotape recorder, and monitor. Many major manufacturers are now offering origination packages to fit the needs of the low, medium and large budget system.

camera, also with zoom lens, is used for live pickup. The system operates effectively with normal room lighting and occupies less than 15 square feet of floor space.

Another one-man system package consists of a console providing complete control of two studio camera chains, a film chain camera, and a videotape recorder. The console contains all necessary equipment for professional programming, including: switcher/fader, special effects generator, wave form monitor, film projector control, and a seven input audio mixer. Five transistorized displays monitor the output of two cameras, film camera, preview bus, and the program line.

Local news and weather are community services that usually draw a large number of viewers. One of the greatest attractions is the live telecasting of local sports events. This can be accomplished with a minimum of equipment (monochrome) in small cities or as in the case of New York City with complete color coverage of the sports events in Madison Square Garden. A minimum unattended set-up for local origination of weather reports could be on an FM audio channel. This can be tied in with a VHF monitor receiver for the local ESSA weather broadcast. To this can be added a vidicon camera and a small instrument package showing wind speed and direction, time and temperature. A more elaborate display would utilize a weather radar in combination with the instruments on a split screen or through the use of a sequencer.

### *Medium Budget Systems*

For local news an audio tape recorder-player and modulator can be added. A microphone should also be available for "live" bulletins. A simple way of providing local news and weather plus other items of local interest for slightly more than $1000 is to use a rotary card holder that is programmed to keep each card in position in front of the camera for 15 seconds. To add live news coverage, a 16-mm movie projector and camera can be utilized as well as a 35-mm slide projector for still pictures. A sync generator should be used when two or more

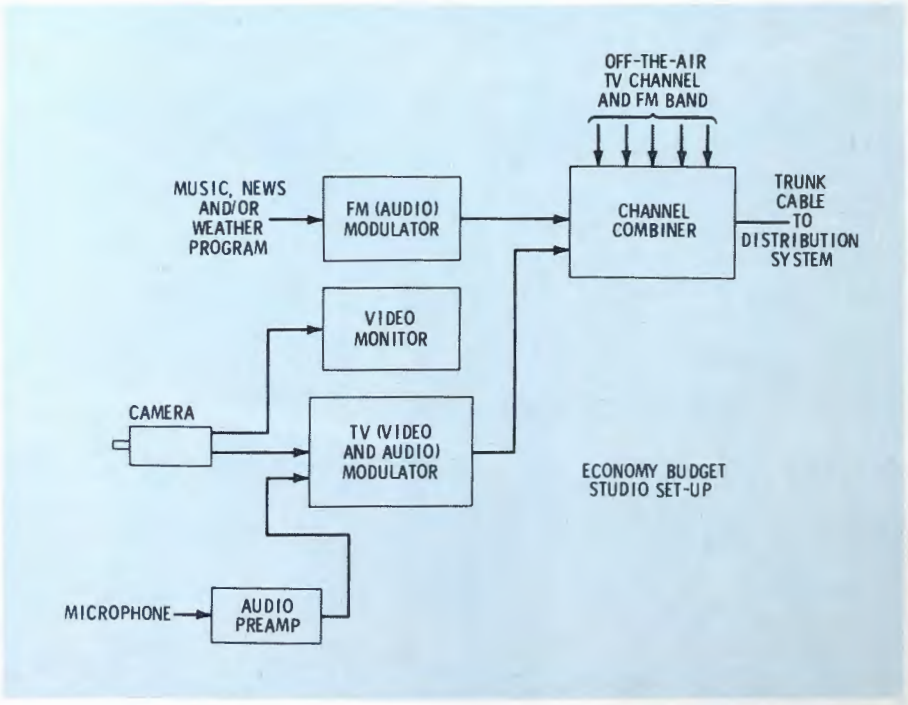



**Fig. 4** Economy budget studio set-up.

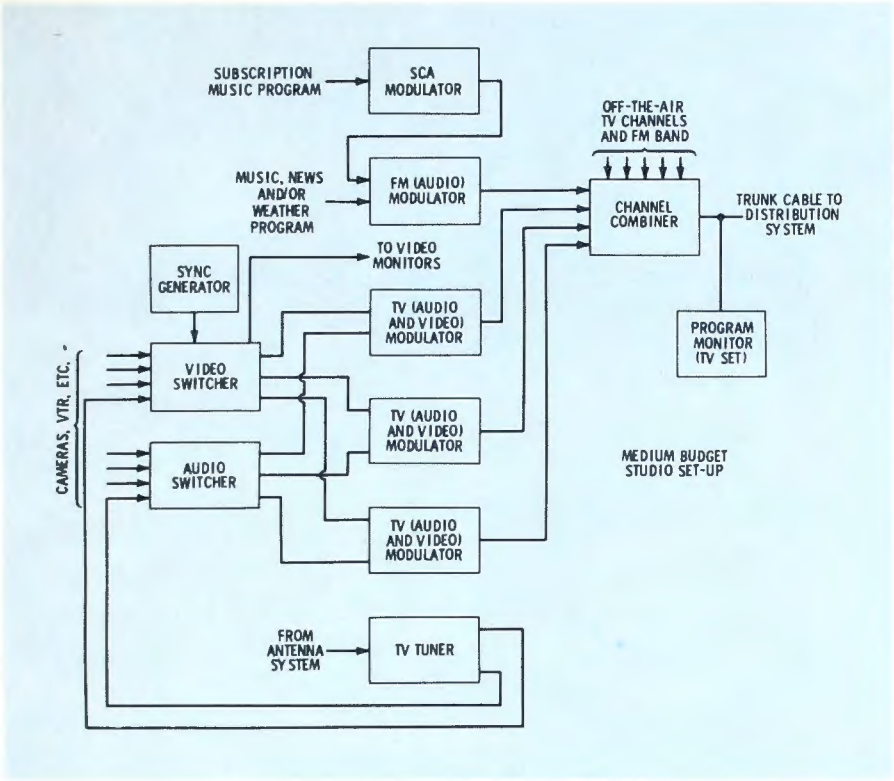



**Fig. 5** Medium budget studio set-up.

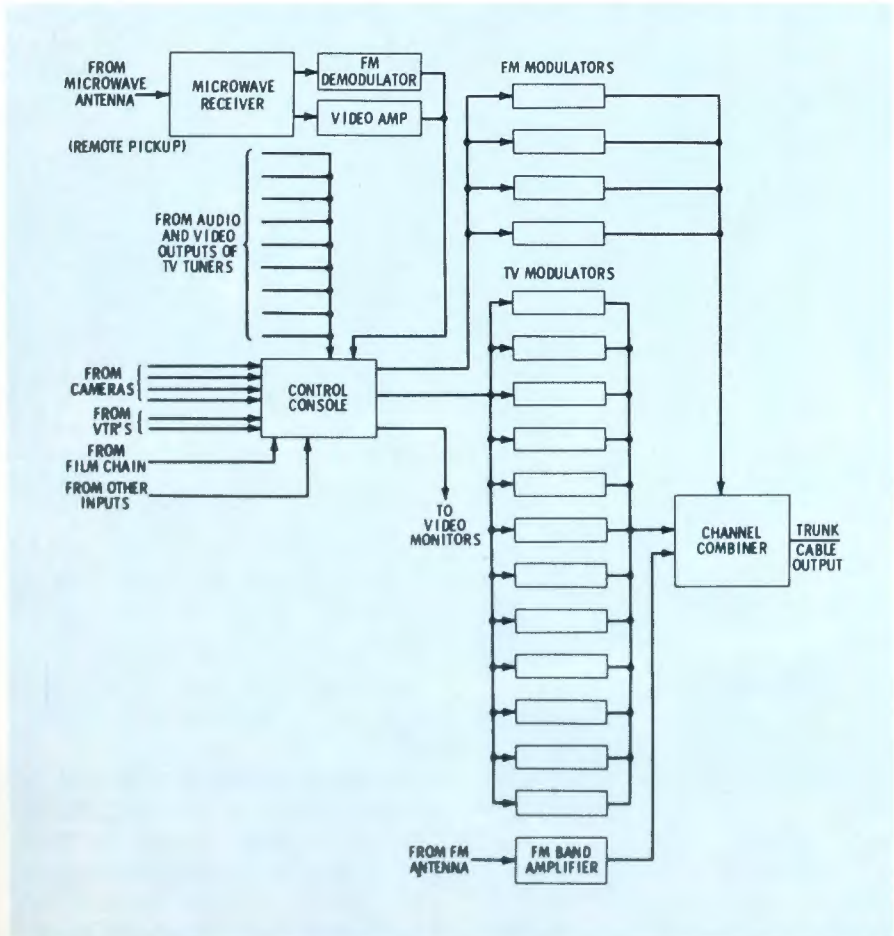



**Fig. 6** High budget system. Control console permits selection of any TV channel for locally originated programs.

cameras are used to prevent picture "roll-over" when switching from one source to another.

If live coverage is desired, a panel truck should be outfitted with a camera and platform, an audio system microwave link, switching panel and portable lighting units. The microwave should have an order wire circuit to enable the remote crew to communicate directly with the studio. If a direct link is not employed, a videotape recorder can be used and the tape quickly returned to the studio for broadcast.

The use of a single studio camera with several different film projectors in a film chain can be accomplished by using an optical multiplexer. This permits smooth transition from one source of programming to another without any unnecessary mechanical switching.

### *Large Budget Systems*

The optimum in local program origination is the full-color operation. At least one of the cable systems now offers full programming in color. This provides film programs of the same color quality as provided by the networks. The film system employs a four-tube color film camera, motion picture and slide projectors and an optical multiplexer. For stock ticker quotations, weather, news headlines and other printed material a system is used to convert the information directly into a TV signal without using a camera.

To give adequate coverage of major sporting events at least four cameras should be used. Two at playing level and two elevated for general coverage. The color coverage is seen on the cable system and can also be sent to the visiting teams home city over Bell System leased circuits. Nearly all cameras have zoom lenses for added versatility. To have a more complete sports facility, a VTR (videotape recorder) for instant replay and "stop-action" could be added.

In planning local origination programming, the educational system should be considered. Most communities request a certain amount of time devoted to lectures and educational material. This requires a minimum amount of added equipment: usually only one or two mono-

**Fig. 7** This system arrangement allows the color camera to be removed from the film chain pedestal. With the addition of a standard zoom lens, it can be used for studio work.

chrome cameras, a sync generator and an audio system. This same set-up can be used to interview people of local interest such as officials or visiting celebrities.

### *Studio Location*

Since the head end is usually at an isolated site and may not be a convenient location for a studio, it might be worth considering establishment of the studio elsewhere. The problem is one of feeding its signals into the cable system. There are the following options:

1. Installation of a studio-to-head end microwave link.
2. Leasing of a video pair and an audio program circuit from the studio to the head end; or running your own video pair and a twisted pair for audio.
3. Running of a separate coaxial cable from the studio to the head end.
4. Running of a coaxial cable from the studio to a coupler on the trunk cable, just ahead of the first feeder cable tap-off point.
5. Conversion of the cable plant from unidirectional operation to bi-directional capability between the studio and the head end.
6. Producing all programs at the studio, recording them on tape, and then playing them back at the head end.

If the sixth option is adopted, all programming can be taped at the studio, including inserts, views of opaques, slides, etc. The tapes can then be delivered to the head end for play-back as scheduled. To provide program continuity, at least two videotape machines should be

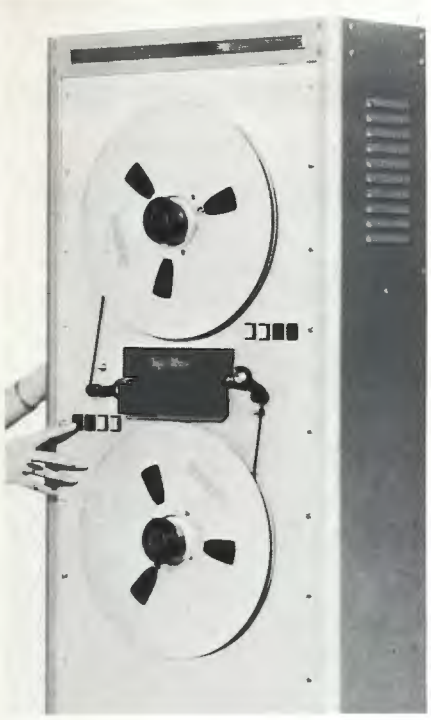


**Fig. 8** Sixteen hours of pre-recorded audio programming can be played on this machine. The 14-inch reels will hold 9600 feet of tape.

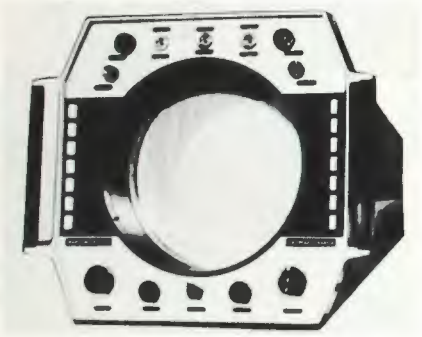


**Fig. 9** Relatively low cost marine radar can be modified for use as a weather radar unit.

installed at the head end. It is even possible to control the videtotape machines remotely through a leased telephone circuit.

### *Audio Facilities*

Audio facilities for live programs and for taping of programs for delayed transmission must, of course, be provided and studio acoustics must be considered. It is essential that the studio be sound-proofed to prevent or at least minimize pickup of outside noises.

**Fig. 10** Local nightclubs are good sources for live remote or taped entertainment programs.

**Fig. 11** Visiting celebrities are good subjects for interview and news programs. Robert Culp is shown here being interviewed by Eddie O'Day of Teleprompter CATV. But ambitious programming will make added demands on equipment and technical personnel.

**Fig. 12** Viewfinder cameras keep the cameraman from shooting blind.

Reverberation and pickup of outside noises can be minimized by carpeting the studio walls, floor and ceiling. Or, the walls and ceiling can be covered with sound absorbent tiles. It might be better not to cover all surfaces with sound absorbent material to avoid an overly-dead room which would result in lack of realistic sound.

A minimum single-camera set-up could use only a single microphone, suspended by a boom, plus a preamplifier to boost the level high enough to drive the audio channel of the TV modulator. (Some vidicon cameras contain an audio preamplifier.) Also essential are means for controlling and monitoring (VU Meter) audio level.

When more than one microphone and other sound sources (record player, audiotape player) are involved, an audio control unit (mixer) is usually provided for blending and controlling the levels of the various sound sources.

For providing musical backgrounds and sound effects from disc recordings, a record turntable and a phonograph pick-up are required. A turntable, operable only at 33 rpm, enables playback of LP (long playing) recordings up to 12 inches in diameter. A multi-speed turntable, operable at 33, 45 and 78 rpm, enables playback of all types of discs. The pick-up should be of the monophonic (not stereo), magnetic type, equipped with a diamond stylus, to provide optimum fidelity and to minimize record wear. For more flexibility, two record players can be provided so that one can be readied while the other is in use.

An audiotape recorder-player is one of the most versatile sound instruments since it can be used for both recording and playback. In the studio, it can be used for playing back pre-recorded tapes and for recording and playing back lectures, narrations and music. Only a professional quality tape recorder should be considered. Either a monophonic or stereophonic (operated in its monophonic mode) tape recorder can be used.

The audiotape recorder can be of the reel-to-reel type or one that utilizes tape cassettes. The advantage of cassettes is compact, easy storage. Furthermore, it is not necessary to actually touch the tape. But editing is more difficult, particularly if it requires cutting out or inserting sections of tape.

For audio-only programs, tape decks are now available which permit recording and playing back up to 16 hours of programming on a single 14 inch reel of tape.

While there are many types of microphones, only a few are used in CATV applications. Omidirectional microphones can be used in studios to pick up sounds from all directions. Cardioid microphones, which are more sensitive to sounds from the front than to sounds from the rear, are excellent for general use. Recently developed snorkel microphones are unidirectional and very sensitive to sounds directly in front of them, making them particularly suitable for picking up distant voices without picking up unwanted sounds.

In the television studio, the microphones can be mounted on floor

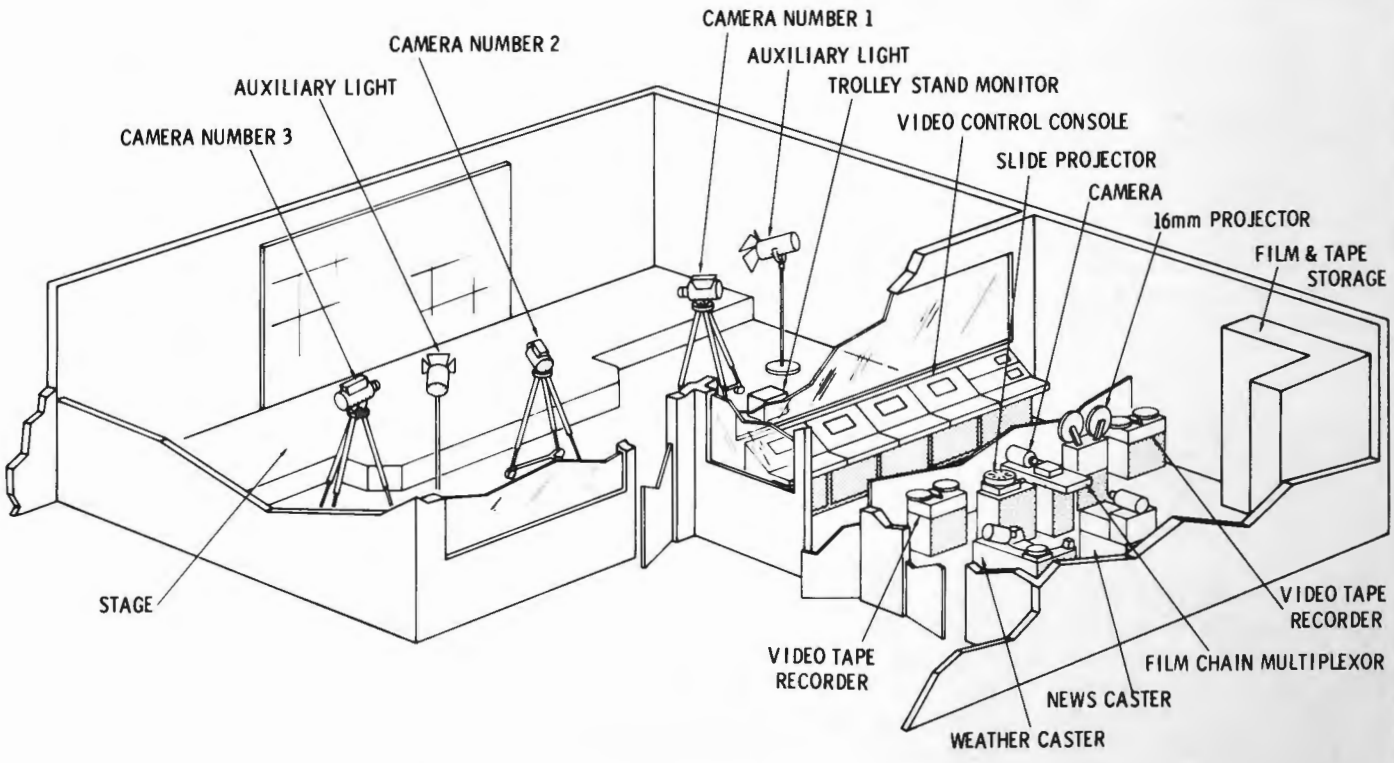
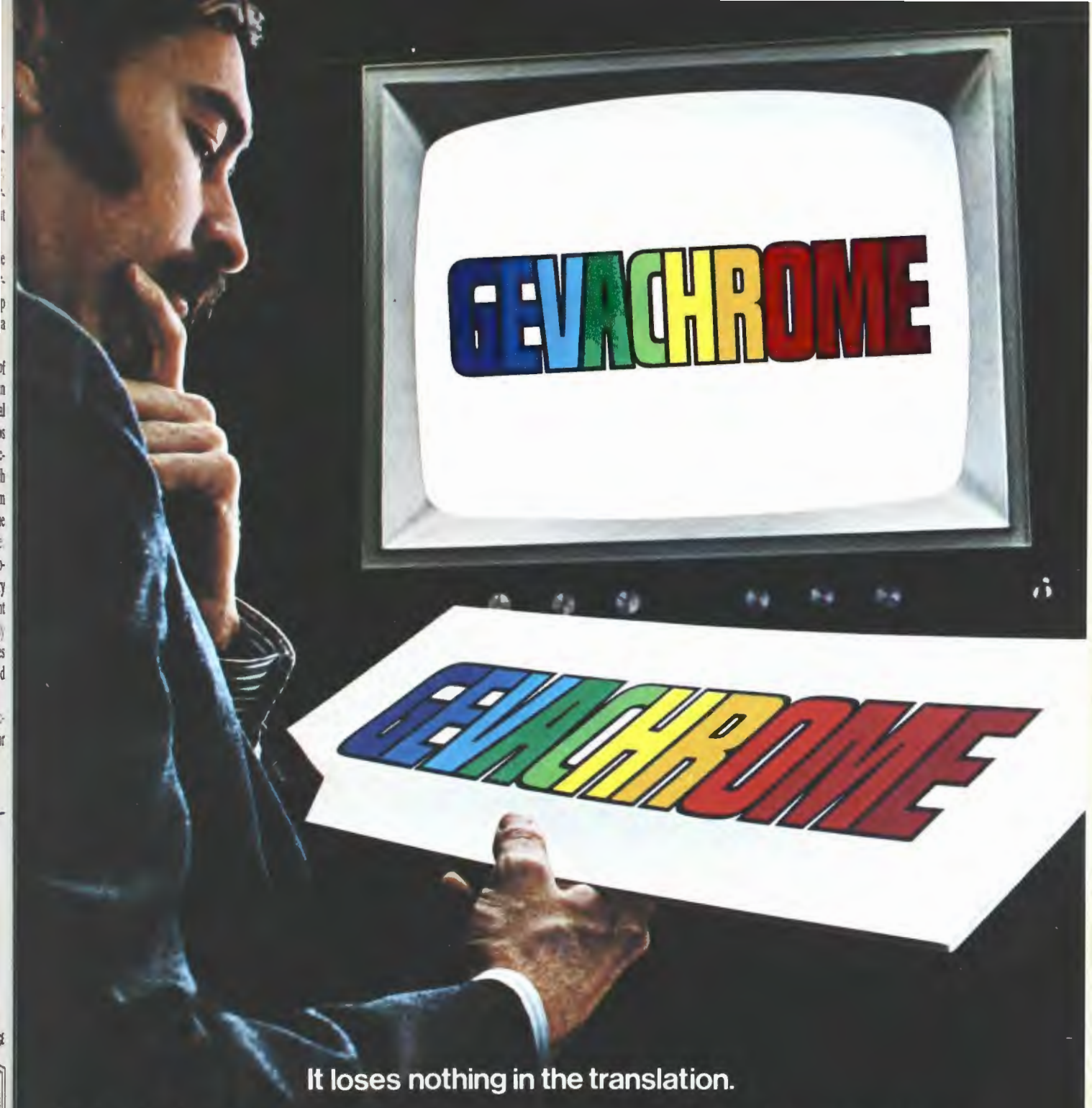



**Fig. 13** Layout of a typical local origination facility.




## It loses nothing in the translation.

Film and television have always talked different languages. The subtle colors you see through the camera viewfinder can often become harsh and contrasty on the TV screen.

That's why Agfa-Gevaert designed two low-contrast reversal films specifically for TV transmission.

Gevachrome T 6.00 combines extremely fine grain with the low contrast required for television. In both interior and exterior scenes its true color rendition retains all the brilliance and sharpness you want, without losing important middle tones in transmission. Its ASA 50 speed can be doubled in the laboratory.

And, when you're shooting in available light, you should be using Gevachrome T 6.05. Its exposure index, too, can be doubled—to an ultra-fast ASA 250—without the graininess you expect from high-speed films. A low contrast film, T 6.05 lets you take in all the action without taking along the extra lights.

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stands or suspended from adjustable overhead booms. For newscasts, a desk-stand microphone can be used by the announcer, but a lavalier microphone, suspended from the announcer's neck, allows freedom of movement and keeps his voice within the desired range of the microphone.

### *Videotape Recorders*

A videotape recorder is an essential part of a program origination set-up since it records still and moving pictures and sound on reels of magnetic tape much as a conventional audio tape recorder records sound alone, and like an audio recorder, it permits instant replay of recorded material. Videotape recorders recorded television pictures from a television camera, from a television receiver or by duplication from another recording. Sound tracks on the video tape permit audio recording from microphones or other audio sources, resulting in sound motion pictures.

In audio tape recording, where frequency response up to 18,000 Hz allows high fidelity recording of music, the tape moves past the recorder's stationary heads. Tape speed of 7½-inches-per-second is the accepted standard speed for high quality performance. Since much higher frequencies are required to record TV pictures, the tape is moved past rotating heads, increasing the frequency response to permit the recording of picture information.

Two kinds of video tape recorders are commonly used today—transverse and helical. In 1956, the rotary recording head and a technique called transverse recording was introduced and still is the standard in the broadcast industry. Two-inch-wide video tape is moved past recording heads at 7½-inches-per-second. Four record/playback heads are mounted on a disc which is rotated rapidly across the tape at virtually a 90 degree angle to the path of the tape, increasing the relative tape-to-head speed to 1,500 inches-per-second and achieving frequencies of more than 5,000,000 Hz per second.

In 1963, a new generation of smaller recorders was introduced, utilizing a helical recording technique. One or two record/playback heads are mounted on a moving drum and record across the moving tape in a diagonal curve known as a helix. In the one-inch-wide format, the tape travels across the moving head at 9.6 inches-per-second to produce a relative tape speed of 1,000 inches-per-second and frequencies of 3.2 MHz.

Minimum equipment needed to produce a video tape program is a camera, a tripod for securing the camera, a microphone for picking up sound, a videotape recorder for recording the signals, a reel of magnetic tape for providing the recording surface, and a television set for first previewing and then monitoring the picture during transmission. A simple professional videotape recording system may be purchased for approximately $2,000.

More complex systems—incorporating electronic editing, color recording and playback, multi-recorder and multi-camera installations—are necessarily more expensive.

In addition to conventional videotape recorders which provide one video and one audio channel, an audio-visual recorder, capable of recording video and as many as five different audio tracks, is now available.

Since the recorder is capable of video recording or playback combined with any or all of five different audio channels, multi-lingual audio can be transmitted simultaneously with the picture. The picture and the English-language audio can be transmitted over a TV channel, and audio in other languages can be transmitted over separate FM channels. Foreign language viewers would watch the picture with a TV receiver and listen to the audio with an FM receiver. ▲

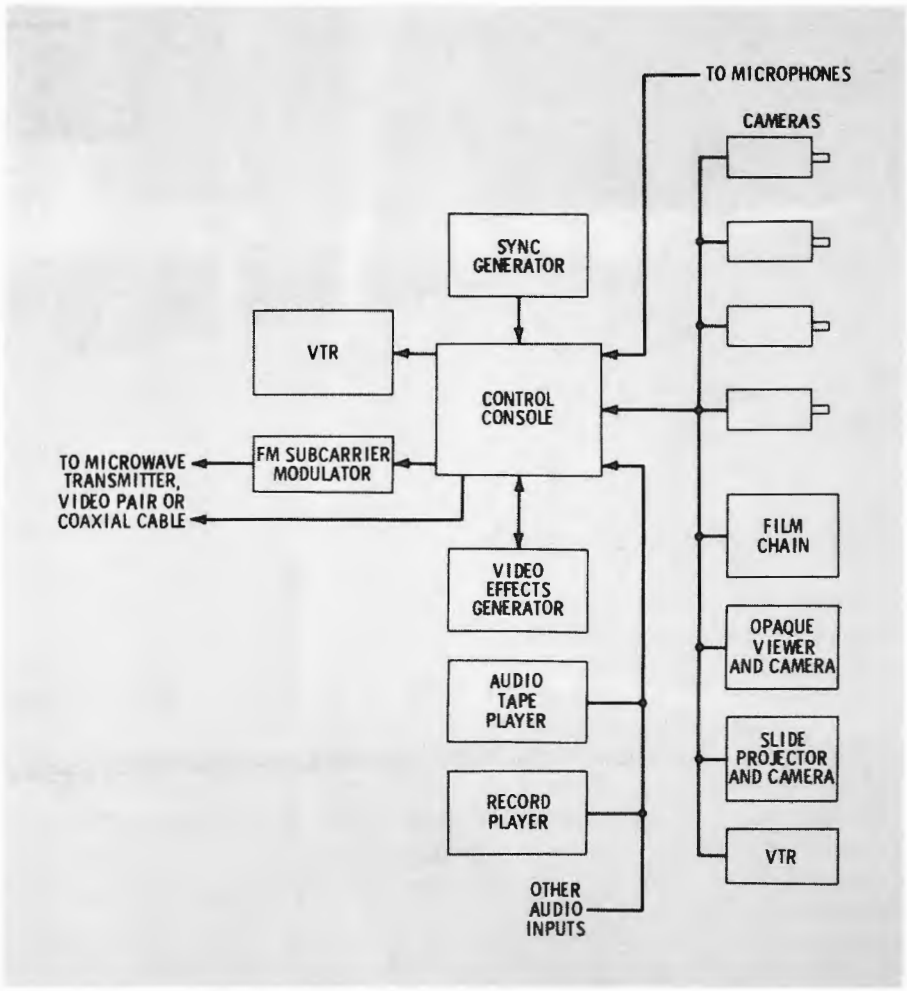



**Fig. 14** Example of facilities for a remote studio.

# CATV Origination Directory

This directory of local program origination equipment was compiled by the staff of Leo G. Sands Associates, Inc. The firm has 16 years of experience in market research and maintains files of data on all types of equipment used in telecommunications, CATV, and broadcasting applications.

No directory can include everyone in the field covered. This is so because some manufacturers and marketers have not adequately made their products known or because they do not answer directory questionnaires. For these reasons, we suggest you check additional type equipment categories in the Broadcast Directory section of this special issue. This will be especially helpful when looking for equipment not directly related to Cable origination components.

During the time that this directory section was being compiled, U.S. Postal Service letter carriers were on strike. Doubtless, some mail never did reach its destination. Suppliers whose listings were not included are urged to send the appropriate information to **Broadcast Engineering** so that they may be included in future directories.

### Cameras
### Program Origination Equipment
Ameco Inc.
Ampex Corp.
Blonder-Tongue Labs Inc.
Brown Engineering Co., Inc.
Brush Instruments Div., Gould Inc.
Canadian Marconi Co.
Catel
CBS Labs
Chester Electronic Labs.
Cohu Electronics Inc.
Concord Electronics Corp.
Commercial Elect.
Diamond Power Specialty Corp.
Fairchild
GBC Closed Circuit TV
General Electric Co.
Karl Heitz, Inc.
International Video Corp.
Kalart Co., Inc.
Listec TV Equipment Corp.
Marconi Div., English Electronic Corp.
Midland International Corp.
Motorola Inc., Communications Div.
Norelco, Philips Broadcast Equip.
Parkard Bell
Panasonic, VTR/CCTV Dept.
Raytheon Learning Systems Co.
RCA Corporation
Riker Information Systems Inc.
Roberts Div. of Rheem Mfg. Co.
Sarkes Tarzian, Broadcast Equip. Div.
Shibadan Corp. of America
Siemens America, Inc.
Singer Co., GPL-TV Link Div.
Sonocraft Corp., CCTV Div.
Sylvania Electric Products Inc.
Telemation
Tele Measurements Inc.
Television Utilities Co.
Tyler R. H. Co., CATV Div.
Vikoa, Inc.
Visual Electronics Corp.
Westinghouse Electric Corp.

### Film Projectors
ATV Engineering Specialties
Chester Electronics Labs.
Christie Electric Corp.
Karl Heitz, Inc.
Listec TV Equipment Corp.
L-W Photo Inc.
Magna-Tech Electronic Co., Inc.
RCA Corporation
Sarkes Tarzian Inc., Broadcast Equip. Div.
Singer Co., GPL-TV Link Div.
Sonocraft Corp., CCTV Div.
Telepro Industries
Triad Corp.
Tyler R. H. Co., CATV Div.
Vikoa, Inc.

### Lighting Systems
Bardwell McAlister Inc.
Berkey-Colortran Inc.
Century-Strand
FB Ceco Inc.
Houston Electronics
Janson Industries
Kliegl Brothers
Lighting Unlimited
Mole Richardson Co.
RCA Corporation
Singer Prod. Co.
Skirpan Electronics
Sonocraft Corp.
Sylvania
Tele Measurements Inc.
Telequip Corp.
Visual Electronics

### Long Play Audio Tape Equipment
International Good Music
Magnecord
Sarkes Tarzian Inc., Broadcast Equip. Div.
Scully Recording Instruments Co.
Stancil-Hoffman
Tape-Athon Corp.
VIF International

### Monitors
Ameco, Inc.
Ball Bros. Research Corp., Comm. Div.
Chester Electronic Labs
Cohu Electronics, San Diego Div.
Conrac Div.
Diamond Power Specialty Corp.
Hewlett-Packard
Listec TV Equipment Corp.
Miratel Electronics
Motorola Inc., Communications Div.
Panasonic, VTR/CCTV Dept.
Rank Precision Ind., Broadcast Div.
RCA Corporation
Riker Information Systems Inc.
Roberts Div. of Rheem Mfg. Co.
Sarkes Tarzian Inc., Broadcast Equip. Div.
Shibadan Corp. of America
Singer Co., GPL-TV Link Div.
Sonocraft, CCTV Div.
Telemation, Inc.
Television Equip. Assoc.
Television Utilities, Co.
Tyler R. H. Co., CATV Div.

### Video Effects Machines
Alma Engineering Inc.
Ball Bros. Research Corp., Comm. Div.
Chester Electronic Labs.
Colorado Video Inc.
Cohu Electronics, San Diego Div.
Dynair Electronics Inc., Factory Div.
Grass Valley Group Inc.
Kliegl Brothers
Panasonic, VTR/CCTV Dept.
Richmond Hill Labs, Ltd.
Riker Information Systems Inc.
Sarkes Tarzian Inc., Broadcast Equip. Div.
Shibadan Corp. of America
Shintron Co., Inc., Video Div.
Singer Co., GPL-TV Link Div.
Spindler & Sauppe, Inc.
Telemation, Inc.
Telemet, Div. of Geotel

### TV Modulators
Catel Corp.
Dynair Electronics, Factory Div.
Jerrold Electronics Corp., CATV Div.
Sarkes Tarzian Inc., Broadcast Equip. Div.
Shibaden Corp. of America
Sonocraft Corp., CCTV Div.
Telemet, Div. of Goetel
Tyler R. H. Co., CATV Div.

### Videotape Recorders
Ampex Corp.
Chester Electronic Labs.
Concord Electronics Corp.
Craig Panorama, Inc.
Diamond Power Specialty Corp.
General Electric Co.
Karl Heitz, Inc.
International Video Corp.
Listec TV Equip. Corp.
Norelco, Philips Broadcast Equip. Corp.
Panasonic, VTR/CCTV Dept.
RCA Corporation
Riker Information Systems Inc.
Roberts Div. of Rheem Mfg. Co.
Shibadan Corp. of America
Singer Co., GPL-TV Link Div.
Sonocraft, CCTV Div.
Sony Corp. of America
Telemation, Inc.
Tyler R. H. Co., CATV Div.

### Video Switchers
Alma Engineering, Inc.
Ampex Corp.
Ball Bros. Research Corp., Comm. Div.
Catel Corp.
Central Dynamics
Chester Electronic Labs.
Cohu Electronics Inc., San Diego Div.
Computer Image Corp.
Dynair Electronics Inc., Factory Div.
Grass Valley Group Inc.
Karl Heitz, Inc.
Richmond Hill Labs., Ltd.
International Good Music
Kliegl Bros.
3M Co., Mincom Div.
Panasonic, VTR/CCTV Dept.
Philips Broadcast Equip.
RCA Corporation
Riker Information Systems Inc.
Sarkes Tarzian Inc., Broadcast Equip. Div.
Shibadan Corp. of America
Shintron Co. Inc., Video Div.
Singer Co., GPL-TV Link Div.
Sonocraft, CCTV Div.
Telemation, Inc.
Telemet Div. of Geotel
Television Utilities Co.
Trompeter Electronics, Inc.
Tyler R. H. Co., CATV Div.
Vital Industries, Inc.

### Sync Generators
Ball Bros. Research Corp., Comm. Div.
Chester Electronic Labs.
Colorado Video Inc.
Cohu Electronics, San Diego Div.
Dynair Electronics Inc., Factory Div.
Grass Valley Group Inc.
Karl Heitz, Inc.
Kliegl Bros.
Listec TV Equipment Corp.
Panasonic, VTR/CCTV Dept.
RCA Corporation
Sarkes Tarzian Inc., Broadcast Equip. Div.
Shibadan Corp. of America
Singer Co., GPL-TV Link Div.
Sonocraft, CCTV Div.
Tektronix, Inc.
Telemation, Inc.
Telemet, Div. of Geotel
Tyler R. H. Co., CATV Div.

### Auxiliary Equipment
**Cleaners - Ultrasonic - Film, Tape**
Lipsner-Smith Corp.
**Compensators - Color**
3M Co., Mincom Div.
**Consoles, Video**
Electrodyne Corp.
RCA Corporation
Shibadan Corp. of America
**Controls - Audio**
Collins Radio Co., Broadcast Div.
Electrodyne Corp.
Gates Radio Co.
International Good Music
Langevin
Riker Information Systems Inc.
Switchcraft, Inc.
Ultraudio Products
**Controls - Camera**
O'Connor Engineering Labs Inc., Photograpic Div.
**Controls - Zoom Lens**
Power-Optics Inc.
Vicon Industries Inc.
**Film - Inspection Equipment**
Harwald Co.
**Film - Processing Equipment**
Grass Valley Group Inc.
Kliegl Bros.
Treise Engineering Inc.
**Film - Systems**
RCA Corporation
Telepro
**Lenses**
Bausch & Lomb Inc.
Motorola Inc., Comm. Div.
Rank Broadcast Div.
Vikoa, Inc.

**Rollers - Caption**
Listec TV Equipment Corp.
**Tripods - Stands - Dollies**
Davis & Sanford
Listec TV Equipment Corp.
Quick-Set Inc.
Riker Information Systems Inc.

**Auxiliary Equipment—General**
Alma Engineering Inc.
Anaconda Electronics
Asteroid Corp.
Ball Bros. Research Corp., Comm. Div.
Behrends, Inc.
Benco Television Corp.
Brush Instruments Div., Gould Inc.
Chester Electronic Labs.
Cohu Electronics, San Diego Div.
Davis & Sanford
Diamond Power Specialty Corp.
Electrodyne Corp.
Electro-Voice, Inc.
GBC Closed Circuit Television Corp.
Grass Valley Group, Inc.
Harwald Co.
Karl Heitz, Inc.
HTV Systems Inc.
International Good Music
Kaiser-Cox Corp.
Kliegl Bros.
Listec TV Equipment Corp.
Magna-Tech Electronic Co., Inc.
3M Co., Mincom Div.
O'Connor Eng. Labs Inc., Photographic Div.
Philips Broadcast Equip.
Photo Research Corp.
Quick-Set Inc.
Rank Precision Ind., Broadcast Div.
RCA Corporation
Riker Information Systems Inc.
Shibadan Corp. of America
Shure Bros., Inc.
Spindler-Sauppe
Taco
Tektronix, Inc.
Telemation, Inc.
Telepro Industries
Telesync Corp.
Television Equipment Assoc.
Television Presentations
Total Technology
Vicon Industries
Visual Dynamics
Visual Electronics
Woodward Assoc.

# Guide To Manufacturers

### A

**Alma Engineering Inc.**
7990 Dagget St.
San Diego, Cal. 92111

**Ameco Inc.**
2949 W. Osborn Rd.
Phoenix, Ariz. 85017

**Ampex Corp.**
401 Broadway
Redwood City, Cal. 95063

**Anaconda Electronics**
1430 S. Anaheim Blvd.
Anaheim, Cal. 92803

**Asteroid Corp.**
5665 Kearny Villa Rd.
San Diego, Cal. 92123

**ATV Engineering**
4202 36th Ave. West
Seattle, Wash. 98199

### B

**Ball Bros. Research Corp., Commercial Div.**
1050 33rd St.
Boulder, Colo. 90038

**Bardwell McAlister**
1117 N. McCadden Pl.
Hollywood, Cal. 90038

**Behrends, Inc.**
161 East Grand Ave.
Chicago, Ill. 60611

**Benco Television Corp.**
724 Bugbee St.
Jacksonville, Fla. 32207

**Berkey-Colortran**
1015 Chesnut St.
Burbank, Cal. 91502

**Blonder-Tongue Labs Inc.**
9 Alling St.
Newark, N.J. 07102

**Broadcast Electronics**
8810 Brookville Rd.
Silver Springs, Md. 20910

**Broadcast Products Inc.**
12330 Wilkins Ave.
Rockville, Md. 20851

**Brown Engineering Co., Inc.**
300 Sparkman Dr.
Huntsville, Ala. 35805

**Brush Instruments Div. Gould Inc.**
3631 Perkins Ave.
Cleveland, Ohio 44114

### C

**Canadian Marconi Co.**
2442 Trenton Ave.
Montreal 16, Quebec

**Catel Corp.**
517 Marine View Ave.
Belmont, Cal. 94002

**Central Dynamics**
903 Main St.
Cambridge, Mass. 02139

**Century-Strand**
3 Entin Road
Clifton, N.J. 07014

**CBS Labs Div., Columbia Broadcasting System Inc.**
227 High Ridge Rd.
Stanford, Conn. 06905

**C-Cor Electronics, Inc.**
State College, Pa. 16801

**Chester Electronic Labs. Div. Sylvania Information Systems Group**
Winthrop Road
Chester, Conn. 06412

**Christie Electric Corp.**
3410 W. 67th Street
Los Angeles, Cal. 90060

**Cohu Electronics Inc., San Diego Div.**
P.O. Box 623
San Diego, Cal. 92112

**Collins Radio Co., Broadcast Div.**
Mail Stop 407023
Dallas, Texas 75207

**Colorado Video Inc.**
P.O. Box 928
Boulder, Colo. 90302

**Commercial Elect.**
1271 Terra Bella Ave.
Mountain View, Calif. 94040

**Computer Image Corp.**
2685 Beverly Dr.
Beverly Hills, Cal. 90212

**Concord Electronics Corp.**
1935 Armacost Ave.
Los Angeles, Cal. 90025

**Conrac**
600 N. Rimsdale Ave.
Covina, Cal. 91722

**Craig Panorma, Inc.**
2302 E. 15th St.
Los Angeles, Cal. 90021

### D

**Davis & Sanford**
24 Pleasant St.
New Rochelle, N.Y. 10802

**Diamond Power Specialty Corp.**
P.O. Box 415
Lancaster, Ohio 43130

**Dynair Electronics Inc., Factory Div.**
6360 Federal Blvd.
San Diego, Cal. 92114

### E

**Electrodyne Corp.**
7315 Greenbush Ave.
North Hollywood, Cal. 91605

**Electro-Voice, Inc.**
Buchanan, Mich. 49107

### F

**Fairchild**
30 Park Place
Paramus, N.J. 07652

**F. B. Ceco Inc.**
315 W. 43rd St.
New York, N.Y. 10036

### G

**Gates Radio Co.**
123 Hampshire St.
Quincy, Ill. 62301

**GBC Closed Circuit Television Corp.**
74 Fifth Ave.
New York, N.Y. 10011

**General Electric Co.**
2200 N. 22nd St.
Decatur, Ill. 62526

**Grass Valley Group Inc.**
P.O. Box 114
Grass Valley, Cal. 95945

### H

**Harwald Co.**
1245 Chicago Ave.
Evanston, Ill. 60202

**Karl Heitz, Inc.**
979 Third Avenue
New York, N.Y. 10022

**Hewlett-Packard**
100 Locust Ave.
Berkeley Heights, N.J. 07922

**Richmond Hill Labs., Ltd.**
1240 Ellesmere Rd.
Scarborough, Ont.

**HTV Systems, Inc.**
10 Monroe St.
East Rochester, N.Y. 14445

**Houston Electronics**
11801 W. Olympic Blvd.
Los Angeles, Cal. 90064

### I

**International Good Music**
3950 Home Road
Bellingham, Wash. 98225

**International Video Corp.**
675 Alamor Ave.
Sunnyvale, Cal. 94086

### J

**Janson Industries**
Box 985
Canton, Ohio 44701

**Jerrold Electronics Corp., CATV Div.**
401 Walnut St.
Philadelphia, Pa. 19105

### K

**Kaiser-Cox Corp.**
Box 9728
Phoenix, Ariz. 85020

**Kalart Co., Inc.**
Hultenius St.
Plainville, Conn. 06062

**Kleigl Bros.**
32-32 48th Ave.
L.I.C., N.Y. 11101

### L

**Langevin**
1801 E. Carnegie Ave.
Santa Anna, Cal. 92705

**Lighting Unlimited**
560 W. Beech St.
Long Beach, N.Y. 11561

**Lipsner-Smith Corp.**
7334 N. Clark St.
Chicago, Ill. 60626

**Listec TV Equipment Corp.**
35 Cain Drive
Plainview, N.Y. 11803

L-W Photo Inc.
1541 Cabrito Rd.
Van Nuys, Cal. 91406

**M**

**Magnecord**
9600 Aldrich Ave. South
Minneapolis, Minn. 55420

**Magna-Tech Electronic Co., Inc.**
630 Ninth Ave.
New York, N.Y. 10036

**Marconi Div., English Electric Corp.**
1 Park Ave.
New York, N.Y. 10016

**Midland International Corp.**
1909 Vernon St.
N. Kansas City, Mo. 64116

**Mincom Div., 3M Co.**
300 S. Lewis Rd.
Camarillo, Cal. 93010

**Miratel Electronics**
3600 Richardson St.
St. Paul, Minn. 55112

**Mole Richardson**
937 N. Sycamore Ave.
Hollywood, Cal. 90038

**Motorola Inc., Communications Div.**
1301 Algonquin Rd.
Schaumberg, Ill. 60172

**N**

**Norelco, Philips Broadcast Equip. Corp.**
100 E .42nd St.
New York, N.Y. 10017

**O**

**O'Connor Eng. Labs Inc., Photographic Div.**
3490 E. Foothill
Pasadena, Cal. 91107

**P**

**Panasonic, VTR/CCTV Dept., Matsushita Electric Corp. of America**
23-05 44th Road
L.I.C., N.Y. 11101

**Philips Broadcast Equip. Corp.**
299 Rt. 17
Paramus, N.J. 07652

**Photo Research Corp.**
3000 N. Hollywood Way
Burbank, Cal. 91502

**Power-Optics Inc.**
P.O. Box 266
Fairview Village, Pa. 19409

**Q**

**Quick-Set Inc.**
8121 Central Park Ave.
Skokie, Ill. 60076

**R**

**Rank Precision Ind., Broadcast Div.**
260 North Rt. 303
West Nyack, N.Y. 10956

**Raytheon Learning Systems Co.**
475 S. Dean St.
Englewood, N.J. 07631

**RCA Corporation**
Front & Cooper Sts.
Camden, N.J. 08102

**Riker Information Systems Inc.**
101 Industrial East
Clifton, N.J. 07012

**Roberts Div. of Rheem Mfg. Co.**
Los Angeles, Cal. 90016

**S**

**Sarkes Tarzian Inc., Broadcast Equip. Div.**
E. Hillside Dr.
Bloomington, Ind. 47401

**Scully Recording Instruments Co.**
400 Bunnell St.
Bridgeport, Conn. 06607

**Shibadan Corp. of America**
58-25 Brooklyn-Queens Expwy.
Woodside, N.Y. 11377

**Shintron Co. Inc., Video Div.**
144 Rogers St.
Cambridge, Mass. 02142

**Shure Bros., Inc.**
222 Hartrey Ave.
Evanston, Ill. 60204

**Siemens America, Inc.**
350 Fifth Ave.
New York, N.Y. 10001

**Singer Co., GPL-TV Link Div.**
Binghamton, N.Y.

**Skirpan Electronics**
4143 24th St.
Long Island, N.Y. 11101

**Sonocraft Corp., CCTV Div.**
29 W. 36th St.
New York, N.Y. 10018

**Sony Corp. of America**
47-47 Van Dam St.
L.I.C., N.Y. 11101

**Spectra Sonics**
770 Wall Ave.
Ogden, Utah 84404

**Spindler-Sauppe, Inc.**
1329 Grand Central Ave.
Glendale, Cal. 91201

**Stancil-Hoffman Corp.**
921 North Highland
Hollywood, Cal. 90038

**Switchcraft, Inc.**
5555 N. Elston Ave.
Chicago, Ill. 60630

**Sylvania Electric Products Inc., Comm. Elect. Div.**
Burlington Road
Bedford, Mass. 01730

**T**

**Taco**
Sherburne, New York 13460

**Tape-Athon Corp.**
502 S. Isis
Inglewood, Cal. 90301

**Tektronix, Inc.**
P.O. Box 500
Beaverton, Oregon 97005

**Telemation, Inc.**
2275 S. West Temple
Salt Lake City, Utah 84115

**Tele Measurements Inc.**
145 Main Ave.
Clifton, N.J. 07014

**Telemet, Div. of Geotel**
185 Dixon Ave.
Amityville, N.Y. 11701

**Telepro Industries**
3 Olney Road
Cherry Hill, N.J.

**Telequip Corp.**
224 Glen Cove Ave.
Glen Cove, N.Y. 11524

**Telesync Corp.**
20 Insley St.
Demarest, N.J. 07627

**Television Equipment Assoc.**
P.O. Box 1391
Bayville, N.Y. 11709

**Television Presentations**
375 Park Ave.
New York, N.Y. 10017

**Television Utilities Co.**
10-11 50th Avenue
Long Island City, N.Y.

**Total Technology**
180 Constitution Drive
Menlo Park, Cal. 94025

**Treise Engineering Inc.**
1941 First St.
San Fernando, Cal. 91340

**Triad Corporation**
777 Flower St.
Glendale, Cal. 91201

**Trompeter Electronics, Inc.**
8936 Comache Ave.
Chatsworth, Cal. 91311

**Tyler R. H. Co., CATV Div.**
1404 15th St.
Wellington, Texas 79095

**U**

**Ultraudio Products**
P.O. Box 921
Beverly Hills, Cal. 90213

**V**

**Vicon Industries Inc.**
13 Stepar Place
Huntington Station, N.Y. 11746

**VIF International**
P.O. Box 1555
Mountain View, Cal. 94040

**Vikoa, Inc.**
400 Ninth St.
Hoboken, N.J. 07030

**Visual Dynamics**
8530 Wilshire Blvd.
Beverly Hills, Cal. 90211

**Visual Electronics Corp.**
356 W. 40th St.
New York, N.Y. 10036

**Vital Industries, Inc.**
3614 SW Archer Rd.
Gainesville, Fla. 32601

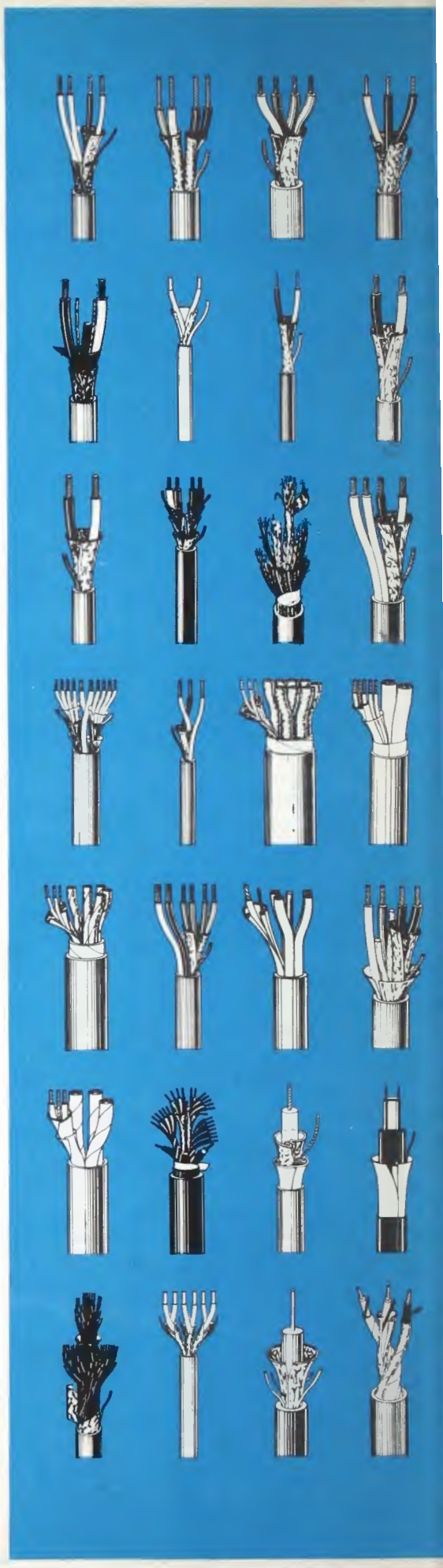
**W**

**Westinghouse Electric Corp.**
E. Pittsburgh, Pa. 15112

**Woodward Assoc., Inc.**
P.O. Box 22
Fayetteville, N.Y. 13066

# end your signal pollution problems

## Beldfoil® ISO-Shielded™ Cable

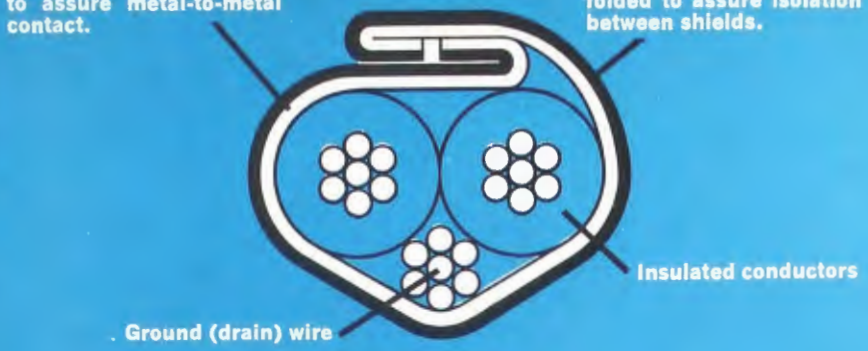


It's the cable with virtually perfect shielding. It's a Belden exclusive. Beldfoil ISO-Shield is like a continuous metal tube enclosing each pair of conductors in a cable. It locks out crosstalk or interference . . . whether from outside sources or between shielded elements in the cable.

Beldfoil is a layer of aluminum foil bonded to a tough polyester film (for insulation and added strength.) To form an ISO-Shield, we apply it in any one of several unique ways to meet the requirements of different applications. (See Figures 1 and 2, for example). Each gives more physical shield coverage than braided wire or spiral wrapped (served) shields. And greater shield effectiveness . . . even after repeated flexing.

Beldfoil ISO-Shielded Cables are small, lightweight. They terminate easily. They're modest in price. Your Belden Distributor stocks a wide variety of standard Beldfoil shielded cables as listed in the "Belden Electronic Wire and Cable Catalog" (ask him for the latest edition). And, should you have specifications no standard product can meet, ask him to quote on a specially engineered design. Or, if you choose, contact: Belden Corporation, P. O. Box 5070-A, Chicago, Ill. 60680. Phone (312) 378-1000.

FIGURE 1



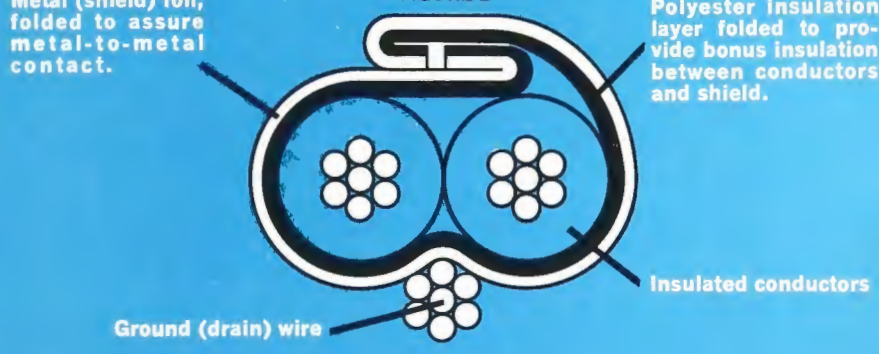

## Beldfoil Multiple Pair Individually Shielded Cable

The Figure 1 cross-section shows Belden's exclusive Z-folded Beldfoil ISO-Shield. Note the metal-to-metal contact between the two edges of the aluminum foil. In essence, you have a continuous aluminum tube. And the polyester layer on the outside of the fold assures the isolation between shields so necessary for best performance in the field.

### Technical Data

Nominal values for multiple pair individually shielded cables containing 3 to 27 pairs (including 8769 and 8773 through 8778 Series cables)
Suggested working voltage: 300 volts rms max.
Working voltage between adjacent shields: 50 volts rms max.
Capacitance between conductors in a pair: 30 pf per ft. nom.
Capacitance between one conductor and other conductor connected to shield: 55 pf per ft. nom.
Capacitance between shields on adjacent pairs: 115 pf per ft. nom.
Insulation resistance between shields on adjacent pairs: 100 megohms per 1000 ft. nom.

FIGURE 2




## Beldfoil Shielded Single Pair Cable

The Figure 2 cross-section shows the exclusive Belden Z-fold with the polyester insulating layer inward. This makes use of the high dielectric strength of the polyester film as bonus insulation between the conductors and the shield. (The cable jacket provides the primary insulation of the shield from outside objects or adjacent cables.)

### Technical Data

Nominal values for 8451 Shielded Pair Cable
Suggested working voltage: 200 volts rms max.
Capacitance between conductors: 34 pf per ft. nom.
Capacitance between one conductor and other conductor connected to shield: 67 pf per ft. nom.

BELDEN

*new ideas for moving electrical energy*

Circle Number 38 on Reader Reply Card

# Broadcast Product Directory

## A listing of over 300 products and services compiled from questionnaires completed by the manufacturers.

### A

**Alarm, Fault**
Bird Electronic Corp.
Diversified Consultants
Gotham Audio Corp.
Houston Electronics
Mallory
Moseley Electronics
Noller Control Systems
Rust Corp.
Singer Prod. Co., Inc.

**Alarm, Signal**
Diversified Consultants
Electronic Designers, Inc.
Engineering Assoc.
RFE Labs
Rust Corp.
Trepac Corp. America
Videometrics, Inc.

**Amplifier, AF, AGC**
Altec Lansing
AMFCO, Inc.
Ball Brothers
Bauer/Sparta Trans. Prod.
CCA Electronics
C Cor Electronics
Collins Radio Co.
Fairchild Recording Eqpt.
GE Visual Comm. Prod.
Gates Radio Co.
Grass Valley Group
Marti Electronics
Melcor Electronics Corp.
Tape-Athon Corp.
Visual Electronics Corp.
Ward Electronic Indus.
Wilkinson Elect. Inc.

**Amplifier, AF, Compressing**
Altec Lansing
Bauer/Sparta Trans. Prod.
Bogen Communications
CBS Labs
CCA Electronics
Collins Radio Co.
Electrodyne Corp.
Fairchild Recording Eqpt.
Gately Electronics
Gates Radio Co.
Marti Electronics
McMartin Industries, Inc.
Melcor Electronics Corp.
Multronics, Inc.
Philips Broadcast Equipment
Precision Elect., Inc.
Ultra Audio Products
Universal Audio, Inc.
Ward Electronic Indus.
Wilkinson Elect. Inc.

**Amplifier, AF, General Purpose**
Allied Electronic Corp.
Altec Lansing
Amer. Geloso Electronics
Ampex Corp.
Arbor Systems, Inc.
B&K Instruments Inc.
Bauer/Sparta Trans. Prod.
Bell P/A Prod. Corp.
Bogen Communications
Bradford Information Sys.
Broadcast Prod. Co., Inc.
Calbest Electronics
C Cor Electronics
Collins Radio Co.
Crown International
Custom Craft Designs
Denrad Mfg. Co., Inc.
Dynair Electronics
Electrodyne Corp.
Electronic Designers, Inc.
Electro-Voice, Inc.
GE Electronic Components
GF Visual Comm. Prod.
Gately Electronics
Gates Radio Co.
Grass Valley Group
Gray Research Div.
Hewlett Packard Co.
Interntl. Nuclear Corp.
Marti Electronics
McMartin Industries, Inc.
Melcor Electronics Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
Precision Elect., Inc.
Precision Lab.
Rangertone Electronics
Round Hill Assoc.
Singer Prod. Co., Inc.
Television & Computer Corp.
Ultra Audio Products
Universal Audio, Inc.
Visual Electronics Corp.
Ward Electronic Indus.

**Amplifier, AF, Peak Limiting, AM**
Altec Lansing
Bauer Electronics Corp.
Bogen Communications
CBS Labs
CCA Electronics
Collins Radio Co.
Electrondyne Corp.
Electronic System Eng.
Fairchild Recording Eqpt.
Gately Electronics
Gates Radio Co.
Melcor Electronics Corp.
Multronics, Inc.
Singer Prod. Co., Inc.
Tartan Electronics Corp.
Universal Audio, Inc.
Ward Electronic Indus.
Wilkinson Elect., Inc.

**Amplifier, AF, Peak Limiting, FM**
Bauer Electronics Corp.
Bogen Communications
CBS Labs
CCA Electronics
Collins Radio Co.
Electrodyne Corp.
Electronic System Eng.
Fairchild Recording Eqpt.
Gately Electronics
Gates Radio Co.
Singer Prod. Co., Inc.
Universal Audio Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Amplifier, AF, Remote**
Altec Lansing
Arbor Systems, Inc.
Bogen Communications
Broadcast Electronics
Collins Radio Co.
Fairchild Recording Eqpt.
Gately Electronics
Gates Radio Co.
Lang Elect. Inc.
Round Hill Assoc.
Shure Brothers, Inc.
Singer Prod. Co., Inc.
Tapecaster
Ultra Audio Products
Universal Audio, Inc.
Visual Electronics Corp.
Ward Electronic Indus.

**Amplifier, AF, Reverberation**
Altec Lansing
Bauer Electronics Corp.
Electronic Designers, Inc.
Gately Electronics
Gotham Audio Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
Singer Prod. Co., Inc.
Ultra Audio Products
Visual Electronics Corp.

**Amplifier, AF, Stereo**
Allied Electronic Corp.
Altec Lansing
Bauer/Sparta Trans. Prod.
Bogen Communications
Calbest Electronics
Collins Radio Co.
Crown International
Electronic Designers, Inc.
Electro-Voice, Inc.
Gately Electronics
Gates Radio Co.
Heath Co.
Koss Electronics, Inc.
Magnecord
Melcor Electronics Corp.
Precision Elect., Inc.
Albert Schultz, Inc.
Shure Brothers, Inc.
Singer Prod. Co., Inc.
Standard Radio Corp.
Superscope, Inc.
Tartan Electronics Corp.
Telexcommunications Div.
Visual Electronics Corp.

**Amplifier, Bridging**
AMFCO, Inc.
Anaconda Electronics
Arbor Systems, Inc.
Atlantic Research
Bauer/Sparta Trans. Prod.
C Cor Electronics
Collins Radio Co.
Comrex Corp.
Delta Electronics, Inc.
Denrad Mfg. Co., Inc.
Dynair Electronics
Gately Electronics
Gates Radio Co.
Interntl. Nuclear Corp.
JFD Electronics Co.
Katona Electronics Co.
McMartin Industries, Inc.
Rust Corp.
Singer Prod. Co., Inc.
Spencer Kennedy Lab.
Ultra Audio Products
Universal Audio, Inc.
Vikoa, Inc.
Visual Electronics Corp.
Ward Electronic Indus.

**Amplifier, Clamping**
Alma Engineering
Bell & Howell Tape Div.
Dynair Electronics
Grass Valley Group
Interntl. Nuclear Corp.
Presearch, Inc.
Raytheon Co.
Riker Video Industries
Tartan Electronics Corp.
Telemet Co.
Videon Corp.
Visual Electronics Corp.
Vital Industries

**Amplifier, DC**
American Data Corp.
Bauer/Sparta Trans. Prod.
Crown International
GE Electronic Components
Hewlett Packard Co.
Honeywell, Inc.
Melcor Electronics Corp.
Moseley Electronics
Presearch, Inc.
Rust Corp.
Rustrak Instrument Div.
Videon Corp.

**Amplifier, Distribution**
Alma Engineering
Ameco, Inc.
American Data Corp.
Anaconda Electronics
Applied Elect. Mechanics
B&K Instruments Inc.
Bell P/A Prod. Corp.
Blonder Tongue Lab., Inc.
Bogen Communications
Bradford Information Sys.
Broadcast Electronics
Broadcast Prod. Co., Inc.
C Cor Electronics
Canoga Elect. Co.
Central Dynamics Corp.
Cohu
Collins Radio Co.
Delta Electronics, Inc.
Dynair Electronics
Electrodyne Corp.
GBC CCTV
Gately Electronics
Grass Valley Group
Interntl. Nuclear Corp.
Katona Electronics Co.
Low Power Broadcast Co.
Melcor Electronics Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
Presearch, Inc.
RCA Broadcast Comm. Prd.
Riker Video Industries
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Shintron Co., Inc.
Spencer Kennedy Lab

Spotmaster
Tartan Electronics Corp.
Telemation, Inc.
Telemet Co.
TelComp
Videon Corp.
Visual Electronics Corp.
Vital Industries
Ward Electronic Indus.

**Amplifier, Keying**
Presearch, Inc.
Riker Video Industries
Videon Corp.

**Amplifier, Masking**
CBS Labs
Presearch, Inc.
Riker Video Industries
Videon Corp.

**Amplifier, Pulse**
Alma Engineering
American Data Corp.
Applied Elect. Mechanics
Bogen Communications
C Cor Electronics
Central Dynamics Corp.
Cohu Electronics, Inc.
Du Val I Fit Corp.
Dynair Electronics
G E Electronic Components
General Radio Co.
Grass Valley Group
Hewlett Packard Co.
Presearch, Inc.
RCA Broadcast Comm. Prd.
Richmond Hill
Riker Video Industries
Sarkes Tarzian, Inc.
Tartan Electronics Corp.
Telemation, Inc.
Telemet Co.
Videon Corp.
Visual Electronics Corp.
Ward Electronic Indus.

**Amplifier, RF, General Purpose**
Ameco, Inc.
Blonder Tongue Lab., Inc.
Bogen Communications
CCA Electronics
C Cor Electronics
Calbest Electronics
Collins Radio Co.
G E Electronic Components
Hewlett Packard Co.
Katona Electronics Co.
Kay Electric Co.
Microwave Assoc., Inc.
Rodelco
Rust Corp.
Vikoa, Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Amplifier, RF, Peak Limiting**
Belar Electronics Lab.
Gates Radio
Microwave Assoc., Inc.

**Amplifier, RF, Power**
Amer. Electronic Lab.
Bauer Electronics Corp.
CCA Electronics
C Cor Electronics
Collins Radio Co.
Continental Electronics
Eimac Div.
GE Visual Comm. Prod.
Gates Radio Co.
Hammarlund Mfg.
Hewlett Packard Co.
Kay Electric Co.
Microwave Assoc., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Amplifier, Sensing**
Applied Elect. Mechanics
Broadcast Prod. Co., Inc.
Houston Electronics
RFE Labs
Riker Video Industries
Ward Electronic Indus.

**Amplifier, Stabilizing**
Central Dynamics Corp.
Grass Valley Group
Internt'l. Nuclear Corp.
Presearch, Inc.
RCA Broadcast Comm. Prd.
Riker Video Industries
Telemet Co.
Videon Corp.
Ward Electronic Indus.
Vital Industries

**Amplifier, TV, Video**
Alma Engineering
Ball Brothers
Blonder Tongue Lab., Inc.
C Cor Electronics
The Catel Corp.
Central Dynamics Corp.
Cohu Electronic, Inc.
Dage Bell Div.
Dynair Electronics
Fairlane Electronics
GBC CCTV
GE Visual Comm. Prod.
Grass Valley Group
Ikegami Co., Ltd.
Internt'l. Nuclear Corp.
Jerrold Electronics Co.
JFD Electronics Co.
Kay Electric Co.
Miratel Div., Ball Bros.
Multronics, Inc.
Philips Broadcast Equipment
Presearch, Inc.
RCA Broadcast Comm. Prd.
Raytheon Co.
Richmond Hill
Riker Video Industries
Sarkes Tarzian, Inc.
Shintron Co., Inc.
Singer Prod. Co., Inc.
Tartan Electronics Corp.
Tele Cine, Inc.
Videon Corp.
Ward Electronic Indus.
Applied Elect. Mechanics
Vital Industries

**Amplifier, Video, Sweep**
C Cor Electronics
Kay Electric Co.
Leader Instruments Corp.

**Analyzers, Distortion**
B&K Instruments, Inc.
Collins Radio Co.
General Radio Co.
Heath Co.
Hewlett Packard Co.
Shibaden Corp. of Amer.

**Analyzers, Harmonic**
General Radio Co.
Hewlett Packard Co.
Micom, Inc.
Rohde Schwarz Sales

**Analyzers, Intermodulation**
Heath Co.
Rohde Schwarz Sales

**Analyzers, Noise**
B&K Instruments, Inc.
Collins Radio Co.
General Microwave Corp.
General Radio Co.
Hewlett Packard Co.
Shibaden Corp. of Amer.

**Analyzers, Sideband**
Collins Radio Co.
Dynair Electronics
Metrics Div.
Rohde Schwarz Sales
Singer Prod. Co., Inc.
Ward Electronic Indus.

**Analyzers, Spectrum**
B&K Instruments, Inc.
Collins Radio Co.
Dynair Electronics
Heath Co.
Hewlett Packard Co.
Kay Electric Co.
Metrics Div.
Rohde Schwarz Sales
Singer Prod. Co., Inc.
Tektronix, Inc.

**Analyzers, Video**
B&K Instruments, Inc.
Colorado Video, Inc.
Shibaden Corp. of Amer.

**Antennas, AM**
Advance Industries
Antenna Prod. Div.
Collins Radio Co.
Continental Electronics
Gates Radio Co.
Marconi Div.
Rohn Mfg.
RCA Broadcast Comm. Prd.
Scala Radio Corp.
Singer Prod. Co., Inc.
Visual Electronics Corp.

**Antennas, FM**
Alford Mfg. Co.
Ameco, Inc.
Ampex
CCA Electronics
Collins Radio Co.
Finney Co.
G C Electronics
Gates Radio Co.
Jampro Antenna Co.
Jerrold Electronics Co.
JFD Electronics Co.
Marconi Div.
Marti Electronics
McMartin Industries, Inc.
RCA Broadcast Comm. Prd.
R F Systems
Saxton Prod., Inc.
Scala Radio Corp.
Singer Prod. Co., Inc.
Sitco Antenna Co.
Taco
Visual Electronics Corp.
Waber Electronics, Inc.
Zenith Sales Corp.

**Antennas, LF**
Collins Radio Co.
Continental Electronics
Multronics, Inc.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.

**Antennas, MF**
Antenna Prod. Div.
Collins Radio Co.
Continental Electronics
Marconi Div.
Multronics, Inc.
Singer Prod. Co., Inc.

**Antennas, Microwave**
Advance Industries
Ameco, Inc.
Amer. Electronic Lab.
Andrew Corp.
Andrews Towers, Inc.
Collins Radio Co.
Du Val I Fit Corp.
Jerrold Electronics Co.
Electronic Res. Labs, Inc.
Metrics Div.
Micro Link Div.
Microwave Assoc., Inc.
Narda Microwave Corp.
Prodelin, Inc.
RCA Broadcast Comm. Prd.
R F Systems
Raytheon Co.
Singer Prod. Co. Inc.

**Antennas, Mobile**
Andrew Corp.
Andrews Towers, Inc.
Collins Radio Co.
Communication Prod. Div.
G C Electronics
Marti Electronics
Microwave Assoc., Inc.
Prodelin, Inc.
RCA Broadcast Comm. Prd.
R F Systems
Singer Prod. Co., Inc.
Utica Electronics
Waters Mfg., Inc.

**Antennas, Remote Pickup**
Communication Prod. Div.
Gates Radio Co.
Microwave Assoc., Inc.
Prodelin, Inc.
Scala Radio Corp.
Singer Prod. Co., Inc.

**Antennas, TV**
Alford Mfg. Co.
Allied Electronic Corp.
Ameco, Inc.
Ampex
Blonder Tongue Lab., Inc.
Cush Craft
Du Val I Fit Corp.
Finney Co.
G C Electronics
GE Visual Comm. Prod.
Gates Radio Co.
Jampro Antenna Co.
Jerrold Electronics Co.
Marconi Div.
Multronics, Inc.
RCA Broadcast Comm. Prd.
R F Systems
Scala Radio Corp.
Singer Prod. Co., Inc.
Taco
Vikoa, Inc.
Zenith Sales Corp.

**Antennas, 2500 MHz**
Alford Mfg. Co.
Amer. Electronic Lab.
Andrew Corp.
Andrews Towers, Inc.
Jerrold Electronics Co.
Micro Link Div.
Microwave Assoc. Inc.
Narda Microwave Corp.
Prodelin, Inc.
RCA Broadcast Comm. Prd.
Raytheon Co.
Scala Radio Corp.
Singer Prod. Co., Inc.

**Antennas, Systems, HF**
Andrew Corp.
Antenna Prod. Div.
Collins Radio Co.
Continental Electronics
Marconi Div.
Multronics, Inc.
RCA Broadcast Comm. Prd.
Scala Radio Corp.
JFD Electronics Co.

**Arms, Phonograph (see Arms, Tone)**
Broadcast Electronics
Gates Radio Co.
Gray Research Div.
Albert Schultz, Inc.
Shure Brothers, Inc.
Singer Prod. Co., Inc.

**Arms, Tone**
Broadcast Electronics
Gates Radio Co.
Gotham Audio Corp.
Gray Research Div.
Russ Electronics, Inc.
Albert Schultz, Inc.
Shure Brothers, Inc.

**Attenuators, Audio**
Altec Lansing
Ameco, Inc.
Centralab
Collins Radio Co.
Fairchild Recording Eqpt.
Gotham Audio Corp.
Holland Electronics
Jensen Mfg. Div.
Kay Electric Co.
Lang Electronics, Inc.
Mallory
Omite Mfg. Co.
Painton, Inc.
Tech Laboratories, Inc.
Telonic Instruments
Texscan Corp.
Universal Audio, Inc.
Weinschel Engineering Co.

**Attenuators, Fixed**
AVA Elect. & Machine Corp.
Collins Radio Co.
Davco Electronics Corp.
General Microwave Corp.
Holland Electronics
Kay Electric Co.
Microlab
Microwave Assoc., Inc.
Narda Microwave Corp.
TV Cable Supply Co.
Tech Laboratories, Inc.
Texscan Corp.
Weinschel Engineering Co.

### Attenuators, Impedance Matching
Ameco, Inc.
AVA Elect. & Machine Corp.
Collins Radio Co.
Holland Electronics
Metrologie Compagnie Gen.
Microlab
Narda Microwave Corp.
Omite Mfg. Co.
Rohde Schwarz Sales
Tech Laboratories, Inc.
Texscan Corp.
Trompeter Electronics
United Recording
Weinschel Engineering Co.

### Attenuators, Microwave
Ameco, Inc.
Bell P/A Prod. Corp.
Collins Radio Co.
General Microwave Corp.
Kay Electric Co.
Lectronic Res. Labs., Inc.
Metrics Div.
Microlab
Microwave Assoc., Inc.
Narda Microwave Corp.
Rohde Schwartz Sales
Telonic Instruments
Weinschel Engineering Co.

### Attenuators, RF
Ameco, Inc.
AVA Elect. & Machine Corp.
Bell P/A Prod. Corp.
Bird Electronic Corp.
Blonder Tongue Lab., Inc.
Collins Radio Co.
Davco Electronics Corp.
General Microwave Corp.
Hewlett Packard Co.
Holland Electronics
Jerrold Electronics Co.
Katona Electronics Co.
Kay Electric Co.
Electronic Res. Labs., Inc.
Metrics Div.
Microwave Assoc., Inc.
Narda Microwave Corp.
Rohde Schwartz Sales
Tech Laboratories, Inc.
Telonic Instruments
Texscan Corp.
Vikoa, Inc.
Waters Mfg. Inc.
Weinschel Engineering Co.

### Attenuators, Video
Ameco, Inc.
Fairlane Electronics
Holland Electronics
Kay Electric Co.
Microlab
Narda Microwave Corp.
Painton, Inc.
Sarkes Tarzian, Inc.
Telonic Instruments
Texscan Corp.
Trompeter Electronics
Videon Corp.
Weinschel Engineering Co.

### Automation, Equipment, Program Control
Aitken
Ameco, Inc.
American Data Corp.
Ampex
Arbor Systems, Inc.
Bauer/Sparta Trans. Prod.
B&K Instruments, Inc.
Broadcast Prod. Co., Inc.
Chrono Log Corp.
Collins Radio Co.
Datatron, Inc.
Gates Radio Co.
General Elect.
Industrial Instrument
Internatl. Good Music, Inc.
MaCarta
Marconi Div.
Moseley Assoc.
Orbit Radio and Video
Presearch, Inc.
RCA Broadcast Comm. Prd.
RFE Labs
Riker Video Industries
Rust Corp.
Sarkes Tarzian, Inc.
Sono-Mag Corp.
Sparta Elect. Corp.
Tape-Athon Corp.
Tech Laboratories, Inc.
Telemation
Tracor Ind. Inst. Div.
Ultimation Systems
Visual Electronics Corp.
Ward Electronic Indust.
Zoomar Inc.

## B

### Blowers and Fans
Ameco, Inc.
Bud Radio, Inc.
Dynacool Mfg. Co., Inc.
GE Electronic Components
Lectronic Res. Labs., Inc.

## C

### Cable, Coaxial, Flexible
Alpha Wire
Ameco, Inc.
Amphenol Corp.
Anaconda Electronics
Andrew Corp.
Andrews Towers, Inc.
Belden Corp.
Birnbach Co., Inc.
Boston Insulated
Brand Rex
CATV Equipment Co.
Columbia Electronic CBL
Communication Prod. Div.
Comm-Scope Corp.
Gates Radio Co.
General Cable Corp.
Gotham Audio Corp.
Gulf Electro Sales, Inc.
IRC Div. TRW, Inc.
Jampro Antenna Co.
Jerrold Electronics Co.
Katona Electronics Co.
Listec TV Equip. Corp.
Phelps Dodge Electronics
Prodelin, Inc.
Pruzan Co.
Rome Cable Div.
Saxton Prod., Inc.
Singer Prod. Co., Inc.
Superior Continental Co.
Terminal Hudson Elect.
Times Wire And Cable
Vikoa, Inc.
Weinschel Engineering, Co.

### Cable, Coaxial, Rigid
Alpha Wire
Amphenol Corp.
Andrew Corp.
Andrews Towers, Inc.
Columbia Electronic CBL
Communication Prod. Div.
Gates Radio Co.
General Cable Corp.
IRC Div. TRW Inc.
Jampro Antenna Co.
Phelps Dodge Electronic
Prodelin, Inc.
Rome Cable Div.
Saxton Prod., Inc.
Singer Prod. Co., Inc.
Times Wire And Cable
Weinschel Engineering Co.

### Cable, Direct-Burial
Alpha Wire
Amphenol Corp.
Anaconda Electronics
Andrews Towers, Inc.
Belden Corp.
Birnbach Co., Inc.
Boston Insulated
Brand Rex
Columbia Electronic CBL
Comm-Scope Corp.
General Cable Corp.
Katona Electronics Co.
Listec TV Equip. Corp.
Phelps Dodge Electronic
Prodelin, Inc.
Rome Cable Div.
Saxton Prod., Inc.
Singer Prod. Co., Inc.
Superior Continental Co.
TV Cable Supply Co.
Times Wire And Cable
Vikoa, Inc.

### Cable, Shielded, Audio
Alpha Wire
Amphenol Corp.
Belden Corp.
Birnbach Co., Inc.
Boston Insulated
Brand Rex
Columbia Electronic CBL
D & B Electronics Co.
G C Electronics
Gates Radio Co.
General Cable Corp.
Gotham Audio Corp.
IRC Div. TRW, Inc.
Nortronics Co., Inc.
Saxton Prod., Inc.
Singer Prod. Co., Inc.
Vikoa, Inc.

### Calibration Service, Instrument
B&K Instruments, Inc.
Comm. Radio Monitoring
Edison Electronic Co.
Hewlett Packard Co.
Honeywell, Inc.
Instrument Lab. Corp.
Potomac Instruments, Inc.
Simpson Electric Co.
Weinschel Engineering Co.

### Camera, Mounting Equipment
Ameco, Inc.
Burke & James
Du Val I Fit Corp.
FB Ceco, Inc.
GBC CCTV
Hewlett Packard Co.
Houston Fearless Corp.
Innovative Television Equip.
Listec TV Equip. Corp.
Philips Broadcast Equipment
Power Optics, Inc.
Precision Lab.
Quick-Set
RCA Broadcast Comm. Prd.
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Sylvania Comm. Electronic
Teledyne Co.
Telemation, Inc.
Telequip Corp.
Television Prod., Inc.
Vikoa, Inc.
Visual Electronics Corp.
Zoomar, Inc.

### Camera, Remote (Control Equipment)
Ameco, Inc.
Du Val I Fit Corp.
FB Ceco, Inc.
GBC CCTV
Ikegami Co. Ltd.
Industrial Instrument
Listec TV Equip. Corp.
Philips Broadcast Equipment
Power Optics, Inc.
RCA Broadcast Comm. Prd.
Shibaden Corp. Of Amer.
Sonocraft Corp.
Sylvania Comm. Electronics
Tele Cine, Inc.
Telemation, Inc.
Trepac Corp. of America
Tracor Ind. Inst. Div.

### Cameras, Film, Cine
Ameco, Inc.
Arriflex Corp. of Amer.
Cohu Electronics, Inc.
Eastman Kodak Co.
FB Ceco, Inc.
Fairchild Industrial
GAF Corp.
North American Philips AKG
Philips Broadcast Equipment
Precision Lab.
Teledyne Co.
Telemation, Inc.

### Cameras, Film, Still
Burke, James
Cohu Electronics, Inc.
Eastman Kodak Co.
GAF Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
Traid Corp.

### Cameras, Image Motion Compensation
Dynasciences Corp.

### Cameras, Oscilloscope
Ameco, Inc.
Fairchild Industrial
Hewlett Packard Co.
Metrics Div.
Tektronix, Inc.
Tele Cine, Inc.
Telemation, Inc.

### Cameras, TV, Color
Ampex
Ameco, Inc.
Bell & Howell Tape Div.
CATV Equipment Co.
Cohu Electronics, Inc.
Commercial Elect.
Du Val I Fit Corp.
Fernseh
GBC CCTV
GE Visual Comm. Prod.
Ikegami Co. Ltd.
International Video Corp.
The Janson Industries
Lerro Electrical Corp.
Marconi Div.
North American Philips AKG
Philips Broadcast Equipment
Packard Bell Electronics
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Telemation
Tele Measurements, Inc.
Visual Electronics

### Cameras, TV, Monochrome
ATV Research
Ameco, Inc.
Bell & Howell Tape Div.
Bendix Corp.
Bradford Information Sys.
CATV Equipment Co.
Canoga Elect. Co.
Cohu Electronics, Inc.
Colorado Video, Inc.
Concord Elect. Corp.
Dage Bell Div.
Diamond Electronics
Du Val I Fit Corp.
GBC CCTV
GE Visual Comm. Prod.
GPL Div. Singer General
Gen. Electrodynamics
General Television Ntwk.
Ikegami Co. Ltd.
The Janson Industries
Jerrold Electronics Co.
Lerro Electrical Corp.
Marconi Div.
Motorola
MTI Div., KMS Industries
Nemo Recording Labs
North American Philips AKG
Philips Broadcast Equipment
Packard Bell Electronics
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Shintron Co., Inc.
Sonocraft Corp.
Sony Corp. of America
Sylvania Comm. Electronic
Telemation, Inc.
Tele Measurements, Inc.
Vikoa, Inc.

### Cartridges, Magnetic Tape
Amerline Corp.
Ampro
Audio Devices
Broadcast Electronics
Channel Marketing, Inc.
Cine Sonic Sound, Inc.
Gates Radio Co.
Internti. Good Music, Inc.
MaCarta, Inc.
Magnatech Co.
Magna Tech. Corp.
Magnetic Prod. Div.
Marathon Broadcast Equip.
RCA Broadcast Comm. Prd.
Singer Prod. Co. Inc.
Tapecaster
Telexcommunications Div.
Sparta Elect. Corp.
Stanton Magnetics, Inc.

### Cartridges, Phono
Bourns
Broadcast Electronics
Electro-Voice, Inc.

If spec sheets are among your favorite reading, we don't blame you for getting confused at times. Columns of figures aren't always too eloquent on their own, only in context or comparison with other specs. And statistics can be used to support anything – especially statisticians.

So it's nice to know how to read between the lines of a spec sheet. To know, for instance, that not all makers use the same measuring standards. Take overall frequency response: ours is measured at a −10dB level, the accepted broadcast standard. Yet certain other brands measure from as low as −24 dB.

Unfair to us? Yes. But more important, it's unfair to you.

Of course, there are other ways to play the numbers game. We say go ahead and compare specs till your head spins. But do it right: consider your own overall needs and objectives. Consider specs in relation to other specs on the same component. Compare that unit spec for spec, ***standard for standard,*** with competing models. Then go give a listen.

True, you can't be a computer.

But you shouldn't have to be a speculator, either.

INSTITUTE OF HIGH FIDELITY INC

**TEAC**

TEAC Corporation of America • 2000 Colorado Avenue • Santa Monica, C

G E Distributor Sales Op.
G E Electronic Components
Gates Radio Co.
Gotham Audio Corp.
Shure Brothers, Inc.
Singer Prod. Co., Inc.
Sparta Elect. Corp.
Stanton Magnetics, Inc.

**Cartridge, Tape (Recording Service)**
Broadcast Electronics
Cine Sonic Sound, Inc.
Magna Tech Corp.
Singer Prod. Co. Inc.
Stanton Magnetics, Inc.

**Clocks & Chronographs**
American Data Corp.
Bradford Information Sys.
Broadcast Prod. Co., Inc.
Chrono Log Corp.
Electrodyne Corp.
Gibbs Mfg. Research Co.
Interntl. Good Music, Inc.
Listec TV Equip. Corp.
Parabam, Inc.
Riker Video Industries
Standard Elect. Time
Telecomp Mfg.
Television & Computer Corp.
Visual Electronics Corp.

**Communications Systems, Land, Mobile**
Canoga Elect. Co.
Collins Radio Co.
Comrex Corp.
Hammarlund Mfg.
Marti Electronics
Moseley Assoc., Inc.
Moseley Electronics
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Surface Construction

**Communications Systems, Microwave**
Amer. Electronic Lab.
Andrew Corp.
Canoga Elect. Co.
Collins Radio Co.
Jerrold Electronics Co.
Lenkurt Electric Co., Inc.
Marti Electronics
Micro Link Div.
Microwave Assoc., Inc.
Moseley Assoc., Inc.
Moseley Electronics
Prodelin, Inc.
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Surface Construction
Telefunken Sales Corp.

**Communications Systems, Multiplex**
Belar Electronics Lab.
Calbest Electronics
Canoga Elect. Co.
Collins Radio Co.
Lenkurt Electric Co., Inc.
Moseley Assoc., Inc.
Noller Control Systems
RCA Broadcast Comm. Prd.
RFE Labs
Scantlin Electronics
Singer Prod. Co., Inc.
Surface Construction
Telefunken Sales Corp.

**Communications Systems, Teleprinter**
Collins Radio Co.
Marconi Div.
Scantlin Electronics
Singer Prod. Co., Inc.
Trepac Corp. America

**Computer Equipment**
Collins Radio Co.
Colorado Video, Inc.
G E Electronic Components
Harvey Radio Co., Inc.
Heath Co.
Interntl. Good Music, Inc.
Sarkes Tarzian, Inc.
Scantlin Electronics

**Console, Audio, AM**
Accurate Sound Co.
Alma Engineering
Ancha Electronics, Inc.
Arbor Systems, Inc.
Bauer/Sparta Trans. Prod.
CCA
Collins Radio Co.
Electrodyne Corp.
Fairchild Recording Eqpt.
GE Visual Comm. Prod.
Gately Electronics
Gates Radio Co.
Gotham Audio Corp.
Granger Assoc.
Harvey Radio Co., Inc.
Houston Electronics
Ikegami Co. Ltd.
Interntl. Good Music, Inc.
Little Joe Enterprises
Low Power Broadcast Co.
Orbit Radio and Video
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Tartan Electronics Corp.
Telectro Systems Corp.
Ultra Audio Products
United Radio Supply, Inc.
Universal Audio, Inc.
Visual Electronics Corp.
Ward Electronic Indus.
Wilkinson Elect., Inc.

**Console, Audio, FM**
Accurate Sound Co.
Alma Engineering
Ancha Electronics, Inc.
Arbor Systems, Inc.
Bauer/Sparta Trans. Prod.
CCA Elect.
Collins Radio Co.
Du Val I Fit Corp.
Electrodyne Corp.
Fairchild Recording Eqpt.
GE Visual Comm. Prod.
Gately Electronics
Gates Radio Co.
Gotham Audio Corp.
Harvey Radio Co., Inc.
Houston Electronics
Ikegami Co. Ltd.
Little Joe Enterprises
Orbit Radio and Video
Rupert-Neve
Singer Prod. Co., Inc.
Tartan Electronics Corp.
Telectro Systems Corp.
Ultra Audio Products
United Radio Supply, Inc.
Visual Electronics Corp.
Ward Electronic Indus.
Wilkinson Elect., Inc.

**Console, Audio, Portable**
Accurate Sound Co.
Bauer/Sparta Trans. Prod.
Broadcast Prod. Co., Inc.
Collins Radio Co.
Delta Electronics, Inc.
Electrodyne Corp.
Fairchild Recording Eqpt.
Gately Electronics
Gates Radio Co.
Gotham Audio Corp.
Harvey Radio Co., Inc.
Houston Electronics
Little Joe Enterprises
Low Power Broadcast Co.
McCurdy Radio
McMartin Industries, Inc.
Nemo Recording Labs.
North American Philips AKG
Orbit Radio and Video
Philips Broadcast Eqpt.
Shure Brothers, Inc.
Singer Prod. Co., Inc.
Telectro Systems Corp.
Ultra Audio Products
United Radio Supply, Inc.
Visual Electronics Corp.
Ward Electronic Indus.
Wilkinson Elect., Inc.

**Console, Audio, Recording**
Altec Lansing
Accurate Sound Co.
Ancha Electronics, Inc.
Arbor Systems, Inc.
Bauer Electronics Corp.
Broadcast Prod. Co., Inc.
Collins Radio Co.
Electrodyne Corp.
Fairchild Recording Eqpt.
Gately Electronics
Gates Radio Co.
Gotham Audio Corp.
Harvey Radio Co., Inc.
Houston Electronics
Lang Electronics, Inc.
Little Joe Enterprises
McCurdy Radio
McMartin Industries, Inc.
Nemo Recording Labs
North American Philips AKG
Orbit Radio and Video
Philips Broadcast Equip.
Rupert-Neve
Singer Prod. Co., Inc.
Sonocraft Corp.
Sparta Elect. Corp.
Tartan Electronics Corp.
Telectro Systems Corp.
Ultra Audio Products
United Radio Supply, Inc.
Visual Electronics Corp.
Ward Electronic Indus.

**Console, Audio, TV**
Alcor, Inc.
Alma Engineering
Ancha Electronics, Inc.
Bauer/Sparta Trans. Prod.
Bradford Information Sys.
Collins Radio Co.
Delta Electronics, Inc.
Electrodyne Corp.
Fairchild Recording Eqpt.
GBC CCTV
GPL Div. Singer General
Gately Electronics
Gates Radio Co.
Gotham Audio Corp.
Houston Electronics
Ikegami Co., Ltd.
Interntl. Good Music, Inc.
Interntl. Nuclear Corp.
Lang Electronics, Inc.
Orbit Radio and Video
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Tartan Electronics Corp.
Tele Measurements, Inc.
Ultra Audio Products
Visual Electronics Corp.
Ward Electronic Indus.

**Console, Video, Portable**
Alcor, Inc.
GBC CCTV
Interntl. Nuclear Corp.
Riker Video Industries
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Shintron Co., Inc.
Tartan Electronics Corp.
Ward Electronic Indus.

**Console, Video, Studio**
Alma Engineering
GBC CCTV
GE Visual Comm. Prod.
GPL Div. Singer General
Interntl. Nuclear Corp.
RCA Broadcast Comm. Prd.
Riker Video Industries
Sarkes Tarzian Inc.
Shibaden Corp. of Amer.
Sonocraft Corp.
Sylvania Comm. Electronic
Tartan Electronics Corp.
Universal Audio, Inc.
Ward Electronic Indus.

**Converters**
American Data Corp.
CATV Equipment Co.
Canoga Elect. Co.
Catel Corp.
G E Electronic Components
Honeywell, Inc.
Kato Engineering Co.
Micro Link Div.
RHG Electronics
Singer Prod. Co., Inc.

**Counters, Frequency**
Collins Radio Co.
Engineering Assoc.
G E Electronic Components
General Radio Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Honeywell, Inc.
Kay Electric Co.
McMartin Industries, Inc.
N E Electronics Corp.
Simpson Electric Co.

## D

**Delay Lines**
Allen Avionics
Anderson Labs.
Andrews Towers, Inc.
Cook Electric Co.
General Radio Co.
Kappa Networks
Phelps Dodge Electronics
Presearch, Inc.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Times Wire and Cable

**Demagnetizers, Bulk Tape**
Aerovox Corp.
Bauer/Sparta Trans. Prod.
G C Electronics
Hewlett Packard Co.
Lang Electronics, Inc.
Minneapolis Magnetics
Orbit Radio and Video

**Demodulators**
Ameco, Inc.
Belar Electronics Lab.
The Catel Corp.
Collins Radio Co.
Dynair Electronics
Fairlane Electronics
Hewlett Packard Co.
Kahn Research Lab. Inc.
Rohde Schwartz Sales
Ward Electronic Indus.

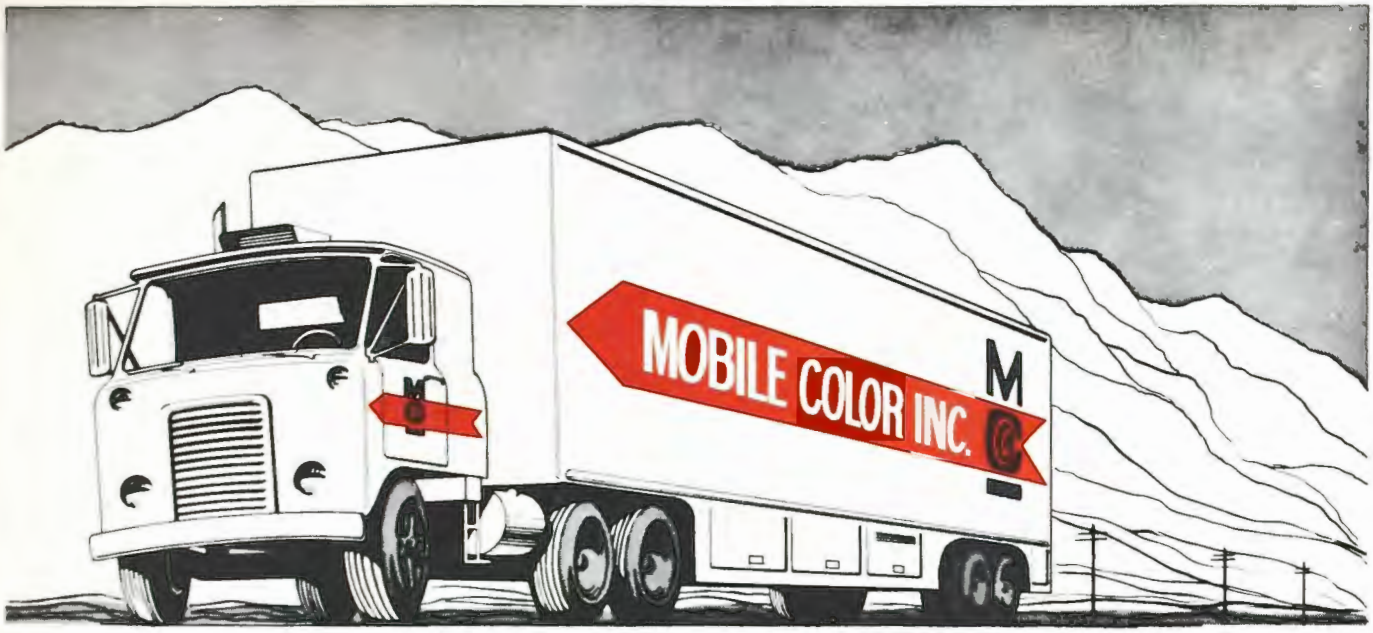
**Detectors, RF**
Bird Electronic Corp.
Blonder Tongue Lab., Inc.
Microwave Assoc., Inc.
Solitron Devices, Inc.
Spencer Kennedy Lab.
Telonic Instruments
Weinschel Engineering Co.

**Detectors, Microwave**
Collins Radio Co.
G E Electronic Components
Microlab
Microwave Assoc., Inc.
Narda Microwave Corp.
Solitron Devices, Inc.
Sylvania Semiconductor
Weinschel Engineering Co.

**Detectors, Standing Wave**
Bird Electronic Corp.
Collins Radio Co.
Narda Microwave Corp.
Rohde Schwartz Sales
Singer Prod. Co., Inc
Texscan Corp.
Weinschel Engineering Co.

**Diplexers**
Alford Mfg. Co.
Collins Radio Co.
Jampo Antenna Co.
Ikegami Co. Ltd.
Microlab
Microwave Assoc., Inc.
Phelps Dodge Electronic
Singer Prod. Co., Inc.

**Display Equipment—TV**
CBS Labs
Central Dynamics Corp.
Colorado Video, Inc.
GPL Div. Singer General
General Television Ntwk.
Marconi Div.
Parabam, Inc.
Photo Research Corp.
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.

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P O Box 7171
Omaha, Nebraska 68107

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Scantlin Electronics
Shintron Co., Inc.
Sylvania Comm. Electronics
Television Presentations

**Dividers, Frequency**
Collins Radio Co.
G E Electronic Components
Hartley Prod. Corp.
Hewlett Packard Co.
Jensen Mfg. Div.
Microlab
Presearch, Inc.

**Dividers, Power**
Alford Mfg. Co.
Collins Radio Co.
Microlab
Microwave Assoc., Inc.
Narda Microwave Corp.
Trompeter Electronics
Weinschel Engineering Co.

**Dividers, Voltage**
Collins Radio Co.
G E Electronic Components
General Radio Co.
ITT Jennings
Omite Mfg. Co.

## E

**Editors, Audio Tape**
Nemo Recording Labs.
Rangertone Electronics

**Editors, Film**
Burke, James
FB Ceco, Inc.
The Kalart Co., Inc.
Neumade Prod. Corp.

**Editors, Video Tape**
Central Dynamics Corp.
GBC CCTV
Gotham Audio Corp.
RCA Broadcast Comm. Prd.
Shibaden Corp. of Amer.
Visual Electronics Corp.

**Enhancers, TV Image**
CBS Labs
Colorado Video, Inc.
Dynasciences Corp.
Gen. Electrodynamics
Grass Valley Group
Philips Broadcast Equipment
Sarkes Tarzian, Inc.
Visual Electronics Corp.

**Equalizers, Audio Emphasis**
B&K Instruments, Inc.
Electrodyne Corp.
Fairchild Recording Eqpt.
Gately Electronics
Gotham Audio Corp.
Gray Research Div.
Lang Electronics, Inc.
Melcor Electronics Corp.
Painton, Inc.
Pulse Techniques, Inc.
Ultra Audio Products

**Equalizers, Vertical Aperature**
Dynasciences

**Erasers, Magnetic (See Heads and Demagnetizers)**
Channel Marketing, Inc.
Duotone Co., Inc.
Gates Radio Co.
Lang Electronics, Inc.
Minneapolis Magnetics
Nortronics Co., Inc.
Albert Schultz, Inc.

**Exciters, FM**
Amer. Electronic Lab.
Belar Electronics Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Granger Assoc.
Marti Electronics
Moseley Electronics
Singer Prod. Co., Inc.
Wilkinson Elect., Inc.

## F

**Film, Photographic**
Afg. Gevaert
Eastman Kodak Co.
FB Ceco, Inc.
GAF Corp.

**Film, Processing Service**
Eastman Kodak Co.
Houston Photo Prod., Inc.
Jamieson Film Co.
Lipsner Smith
Photo Lab., Inc.
Russell Film Lab.
Tech. Film Labs., Inc.
Treise Engineering
WTTW Recording Serv.

**Filters, Antenna**
Bird Electronic Corp.
Collins Radio Co.
G C Electronics
McMartin Industries, Inc.

**Film Chain**
Ampex
Blonder-Tongue
Cohu Electronics
Diamond Power
General Elect.
Kalart
MacKenzie Labs.
Magna Tech
Packard Bell
Philips Broadcast Equipment
RCA
Raytheon
Russco
Sarkes Tarzian
Shiba Elect.
Sylvania
Tele-Cine
Telemation
Tele Measurements
Visual

## G

**Generators, FM, Subcarrier**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Hockok Elect. Instrument
Marti Electronics
McMartin Industries, Inc.
Moseley Assoc., Inc.
Singer Prod. Co., Inc.
Wilkinson Elect., Inc.

**Generators, Power, Electric Motor**
Columbia Electric Mfg. Co.
G E Electronic Components
Kato Engineering Co.

**Generators, Power, Gasoline Engine**
FB Ceco, Inc.
Gates Radio Co.
Kato Engineering Co.
Mole Richardson Co.
Singer Prod. Co., Inc.
TV Cable Supply Co.

**Generators, Signal, AF**
B&K Instruments, Inc.
Barker Williamson Div.
Delta Electronics, Inc.
General Radio Co.
Gibbs Mfg. Research Co.
Heath Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Kay Electric Co.
Leader Instruments Corp.
Metrologie Compagnie Gen.
N E Electronics Corp.
RCA Electronic Comp. Div.
Rohde Schwartz Sales
Texscan Corp.

**Generators, Color Bar**
Allied Electronic Corp.
American Data Corp.
Applied Electro Mech.
Cohu
Engineering Assoc.
Heath Co.
Hickok Elect. Instrument
International Nuclear Corp.
Leader Instruments Corp.
Marconi Div.
Metrologie Compagnie Gen.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
RCA Electronic Comp. Div.
Richmond Hill
Riker Video Industries
Shibaden Corp. of Amer.
Telemation, Inc.
Tele Measurements, Inc.
Telemet Co.
Videometrics, Inc.
Videon Corp.
Visual Electronics Corp.
Ward Electronics

**Generators, Signal, Dot Bar**
American Data Corp.
Colorado Video, Inc.
Heath Co.
Hickok Elect. Instrument
Leader Instruments Corp.
Marconi Div.
Philips Broadcast Equipment
RCA Electronic Comp. Div.
Richmond Hill
Riker Video Industries
Sencore, Inc.
Shibaden Corp. of Amer.
Tektronix, Inc.
Telemation, Inc.
Tele Measurements, Inc.
Videometrics, Inc.
Videon Corp.
Visual Electronics Corp.
Ward Electronics

**Generators, Signal Marker**
Blonder Tongue Lab., Inc.
Hewlett Packard Co.
Kay Electric Co.
Leader Instruments Corp.
Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Shibaden Corp. of Amer.
Tektronix, Inc.

**Generators, Signal Pulse**
Canoga Elect. Co.
Data Pulse
FB Ceco, Inc.
General Radio Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Honeywell, Inc.
Marconi Instruments
Narda Microwave Corp.
Richmond Hill
Tektronix, Inc.
Videometrics, Inc.
Visual Electronics, Corp.
Ward Electronics

**Generators, Signal, RF**
Allied Electronic Corp.
Blonder Tongue Lab., Inc.
Canoga Elect. Co.
Delta Electronics, Inc.
Engineering Assoc.
General Radio Co.
Gibbs Mfg., Research Co.
Heath Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Kay Electric Co.
Leader Instruments Corp.
Narda Microwave Corp.
RCA Electronic Comp. Div.
Richmond Hill
Rohde Schwarz Sales
Shibaden Corp. of Amer.
Spencer Kennedy Lab.
Texscan Corp.
Triplett Elect. Instrument
Weinschel Engineering Co.

**Generators, Special Effect**
American Data Corp.
Applied Elect. Mechanics
B&K Instruments, Inc.
Central Dynamics Corp.
Colorado Video, Inc.
Concord Elect. Corp.
Dynair Electronics
Grass Valley Group
International Nuclear
Marconi Div.
Philips Broadcast Equip.
Richmond Hill
Riker Video Industries
Shibaden Corp. of Amer.
Shintron Co., Inc.
Telemation, Inc.
Tele Measurements, Inc.
Telemet Co.
Videon Corp.

**Generators, Signal, Square Wave**
General Radio Co.
Heath Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Leader Instruments Corp.
Marconi Instruments
Parabam, Inc.
Shibaden Corp. of Amer.
Tektronix, Inc.
Telemation, Inc.
Tele Measurements, Inc.
Telemet Co.
Universal Audio, Inc.
Videometrics, Inc.
Weinschel Engineering Co.

**Generators, Signal, TV Synchronizing**
American Data Corp.
Central Dynamics Corp.
Chrono Log Corp.
Cohu Electronics, Inc.
Colorado Video, Inc.
Concord Elect. Corp.
Dage Bell Div.
Du Val I Fit Corp.
Dynair Electronics
Electronic Designers, Inc.
GE Visual Comm. Prod.
GPL Div. Singer General
Gen. Electrodynamics
Grass Valley Group
Ikegami Co. Ltd.
Industrial Instrument
International Nuclear
Marconi Div.
MTI Div., KMS Industries
Philips Broadcast Equipment
Presearch, Inc.
RCA Broadcast Comm. Prd.
Richmond Hill
Riker Video Industries
Rohde Schwarz Sales
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Shintron Co., Inc.
Sylvania Comm. Electronics
Tektronix, Inc.
Telemation, Inc.
Tele Measurements, Inc.
Telemet Co.
Texscan Corp.
Tracor Ind. Inst. Div.
Videometrics, Inc.
Videon Corp.

**Generators, Signal, VITS**
Electronic Designers, Inc.
Richmond Hill
Riker Video Industries
Rohde Schwarz Sales
Tektronix, Inc.
Tele Measurements, Inc.
Telemet Co.
Videometrics, Inc.
Videon Corp.

## H

**Heads, Erase, Magnetic**
Lipps, Inc.
Magna Tech. Corp.
Magnusonic Devices, Inc.
Michigan Magnetics
Minneapolis Magnetics
Nortronics Co., Inc.
Recordex Corp.
Singer Prod. Co., Inc.
Taber Mfg. Engr. Co.
Tapecaster

**Heads, Recording, Magnetic**
Lipps, Inc.
Magnusonic Devices, Inc.
Michigan Magnetics
Minneapolis Magnetics

# Buy a rainbow with black & white money.

Here is a complete color TV program origination system sporting a very easy to take monochrome price tag. Your first question might be "Where did they do the cutting?" But read what's in the system and you'll find that the only cut was in the price.

The Visual Basic Color TV Origination System comes complete with 5 color sources: 2 film, 1 slide, 2 video tape. It has a fully pre-wired remote control console/equipment rack; full remote control for the film island; output switching; an audio mixer — even a lavalier microphone. It is set-up for NTSC-type color, and can be had with full NTSC color if you wish. And, of course, you can expand to whatever degree of sophistication you want with concepts like Visual's titling systems.

The Visual Basic Color TV Origination System. It's from the people who bring you a full line of quality broadcast equipment including advanced monochrome and color cameras, Rapid-Q cartridge tape equipment, audio consoles, and a great deal more.

But mostly it's the basic color TV origination system you need now. At a price you can pay now — without turning colors.

Write **Visual Electronics Corporation,** 356 W. 40th St., New York, N.Y. 10018.

Circle Number 42 on Reader Reply Card

Nortronics Co., Inc.
Rangertone Electronics
Recordex Corp.
Singer Prod. Co., Inc.
Taber Mfg. Engr. Co.
Tapecaster

**Heaters, Station, Van**
Valad Elect.

## I

**Integrated Circuits (Also See Semiconductors)**
Centralab
Collins Radio Co.
G E Distributor Sales Op.
Microlab
Motorola Semiconductor
RCA Electronic Comp. Div.
Texas Instrument
Thor Electronics Corp.

**Industrial TV (Also See TV, Closed Circuit)**
ATV Research
Alcor, Inc.
Alma Engineering
Anaconda Electronics
Blonder Tongue Lab., Inc.
Bradford Information Sys.
Canoga Elect. Co.
Cohu Electronics, Inc.
Colorado Video, Inc.
Concord Elect. Corp.
Dage Bell Div.
Diamond Electronics
Du Van I Fit Corp.
Dynair Electronics
GBC CCTV
G E Electronic Components
GF Visual Comm. Prod.
Gen. Electrodynamics
Ikegami Co. Ltd.
The Janson Industries
Katona Electronics Co.
Lerro Electrical Corp.
Marconi Div.
Orbit Radio and Video
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Riker Video Industries
Rust Corp.
Setchell Carlson, Inc.
Shibaden Corp. of Amer.
Shintron Co., Inc.
Singer Prod. Co. Inc.
Sonocraft Corp.
Sylvania Comm. Electronics
Tektronix, Inc.
Telemation, Inc.
Tele Measurements, Inc.
Television Presentations
Vikoa, Inc.
Visual Electronics Corp.
Zoomar, Inc.

## J

**Jack Panel Assemblies**
Altec Lansing
Audio Accessories, Inc.
CEI
Collins Radio Co.
Cooke Engineering Co.
Gates Radio Co.
Gulf Electro Sales, Inc.
Holland Electronics
Phelps Dodge Electronic
Potomac Instruments, Inc.
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Switchcraft, Inc.
Terminal Hudson Elect.
Trompeter Electronics

## K

**Kits**
Allied Electronic Corp.
Bardwell & McAlister, Inc.
Eico
Engineering Assoc.
G C Electronics
Heath Co.
Jensen Mfg. Div.
Mole Richardson Co.
P K Neuses, Inc.
Singer Prod. Co., Inc.
Upson Tools, Inc.
Vaco Products Co.
Waber Electronics, Inc.

## L

**Lenses, Optical, Fixed**
Angenieux Corp.
Arriflex Corp.
Burke & James
Canon
Concord Elect. Corp.
Dage Bell Div.
Dynamic Optics, Inc.
FB Ceco, Inc.
GBC CCTV
Gen. Electrodynamics
Rank Precision
RCA Broadcast Comm. Prd.
Shibaden Corp. of Amer.
Tele Cine, Inc.
Teledyne Co.
Visual Electronics Corp.
Zoomar, Inc.

**Lenses, Optical, Zoom**
Ampex
Angenieux Corp.
Arriflex Corp.
Burke & James
Canon
Concord Elect. Corp.
Dage Bell Div.
Dynamic Optics, Inc.
FB Ceco, Inc.
GBC CCTV
Power Optics
Rank Precision
RCA Broadcast Comm. Prd.
Shibaden Corp. of Amer.
Sonocraft Corp.
Tele Cine, Inc.
Teledyne Co.
Visual Electronics Corp.
Zoomar, Inc.

**Lighting, TV Controls**
Berkey Colortran, Inc.
Burke & James
Century-Strand
FB Ceco, Inc.
Houston Electronics
The Janson Industries
Kliegl Bros. Lighting
Lighting Unlimited
Metropolitan Elect. Mfg. Co.
Mole Richardson Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Tele Measurements, Inc.
Ultra Audio Products
Visual Electronics Corp.
Skirpan Electronics, Inc.

**Lighting, TV, Systems**
Bardwell & McAlister, Inc.
Berkey Colortran, Inc.
Burke & James
Century-Strand
Du Val I Fit Corp.
FB Ceco, Inc.
The Janson Industries
Kliegl Bros. Lighting
Lighting Unlimited
Metropolitan Elect. Mfg. Co.
Mole Richardson Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Skirpan Electronics Inc.
Sonocraft Corp.
Tele Measurements, Inc.
Telequip Corp.
Visual Electronics Corp.

**Lightning Arresters**
Collins Radio Co.
G C Electronics
G E Electronic Components
Joslyn Electronic Sys.
Singer Prod. Co., Inc.
Skirpan Electronics, Inc.
Vikoa, Inc.

**Lights, Tower, Obstruction**
Electronic Lights, Inc.
Gates Radio Co.
Harwood Mfg. Co.
Hughey Phillips, Inc.
Little Joe Enterprises
RCA Broadcast Comm. Prd.
Rohn Mfg. Co.
Singer Prod. Co., Inc.

## M

**Maintenance Services, Cartridge Tape**
Broadcast Prod. Co., Inc.
Collins Radio Co.
JOA Cartridge Service
RCA Service Co.
Paul Shepard, Inc.
Singer Prod. Co., Inc.

**Maintenance Services, FM**
Amer. Electronic Lab.
Collins Radio Co.
Little Joe Enterprises
RCA Service Co.
Paul Shepard, Inc.
Taber Mfg. Engr. Co.

**Maintenance Services, Microwave**
Amer. Electronic Lab.
Collins Radio Co.
Micro Link Div.
RCA Service Co.
Paul Shepard, Inc.

**Maintenance Services, TV**
Alcor Inc.
GBC CCTV
GE Visual Comm. Prod.
Sarkes Tarzian, Inc.
Paul Shepard, Inc.
Taber Mfg. & Engr. Co.
Tele Measurements, Inc.

**Meters, Field Strength, AM & FM**
Anaconda Electronics
Defense Electronics
Engineering Assoc.
Leader Instruments Corp.
McMartin Industries, Inc.
Metrics Div.
Potomac Instruments, Inc.
Simpson Electric Co.
Singer Prod. Co., Inc.
Wilkinson Elect. Inc.

**Meters, Field Strength, TV, UHF**
Blonder Tongue Lab, Inc.
CATV Equipment Co.
Defense Electronics
Engineering Assoc.
Jerrold Electronics Co.
JFD Electronics Co.
Katona Electronics Co.
Leader Instruments Corp.
Measurements
Potomac Instruments, Inc.
Rohde & Schwarz Sales
Sencore, Inc.
Simpson Electric Co.
TV Cable Supply Co.
Vikoa, Inc.
Video Instrument Corp.

**Meters, Flutter & WOW**
Gotham Audio Corp.
Kay Electric Co.
Leader Instruments Corp.
Micom, Inc.
Sentinel, Inc.

**Meters, Frequency**
Belar Electronics Lab.
Collins Radio Co.
Engineering Assoc.
G E Electronic Components
General Radio Co.
Hewlett Packard Co.
Hickok Elec. Instrument
Lampkin Lab. Inc.
Metrologie Compagnie Gen.
Microlab
Narda Microwave Corp.
Simpson Electric Co.
Singer Prod. Co. Inc.
Waters Mfg. Inc.

**Meters, Frequency Calibrating**
Hewlett Packard Co.
Hickok Elect. Instrument
Microlab
Micro Link Div.
Narda Microwave Corp.
Singer Prod. Co., Inc.

**Meters, Phase Angle**
G E Electronic Components
Metrics Div.
Potomac Instruments, Inc.
Rohde & Schwarz Sales

**Meters, Power**
Bird Electronic Corp.
Engineering Assoc.
General Microwave Corp.
Hewlett Packard Co.
Micro Link Div.
Narda Microwave Corp.
Rohde & Schwarz Sales
Simpson Electric Co.

**Meters, Standing Wave**
Bird Electronic Corp.
General Microwave Corp.
Hewlett Packard Co.
Metrologie Compagnie Gen.
Narda Microwave Corp.
Rohde & Schwarz Sales
Singer Prod. Co., Inc.
Weinschel Engineering Co.

**Microphone Stand & Boom**
Altec Lansing
Amer. Geloso Electronics
Atlas Sound Div.
Century-Strand
Custom Craft Designs
FB Ceco, Inc.
Gates Radio Co.
Gotham Audio Corp.
Houston Fearless Corp.
Lang Electronics Inc.
Mole Richardson Co.
North Amer. Philips AKG
Philips Broadcast Equipment
Primo Co. Ltd.
RCA Electronic Comp. Div.
RCA Service Co.
Sennheiser Electronics
Singer Prod. Co., Inc.
Television Products Inc.
Turner Microphone Co.
Zoomar, Inc.

**Microphones, Condenser**
Altec Lansing
B&K Instruments Inc.
FB Ceco, Inc.
Gates Radio Co.
Gotham Audio Corp.
Lang Electronics, Inc.
North Amer. Philips AKG
Orbit Radio and Video
Philips Broadcast Equipment
RCA Electronic Comp. Div.
RCA Service Co.
Sennheiser Electronics
Singer Prod. Co., Inc.
Sonocraft Corp.
Superscope, Inc.
Trusonic
Primo Co., Ltd.
Sparta Elect. Corp.

**Microphones, Dynamic**
Altec Lansing
Amer. Geloso Electronics
Bauer/Sparta Trans. Prod.
Collins Radio Co.
Electro-Voice, Inc.
FB Ceco, Inc.
G C Electronics
Gates Radio Co.
Lang Electronics, Inc.
Magnatech Co.
Miles Reproducer Co.
North Amer. Philips AKG
Philips Broadcast Equipment
Primo Co., Ltd.
RCA Electronic Comp. Div.
RCA Service Co.

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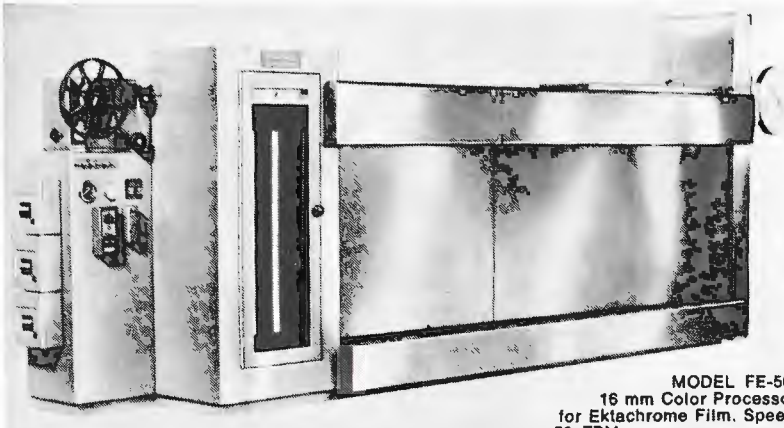

MODEL FE-50:
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- **"FILMLINE OVERDRIVE FILM TRANSPORT SYSTEM"** This marvel of engineering completely eliminates film breakage, pulled perforations, scratches and operator error. The film can be deliberately stalled in the machine without film breakage or significant change of film footage in solutions. The heart of any film processor is the drive system. No other film drive system such as sprocket drive, bottom drive or simple clutch drives with floating lower assemblies can give you the performance capability of the unique Filmline Overdrive Film Transport System.
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- **"TEMP-GUARD"** positive temperature control system. Completely transistorized circuitry insures temperature control to well within processing tolerances. Temp-Guard controls temperatures accurately and without the problems of other systems of lesser sophistication.
- **"TURBO-FLOW"** impingement dryer. Shortens dry-to-dry time, improves film results, and carefully controls humidity content of your valuable (and sometimes rare) originals. Immediate projection capability is assured because the film dries flat without the usual curl associated with other film processors.
- **"ZERO DOWN TIME"** The reputation of any film processor is only as good as its reliability. The combination of the exclusive and special added Filmline features guarantees trouble-free operation with absolute minimum down-time and without continual operator adjustments. Recapture your original investment in 2 years on maintenance savings alone. Filmline's "Push the button and walk-away processing" allows inexperienced operators to turn out highest quality film.
- **"MATERIALS, CONSTRUCTION AND DESIGN"** All Filmline machines are constructed entirely of metal and tanks are type 316 stainless steel, heliarc welded to government specifications. The finest components available are used and rigid quality control standards are maintained.

Compare Filmline features to other processors costing more money. Feature-by-feature, a careful evaluation will convince you that Filmline offers you more for your investment.

## Additional Features included in price of machine (Not as extras).

Magazine load, daylight operation ■ Feed-in time delay elevator (completely accessible) ■ Take-up time delay elevator (completely accessible) ■ Red brass bleach tank, shafts, etc. Prehardener solution filter ■ Precision Filmline Venturi air squeegee prior to drybox entry ■ Air vent on prehardener ■ Solid state variable speed D.C. drive main motor ■ Bottom drains and valves on all tanks ■ Extended development time up to two additional camera stops at 50 FPM ■ Pump recirculation of all eight solutions thru spray bars ■ Temperature is sensed in the recirculation line ■ All solutions temperature controlled, no chilled water required ■ Built-in air compressor ■ Captive bottom assemblies assure you constant footage in each solution ■ Change over from standard developing to extended developing can be accomplished in a matter of seconds ■ Impingement dryer allows shorter put through time.

**Partial listing of Filmline Color Installations:** — NBC- New York, NBC- Washington, NBC- Cleveland, NBC- Chicago, CBS & ABC Networks, Eastman Kodak, Rochester.

**Laboratories:** De Luxe Labs, General Film Labs (Hollywood), Pathe-Labs, Precision Labs, Mecca Labs, Color Service Co., Capital Film Labs, Byron Film Labs, MGM, Movie Lab, Lab-TV, Technical Film Labs, Telecolor Film Labs, Guffanti Film Labs, A-One Labs, All-service Labs, NASA Cape Kennedy, Ford Motion Picture Labs.

**TV Stations:** WAPI-TV, KTVI-TV, WXYZ-TV, WTPA-TV, WBTV-TV, WEAT-TV, WMAL-TV, WSYR-TV, WDSU-TV, WVUE-TV, WJXT-TV, WTOP-TV, WAVY-TV, KTAR-TV, WTVR-TV, WFBC-TV, WMAR-TV, WCKT-TV, WAVE-TV, WCPO-TV, WAPA-TV, WCIV-TV, WJIM-TV, WWL-TV, KYW-TV, KETV-TV, WNBQ-TV, KSLA-TV, WSAZ-TV, WHP-TV, WHCT-TV, WTWO-TV.

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Shure Brothers, Inc.
Singer Prod. Co., Inc.
Sonocraft Corp.
Sony
Sparta Elect. Corp.
Superscope, Inc.
Turner Microphone Co.

### Microphones, Velocity

Altec Lansing
FB Ceco, Inc.
Gates Radio Co.
Philips Broadcast Equipment
Primo Co., Ltd.
RCA Electronic Comp. Div.
RCA Service Co.
Shure Brothers, Inc.
Sony

### Microphones, Wireless

Amer. Geloso Electronics
Bauer/Sparta Trans. Prod.
Comrex Corp.
FB Ceco, Inc.
Gates Radio Co.
Lang Electronics, Inc.
Magnatech Co.
Microwave Assoc. Inc.
Miles Reproducer Co.
Orbit Radio and Video
Primo Co., Ltd.
RCA Service Co.
Albert Schultz, Inc.
Sennheiser Electronics
Singer Prod. Co., Inc.
Sonocraft Corp.
Superscope, Inc.
Trusonic

### Microwave Components

Alford Mfg. Co.
Amperex Corp.
Andrew Corp.
Andrews Towers, Inc.
Bird Electronic Corp.
Calvert Electronics, Inc.
Collins Radio Co.
Eimdc Div.
Fort Worth Tower Co.
G E Electronic Components
Lectronic Res. Labs, Inc.
Lenkurt Elect.
Microlab
Microwave Assoc. Inc.
Motorola Semiconductor
Narda Microwave Corp.
Phelps Dodge Electronics
Prodelin, Inc.
RCA Service Co.
Raytheon Co.
RHG Electronics
Singer Prod. Co., Inc.
Solitron Devices, Inc.
Sylvania Semiconductor
Telequip Corp.
Texas Instrument
Texscan Corp.
Weinschel Engineering Co.

### Microwave Systems, STL

Andrew Corp.
Collins Radio Co.
Du Val I Fit Corp.
GE Visual Comm. Prod.
Lenkurt Electric Co., Inc.
Marti Electronics
Micro Link Div.
Microwave Assoc., Inc.
Moseley Assoc., Inc.
RCA Broadcast Comm. Prd.
RCA Service Co.
Raytheon Co.
RHG Electronics
Sarkes Tarzian, Inc.
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Surface Construction

### Microwave Systems, 2500 MHz

Andrew Corp.
Chester Electronic Lab.
Colins Radio Co.
Lerro Electrical Corp.
Micro Link Div.
Microwave Assoc., Inc.
RCA Broadcast Comm. Prd.
RCA Service Co.
Raytheon Co.
RHG Electronics
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Surface Construction

### Mixers (Also See Consoles)

Altec Lansing
Bauer Electronics Corp.
Bradford Information System
Collins Radio Co.
Delta Electronics, Inc.
FB Ceco, Inc.
Gately Electronics
Gates Radio Co.
Harvey Radio Co., Inc.
Houston Electronics
Lang Electronics, Inc.
McMartin Industries, Inc.
Metrologie Compagnie Gen.
Microwave Assoc., Inc.
North American Philips AKG
Philips Broadcast Equipment
Orbit Radio and Video
RCA Service Co.
Shure Brothers, Inc.
Sparta Elect. Corp.
Tartan Electronics Corp.
Visual Electronics Corp.
Weinschel Engineering Co.

### Mobile Equipment

American Data Corp.
Andrews Towers, Inc.
Comrex Corp.
Delta Electronics, Inc.
Commercial Prod. Div.
Hammarlund Mfg.
Marti Electronics
Microwave Assoc., Inc.
Mobile Color, Inc.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
RCA Service Co.
Singer Prod. Co., Inc.
Sparta Elect. Corp.
Superior Continental Co.
Surface Construction
Utica Electronics
Visual Electronics Corp.
H. Wilson Corp.

### Mobile Equipment, TV

Dage Bell Div.
Electronic Mobile Units
General Television Ntwk.
Ikegami Co., Ltd.
The Janson Industries
Listec TV Equip. Corp.
Micro Link Div.
Microwave Assoc., Inc.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
RCA Service Co.
Riker Video Industries
Surface Construction
Sylvania Comm. Electronic
Tele Measurements, Inc.
Visual Electronics Corp.
H. Wilson Corp.

### Modulators, TV

Ampex
Anaconda
Blonder Tongue Lab., Inc.
The Catel Corp.
Dynair Electronics
Gates Radio Co.
Katona Electronics Co.
Micro Link Div.
Orbit Radio and Video
Philips Broadcast Equipment
Packard Bell Electronics
RCA Service Co.
Tele Measurements, Inc.

### Monitors, AM Systems

Arbor Systems, Inc.
Belar Electronics Lab
CBS Labs
CCA Electronics
Collins Radio Co.
Electro-Voice Inc.
Gates Radio Co.
Gotham Audio
Melcor Electronics Corp.
Potomac Instruments, Inc.
RCA Service Co.
Singer Prod. Co., Inc.
Wilkinson Elect. Inc.

### Monitors, FM Systems, Mono

Belar Electronics Lab
Collins Radio Co.
Electro-Voice Inc.
Gates Radio Co.
Gotham Audio
Karg Lab, Inc.
McMartin Industries, Inc.
RCA Service Co.
Singer Prod. Co., Inc.
Utica Electronics

### Monitors, FM Systems, SCA

Belar Electronics Lab.
Collins Radio Co.
Gates Radio Co.
Hammarlund Mfg.
Karg Lab., Inc.
McMartin Industries, Inc.
RCA
Singer Prod. Co., Inc.

### Monitors, FM Systems, Stereo

Ameco, Inc.
Belar Electronics Lab.
Collins Radio Co.
Electro-Voice Inc.
Gates Radio Co.
Karg Lab, Inc.
McMartin Industries, Inc.
Singer Prod. Co., Inc.
Telemeasurements

### Monitors, Frequency

Ameco, Inc.
Belar Electronics Lab
CCA Electronics
Collins Radio Co.
Edison Electronic Co.
Gates Radio Co.
Hewlett Packard Co.
Lampkin Lab, Inc.
McMartin Industries, Inc.
Microlab
Singer Prod. Co., Inc.
Wilkinson Elect., Inc.

### Monitors, Modulation

American Data Corp.
Belar Electronics
CBS Labs.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Lampkin Lab., Inc.
McMartin Industries, Inc.
Metron Instruments
Micro Link Div.
Singer Prod. Co., Inc.
Telemeasurements
Wilkinson Elect., Inc.

### Monitors, Phase

Defense Electronics, Inc.
Delta Elect.
Gates Radio Co.
Potomac Instruments, Inc.
Singer Prod. Co., Inc.

### Monitors, Power

Bird Electronic Corp.
Delta Elect.
Hewlett Packard Co.

### Monitors, Video

Ameco, Inc.
America Data Corp.
Bell & Howell Tape Div.
Concord Elect. Corp.
Conrac
Du Val I Fit Corp.
GE Visual Comm. Prod.
GPL Div. Singer General
Gates Radio Co.
General Television Ntwk.
Hewlett Packard Co.
Ikegami Co., Ltd.
Lerro Electrical Corp.
Miratel Div. Ball Bros.
Nemo Recording Labs
North Amer. Electronics
Packard Bell Electronics
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Sarkes Tarzian Inc.
Setchell Carlson, Inc.
Shibaden Corp. of Amer.
Sonocraft Corp.
Sony Corp. of America
Sylvania Comm. Electronics
Tektronix, Inc.
Tele Measurements, Inc.
Telequip Corp.
Vikoa, Inc.
Visual Electronics Corp.

### Monitors, Waveform

American Data Corp.
Calif. Instruments Corp.
Hewlett Packard Co.
Ikegami Co., Ltd.
Marconi Div.
Microlab
Miratel Div. Ball Bros.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Sony Corp. of America
Tektronix, Inc.
Telemation, Inc.
Tele Measurements, Inc.

### Multiplexers

The Catel Corp.
Collins Radio Co.
GE Visual Comm. Prod.
GPL Div. Singer General
Johnson Electronics
RFE Labs
Philips Broadcast Equipment
Singer Prod. Co., Inc.
Sonocraft Corp.
Telemation, Inc.
Tele Measurements, Inc.

## N

### Narrow Band FM Equipment

Collins Radio Co.
Comrex Corp.
Hammarlund Mfg.
Marti Electronics
Singer Prod. Co., Inc.

### Networks, Matching, Audio

Collins Radio Co.
Electrodyne Corp.
Jensen Mfg. Div.
Kappa Networks
Singer Prod. Co., Inc.
TT Electronics, Inc.
Universal Audio, Inc.

### Networks, Matching, RF

Alford Mfg. Co.
Blonder Tongue Lab, Inc.
Collins Radio Co.
Continental Electronics
Gates Radio Co.
Kappa Networks
Multronics, Inc.
Narda Microwave Corp.
Singer Prod. Co., Inc.
TT Electronics, Inc.

### Networks, Phasing

Amer. Electronic Lab
CCA Electronics
Collins Radio Co.
Continental Electronics
Gates Radio Co.
Kappa Networks
Multronics, Inc.
Presearch, Inc.
Ward Electronic Indus.

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Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Simpson Electric Co.
Singer Prod. Co., Inc.
Terminal Hudson Electrs.
Triplett Elect. Instruments

**Oscillators, AM**
Arbor Systems, Inc.
Engineering Assoc.
Gibbs Mfg. & Research Co.
Heath Co.
Leader Instruments Corp.
Singer Prod. Co., Inc.
Trepac Corp. America

**Oscillators, FM**
Belar Electronics Lab
Heath Co.
Leader Instruments Corp.
Microwave Assoc., Inc.

**Oscillators, TV**
Heath Co.
Riker Video Industries
Tektronix, Inc.

**Oscilloscopes**
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Eico
Heath Co.
Hewlett Packard Co.
Hickok Elect. Instruments
Leader Instruments Corp.
Measurements
Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Sencore, Inc.
Singer Prod. Co., Inc.
Tektronix, Inc.
Texscan Corp.

**P**

**Phasing Units (See Networks Phasing)**
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Presearch, Inc.
Videon Corp.

**Phonograph Turntables (See Turntables)**
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Gates Radio Co.
Gotham Audio Corp.
Albert Schultz, Inc.
Sonocraft Corp.
Superscope, Inc.
QRK

**Power Supplies, AC**
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Ameco, Inc.
American Data
Anaconda Electronics
CATV Equipment Co.
Collins Radio Co.
Delta Electronics, Inc.
Engineering Assoc.
Essex Wire Co., RBM Div.
FB Ceco, Inc.
Fairchild Recording Eqpt.
G E Electronic Components
Heath Co.
Honeywell, Inc.
Ikegami Co., Ltd.
Mole Richardson Co.
Singer Prod. Co., Inc.
Terminal Hudson Elect.
Topaz, Inc.

**Power Supplies, Precision**
Advanced High Voltage Co.
Altec Lansing
American Data Corp.
Collins Radio Co.
Engineering Assoc.
Fairlane Electronics
Heath Co.
Hewlett Packard Co.
Multimetrics, Inc.
Precision Lab.
Resalab, Inc.

**Preamplifiers, Audio**
Alcor, Inc.
Alma Engineering
Altec Lansing
Ameco, Inc.
American Data Corp.
Arbor Systems, Inc.
B&K Instruments, Inc.
Bauer/Sparta Trans. Prod.
Bell P/A Prod. Corp.
Bogen Communications
Bradford Information Sys.
CCA Electronics
Collins Radio Co.
Crown International
Delta Electronics, Inc.
Denrad Mfg. Co., Inc.
Dynair Electronics
Electrodyne Corp.
Electronic Designers, Inc.
Fairchild Recording Eqpt.
GE Visual Comm. Prod.
Gately Electronics
Gates Radio Co.
Grass Valley Group
Interntl. Nuclear Corp.
Koss Electronics, Inc.
Lang Electronics, Inc.
Leader Instruments Corp.
Marti Electronics
McMartin Industries, Inc.
Melcor Electronics Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
Orbit Radio and Video
QRK Electronic Prod.
Russco Electronics Mfg.
Shure Brothers, Inc.
Singer Prod. Co., Inc.
Standard Radio Corp.
Superscope, Inc.
Tape-Athon Corp.
Telexcommunications Div.
Universal Audio, Inc.
VIF International
Visual Electronics Corp.
Ward Electronic Indus.

**Preamplifiers, Video**
Aerovox Corp.
Ameco, Inc.
AMF Alexandria
Fairlane Electronics
Interntl. Nuclear Corp.
Philips Broadcast Equipment
Presearch, Inc.
Shintron Co., Inc.
TV Cable Supply Co.
Tele Measurements, Inc.
Visual Electronics Corp.
Ward Electronic Indus.

**Pressurization Equipment, Transmission Line**
Andrew Corp.
Andrews Towers, Inc.
Collins Radio Co.
Superior Continental Co.

**Probes, Oscilloscopes**
Arbor Systems, Inc.
Hewlett Packard Co.
Hickok Elect. Instrument
Leader Instruments Corp.
Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Sencore, Inc.
Tektronix, Inc.
Texscan Corp.

**Processors, Film, B & W**
Cintel Corp.
FB Ceco, Inc.
Fairchild Industrial
Filmline Corp.
Houston Fearless Corp.

Houston Photo Prod.
Tech Film Labs, Inc.
Treise

**Processors, Film, Color**
ABTO
Cintel Corp.
FB Ceco, Inc.
Filmline Corp.
Houston Fearless Corp.
Houston Photo Prod.
Jamieson Film Co.
Mincon Div., 3M Co.
Tech Film Labs, Inc.
Triese

**Projectors, Film**
Arriflex Corp. of Amer.
Du Val I Fit Corp.
Eastman Kodak Co.
FB Ceco, Inc.
GAF Corp.
The Kalart Co., Inc.
L W Photo, Inc.
Lipsner-Smith
Listec TV Equip. Corp.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Tele Cine, Inc.
Traid Corp.
Visual Electronics Corp.

**Projectors, Film, Rear**
FB Ceco, Inc.
Fairchild Industrial
The Kalart Co., Inc.
Telepro Industries
H. Wilson Corp.

**Projectors, Slide**
Century Lighting, Inc.
Eastman Kodak Co.
FB Ceco, Inc.
GAF Corp.
Gray Research Div.
The Kalart Co., Inc.
RCA Broadcast Comm. Prd.
Visual Electronics Corp.

**Projectors, TV, Large Screen**
FB Ceco, Inc.
GBC CCTV
GPL Div. Singer General
General Television Ntwk.
Hokushin Elect. Co.
The Janson Industries
The Kalart Co., Inc.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Tele Measurements, Inc.

## R

**Radar, Weather**
Canoga Elect. Co.
Collins Radio Co.
Gen. Electrodynamics
Kaar Engr. Co.

**Radomes**
Advance Industries
Andrews Towers, Inc.
Collins Radio Co.
Jampro Antenna Co.
Parabam, Inc.

**Receivers, AM**
Bogen Communications
Collins Radio Co.
Comrex Corp.
Delco Radio
Electro-Voice
Gates Radio Co.
Hallicrafters
Hammarlund Mfg.
Heath Co.
IRC Div. TRW, Inc.
Kahn Research Lab., Inc.
North Amer. Philips AKG
Philips Broadcast Equip.
Singer Prod. Co., Inc.
Utica Electronics

**Receivers, FM**
Ameco, Inc.
Belar Electronics Lab
Bogen Communications
Comrex Corp.
Electro-Voice
Delco Radio
Gates Radio Co.
Hammarlund Mfg.
Heath Co.
IRC Div. TRW, Inc.
Marti Electronics
North Amer. Philips AKG
Philips Broadcast Equip.
Singer Prod. Co., Inc.
Utica Electronics
Wilkinson Elect. Inc.

**Receivers, HF**
Amer. Electronic Lab.
Collins Radio Co.
Comrex
Engineering Assoc.
Hammarlund Mfg.
Karg Lab., Inc.
Multronics, Inc.
Narda Microwave Corp.
Singer Prod. Co., Inc.

**Receivers, Multiplex**
Belar Electronics Lab.
Bogen Communications
Calbest Electronics
Electro-Voice, Inc.
Gotham Audio Corp.
Heath Co.
Johnson Electronics
Karg Lab, Inc.
Albert Schultz, Inc.
Singer Prod. Co., Inc.
Standard Radio Corp.
Superscope, Inc.

**Receivers, SCA**
Belar Electronics Lab
Calbest Electronics
Karg Lab, Inc.
Marti Electronics
McMartin Industries, Inc.
Singer Prod. Co., Inc.

**Receivers, TV, Color**
Ameco, Inc.
Heath Co.
RCA
Setchell Carlson, Inc.
Singer Prod. Co., Inc.
Sony Corp. of America
Standard Radio Corp.
Sylvania Comm. Electronics

**Receivers, TV, Monocrome**
Ameco, Inc.
Heath Co.
Nemo Recording Labs
Setchell Carlson, Inc.
Singer Prod. Co., Inc.
Sony Corp. of America
Standard Radio Corp.
Sylvania Comm. Electronics

**Recorders, Disc, Magnetic**
Colorado Video, Inc.
Gen. Electrodynamics
Gotham Audio Corp.
Albert Schultz, Inc.
Telectro Systems Corp.
Visual Electronics Corp.

**Recorders, Film, Light**
3M Company, Mincom Div.
Visual Electronics Corp.

**Recorders, Film, Magnetic**
3M Company, Mincom Div.
W. A. Palmer Films, Inc.
Rangertone Electronics
Telectro Systems Corp.
Visual Electronics Corp.

**Recorders, Logging, Magnetic**
Ampex Corp.
Lang Electronics, Inc.
Metrotech, Inc.
Miles Reproducer Co.
Nagra Magnetic Recorders
Rangertone Electronics
RHG Electronics
Scovill Div.
Tape-Athon Corp.
Telectro Systems Corp.

**Recorders, Tape, Audio**
Accurate Sound Co.
Alcor, Inc.
Allied Electronic Corp.
Amer. Geloso Electronics
Ampex Corp.
Audio Magnetics Corp.
Bauer/Sparta Trans. Prod.
B&K Instruments Inc.
Bell & Howell Tape Div.
Broadcast Electronics
Cine Sonic Sound, Inc.
Concord Elect. Corp.
Continental Elect.
Crown International
Gates Radio Co.
Gauss Electrophysics
Gotham Audio Corp.
Heath Co.
Interntl. Good Music, Inc.
Lang Electronics, Inc.
Magnatech Co.
Magna Tech Corp.
Magnecord
Magnetic Recording Systems
Martel Electronics, Inc.
McKenzie Labs
Metrotech, Inc.
Miles Reproducer Co.
Nemo Recording Labs
North Amer. Philips AKG
Philips Broadcast Equipment
Orbit Radio and Video
RCA Broadcast Comm. Prd.
Rangertone Electronics
Recordex Corp.
Ryder Magnetics Sales
Albert Schultz, Inc.
Scovill Div.

Scully Recording Inst.
Singer Prod. Co., Inc.
Sonocraft Corp.
Soundscriber
Sparta Elect. Corp.
Standard Radio Corp.
Superscope, Inc.
Taber Mfg. & Engr. Co.
Tandberg of America, Inc.
Tape-Athon Corp.
Teac Corp.
Telectro Systems Corp.
Telexcommunications Div.
VIF International
Visual Electronics Corp.

**Recorders, Tape, Audio, Cartridge**

Amer. Geloso Electronics
Ampro Corp.
Audio Magnetics Corp.
Bauer/Sparta Trans. Prod.
Broadcast Electronics
Broadcast Prod. Co., Inc.
Cine Sonic Sound, Inc.
Collins Radio Co.
Concord Elect. Corp.
Gates Radio Co.
Interntl. Good Music, Inc.
International Tapetronics
Lang Electronics, Inc.
MaCarta, Inc.
Magna Tech Corp.
Martel Electronics, Inc.
McKenzie Labs
Nemo Recording Labs
Philips Broadcast Equipment
Power Optics, Inc.
Rangertone Electronics
Recordex Corp.
Albert Schultz, Inc.
Scovill Div.
Singer Prod. Co., Inc.
Sparta Elect Corp.
Standard Radio Corp.
Superscope, Inc.
Tandberg of America, Inc.
Tapecaster
Telectro Systems Corp.
Telexcommunications Div.
Visual Elect.

**Recorders, Replacement Motor**

Minirak Elect. Co.

**Recorders, Magnetic Tape, Logging**

Ampex Corp.
Crown International
Gates Radio Co.
Honeywell, Inc.
Metrotech, Inc.
Philips Broadcast Equipment
Scovill Div.
Telectro Systems Corp.
Telexcommunications Div.

**Recorders, Magnetic Tape, Video**

Ampex
Bell & Howell Tape Div.
CATV Equipment Co.
Concord Elect. Corp.
Dage Bell Div.
GBC CCTV
GPL Div. Singer General
General Television Ntwk.
International Video
Ikegami Co. Ltd.
Philips Broadcast Equipment
Lerro Electrical Corp.
3M Co., Mincom Div.
RCA

**Remote Control Systems**

Aerovox Corp.
Andrews Towers, Inc.
Bauer/Sparta Trans. Prod.
CCA Electronics
Collins Radio Co.
Engineering Assoc.
Gates Radio Co.
G E Electronic Components
Marti Electronics
Micro Link Div.
Mosley Assoc. Inc.
Mosley Electronics
RCA Broadcast Comm. Prd.
RFE Labs
RHG Electronics
Rust Corp.
Singer Prod. Co., Inc.
Trepac Corp. America
Visual Electronics Corp.

**Recorders, Paper Logging and Graphic**

B&K Instruments, Inc.
Bauer Electronics Corp.
G E Electronic Components
Health Co.
Hickok Elec. Instrument
Mosley Electronics
Rust Corp.
Rustrak Instrument Div.
Simpson Electric Co.

**Recorders, Video, Kinescope**

Diamond Electronics
RCA Broadcast Comm. Prd.
Shibaden Corp. of Amer.
Sonocraft Corp.
Telectro Systems Corp.
Tele Measurements Inc.

**Recording Service, Audio, Tape**

Accurate Sound Co.
Aerovox Corp.
Alcor, Inc.
Audio Magnetics Corp.
Cine Sonic Sound Inc.
Duotone Co., Inc.
Interntl. Good Music, Inc.
Magnetic Studios Corp.
Nemo Recording Labs
Orbit Radio and Video
Singer Prod. Co., Inc.
Sound Studios, Inc.
Ultra Audio Products

**Record Players (See Turntables)**

Collins Radio Co.
Gotham Audio Corp.
Gray Research Div.
Albert Schultz, Inc.
Superscope, Inc.

**Reel, Cable & Mike**

Industrial Elect. Reels

**Reflectors, Passive**

Advance Industries
Collins Radio Co.
Fort Worth Tower Co.
Microelect Co., Inc.
Rohn Mfg. Co.

**Regulators, Voltage**

Arbor Systems, Inc.
B&K Instruments, Inc.
Collins Radio Co.
Engineering Assoc.
G E Electronic Components
Kato Engineering Co.
Terminal Hudson Elect.

**Rewinders, Film**

FB Ceco, Inc.
Neumade Prod. Corp.
Precision Lab
RCA Broadcast Comm. Prd.

**Rewinders, Tape**

Bell Sound Studios
Harvey Radio Co., Inc.
Neumade Prod. Corp.
Recordex Corp.
Singer Prod. Co., Inc.
Sparta Elect. Corp.

**S**

**Scramblers, Speech**

Collins Radio Co.
Hewlett Packard Co.
Kahn Research Lab., Inc.
Singer Prod. Co., Inc.
Trepac Corp. America

**Screens, Projection, Front**
FB Ceco, Inc.
Raven Screen Corp.
Sonocraft Corp.

**Screens, Projection, Rear**
FB Ceco, Inc.
Raven Screen Corp.
Sonocraft Corp.
H. Wilson Corp.

**Semiconductor, Rectifiers, General**
Amperex Corp.
Calvert Electronics, Inc.
Collins Radio Co.
G E Distributor Sales Op.
G E Electronic Components
Heintz and Kaufman Ltd.
IRC Div. TRW, Inc.
JSH Elect Co.
Mallory
Motorola Semiconductor
RCA Electronic Comp. Div.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Sylvania Semiconductor
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductor, Rectifiers High Voltage**
Amperex Corp.
Calvert Electronics, Inc.
Collins Radio Co.
G E Distributor Sales Op.
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Motorola Semiconductor
RCA Electronic Comp. Div.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.
Wilkinson Elect., Inc.

**Semiconductor, Rectifiers, Power**
Amperex Corp.
Calvert Electronics, Inc.
Collins Radio Co.
G E Distributor Sales Op.
G E Electronic Components
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Mallory
Motorola Semiconductor
RCA Electronic Comp. Div.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Sylvania Semiconductor
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductor, Rectifiers, Silicon Controlled-SCR**
Amperex Corp.
Calvert Electronics, Inc.
Collins Radio Co.
Delco Radio
G E Electronic Components
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Kliegl Bros. Lighting
Motorola Semiconductor
RCA Electronic Comp. Div.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductors, Thyristors**
Calvert Electronics, Inc.
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Kliegl Bros. Lighting
Motorola Semiconductor
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductors, Transistors, AF**
Calvert Electronics, Inc.
Delco Radio
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Motorola Semiconductor
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Sylvania Semiconductor
Telefunken Sales Corp.
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductors, Transistors, FE**
Amperex Corp.
Calvert Electronics, Inc.
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Motorola Semiconductor
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductor, Transistors, General**
Boonton Electronics
Calvert Electronics, Inc.
Delco Radio
G E Electronic Components
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Motorola Semiconductor
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Sylvania Semiconductor
Telefunken Sales Corp.
Terminal Hudson Elect.
Texas Instrument
Thor Electronics Corp.

**Semiconductor, Transistors, RF**
Calvert Electronics, Inc.
Heintz and Kaufman, Ltd.
JSH Elect. Co.
Motorola Semiconductor
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Solitron Devices, Inc.
Sylvania Semiconductor
Telefunken Sales Corp.
Texas Instrument
Thor Electronics Corp.

**Shifters, Phase, Microwave**
Collins Radio Co.
Hewlett Packard Co.
Microlab
Microwave Assoc., Inc.
Narda Microwave Corp.
Weinschel Engineering Co.

**Sound Systems, Outdoor**
Aerovox Corp.
Alcor, Inc.
Allied Electronic Corp.
Altec Lansing
Amer. Geloso Electronics
Applied Elect. Mechanics
Audio Distributor, Inc.
Bell P/A Prod. Corp.
Bogen Communications
Electrodyne Corp.
Electro-Voice
Harvey Radio Co., Inc.
Houston Electronics
Jensen Mfg. Div.
Magnetic Studios Corp.
McMartin Industries, Inc.
North Amer. Philips AKG
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Rangertone Electronics
Ultra Audio Products

**Sound Systems, Portable**
Aerovox Corp.
Alcor, Inc.
Allied Electronic Corp.
Altec Lansing
Amer. Geloso Electronics
Applied Elect. Mechanics

Audio Distributor, Inc.
Bell P/A Prod. Corp.
Bogen Communications
Comrex Corp.
Electrodyne Corp.
Electro-Voice
Harvey Radio Co., Inc.
Houston Electronics
Jensen Mfg. Div.
Magnetic Studios Corp.
McMartin Industries, Inc.
North Amer. Philips AKG
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Rangertone Electronics
Ultra Audio Products

### Sound Systems, Theater

Aerovox Corp.
Alcor, Inc.
Altec Lansing
Amer. Geloso Electronics
Audio Distributor, Inc.
Bogen Communications
Electrodyne Corp.
Electro-Voice
Harvey Radio Co., Inc.
Houston Electronics
Jensen Mfg. Div.
Magnetic Studios Corp.
McMartin Industries, Inc.
North Amer. Philips AKG
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Rangertone Electronics
Tartan Electronics Corp.
Universal Audio, Inc.

### Speakers

Alcor, Inc.
Allied Electronic Corp.
Altec Lansing
Amer. Geloso Electronics
Atlas Sound Div.
Bogen Communications
Cleveland Electronics
Electro-Voice, Inc.
Gotham Audio Corp.
Hartley Prod. Corp.
Jensen Mfg. Div.
Koss Electronics, Inc.
North Amer. Philips AKG
Philips Broadcast Equipment
Oaktron Industries, Inc.
Albert Schultz, Inc.
Singer Prod. Co., Inc.
Superscope, Inc.
Tandberg of America, Inc.

### STL Equipment

Andrews Towers, Inc.
Collins Radio Co.
Comrex Corp.
Dynair Electronics
GE Visual Comm. Prod.
Gates Radio Co.
Marti Electronics
Micro Link Div.
Microwave Assoc., Inc.
Moseley Assoc., Inc.
Moseley Electronics
RCA Electronic Comp. Div.
RHG Electronics
Sarkes Tarzian, Inc.
Scala Radio Corp.
Singer Prod. Co., Inc.
Tektronix, Inc.

### Switchers

Alma Engineering
American Data Corp.
Ampex
Audio Design & Mfg.
Bradford Information Sys.
Catel Corp.
Central Dynamics
3M Co., Mincom Div.
Dynair Electronics
Essex Wire Co., RBM Div.
Jerrold
Richmond Hill
Riker Video Industries
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Tartan Electronics Corp.
Telemet
Terminal Hudson Elect.
Vidion Corp.
Vikoa
Visual Electronics Corp.
Vital
Ward Electronic Indus.

### Switches, Coaxial

Alford Mfg. Co.
Amer. Electronic Lab.
Andrew Corp.
Andrews Towers, Inc.
B rd Electronic Corp.
Blonder Tongue Lab, Inc.
CEI
Collins Radio Co.
ITT Jennings
Jampro Antenna Co.
Kay Electric Co.
Lectronic Res. Labs, Inc.
Matrix
Microlab
Microwave Assoc., Inc.
Narda Microwave Corp.
Prodelin, Inc.
Singer Prod. Co., Inc.
Telonic Instruments
Texscan Corp.
Trompeter Electronics
Waters Mfg., Inc.
Weinschel Engineering Co.

### Switches, Crossbar

Andrew Corp.
Collins Radio Co.
Dynair Electronics
Grass Valley Group
Rust Corp.
Singer Prod. Co., Inc.
Tape-Athon Corp.
Trompeter Electronics
Vital Industries

### Switching Systems

Alma Engineering
American Data Corp.
Ampex
Andrew Corp.
Andrews Towers, Inc.
Arbor Systems, Inc.
Bradford Information Sys.
Canoga Elect. Co.
Central Dynamics Corp.
Cohu Electronics, Inc.
Collins Radio Co.
Dynair Electronics
Grass Valley Group
Holland Electronics
International Video
Matrix
RCA Broadcast Comm. Prd.
Richmond Hill
Riker Video Industries
Rust Corp.
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Switchcraft, Inc.
Tartan Electronics Corp.
Telemation, Inc.
Trepac Corp. America
Trompeter Electronics
Videon Corp.
Vikoa, Inc.
Ward Electronic Indus.
Vital Industries

## T

### Tape, Decks, Magnetic

Accurate Sound Co.
Ampex Corp.
Bauer/Sparta Trans. Prod.
Bell & Howell Tape Div.
Broadcast Electronics
Collins Radio Co.
Crown International
Gates Radio Co.
Gotham Audio Corp.
Hewlett Packard Co.
Internatl. Good Music, Inc.
Lang Electronics, Inc.
Magna Tech Corp.
Magnecord
McKenzie Labs
RCA Broadcast Comm. Prd.
Recordex Corp.
Albert Schultz, Inc.
Singer Prod. Co., Inc.
Superscope, Inc.
Tandberg of America, Inc.
Tape-Athon Corp.
Teac Corp.
Telexcommunications Div.
Visual Electronics Corp.
Wide Response

### Tape Duplicators

Accurate Sound Co.
Aerovox Corp.
Alcor, Inc.
Ampex Corp.
Bell Sound Studios
Crown International
Harvey Radio Co., Inc.
Lang Electronics, Inc.
Magna Tech. Corp.
Magnecord
Magnetic Studios Corp.
Minneapolis Magnetics
Orbit Radio and Video
Philips Broadcast Equipment
Recordex Corp.
Sonocraft Corp.
Telectro Systems Corp.
Telexcommunications Div.
WTTW Recording Serv.

### Tape, Magnetic Recording, Audio

Allied Electronic Corp.
Amer. Geloso Electronics
Ampex Corp.
Audio Devices
Audio Magnetics Corp.
Bauer/Sparta Trans. Prod.
Broadcast Electronics
Channel Marketing, Inc.
Concord Elect. Corp.
Crown International
Duotone Co., Inc.
Eastman Kodak Co.
Elektromesstechnik
Magnatech Co.
Magnetic Prod. Div.
Magnetic Studios Corp.
Miles Reproducer Co.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Recordex Corp.
Ryder Magnetics Sales
Sarkes Tarzian, Inc.
Albert Schultz, Inc.
Singer Prod. Co., Inc.
Sonocraft Corp.
Stancil-Hoffman
Superscope, Inc.
Tandberg of America, Inc.
Tape-Athon Corp.
Teac Corp.
Wide Response

### Tape, Magnetic Recording, Audio Cartridges

Amer. Geloso Electronics
Audio Devices
Audio Magnetics Corp.
Bauer/Sparta Trans. Prod.
Broadcast Electronics
Broadcast Prod. Co., Inc.
Channel Marketing, Inc.
Concord Elect. Corp.
Continental Elect.
JOA Cartridge Service
Magnetic Prod. Div.
Marathon Broadcast Equip.
McKenzie Labs
Nemo Recording Labs
RCA Broadcast Comm. Prd.
Recordex Corp.
Albert Schultz, Inc.
Singer Prod. Co., Inc.
Superscope, Inc.
Tapecaster
Telepro Industries

### Tape, Magnetic Recording, Computer

Audio Devices
Magnetic Prod. Div.
Memorex Corp.
Singer Prod. Co., Inc.
Wide Response

### Tape, Magnetic Recording, Test

Ampex Corp.
Audio Devices
Nortronics Co., Inc.

RCA Broadcast Comm. Prd.
Albert Schultz, Inc.
Taber Mfg., Engr. Co.

**Tape, Magnetic Recording, Video**
Audio Devices
3M Company, Mincom Div.
Cine Sonic Sound, Inc
Concord Elect. Corp.
GBC CCTV
Lerro Electrical Corp.
Magnetic Prod. Div.
Memorex Corp.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Recordex Corp.
Shibaden Corp. of Amer.
Sonocraft Corp.
Sony Corp. of America
Telectro Systems Corp.
Tele Measurements, Inc.
WTTW Recording Serv
Wide Response

**Tape, Recording, Logging**
Audio Devices
Cine Sonic Sound, Inc.
RHG Electronics
Tele Cine, Inc.
Wide Response

**Test Slides, Video**
D. & S. Corley

**Testers, Semiconductor**
Amer. Electronic Lab.
Collins Radio Co.
Delta Elect. Instrument
Eico
Heath Co.
Hickok Elect. Instrument
Rohde Schwarz Sales
Sencore, Inc.
Singer Prod. Co., Inc.
Tektronix, Inc.
Triplett Elect. Instrument

**Testers, Vacuum Tube**
Allied Electronic Corp.
Hickok Elect. Instrument
RCA Electronic Comp. Div.
Sencore, Inc.
Singer Prod. Co., Inc.
Triplett Elect. Instrument

**Towers, Antenna**
Advance Industries
Dresser Crane
E Z Way Prod., Inc.
Fort Worth Tower Co.
G C Electronics
Gates Radio Co.
Jampro Antenna Co.
Kline Iron Steel Co.
Little Joe Enterprises
Microelect Co., Inc.
Multronics, Inc.
Rohn Mfg. Co.
R F Systems
Paul Shepard, Inc.
Stainless, Inc.
Swager Tower Corp.
Up Right Scaffolds

**Towers, Antenna, Receiving**
Ameco, Inc.
Antenna Prod. Div.
Dresser Crane
E Z Way Prod., Inc.
Little Joe Enterprises
Microelect Co., Inc.
R F Systems
Rohn Mfg. Co.
Singer Prod. Co., Inc.
Stainless, Inc.
Swager Tower Corp.

**Towers, Antenna, Transmitting, AM**
Advance Industries
Antenna Prod. Div.
Collins Radio Co.
Dresser Crane
E Z Way Prod., Inc.
Fort Worth Tower Co.
Gates Radio Co.
Jampro Antenna Co.
Kline Iron Steel Co.
Little Joe Enterprises
Microelect Co., Inc.
RCA Broadcast Comm. Prd.

# READER SERVICE CARD Broadcast Engineering

**FOR ISSUE OF JUNE, 1970**

**CARD EXPIRES SEPTEMBER 1, 1970**

**After that date, please contact manufacturer direct.**

Please print or type.

Name .....

Firm .....

PO Box or Street .....

City & State ..... Zip

Please sign .....

Circle Numbers below which correspond to items on which you want information:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 | 31 | 46 | 61 | 76 | 91 | 106 | 121 | 136 | 151 | 166 | 181 |
| 2 | 17 | 32 | 47 | 62 | 77 | 92 | 107 | 122 | 137 | 152 | 167 | 182 |
| 3 | 18 | 33 | 48 | 63 | 78 | 93 | 108 | 123 | 138 | 153 | 168 | 183 |
| 4 | 19 | 34 | 49 | 64 | 79 | 94 | 109 | 124 | 139 | 154 | 169 | 184 |
| 5 | 20 | 35 | 50 | 65 | 80 | 95 | 110 | 125 | 140 | 155 | 170 | 185 |
| 6 | 21 | 36 | 51 | 66 | 81 | 96 | 111 | 126 | 141 | 156 | 171 | 186 |
| 7 | 22 | 37 | 52 | 67 | 82 | 97 | 112 | 127 | 142 | 157 | 172 | 187 |
| 8 | 23 | 38 | 53 | 68 | 83 | 98 | 113 | 128 | 143 | 158 | 173 | 188 |
| 9 | 24 | 39 | 54 | 69 | 84 | 99 | 114 | 129 | 144 | 159 | 174 | 189 |
| 10 | 25 | 40 | 55 | 70 | 85 | 100 | 115 | 130 | 145 | 160 | 175 | 190 |
| 11 | 26 | 41 | 56 | 71 | 86 | 101 | 116 | 131 | 146 | 161 | 176 | 191 |
| 12 | 27 | 42 | 57 | 72 | 87 | 102 | 117 | 132 | 147 | 162 | 177 | 192 |
| 13 | 28 | 43 | 58 | 73 | 88 | 103 | 118 | 133 | 148 | 163 | 178 | 193 |
| 14 | 29 | 44 | 59 | 74 | 89 | 104 | 119 | 134 | 149 | 164 | 179 | 194 |
| 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | 195 |

Please check every box which applies to you.

I want to continue to receive Broadcast Engineering regularly without charge. ☐ Yes ☐ No

(Note: Complimentary circulation limited to occupations listed below.)

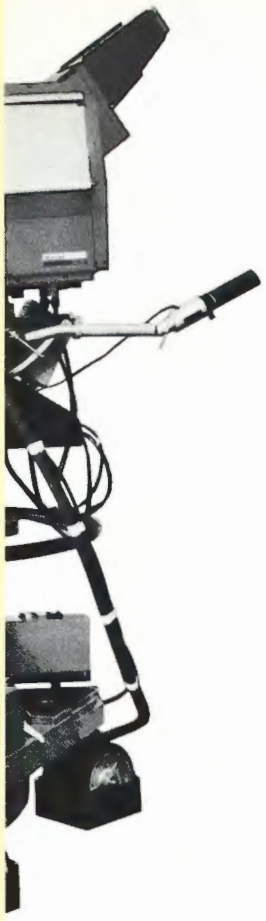
**Please check both your business and occupation:**

- ☐ A. AM Radio Station
- ☐ B. FM Radio Station
- ☐ C. Television Station
- ☐ D. ETV Station
- ☐ E. CATV Station
- ☐ F. Instructional TV
- ☐ G. Network Station
- ☐ H. Consulting Engineer
- ☐ I. College Station
- ☐ J. Recording Studio
- ☐ K. Manufacturer or Distributer
- ☐ L. Government Agency, Library
- ☐ M. Engineering School
- ☐ N. Owner, Manager, Officer
- ☐ O. Engineer, Technician
- ☐ P. Other .....

**Please check boxes that apply.**

- ☐ specify ☐ purchase
- ☐ approve purchase of:
  - ☐ Services
  - ☐ Capital Equipment
  - ☐ Replacement Parts

A



under the complete control of a production staff.

The speed of the shot-to-shot transitions may be varied to suit the situation.

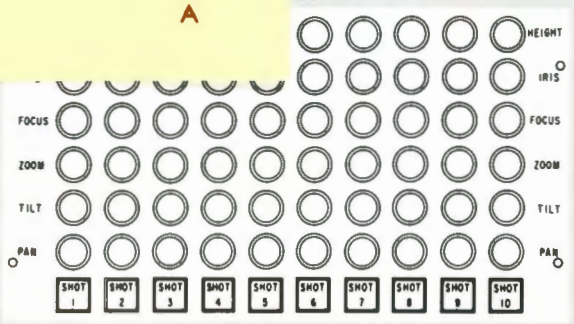
Each shot is recalled, on air, by the simple pressing of appropriate shot buttons. If a subject should move from prearranged pattern, on-air adjustments can be made at the Control Panel. The pre-set shots may be used in predetermined sequence or at will, depending on the nature of the production.

Investigate the P.O.I. Remote Control System as a production aid, it will open your eyes to unlimited possibilities, not only in production but in the economic aspects of automated camera control.

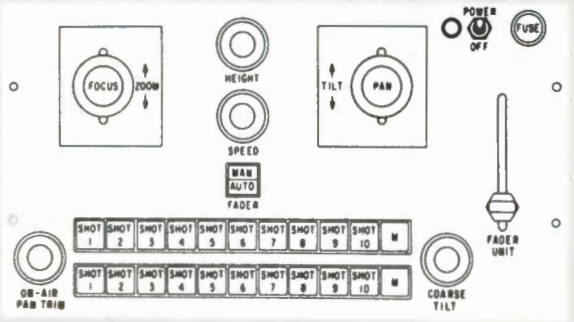
We invite inquiries on this equipment and urge you to request our material describing it, together with a list of stations now using it.

006

NG PANEL




CONTROL PANEL




**POWER OPTICS, INC.**

FAIRVIEW VILLAGE, PA. 19409 • (215) 272-5300 • TELEX 846411

*Western Inquiries contact: Television Products, Inc. (213) 678-2388*

Circle Number 55 on Reader Reply Card

Towers, Antenna
Advance Industries
Dresser Crane
E Z Way Prod., Inc.
Fort Worth Tower Co.
G C Electronics
Gates Radio Co.
Jampro Antenna Co.
Kline Iron Steel Co.
Little Joe Enterprises
Microelect Co., Inc.
Multronics, Inc.
Rohn Mfg. Co.
R F Systems
Paul Shepard, Inc.
Stainless, Inc.
Swager Tower Corp.
Up Right Scaffolds

**Towers, Antenna, Receiving**
Ameco, Inc.
Antenna Prod. Div.
Dresser Crane
E Z Way Prod., Inc.
Little Joe Enterprises
Microelect Co., Inc.
R F Systems
Rohn Mfg. Co.
Singer Prod. Co., Inc.
Stainless, Inc.
Swager Tower Corp.

**Towers, Antenna, Transmitting, AM**
Advance Industries
Antenna Prod. Div.
Collins Radio Co.
Dresser Crane
E Z Way Prod., Inc.
Fort Worth Tower Co.
Gates Radio Co.
Jampro Antenna Co.
Kline Iron Steel Co.
Little Joe Enterprises
Microelect Co., Inc.
RCA Broadcast Comm. Prd.

# REMOTELY CONTROLLED CAMERA SYSTEMS

**for:** ***News & Weather Presentations***
***Workshop & Demonstrations***
***Interviews & Panel shows***
***Commercial Video Taping***
***Special Effects***

With the P.O.I. Remote Camera Control System it is possible to precisely set shots for repetitive exact recall:

***Pedestal Height . . . Pan . . . Tilt . . .***
***Zoom . . . Focus . . . Iris.***

The Shot-Setting Panel provides for up to ten shots, each of which may be carefully pre-set in rehearsal under the complete control of a production staff.

The speed of the shot-to-shot transitions may be varied to suit the situation.

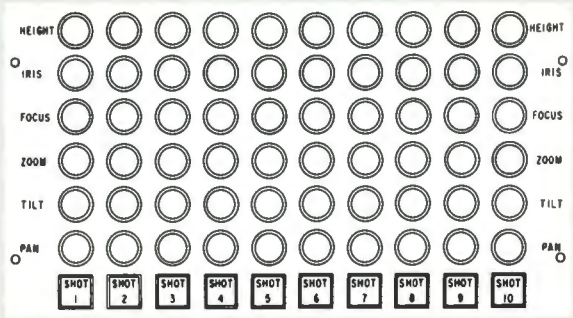
Each shot is recalled, on air, by the simple pressing of appropriate shot buttons. If a subject should move from prearranged pattern, on-air adjustments can be made at the Control Panel. The pre-set shots may be used in predetermined sequence or at will, depending on the nature of the production.

Investigate the P.O.I. Remote Control System as a production aid, it will open your eyes to unlimited possibilities, not only in production but in the economic aspects of automated camera control.

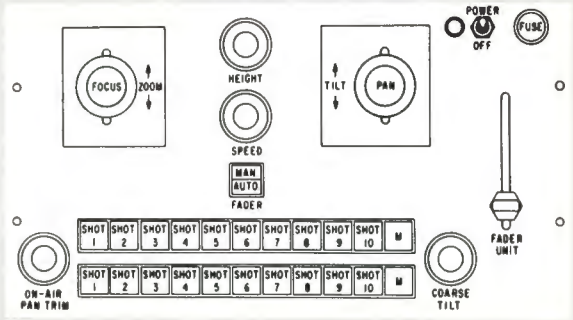
We invite inquiries on this equipment and urge you to request our material describing it, together with a list of stations now using it.

006

**SHOT-SETTING PANEL**




**CONTROL PANEL**




**POWER OPTICS, INC.**

FAIRVIEW VILLAGE, PA. 19409 • (215) 272-5300 • TELEX 846411

*Western Inquiries contact: Television Products, Inc. (213) 678-2388*

Circle Number 55 on Reader Reply Card

Visual Electronics Corp.
Rohn Mfg. Co.
Paul Shepard, Inc.
Singer Prod. Co., Inc.
Stainless, Inc.
Swager Tower Corp.
United State Towers
Visual Electronics Corp.

**Towers, Antenna, Transmitting, FM**
Advance Industries
Antenna Prod. Div.
Collins Radio Co.
Dresser Crane
E Z Way Prod., Inc.
Fort Worth Tower Co.
Gates Radio Co.
Jampro Antenna Co.
Kline Iron Steel Co.
Little Joe Enterprises
Microelect Co., Inc.
RCA Broadcast Comm. Prd.
Rohn Mfg. Co.
Singer Prod. Co., Inc.
Stainless, Inc.
United State Towers
Swager Tower Corp.
Visual Electronics Corp.

**Towers, Antenna, Transmitting, TV**
Advance Industries
Antenna Prod. Div.
Dresser Crane
E Z Way Prod., Inc.
Jampro Antenna Co.
Kline Iron Steel, Co.
Microelect, Co., Inc.
RCA Broadcast Comm. Prd.
Rohn Mfg. Co.
Paul Shepard, Inc.
Singer Prod. Co., Inc.
Stainless, Inc.
Swager Tower Corp.
United State Towers
Visual Electronics Corp.

**Translator Systems**
Ampex
Collins Radio Co.
Emcee
Ikegami Co., Ltd.
Rodelco
RCA Broadcast Comm. Prd.

**Transmission Lines**
Ameco, Inc.
Andrew Corp.
Andrews Towers, Inc.
Gates Radio Co.
Narda Microwave Corp.
Phelps Dodge Electronic
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Surface Construction

**Transmission Test Sets**
Hewlett Packard Co.
Narda Microwave Corp.
Phelps Dodge Electronic
Riker Video Industries
Telemation, Inc.
United Recording
Universal Audio, Inc.
Videometrics, Inc.

**Transmitter Kits**
Allied Electronic Corp.
Bauer/Sparta Trans. Prod.
Eico
Gates Radio Co.
Heath

**Transmitter, AM, Carrier**
Collins Radio, Co.
Low Power Broadcast Co.
Marconi Div.
Singer Prod. Co., Inc.
Telefunken Sales Corp.

**Transmitters, AM, Low Power**
American Elect. Lab.
Bauer/Sparta Trans. Prod.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Low Power Broadcast Co.
LTV Ling Altec, Inc.
Marconi Div.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.

**Transmitters, AM, 250 Watts**
Amer. Electronic Lab.
Bauer Electronics Corp.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Singer Prod. Co., Inc.
Visual Electronics Corp.

**Transmitters, AM, 500 Watts**
Amer. Elcetronic Lab.
Bauer Electronics
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Singer Prod. Co., Inc.
Visual Electronics Corp.

**Transmitters, AM, 1 kw**
Amer. Electronic Lab.
Bauer Electronics Corp.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Marconi Div.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, AM, 5 kw**
Amer. Electronic Lab.
Bauer Electronics Corp.
CCA Electronics
Collins Radio Co.
Continental Electronics
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, AM, 10 kw**
Amer. Electronic Lab.
Bauer Electronics Corp.
CCA Electronics
Collins Radio Co.
Continental Electronics
Gates Radio Co.
Marconi Div.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, AM, 25 kw**
Amer. Electronic Lab.
CCA Electronics
Continental Electronics
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Visual Electronics Corp.

**Transmitters, AM, 50 kw**
Amer Electronic Lab.
CCA Electronics
Continental Electronics
Gates Radio Co.
GE Visual Comm. Prod.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.

**Transmitters, AM, over 50 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Continental Electronics
Gates Radio Co.
Marconi Div.
Singer Prod. Co., Inc.
Visual Electronics Corp.

**Transmitters, AM, to order**
CCA Electronics
Collins Radio Co.
Continental Electronics
Gates Radio Co.
Marconi Div.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Wilkinson Elect., Inc.

**Transmitters, FM**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Corp.
The Catel Corp.
Gates Radio Co.
Marconi Div.
Miles Reproducer Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Telefunken Sales Corp.
Utica Electronics
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 10 Watts**
Ampex
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Marti Electronics
Moseley Assoc.
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 50 Watts**
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Hammarlund Mfg.
Moseley Assoc.
Singer Prod. Co., Inc.
Utica Electronics
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 100 Watts**
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Hammarlund Mfg.
Marti Electronics
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, TV, 500 Watts**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 1 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Marconi Div.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 3 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 5 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Marconi Div.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 7.5 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 10 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
RCA Broadcast Comm. Prd.
Standard Elect. Corp.
Singer Prod. Co., Inc.
Visual Electronics Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 15 kw**
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Singer Prod. Co., Inc.
Visual Electronics Corp.

**Transmitters, FM, 20 kw**
Amer. Electronic Lab.
CCA Electronics
Collins Radio Co.
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Wilkinson Elect., Inc.

**Transmitters, FM, 40 kw**
CCA Electronics
Collins Radio Co.
Gates Radio Co.
Singer Prod. Co., Inc.
Standard Elect. Corp.
Visual Electronics Corp.

**Transmitters, FM, 50 kw**
CCA Electronics
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.

**Transmitters, FM, 100 kw**
CCA Electronics
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.

**Transmitters, FM, to order**
CCA Electronics
Gates Radio Co.
RCA Broadcast Comm. Prd.
Singer Prod. Co., Inc.

**Transmitters, TV**
Ampex
Du Val I Fit Corp.
Gates Radio Co.
Ikegami Co. Ltd.
The Janson Industries
Marconi Div.
Micro Link Div.
RCA Broadcast Comm. Prd.

**Transmitters, TV, 1 watt**
Dynair Electronics
Gates Radio Co.
Micro Link Div.
Rohde Schwarz Sales

**Transmitters, TV, 10 watts**
Gates Radio Co.
Marconi Div.
Micro Link Div.

**Transmitters, TV, 20 watts**
Gates Radio Co.

**Transmitters, TV, 60 watts**
Gates Radio Co.

**Transmitters, TV, 100 watts**
Gates Radio Co.
GE Visual Comm. Prod.

**Transmitters, TV, 500 watts**
Gates Radio Co.
Marconi Div.
Standard Elect. Corp.

**Transmitters, TV, 1 kw**
GE Visual Comm. Prod.
Gates Radio Co.
Marconi Div
RCA Broadcast Comm. Prd.
Sarkes Tarzian, Inc.

**Transmitters, TV, 2 kw**
Gates Radio Co.
Standard Elect. Corp.

**Transmitters, TV, 5 kw**
GE Visual Comm. Prod.
Gates Radio Co.

Marconi Div.
RCA Broadcast Comm. Prd.
Standard Elect. Corp.

**Transmitters, TV, 6 kw**
GE Visual Comm. Prod.

**Transmitters, TV, 10 kw**
Ampex
Marconi Div.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Standard Elect. Corp.

**Transmitters, TV, 11 kw**
GE Visual Comm. Prod.

**Transmitters, TV, 12 kw**
Ampex
RCA Broadcast Comm. Prd.

**Transmitters, TV, 15 kw**
Ampex
GE Visual Comm. Prod.
Marconi Div.

**Transmitters, TV, 25 kw**
Ampex
Marconi Div.
RCA Broadcast Comm. Prd.
Standard Elect. Corp.

**Transmitters, TV, 30 kw**
Ampex
GE Visual Comm. Prod.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Visual

**Transmitters, TV, 35 kw**
GE Visual Comm. Prod.
Standard Elect. Corp.

**Transmitters, TV, 50 kw**
Ampex
GE Visual Comm. Prod.
Marconi Div.
RCA Broadcast Comm. Prd.
Standard Elect. Corp.

**Transmitters, TV, 55 kw**
Ampex
Gates
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.

**Transmitters, TV, 100 kw**
Ampex
GE Visual Comm. Prod.

**Transmitters, TV, Specify Power**
Ampex
GE Visual Comm. Prod.
Gates Radio Co.
Multronics, Inc.
RCA Broadcast Comm. Prd.

**Transmitters, TV, to order**
Gates Radio Co.
Multronics, Inc.
RCA Broadcast Comm. Prd.
Shibaden Corp. of Amer.

**Turntables, Phonograph**
Allied Electronic Corp.
Bogen Communications
Collins Radio Co.
Gates Radio Co.
Gotham Audio Corp.
Gray Research
Koss Electronics, Inc.
Magnatech Co.
QRK Electronic Prod.
RCA Broadcast Comm. Prd.
Russco Electronics Mfg.
Albert Schultz, Inc.
Singer Prod. Co., Inc.
Sparta Elect. Corp.
Superscope, Inc.

**TV Systems, Closed Circuit**
ATV Research
Aerovox Corp.
Alcor, Inc.
Amer. Cable Electronics
Anaconda Electronics
Bell & Howell Tape Div.
Canoga Elect. Co.
Cohu Electronics, Inc.
Colorado Video, Inc.
Dage Bell Div.
Diamond Electronics
Dynair Electronics
FB Ceco, Inc.
Jerrold Electronics
GBC CCTV
G E Electronic Components
GE Visual Comm. Prod.
Gen. Electrodynamics
Ikegami Co., Ltd.
International Video
The Janson Industries
JFD Electronics, Co.
Kaiser Cox Corp.
Lerro Electrical Corp.
MTI Div. KMS Industries
Marconi Div.
Micro Link Div.
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
Riker Video Industries
Sarkes Tarzian, Inc.
Singer Prod. Co., Inc.
Superior Continental Co.
Surface Construction
Sylvania Comm. Electronic
Tartan Electronics Corp.
Tektronix, Inc.
Telemation, Inc.
Tele Measurements, Inc.
Telequip
Television Presentations
Vikoa
Visual Electronics Corp.

## V

**Vacuum Tubes, Camera, Image-Orthicon**
Amperex Corp.
G E Distributor Sales Op.
G E Electronic Components
G E Pickup Tube Operation
Heintz and Kaufman Ltd.
JSH Elect. Co.
Lerro Electrical Corp.
RCA Broadcast Comm. Prd.
RCA Electronic Comp. Div.
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Thor Electronics Corp.
Visual Electronics Corp.
Westinghouse Elect. Corp.

**Vacuum Tubes, Camera, Plumbicon**
Amperex Corp.
G E Distributor Sales Op.
Gen. Electrondynamics
Lerro Electrical Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
Singer Prod. Co., Inc.
Thor Electronics Corp.
Visual Electronics Corp.

**Vacuum Tubes, Camera, Vidicon**
Amperex Corp.
Du Val I Fit Corp.
GBC CCTV
G E Distributor Sales Op.
G E Electronic Components
G E Pickup Tube Operation
Gen. Electrodynamics
Heintz and Kaufman Ltd.
ITT Electron Tube Div.
JSH Elect. Co.
Lerro Electrical Corp.
North Amer. Philips AKG
Philips Broadcast Equipment
RCA Broadcast Comm. Prd.
RCA Electronic Comp. Div.
Shibaden Corp. of Amer.
Singer Prod. Co., Inc.
Teltron, Inc.
Thor Electronics Corp.
Visual Electronics Corp.
Westinghouse Elect. Corp.

**Vacuum Tubes, Cathode Ray, Oscilloscope**
Calvert Electronics, Inc.
Heintz and Kaufman Ltd.
JSH Elect. Co.
Lerro Electrical Corp.
Singer Prod. Co., Inc.
Telefunken Sales Corp.
Thor Electronics Corp.
Westinghouse Elect. Corp.

**Vacuum Tubes, Cathode Ray, TV, Color**
Amperex Corp.
G E Electronic Components
Lerro Electrical Corp.
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Telefunken Sales Corp.
Thor Electronics Corp.
Westinghouse Elect. Corp.
Zenith Sales Corp.

**Vacuum Tubes, Cathode Ray, TV, Monochrome**
Amperex Corp.
Calvert Electronics, Inc.
Lerro Electrical Corp.
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Thor Electronics Corp.
Zenith Sales Corp.

**Vacuum Tubes, Transmitting**
Amperex Corp.
Calvert Electronics, Inc.
Eimac Div.
G E Electronic Components
Gates Radio Co.
Heintz and Kaufman Ltd.
ITT Electron Tube Div.
JSH Elect Co.
Machlett Lab. Div.
Penta Lab.
RCA Electronic Comp. Div.
Singer Prod. Co., Inc.
Telefunken Sales Corp.
Thomson—CSF
Thor Electronics Corp.
Westinghouse Elect. Corp.

**Voltmeters, AC**
Allied Electronic Corp.
American Data Corp.
B&K Instruments, Inc.
Boonton Electronics
Calif. Instruments Corp.
Eico
G E Electronic Components
Heath Co.
Hewlett Packard
Hikok Elect. Instrument
Honeywell, Inc.
Interntl. Instrument, Inc.
Leader Instruments Corp.
Hewlett Packard Co.
Metrics Div.
Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Simpson Electric Co.
Singer Prod. Co., Inc.
Terminal Hudson Elect.
Triplett Elect. Instrument

**Voltmeters, DC**
Allied Electronic Corp.
Boonton Electronics
Calif. Instruments Corp.
G E Electronic Components
Heath Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Honeywell, Inc.
Interntl. Instrument, Inc.
Metrics Div.
Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Simpson Electric Co.
Singer Prod. Co., Inc.
Triplett Elect. Instrument

**Voltmeters, FET**
Eico
Heath Co.
Hickok Elect. Instrument
ITT Jennings
Sencore, Inc.
Simpson Electric Co.

**Voltmeters, Vacuum Tube**
Allied Electronic Corp.
B&K Instruments, Inc.
Eico
Heath Co.
Hewlett Packard Co.
Hickok Elect. Instrument
Leader Instruments Corp.
Metrologie Compagnie Gen.
RCA Electronic Comp. Div.
Simpson Electric Co.
Singer Prod. Co., Inc.
Triplett Elect. Instrument

**W**

**Wattmeters**
Bird Elettronic Corp.
Boonton Electronics
G E Electronic Components
General Microwave Corp.
Metrics Div.
Rohde Schwarz Sales
Simpson Electric Co.
Singer Prod. Co., Inc.
Triplett Elect. Instrument
Waters Mfg., Inc.
Weinschel Engineering Co.

**Wiring & Cabling Services**
Alpha Wire
Applied Elect. Mechanics
Belden Corp.
Boston Insulated
D&B Electronics Co.
General Cable Corp.
IRC Div. TRW, Inc.
Saxton Prod., Inc.
Singer Prod. Co., Inc.
Vikoa, Inc.

# Guide To Manufacturers

**A**

**ATV Research**
13th & Broadway
Dakota City, Neb. 68731
**ABTO, Inc.**
1926 Broadway
New York, N.Y. 10023
**Accurate Sound Co.**
15 North Tyler
San Angelo, Tex. 76903
**Acme Film & Video Tape**
1161 N. Highland Ave.
Los Angeles, Cal. 90038
**Advance Industries**
2301 Bridgeport Drive
Sioux City, Ia. 51101
**Advanced High Voltage Co.**
8635 Yolanda Ave.
Northridge, Cal. 91324
**Aerovox Corp.**
740 Belleville Ave.
New Bedford, Mass. 02741
**Afga-Gevaert Inc.**
275 N. Street
Teterboro, N.J. 07608
**Aitken Comm. Inc.**
701 S. Tenth St.
Taft, Cal. 93268
**Alco Electronic Prod.**
Box 1348
Lawrence, Mass. 01842
**Alcor Inc.**
215 S. Tioga St.
Ithica, N.Y. 14850
**Alford Mfg. Co.**
120 Cross St.
Winchester, Mass. 01890
**Allen Avionics Inc.**
255 E. 2nd St.
Mineola, N.Y. 11501
**Allied Electronic Co.**
**Sub. P. F. Allied Radio**
100 N. Western Ave.
Chicago, Ill. 60612
**Alma Engineering**
7990 Dagget St.
San Diego, Cal. 92111
**Alpha Wire**
711 Lidgerwood Ave.
Elizabeth, N.J. 07207
**Altec Lansing**
1515 S. Manchester
Anaheim, Cal. 92802
**Ameco Inc.**
2949 W. Osborn Rd.
Phoenix, Ariz. 85017
**Amer. Data Corp.**
4306 Govners Dr. S.W.
Huntsville, Ala. 35805
**Amer. Cable Electronics**
9888 Welshire Blvd.
Beverly Hills, Cal. 90210
**Amer. Electronic Lab**
Box 552
Lansdale, Pa. 19446
**Amer. Geloso Electronics**
251 Park Ave. South
New York, N.Y. 10010
**Amerline Corp.**
**Sub. of Revlon Corp.**
1800 W. Fullerton Ave.
Chicago, Ill. 60614
**AMF Alexandria**
1025 N. Royal Street
Alexandria, Va. 22314
**Amperex Corp.**
75 Commerce Way
Hackensack, N.J. 07601
**Amperite Co.**
600 Palisade Ave.
Union City, N.J. 07087
**Ampex Corp.**
401 Broadway
Redwood City, Cal. 94063
**Amphenol Corp.**
Oakbrook North
Oakbrook, Ill. 60521
**Ampro Corp.**
One Limekien Pike
Glenside, Pa. 19038
**Anaconda Electronics**
1430 S. Anaheim Blvd.
Anaheim, Cal. 92803
**Ancha Electronics Inc.**
7055 W. Higgins Ave.
Chicago, Ill. 60656
**Andersen Labs Inc.**
1280 Blue Hills Ave.
Bloomfield, Conn. 06002
**Andrew Corp.**
10500 W. 153rd St.
Orland Park, Ill. 60462
**Andrews Towers Inc.**
1420 Layton Ave.
Ft. Worth, Tex. 76117
**Angenieux Corp.**
448 Merrick Rd.
Oceanside, N.Y. 11572
**Antenna Prod. Div.**
**All Products Co.**
Box 9588
Austin, Tex. 78757
**Applied Elect. Mechanics**
2350 Duke St.
Alexandria, Va. 22314
**Arbor Systems Inc.**
Box 1325
Ann Arbor, Mich. 48106
**Arriflex Corp. of America**
P.O. Box 1050
Woodside, N.Y. 11377

**Atlantic Research**
Shirley Highway & Edsall
Alexandria, Va. 22314
**Atlas Sound Div.**
**Amer. Trading & Prod.**
10 Pomeroy Rd.
Parsippany, N.J. 07054
**Audio Accessories Inc.**
Gilsum, N.H. 03448
**Audio Devices**
235 E. 42nd St.
New York, N.Y. 10017
**Audio Distributor Inc.**
2342 S. Division Ave.
Grand Rapids, Mich. 49507
**Audio Magnetics Corp.**
14600 S. Broadway
Gardena, Cal. 90247
**AVA Elect. & Machine Corp.**
416 Long Lane
Upper Darby, Pa. 19082

**B**

**Ball Bro. Research**
Boulder, Colo. 80302
**B&K Instruments Inc.**
5111 W. 164th St.
Cleveland, Ohio 44142
**Bardwell & McAlister Inc.**
1117 N. McCadden Place
Hollywood, Cal. 90038
**Barker & Williamson**
Sunshine Mining Co.
Canal St.
Bristol, Pa. 19007
**Bauer Electronics Co.**
**Broadcast Prod. Div.**
1601 California Ave.
Palo Alto, Cal. 94304
**Belar Electronics Lab.**
8329 Delaware Ave.
Upper Darby, Pa. 19028
**Belden Corp.**
415 S. Kilpatrick Ave.
Chicago, Ill. 60644
**Bell & Howell Tape Div.**
7100 McCormick Rd.
Chicago, Ill. 60645
**Bell P/A Prod. Corp.**
1200 N. Fifth St.
Columbus, Ohio 43201
**Bell Sound Studios**
**A & B Duplicators Div.**
635 W. 55th St.
New York, N.Y. 10019
**Bendix Corp.**
**Communications Div.**
E. Joppa Road
Baltimore, Md. 21204
**Berkey Colortran Inc.**
1015 Chestnut St.
Burbank, Cal. 91502
**Bird Electronic Corp.**
30303 Aurora Road
Cleveland, Ohio 44139
**Birnbach Co. Inc.**
P. O. Box 592
Freeport, N.Y. 11520
**Blonder Tongue Lab. Inc.**
9 Alling St.
Newark, N.J. 07102
**Bogen Communications**
**Lear Sigler Inc.**
Box 500
Paramus, N.J. 07652
**Boonton Electronics**
Rt. 287 Smith Rd.
Parsippany, N.J. 07054
**Boston Insulated**
**Wire & Cable Co.**
65 Bay St.
Dorchester, Mass. 02125
**Bradford Information Sys.**
4911 N. E. 12th Ave.
Ft. Lauderdale, Fla. 33308
**W. H. Brady Co.**
727 W. Glendale Ave.
Milwaukee, Wis. 53201
**Brand Rex**
Box 498
Williamantic, Conn. 06226
**Broadcast Electronics**
8810 Brookville Road
Silver Springs, Md. 20910
**Broadcast Prod. Co. Inc.**
3814 Everett St.
Kensington, Md. 20795
**Bud Radio Inc.**
Willoughby, Ohio 44094
**Burke & James**
333 W. Lake St.
Chicago, Ill. 60606

**C**

**CAE Industries Ltd.**
387 Sutherland Ave.
Winnepeg, Man., Canada
**CATV Equipment Co.**
1422 34th St.
Seattle, Wash. 98122
**CBS Labs**
227 High Ridge Rd.
Stanford, Conn. 06905
**CCA Electronics**
716 Jersey Ave.
Gloucester, N.J. 08030
**CEI**
7255 Canoga Ave.
Canoga Park, Cal. 91303
**C Cor Electronics**
60 Decibel Road
St. College, Pa. 16801
**CREI Home Study Div.**
**McGraw Hill Book Co.**
3224 16th St. N.W.
Washington, D.C. 20010
**Calbest Electronics**
4801 Exposition Blvd.
Los Angeles, Cal. 90016
**Calif. Instruments Corp.**
3511 Midway Drive
San Diego, Cal. 92110

**Calvert Electronics Inc.**
220 East 23rd St.
New York, N.Y. 10010
**Canoga Elect. Co.**
8966 Comanche Ave.
Chatsworth, Cal. 91311
**Canon, U.S.A., Inc.**
64-10 Queens Blvd.
Woodside, N.Y. 11377
**Cascade Electronics**
Electronic Ave.
Port Moody
Vancouver, B.C., Canada
**The Catel Corp.**
517 Marine View Ave.
Belmont, Cal. 94002
**Central Dynamics Corp.**
Cherry Hill Ind. Center
Cherry Hill, N.J. 08034
**Central Transformer**
850 W. Jackson Blvd.
Chicago, Ill. 60607
**Centralar**
Box 591
Milwaukee, Wis. 53201
**Century-Strand Inc.**
3 Entin Road
Clifton, N.J. 07014
**Channel Marketing Inc.**
26 Springdale Rd.
Cherry Hill, N.J. 08036
**Channelock, Inc.**
S. Main St.
Meadville, Pa. 16335
**Chester Electronic Lab.**
Winthrop Road
Chester, Conn. 06412
**Chrono Log Corp.**
2583 W. Chester Pike
Broomall, Pa. 19008
**Cine Sonic Sound Inc.**
485 8th Ave.
New York, N.Y. 10001
**Cintel Corp.**
11801 W. Olympic Blvd.
Los Angeles, Cal. 90064
**Cleveland Electronic Deflection Components**
2000 Highland Rd.
Twinsburg, Ohio 44087
**Cleveland Electronic Speaker Div.**
1974 E. 61st
Cleveland, Ohio 44103
**Clevite Corp.**
**Burgess Battery Div.**
Freeport, Ill. 61032
**Cohu Electronics Inc.**
Box 623
San Diego, Cal. 92112
**Collins Radio Co.**
Mail Stop 407 023
Dallas, Tex. 75207
**Colorado Video Inc.**
Box 928
Boulder, Colo. 80302
**Columbia Broadcasting**
227 High Ridge Rd.
Stamford, Conn. 06905
**Columbia Electric Mfg. Co.**
4519 Hamilton Ave.
Cleveland, Ohio 44114
**Columbia Electronic Cbl.**
150 Hamlet Ave.
Woonsocket, R.I. 02895
**Commercial Elect.**
1271 Terra Bella Ave.
Mountain View, Calif. 94040
**Comm. Radio Monitoring**
103 S. Market
Lee's Summit, Mo. 64063
**Commercial Prod. Div.**
Box 4197
Lynchburg, Va. 24502
**Communication Prod.**
**Phelps Dodge Elect. Prod.**
Rte. 79
Marlboro, N.J. 07746

**Comrex Corp.**
Box 51
W. Concord, Mass. 01781
**Comm-Scope Corp.**
Box 2406
Hickory, N.C. 28601
**Conant Labs Inc.**
Lincoln, Neb. 68510
**Concord Elect. Corp.**
1935 Armacost Ave.
Los Angeles, Cal. 90023
**Conrac Corp.**
Cramer Div.
Old Saybrook, Conn. 06475
**Continental Elect. Supply Co.**
1620 W. 32nd Place
Hialeah, Fla. 33012
**Continental Electronics**
Box 17040
Dallas, Tex. 75217
**Control Concept-Corp.**
8120 Georgia Ave.
Silver Spring, Md. 20910
**Cook Electric Co.**
200 E. Daniels Rd.
Palatine, Ill. 60067
**Cooke Engineering Co.**
735 N. Saint Asaph St.
Alexandria, Va. 22314
**Crown International**
Box 1000
Elkhart, Ind. 46514
**Cush Craft**
621 Hayward St.
Manchester, N.H. 03103
**Custom Craft Designs**
2135 Drexel St.
W. Hyattsvill, Md. 20783

**D**

**D and B Electronics Co.**
Box 6006
Philadelphia, Pa. 19114
**Dage Bell Div.**
**Raytheon Co.**
455 Sheridan Ave.
Michigan City, Ind. 46360
**Data Memory Inc.**
1255 Terra Bella
Mountain View, Cal. 94040
**Data Pulse**
10150 Jefferson
Culver City, Cal. 90230
**Dataron Inc.**
1562 Reynolds Ave.
Santa Ana, Cal. 92705
**Davco Electronics Corp.**
Drawer 861
Batesville, Ariz. 72501
**Davis & Sanford**
24 Pleasant St.
New Rochelle, N.Y.
**David Clark Co., Inc.**
360 Franklin St.
Worcester, Mass. 01604
**Dearborn Electronics**
**Sprague Electric Co.**
Box 530
Orlando, Fla. 32802
**Defense Electronics**
Rockville, Md. 20850
**Delco Radio**
**Genreal Motors Corp.**
700 E. Firmin St.
Kokomo, Ind. 46901
**Delta Electronics Inc.**
145 Fayette St.
Winston Salem, N.C. 27101
**Delta Electronics Inc.**
4206 Wheeler Ave.
Alexandria, Va. 22304
**Denrad Mfg. Co. Inc.**
312 W. Woodard St.
Denison, Tex. 75020
**Dialight Corp.**
60 Stewart Ave.
Brooklyn, N.Y. 11237
**Diamond Electronics**
Box 415
Lancaster, Ohio 43130
**Diamond Expansion Co.**
**General Cable Corp.**
500 North Ave.
Garwood, N.J. 07027
**Diamond Tool Horseshoe**
4702 Grand Ave.
Duluth, Minn. 55807
**Diversified Consultants**
Box 395
Cloudcraft, N.M. 88317
**Dresser Crane**
Hoist and Tower Div.
875 Michigan Ave.
Columbus, Ohio 43215
**D & S Corley**
Islington, Toronto
**Duotone Co. Inc.**
6875 S.W. 81st St.
S. Miami, Fla. 33134
**Du Val I Fit Corp.**
Gulf States Bldg.
Dallas, Tex. 75201
**Dyancool Mfg. Co. Inc.**
1 Russel St.
Saugerties, N.Y. 12477
**Dynair Electronics**
6360 Federal Blvd.
San Diego, Cal. 92114
**Dynamic Optics Inc.**
38 S. Main St.
Fairport, N.Y. 14450
**Dynasciences Corp.**
Township Line Road
Blue Bell, Pa. 19422

**E**

**E Z Hook Test Products**
1536 Woodburn Ave.
Covington, Ky. 41012
**E Z Way Prod. Inc.**
Box 17196
Tampa, Fla. 33612
**Eastman Kodak Co.**
343 State St.
Rochester, N.Y. 14650
**Eico Elect. Inst. Co., Inc.**
283 Malta Street
Brooklyn, N.Y. 11207
**Eidson Electronic Co.**
1902 N. Third St.
Temple, Tex. 76501
**Eimac Div.**
Varian Associates
301 Industrial Way
San Carlos, Cal. 94070
**Electrodyne Corp.**
7315 Greenbush Ave.
N. Hollywood, Cal. 91605
**Electroline TV Equip. Inc.**
405 Serrano Dr.
San Francisco, Cal. 94132
**Electronic Designers Inc.**
84 Newton Plaza
Plainview, N.Y. 11803
**Electronic Inst. & Spec.**
71 Cross St.
Winchester, Mass. 01890
**Electronic Lights Inc.**
1701 N. Ashland Ave.
Chicago, Ill. 60622
**Electronic Mobile Units**
788 Paterson Ave.
E. Rutherford, N.J. 07072
**Electronic System Eng.**
120½ N. Cleveland
Cushing, Okla. 74023

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**Electro-Voice Inc.**
600 Cecil St.
Buchanan, Minn. 49107
**Emcee Broadcast Products**
600 Cecil St.
White Haven, Pa. 18661
**Enclosure Corp.**
1701 Industrial Blvd.
Pennsauken, N.J. 08110
**Engineering Assoc.**
434 Patterson Rd.
Dayton, Ohio 45419
**Entron Inc.**
2141 Industrial Pkwy.
Silver Spring, Md. 20904
**Equipto**
225 S. Highland
Aurora, Ill. 60507
**Essex Wire Co. RBM Div.**
131 Godfrey St.
Logansport, Ind. 46947
**Essex Wire Corp. Mkt. Div.**
2501 W. Addison
Chicago, Ill. 60618

**F**

**FB Ceco Inc.**
315 W. 43rd St.
New York, N.Y. 10036
**Fairchild Industrial**
2215 Fairchild Ave.
Plainview, N.Y. 11803
**Fairchild Recording Eqpt.**
10-40 45th Ave.
Long Island, N.Y. 11101
**Fairlane Electronics**
Box 335
Long Valley, N.J. 07853
**Fernseh-Bosh Corp.**
2800 S. 25th Ave.
Broadview, Ill.
**Fibre Products Mfg. Co.**
601 W. 26th St.
New York, N.Y. 10001
**Fidelitone Inc.**
6415 N. Ravenswood Ave.
Chicago, Ill. 60626
**Filmline Corp.**
43 Erna Street
Milford, Conn. 06460
**Finney Co.**
34 W. Interstate St.
Bedford, Ohio 44014
**Fisher Berkeley Corp.**
5800 Christie Ave.
Emeryville, Cal. 94608
**Fort Worth Tower Co.**
5201 Bridge St., Box 8597
Ft. Worth, Tex. 76112
**Fotomatic Corp.**
Box 22115
Indianapolis, Ind. 46222

**G**

**GAF Corp.**
140 W. 51 Street
New York, N.Y. 10020
**GBC CCTV**
74 5th Ave.
New York, N.Y. 10011
**G. C. Electronics**
400 S. Wyman St.
Rockford, Ill. 61101
**G. E. Electronic Components**
1 River Road
Schenectady, N.Y. 12305
**G. E. Pickup Tube Operation**
Electronics Pk. Bdg. 6
Syracuse, N.Y. 13201
**GE Visual Comm. Prod.**
Electronics Park
Syracuse, N.Y. 13201
**GPL Div. Singer Gen.**
Pleasantville, N.Y. 10570
**Gardner Lab. Inc.**
Box 5728
Bethesda, Md. 20014
**Gately Electronics**
57 W. Hillcrest Ave.
Haverstown, Pa. 19083
**Gates Radio Co.**
123 Hampshire Street
Quincy, Ill. 62301
**Gauss Electrophysics**
1653 12th St.
Santa Monica, Cal. 90404
**General Cable Corp.**
730 Third Ave.
New York, N.Y. 10017
**Gen. Electrodynamics**
4430 Forest Lane
Garland, Tex. 75040
**General Microwave Corp.**
155 Marine St.
Farmingdale, N.Y. 11735
**General Radio Co.**
22 Baker Ave.
W. Concord, Mass. 01781
**General Television Ntwk.**
901 Livernois
Ferndale, Minn. 48220
**Gibbs Mfg. & Research Co.**
450 N. Main St.
Janesville, Wis. 53545
**Gilbert Engineering Co.**
3700 N. 36th St.
Phoenix, Ariz. 85019
**Gotham Audio Corp.**
2 W. 46th St.
New York, N.Y. 10036
**Granger Assoc.**
1601 California Ave.
Palo Alto, Cal. 94306
**Grantham School of Engr.**
1505 N. Western Ave.
Hollywood, Cal. 90027
**Grass Valley Group**
6515 Sunset Blvd.
Los Angeles, Cal. 90028
**Gray Research & Dev.**
150 Park Ave.
E. Hartford, Conn. 06108

**Greenlee Tool Co.**
2136 12th St.
Rockford, Ill. 61101
**Grinnan Fixture Co.**
16041 Georgetown St. N.E.
Minerva, Ohio 44657
**Gulf Electro Sales Inc.**
6325 Beverly Hill
Houston, Tex. 77027

**H**

**Hammarlund Mfg.**
7388 Hammarlund Dr.
Mars Hill, N.C. 28754
**Hartley Prod. Corp.**
Barnet Place
Ho Ho Kus, N.J. 07423
**Harvey Radio Co. Inc.**
60 Crossways Park West
Woodbury, L.I., N.Y.
**Harwood Mfg. Co.**
466 W. Superior
Chicago, Ill. 60610
**Heath Co.**
Benton Harbor, Mich. 49022
**Heintz and Kaufman Ltd.**
3650 Hayden Ave.
Culver City, Cal. 90230
**Hewlett Packard Co.**
1501 Page Mill Rd.
Palo Alto, Cal. 94304
**Hickok Elect. Instrument**
10514 Dupont Ave.
Cleveland, Ohio 44108
**Hokushin Elect. Co.**
3-30-1, Shimomaruko,
Ohta, Ku, Tokyo
**Holland Electronics**
675 Hinsdale St.
Brooklyn, N.Y. 11207
**Hollingsworth Solderles**
Nutt & Fench Creek Rds.
Phoenixville, Pa. 19460
**Honeywell Inc.**
**Test Instruments Div.**
4800 E. Dry Creek Rd.
Denver, Colo. 80217
**Houston Electronics**
7103 Walkway St.
Houston, Tex. 77036
**Houston Photo Prod. Inc.**
655 E. 20th St.
Yuma, Ariz. 85364
**Hughey & Phillips Inc.**
3050 N. California St.
Burbank, Cal. 91503

**I**

**IRC Div. Trw. Inc.**
401 N. Broad Street
Philadelphia, Pa. 19108
**ITT Electron Tube Div.**
Box 100
Easton, Pa. 18042
**ITT Jennings**
970 McLaughlin Ave.
San Jose, Cal. 95108
**Ikegami Co. Ltd.**
21 Motoki
Kawasak, Japan
**Industrial Devices Inc.**
Edgewater, N.J. 07020
**Industrial Electric Reel**
1509 Chicago St.
Omaha, Neb. 68102
**Industrial Elect.**
**Hardware Corp.**
109 Prince St.
New York, N.Y. 10012
**Innovative Television Equip.**
11661 San Vincente Blvd.
Los Angeles, Cal. 90049
**International Elect. Res.**
135 W. Magnolia Blvd.
Burbank, Cal. 91502
**Interniational Video**
675 Almanor Ave.
Sunnyvale, Cal. 94086
**Interntl. Good Music Inc.**
Box 943
Bellingham, Wash. 98225
**Interntl. Instrument Inc.**
8877 Marsh Hill Rd.
Orange, Conn. 06477
**interntl. Nuclear Corp.**
608 Norris Ave.
Nashville, Tenn. 37204
**Internatl. Wire & Cable**
1300 W. Flectcher St.
Chicago, Ill. 60657
**Instrument Lab. Corp.**
315 W. Walton Place
Chicago, Ill. 60610

**J**

**Jamieson Film Co.**
3825 Bryan St.
Dallas, Texas 75204
**Jampro Antenna Co.**
6939 Power Inn Road
Sacramento, Cal. 95828
**The Janson Industries**
Box 985
Canton, Ohio 44701
**Jensen Mfg. Div.**
**The Muter Co.**
5655 W. 73rd
Chicago, Ill. 60638
**Jerrold Electronics Co.**
401 Walnut St.
Philadelphia, Pa. 19105
**JFD Electronics Co.**
**Systems Division**
15th Ave. at 62nd Street
Brooklyn, N.Y. 11219
**Johnson Electronics**
Casselberry, Fla. 32707
**Joa Cartridge Service**
Box 3087
Philadelphia, Pa. 19150
**Joslyn Electronic Sys.**
Box 817
Goleta, Cal. 93017
**Jump Electronics**
Box 97
Port Sulphur, La. 70083

**K**

**Kaar Engr. Co.**
2250 Charleston Rd.
Mountainview, Cal. 94040
**Kahn Research Lab. Inc.**
81 S. Bergen Place
Freeport, N.Y. 11520
**Kaiser Cox Corp.**
505 S. Woodbury Rd.
Pittman, N.J. 08071
**The Kalart Co. Inc.**
Plainville, Conn. 06062
**Kappa Networks**
165 Rosevelt Ave.
Carteret, N.J. 07008
**Karg Lab Inc.**
162 Ely Avenue
S. Norwalk, Conn. 06856
**Kato Engineering Co.**
1415 First Ave.
Mankato, Minn. 56002
**Katona Electronics Co.**
140 Forsythia Dr. North
Levittown, Pa. 19056
**Kay Electric Co.**
19 Maple Ave.
Pinebrook, N.J. 07058
**Kliegl Bros. Lighting**
3232 48th Ave.
Long Island, N.Y. 11101
**Kline Iron & Steel Co.**
1225 Huger St.
Columbia, S.C. 29202
**Koss Electronics Inc.**
2227 N. 31 Street
Milwaukee, Wis. 53208

**L**

**L. W. Photo Inc.**
15451 Cabrito Road
Van Nuys, Cal. 91406
**Lafayette Radio Electron**
111 Jericho Turnpike
Syosset, N.Y. 11791
**Lampkin Lab. Inc.**
8400 9th Ave. N.W.
Bradenton, Fla. 33505
**Lang Electronics Inc.**
507 Fifth Ave.
New York, N.Y. 10017
**Leader Instruments Corp.**
24-20 Jackson Ave.
Long Island C., N.Y. 11101
**Lectronic Res. Labs. Inc.**
715 Arch St.
Philadelphia, Pa. 19106
**Lenkurt Electric Co. Inc.**
1105 Country Road
San Carlos, Cal. 94070
**Lerro Electrical Corp.**
3125 N. Broad St.
Philadelphia, Pa. 19132
**Lighting Unlimited**
560 W. Beech St.
Long Beach, N.Y. 11561
**Lipps Inc.**
1630 Euclid St.
Santa Monica, Cal. 90404
**Lipsner Smith**
7334 N. Clark St.
Chicago, Ill. 60626
**Listec TV Equip. Corp.**
35 Cain Dr.
Plainview, N.Y. 11803
**Little Joe Enterprises**
400 3rd St.
Port St. Joe, Fla. 32456
**Low Power Broadcast Co.**
248 Swedesford Road
Malvern, Pa. 19355

**M**

**MTI Div KMS Industries**
10534 York Road
Cockeysville, Md. 21030
**MaCarta**
709 Railroad Ave.
W. Des Moines, Iowa 50265
**MacKenzie Labs**
1367 N. Fair Oaks Ave.
Pasadena, Cal. 91103
**Machlett Lab. Div.**
**Raytheon Co.**
1063 Hope St.
Stamford, Conn. 06907
**Magnatech Co.**
3745 Monterey Drive
Minneapolis, Minn. 55416
**Magna Tech Corp.**
2300 Ampex Ave.
Opelika, Ala. 36801
**Magnecord**
**Div. of Telex**
9600 Aldrich Ave. S.
Minneapolis, Minn. 55420
**Magnecraft Electric Co.**
5575 N. Lynch Ave.
Chicago, Ill. 60630
**Magnetic Prod. Div.**
**3M Company**
3M Center
St. Paul, Minn. 55101
**Magnetic Recording Systems**
496 Grand Blvd.
Westbury, N.Y. 11590
**Magnetic Studios Corp.**
1670 W. First Ave.
Columbus, Ohio 43212
**Magnusonic Devices Inc.**
200 Frank Rd.
Hicksville, N.Y. 11802
**Mallory**
101 S. Parker Ave.
Indianapolis, Ind. 46206
**Marathon Broadcast Equip.**
57 N. Putnam St.
Danvers, Mass. 01923
**Marconi Div.**
The English Elec. Corp.
One Park Ave.
New York, N.Y. 10016
**Marconi Instruments**
111 Cedar Lane
Englewood, N.J. 07631

**Martel Electronics Inc.**
2339 S. Cotner Ave.
Los Angeles, Cal. 90064
**Marti Electronics**
105 Poindexter Box 661
Cleburne, Tex. 76031
**Matrix Systems Corp.**
9201 Gazette St.
Chatsworth, Cal. 91311
**The McIntire Co.**
Okner Parkway
Livingston, N.J. 07039
**McCurdy Radio Ind.**
Whitehaven, Pa. 18661
**McMartin Industries Inc.**
605 N. 13th St.
Omaha, Neb. 68102
**Measurements**
Box 180
Boonton, N.J. 07005
**Melcor Electronics Corp.**
1750 New Highway
Farmingdale, N.Y. 11735
**Memorex Corp.**
1180 Shulman Ave.
Santa Clara, Cal. 95050
**Metrics Div.**
**The Singer Co.**
915 Pembroke St.
Bridgeport, Conn. 06608
**Metrologie Compagnie**
Box 30
Chemin De La Croix Rge
Annecy, France
**Metron Instruments**
1051 S. Platte River Dr.
Denver, Colo. 80223
**Metropolitan Elect. Mfg. Co.**
2250 Steinway St.
Long Island, N.Y. 11105
**Metrotech Inc.**
670 National Ave.
Mountain View, Cal. 94040
**Michigan Magnetics**
203 W. Third St.
Vermontville, Minn. 49096
**Micom Inc.**
855 Commercial St.
Palo Alto, Cal. 94303
**Microelect Co. Inc.**
3575 25th St. S.E.
Salem, Ore. 97302
**Microlab**
10 Microlab Rd.
Livingston, N.J. 07039
**Micro Link Div.**
**Varian Associates**
19 Wartburg Ave.
Copiague, N.Y. 11726
**Microwave Assoc. Inc.**
NW Industrial Prk.
Burlington, Mass. 01803
**Miles Reproducer Co.**
598 Broadway
New York, N.Y. 10012
**Minarik Elect.**
224 E. Third St.
Los Angeles, Cal. 90013
**Miller Stephenson Co.**
Route 7
Danbury, Conn. 06810
**Mincom Div.**
**3M Co.**
300 South Lewis Rd.
Camarillo, Cal. 93010
**Minneapolis Magnetics**
2915 Huntington Ave.
Minneapolis, Minn. 55416
**Miratel Div. Ball Bro.**
**Research Corp.**
3600 Richardson St.
St. Paul, Minn. 55112
**Mobile Color, Inc.**
P.O. Box 7171
Omaha, Neb. 68107
**Mole Richardson Co.**
937 N. Sycamore Ave.
Hollywood, Cal. 90038
**Moseley Assoc. Inc.**
111 Castillian Drive
Goleta, Cal. 93017
**Moseley Electronics**
4610 Lindbergh Blvd.
Bridgeton, Mo. 63042
**Donald P. Mossman Inc.**
Box 265
Brewster, N.Y. 10509
**Motorola Communications**
4501 W. Agusta Blvd.
Chicago, Ill. 60651
**Motorola Semiconduct**
**Motorola Inc.**
505 E. McDowell Rd.
Phoenix, Ariz. 85008
**Multimetrics Inc.**
401 Concord Ave.
Bronx, N.Y. 10454
**Multronics Inc.**
5712 Frederick Ave.
Rockville, Md. 20852

## N

**N. E. Electronics Corp.**
Box 649
Concord, N.H. 03301
**Nagra Magnetic Recorders**
565 Fifth Ave.
New York, N.Y. 10017
**Narda Microwave Corp.**
Commercial St.
Plainview, N.Y. 11803
**Nemo Recording Labs**
Box 505 Times Sq. Sta.
New York, N.Y. 10036
**Neumade Prod. Corp.**
720 White Plains Rd.
Scarsdale, N.Y. 10583
**P. K. Neuses Inc.**
1401 Rohlwing Rd.
Rolling Meadow, Ill. 60008
**Nippon Columbia Corp. of Amer.**
501 Fifth Ave.
New York, N.Y. 10017
**Noller Control Systems**
150 E. Standard Ave.
Richmond, Cal. 94801
**North Amer. Electronics**
723 Third Ave. West
Birmingham, Ala. 35204
**North Amer. Philips AKG**
100 East 42nd St.
New York, N.Y. 10017
**North American Philips**
299 Route 17
Paramus, N.J. 07762
**Norton Assoc. Inc.**
10 Di Thomas Court
Copaigue, N.Y. 11726
**Nortronics Co. Inc.**
8101 10th Ave. North
Minneapolis, Minn. 55427

## O

**Oaktron Industries Inc.**
930 30th St.
Monroe, Wis. 53566
**Omite Mfg. Co.**
3601 Howard St.
Skokie, Ill. 60076
**Orbit Radio and Video**
1863 Arlington Box 1644
Louisville, Ky. 40201

**P**

**Packard Bell Elect.**
**Space & Systems Div.**
649 Lawrence Dr.
Newbury Park, Cal. 91320
**Painton Inc.**
109 Wheeler Ave.
Pleasantville, N.Y. 10570
**W. A. Palmer Films**
611 Howard St.
San Francisco, Cal. 94105
**Parabam Inc.**
12822 Yukon Ave.
Hawthorne, Cal. 90250
**Penta Lab**
Box 1469
Santa Barbara, Cal. 93102
**Phelps Dodge Electronic**
60 Dodge Ave., Box 187
New Haven, Ct. 06437
**Philips Broadcast Equip. Corp.**
One Philips Prkwy.
Montvale, N.J. 07645
**Photo Lab Inc.**
3825 Georgia Ave. NW.
Washington, D.C. 20011
**Photo Research Corp.**
3000 N. Hollywood Way
Burbank, Cal. 91502
**Piezo Crystal Co.**
100 K. St.
Carlisle, Pa. 17013
**Potomac Instruments Inc.**
932 Philadelphia Ave.
Silver Spring, Md. 20910
**Power Optics Inc.**
Box 266
Fairview Village, Pa. 19409
**Power Sources**
South Avenue
Burlington, Mass. 01803
**Precision Elect. Inc.**
9101 King St.
Franklin Park, Ill. 60131
**Precision Piezo Serv.**
427 Mayflower St.
Baton Rouge, La. 70802
**Precision Lab.**
**Precision Cine Eqpmt.**
894 E. 51st St.
Brooklyn, N.Y. 11203
**Presearch Inc.**
8720 Georgia Ave.
Silver Spring, Md. 20910
**Primo Co. Ltd.**
1-25-6 Chome Mure
Mitakashi Topyko
Japan
**Prodfin Inc.**
Box 131
Hightstown, N.J. 08520
**Pro Tex Reel Band Co.**
200 Film Bldg.
Cleveland, Ohio 44114
**Pruzan Co.**
1963 1st Ave.
Seattle, Wash. 98134
**Pulse Techniques Inc.**
1411 Palasade Avenue
W. Englewood, N.J. 07666

**Q**

**QRK Electronic Prod.**
2125 N. Barton Ave.
Fresno, Cal. 93703
**Quick-Set Inc.**
8125 Central Park Ave.
Skokie, Ill. 60076

**R**

**RCA Broadcast & Comm. Prd.**
Front & Copper St.
Camden, N.J. 08102
**RCA Electronic Comp.**
415 South 5th St.
Harrison, N.J. 07029
**RCA Service Co.**
Cherry Hill Offices
Camden, N.J. 08101

**RFE Labs**
Box 535
Berkeley, Cal. 94701
**R. F. Systems**
155 King St.
Cohasset, Mass. 02025
**Rank Precision**
4351 Tujunga Ave.
Studio City, Cal. 91604
**Jules Racine Co. Inc.**
521 Fifth Avenue
New York, N.Y. 10017
**Rangertone Electronics**
73 Winthrop St.
Newark, N.J. 07104
**Raven Screen Corp.**
124 East 124th St.
New York, N.Y. 10035
**Raytheon Co.**
1415 Boston Prvdn. Hwy.
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The SM60 cannot be stereotyped—is equally at home in the studio or in the field—stand-mounted or hand-held—in uses as diverse as outdoor sporting events and elaborate variety shows. Small wonder that audio engineers have called it one of the most versatile omni-directional dynamics they've ever encountered, for the SM60 is a unique combination of good looks, strength, performance and economy.

The smooth, wide-range response provides cleanest, natural reproduction of both speech and music. A very effective built-in wind and "pop" filter protects against undesirable effects of close-talking.

Lustrous, non-glare metallic finish and tailored-to-the-hand dimensions provide striking on-camera appearance and superior handability. Specially reinforced machined-steel case front is designed to take abuse that would ruin other microphones—you can drop it on its nose without damage to the internal structure! Efficient windscreen and front end are *quickly* and *easily* removable for cleaning.

Best of all, it is priced competitively with conventional "workhorse" microphones. Why not check out an SM60 now? See your Shure Professional Products Distributor, or contact Shure Brothers Inc., 222 Hartrey Ave., Evanston, Ill. 60204—Phone 312 - 328-9000.

# SHURE SM60

VERSATILE OMNIDIRECTIONAL DYNAMIC MICROPHONE

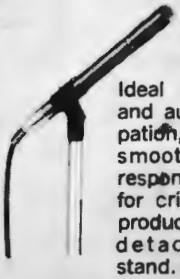
## SHURE PROFESSIONAL MICROPHONES . . . FOR BETTER AUDIO

**MODEL SM56**
**CARDIOID**
**DYNAMIC**

Extremely versatile in studio, control room, and remote use. Also widely acclaimed for rhythm recording. Bright, clean sound. Exceptionally uniform cardioid pattern gives optimum control of environment.

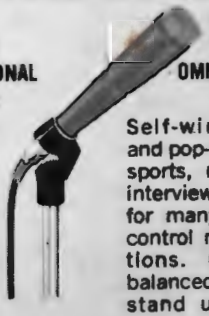
**MODEL SM33**
**UNIDIRECTIONAL**
**RIBBON**

Warm, smooth sound for studio, control room, and scoring stage. Super-cardioid directional pattern. Compact, yet rugged.



**MODEL SM76**
**¾" OMIDIRECTIONAL**
**DYNAMIC**

Ideal for interviews and audience participation, yet unusually smooth wide range response (40-20 KC) for critical music reproduction. Instantly detachable from stand. Steel case with Cannon connector.



**MODEL SM50**
**OMNIDIRECTIONAL**
**DYNAMIC**

Self-windscreened and pop-free for news, sports, remotes, and interviews. Also ideal for many studio and control room applications. Comfortably balanced for hand or stand use. Natural response.

Circle Number 3 on Reader Reply Card