Broadcast Engineering

the technical journal of the broadcast-communication's industry

A Howard W. Sams Publication

A new day in cablecasting

Cablecasting guidelines
Cablecasting equipment
Broadcast buyers guide
Abtography

uses
black & white...

for
color...

at half
the cost
of color film

*ABTOGRAPHY is a new process which attains high photographic quality and color fidelity for TV filming using standard Plus-X film and black and white processing.

Write for details

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Affiliated with: American Broadcasting Companies, Inc. and Technical Operations, Inc.
Circle Number 1 on Reader Reply Card
...that's why Cohu's new 2600 Series Broadcast Sync Generator uses an ultra-stable digitally generated time base to insure jitter-free performance.

Everything depends on your timing pulses. So, stable leading edges are the key factor in designing a sync generator that does what the specs say it does. Our new 2600 series sync gen has digital logic circuits to produce leading edges that serve as the timing of all pulses developed in the system.

Jitter-free sync comes from sequential division of the base frequency from a temperature-compensated crystal oscillator. A precision color standard is built-in and generates pulses required for local color or monochrome broadcasting at 525 lines/frame, 60 Hz with 2:1 interlace. All pulse widths except vertical blanking, drive and sync are adjustable with no interaction of controls.

Three plug-in circuit boards make up the system, which occupies just 1 3/4 inches of vertical space in a standard 19-inch rack. All active circuitry is solid state with integrated circuit construction for maximum reliability.

In addition to the sync gen, output and power supply modules, the system can include an optional colorlock module. The colorlock circuitry locks the sync gen to an external NTSC composite video signal or a monochrome composite video signal.

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.
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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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. Available now.

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DALLAS, TEXAS
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1644 Tully Circle, N.E.
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Circle Number 5 on Reader Reply Card
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 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.

ANDREW CORPORATION, 10500 W. 153RD STREET, ORLAND PARK, ILLINOIS 60462, PHONE (312) 349-3300

www.americanradiohistory.com
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.

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.

Until now.

Meet the Stanton 500AL—the cartridge that's tougher than disc jockeys. Here is the workhorse of the broadcast industry. We designed the entire stylus assembly to withstand the rugged demands of back cueing and the kind of handling that would quickly ruin ordinary pick-ups. Yet its high restoring force and tracking reliability is accomplished without sacrifice of professional standards for frequency response, output, channel separation, etc.

Also inquire about Stanton Models 500AA and 500E—the standards for critical auditioning and broadcast applications. They're designed especially for uninterrupted broadcasting of long-playing records or for disc auditioning and evaluation.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>500AL</th>
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<tr>
<td>Frequency Response</td>
<td>20Hz to 17kHz ± 2½ dB</td>
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<tr>
<td>Output</td>
<td>1.0 mV/cm/sec.</td>
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<td>Load Resistance</td>
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<td>Cable Capacitance</td>
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<td>DC Resistance</td>
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<td>Channel Balance</td>
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<td>Stylus Tip</td>
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<td>0.7 mil Spherical</td>
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For complete information and specifications write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I., New York 11803

Scott Muni
WNEW-FM, New York

June, 1970

Circle Number 7 on Reader Reply Card
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, pre-wired transportable furniture.

QRK-5S STEREO PRE-WIRED SYSTEM
$2995

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

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.

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

main office
CCA ELECTRONICS CORPORATION
716 Jersey Ave., Gloucester City, N.J. 08030
Phone: (609) 458-1716

subsidiary
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Phone: (209) 251-4213

division
REK-O-KUT COMPANY, INC.
1588 N. Sierra Vista, Fresno, Calif. 93703
Phone: (209) 251-4213

June, 1970

Circle Number 10 on Reader Reply Card
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-sec-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 existence. 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-
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.

And named it Criterion 80.

For a closer look at the Criterion 80, write Gates, 123 Hampshire Street, Quincy, Illinois 62301.
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.
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 City, 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, Philippines; 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 purposes 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 $½ of the initial installation charge covering the cost of labor and extra materials used.
3. For stolen TV sets, we are...
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

600 N. Rimsdale Avenue, Covina, California 91722 • (213) 966-3511
Circle Number 15 on Reader Reply Card
can a "teetotaler" be loaded?

New BIRD RF Loads don't drink!

No external water supply is needed for the new 10kW Self-Cooling MODULOAD™ RF Load Resistor Module. In a scant three cubic feet of space, the Model 8636 coaxial load system terminates a 50-ohm line with a low VSWR of 1.1 from DC to 1 GHz and 1.15 to 1.4 GHz. The integral heat-exchanger permits continuous 10kW dissipation in 5° to 45° C and +20° C with anti-freeze.

For lower power termination, a new family of dry RF loads now includes four models from 10W to 150W. The 100W and 150W TERMALINE™ Load Resistors pictured exhibit VSWR of only 1.1 to 1 GHz and 1.2 to 2.5 GHz. Bird Quick-Change connectors (N, HN, UHF, C, SC, LC, BNC, TNC, 90° and 180° EIA) offer unparalleled flexibility without performance degrading adapters.

Write us for the latest developments on RF loads, self-cooled load modules and 15kW-50kW UHF terminations or circle reader service number 16.

FREE Write for 60-page Catalog of Quality Instruments for RF Power Measurements, Circle 17

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Cleveland (Solon) Ohio 44139 • 30303 Aurora Road Ph. 216-248-1200 • TWX 216-248-6458 • Cable BIRDELEC

16

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
Philippines

Send Your Industry News To Broadcast Engineering For Better Coverage
Gute kamera

Germany makes some of the best still cameras in the world. So, where would you expect a good TV camera to come from? Right.

It's the Fernseh KC U 40. The first lightweight camera for both studio and location use with all the performance you'd expect from a 3-tube color camera. High light sensitivity. High signal-to-noise ratio. True color reproduction with optimum focus.

A few of the more special features include one-quarter or one-half inch camera cables, and a tiltable viewer.

For literature, write Robert Bosch Corporation, Marketing Services Dept. 2800 S. 25th Ave., Broadview, Ill. 60153. Distributor inquiries are also invited.

June, 1970

Circle Number 18 on Reader Reply Card
NAB Convention Report
On Automation

Broadcast Engineering's automation editor, Morris Courtwright, 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-shared 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, the sponsor and adjacent. 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.

Schaffers 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 broadcast 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 MacTava, AutoGram (Collins) and Broadcast Products. MacTava 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 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

June, 1970
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 the FCC to treat them as major change applications rather than minor change applications. We feel that the public interest requires that our present discretion be preserved in this regard. For this reason, the proviso language appearing in Section 1.571(a)(1) has been retained.
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Circle Number 21 on Reader Reply Card

June, 1970
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 transmission 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(c) 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 Agreement 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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Your search is over. Here is the bold new standard in cartridge tape performance, versatility and ruggedness. Here is the equipment that has everything.

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Call or write today for information about the new Ten/70 and other SPOTMASTER cartridge tape products and accessories. Remember, Broadcast Electronics is the No. 1 designer/producer of broadcast quality cartridge tape equipment—worldwide!

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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 irrelevant. 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.
IT ALWAYS SEEMS THAT 3M PROVIDES A COUPLE OF FEATURES THAT OTHER PRODUCTS DON'T

TAKE THIS 3M COLOR VIDEO ENCODER, FOR EXAMPLE...

The 3M Brand Color Encoder has two unique features not obtainable elsewhere. The color bar generator is one. It is completely digital, not partially digital. Simplifies setting up procedures, and maintains accuracy between encoders. Affords precision without adjustments. With digital you know it is accurate.

Another unique fact is that the 3M Color Encoder considers smaller, lower cost cameras as well as the big expensive ones. A method of input clamping is used on video signals that eliminates low frequency hum and noise and other unwanted effects on the matrix. If you have access to an SMPTE color test film (hand test over colored bolts of cloth) you can determine whether your camera needs clamping. If it does, you're in clover with this 3M Encoder.

The 3M Color Encoder is compatible with all 3-tube and 4-tube cameras, meets all applicable FCC and EIA specs. There's also a 2F notch filter in the horizontal aperture equalizer to prevent noise beyond camera frequency response.

Luminance enhancement at the flick of a switch assures a sharp picture even if registration is not perfect. With a 4-tube camera, enhancement is from the luminance tube. The green channel is used for enhancement in 3-tube cameras. Switching is on the front panel, as are all operation and setup controls, including notch filter.

Overall, you'll find that the 3M Brand Color Encoder is equal or superior to anything on the market yet costs somewhat less. Could we send a brochure?
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-
Organization is the key word when it comes to selecting the right television camera for your video origination requirements. Cohu’s economical 3200 Series Self-Contained Television Camera has built-in versatility that puts it top of a chart full of possible variations to meet every application.

Start at the top with the basic solid-state camera. It’s designed to meet needs from live to film chain requirements and be flexible enough to fit when your facility expands.

All video origination circuitry is mounted on quickly interchangeable plug-in boards. A flip-down rear door makes for easy maintenance and adjustments.

You can select either standard vidicon or, for increased sensitivity and low “lag” the Plumbicon® tube. The Plumbicon camera becomes a superior studio unit with the addition of a snap-on viewfinder, intercom headset and zoom lens.

For film chain use, the 3200 can be specified with standard vidicon and film camera control.

For special applications a full line of accessories can equip your camera for total remote control capability.

A plug-in sync generator is available as an option. Or you can select a drive generator (for use from an external sync source) to provide common sync to multiple cameras. It’s easier when you start at the top. For complete 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
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 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 origination. 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 10.7 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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June, 1970
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.

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 as 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...
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-

**Figure 5 Minimal non-switch program origination system.**

June, 1970
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 divided into two basic groups: (1) where one or more camera outputs

---

**Fig. 6 Block diagram of a typical video monitor.**
When you know what it takes to make a TEAC, you know why professional people wax lyrical about our A-7030.

This is a no-nonsense pro-quality tape deck, with unrivalled sound reproduction at 15 or 7½ ips. A-streamlined solenoid control system for effortless operation. A system that makes cueing as easy as pushing a button. Automatic rewind and shutoff for built-in convenience.

The A-7030 is the sum of many systems, and the sum of our savvy in producing them. It's the head of our whole fine family of tape decks.

So if somebody wants to write a sonnet on it, we've got a great line for them.

**TEAC**

**SOUNDS LIKE POETRY TO THE PROS.**

**A-7030**

- Dual-speed hysteresis-synchronous motor for capstan drive
- Two heavy duty 6-pole capacitor-start induction motors for reel drive
- Tape tension adjustment
- Massive inertial flywheel, over 1½ pounds
- Instant off-the-tape monitoring without interruption of recording
- Sound-on-sound and echo, with simple external connections
- Built-in mike-line mixer
- Stainless steel panel reinforced with 13/64” aluminum base plate for assured stable performance

**TEAC**

TEAC Corporation of America
2000 Colorado Avenue
Santa Monica, California 90404

Circle Number 26 on Reader Reply Card
are switched to a single output bus; 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, preferably of the pushbutton 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 bus 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 bus there is much less possibility of losing sync, and, (b) the transfer is not nearly as noticeable in the monitor. However, if one signal from feeding back into the other, it is necessary to provide isolation between contacts.

The third, and as yet the 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, it 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 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 bus 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 preferable, 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 15.

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 are already available.
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

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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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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 teleview. 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, saved, 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,
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 3½” x 4½” 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.

June, 1970
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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.
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 sun shining 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 aesthetic 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 attributed 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 closed-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.
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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.

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

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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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News For Newscasters: TV Script-pak ELIMINATES CAMERA-FLARE

Informed sources in TV broadcasting and engineering report that new TV Script-pak effectively stops camera-flare and reduces audio noise as well. Script-pak is especially formulated for color (excellent for black and white too). Copies are color coded for filing and updating. (Gray – studio, yellow – file, pink – update).

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June, 1970

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The innovators introduce:

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**More color control, convenience.** Now the PC-70S-2 is also available with non-linear matrixing to achieve an infinite range of tints and hues. You can color-match to any camera you own. Even those problem colors in packages and costumes snap into true-to-life color. But superb picture quality isn’t the whole story. There are many convenience features to make your cameraman more expert, more productive. For instance, a built-in test signal generator that takes the guesswork out of set-up. An external filter wheel control at the cameraman’s fingertips. The PC-70S-2 ranges far and free from the camera control unit... up to 3,000 feet with standard cable, or 1,000 feet with mini-cable.

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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 facilities 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 efficiently 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.

Circle Number 35 on Reader Reply Card
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

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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.

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

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

With the Gevachrome prepackaged chemicals, you can process both films anywhere in the world. Make it the star of your next show.

It loses nothing in the translation.
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 frommicrophones 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.
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
Ameo Inc.
Ampea Corp.
Blonder-Tongue Labs Inc.
Brown Engineering Co., Inc.
Brush Instruments Div., Gould Inc.
CanadaMarconi Co.
Caltel
CBS Labs
Chester Electronic Labs.
Cohu Electronics Inc.
Concord Electronics Corp.
Commercial Elect.
Diamond Power Specialty Corp.
Fairchild
GMC Closed Circuit TV
General Electric Co.
Kari Heltz, Inc.
International Video Corp.
Kalart Co., Inc.
Listec TV Equipment Corp.
Marconi Div., English
Electronic Corp.
Midgard International Corp.
Motorola Inc., Communications Div.
Norelco, Philips Broadcast Equip.
Pakard Bell
Panasonic, VTR/CCTV Dept.
Anytheon Learning Systems Co.
RCA Corporation
Riker Information Systems Inc.
Roberts Div. of Rheem Mfg. Co.
Sarkes Tarzian, Broadcast Equip.
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 H. H., Co., CATV Div.
Viko, Inc.
Visual Electronics Corp.
Westinghouse Electric Corp.

Film Projectors
ATV Engineering Specialties
Chester Electronic Labs.
Christie Electric Corp.
Kari Heltz, Inc.
Listec TV Equipment Corp.
L-W Photo Inc.
Magna-Tech Electronic Co., Inc.
RCA Corporation
Sarkes Tarzian Inc., Broadcast Equip.
Singer Co., GPL-TV Link Div.
Sonocraft Corp., CCTV Div.
Teleco Industries
Tele Corp.
Tyler R. H., Co., CATV Div.
Viko, Inc.

Lighting Systems
Barlowe McAllister Inc.
Bankey-Coloran 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.
Telecorp Inc.
Visual Electronics

Long Play Audio Tape Equipment
International Good Music
Magnecord
Sarkes Tarzian Inc., Broadcast Equip.
Scull Recording Instruments Co.
Sundick-Ehman
Tape-athon Corp.
VIF International

Monitors
Ameo, Inc.
Chester Electronic Labs
Cohu Electronics, San Diego Div.
Conrad Corp.
Diamond Power Specialty Corp.
Hewlett-Packard
Listec TV Equipment Corp.
Micrel 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.
Shibadan Corp., of America
Singer Co., GPL-TV Link Div.
Sonocraft, CCTV Div.
Telemation, Inc.

Video Switchers
Alma Engineering, Inc.
Ampea Corp.
Catec Corp.
Central Dynamics
Chester Electronic Labs
Computer Image Corp.
Grass Valley Group Inc.
Kari Heltz, Inc.
Richmond Hill Labs., Ltd.
Singer Co., GPL-TV Link Div.
Sonocraft Corp., of America

Video Effects Machines
Alma Engineering Inc.
Chester Electronic Labs.
Colorado Video Inc.
Cohu Electronics, San Diego Div.
Grass Valley Group Inc.
Kliegl Brothers
Panasonic, VTR/CCTV Dept.
Richmond Hill Labs., Ltd.
Riker Information Systems Inc.
Sarkes Tarzian Inc., Broadcast Equip.

Shibadan Corp. of America
Shintron Co., Inc., Video Div.
Singer Co., GPL-TV Link Div.
Sonocraft Corp., of America

Teleclari, Inc.
Telemat Div. of Geotel
Television Utilities Co.
Trombey Electronics, Inc.
Tyler R. H., Co., CATV Div.
Vital Industries, Inc.

Sync Generators
Chester Electronic Labs.
Colorado Video Inc.
Cohu Electronics, San Diego Div.
Grass Valley Group Inc.
Kari Heltz, Inc.
Kliegl Bros.
Listec TV Equipment Corp.
Panasonic, VTR/CCTV Dept.
RCA Corporation
Sarkes Tarzian Inc., Broadcast Equip.
Shibadan Corp. of America
Singer Co., GPL-TV Link Div.
Sonocraft, CCTV Div.
Tektronix, Inc.
Telemation, Inc.

Auxiliary Equipment
Cleengers - 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.
Ultrasonic Products
Controls - Camera
O'Farrell Engineering Labs Inc., Photologic Div.
Controls - Zoom Lens
Power-Optics Inc.
Vicon/Industries Inc.
Film - Inspection Equipment
Kodak Co.
Film - Processing Equipment
Grass Valley Group Inc.
Kliegl Bros.
Trole Engineering Inc.
Film - Systems
RCA Corporation
Telescopio
Lenses
Bausch & Lomb Inc.
Rank Broadcast Div.
Viko, Inc.

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Guide To Manufacturers

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

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

Ampec Corp.
401 Broadway
Redwood City, Cal. 94063

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

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

ATV Engineering
4202 36th Ave. W.
Seattle, Wash. 98199

B
Ball Bros. Research Corp.,
Commercial Div.
1050 33rd St.
Boulder, Colo. 80303

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

Berkeley-Coulter
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.
2422 Trenton Ave.
Montreal 16, Quebec

Casei Corp.
517 Marine View Ave.
Belmont, Cal. 94002

Central Dynamics
503 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. Sylvanion 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 923
San Diego, Cal. 92112

Collins Radio Co., Broadcast Div.
Maritop 407023
Dallas, Texas 75207

Colorado Video Inc.
P.O. Box 328
Soulder, Colo. 80302

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

Computer Image Corp.
2885 Beverly Dr.
Beverly Hills, Cal. 90212

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

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

Krag Panorama. Inc.
2302 E. 15th St.
Los Angeles, Cal. 90021

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

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

6360 Federal Blvd.
San Diego, Cal. 92114

Electro-Voice, Inc.
Buchanan, Mich. 49107

Fairchild
30 Park Place
Paramus, N.J. 07652

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

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, Calif. 95945

Harwood Co.
1245 Chicago Ave.
Evansville, Ind. 47702

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

HTV Systems Inc.
International Good Music
Kaiser-Cox Corp.
Klegel Bros.
Listec TV Equipment Corp.
Magna Tech Electronic Co., Inc.
3M Co., Mincom Div.
O'Donnor 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.

Shibasian Corp. of America
Shure Bros., Inc.
Spinder-Saupe
Teco
Telechron, Inc.
Teleman, Inc.
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Telesync Corp.
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Television Presentations
Total Technology
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Complete V.T.R. Recording System
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1—Norelco VTR EL3401A/54 $585.00;
1—TV Camera TK-204 BD-4 $169.95 and
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June, 1970

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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.
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.

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.
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
Military
Moorely Electronics
Noller Control Systems
Rust Corp.
Singer Prod. Co., Inc.

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Electronic Designers, Inc.
Engineering Assoc.
RFE Labs
Rust Corp.
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Altec Lansing
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Blonder Tongue Lab., Inc.
Collins Radio Co.
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Hewlett Packard Co.
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Katona Electronics Co.
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Narda Microwave Corp.
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Telemation
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Cameras, Film, Cinematography
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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.

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June, 1970
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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.

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**"MATERIALS, CONSTRUCTION AND DESIGN" All Filmline machines are constructed entirely of metal and tanks are type 316 stainless steel, herilac 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, Gaffens Film Labs, A-One Labs, All-service Labs, NASA Cape Kennedy, Ford Motor Picture Labs.

TV Stations: WAPI-TV, KTVI-TV, WXYZ-TV, WPTA-TV, WDTV-TV, WAGT-TV, WJAC-TV, WITF-TV, WBKB-TV, WITP-TV, WITQ-TV, WHEC-TV, WHEC-TV, WAVE-TV, WCPD-TV, WAPA-TV, WCTV-TV, WJTV-TV, WMTR-TV, WNTY-TV, WNTY-TV, WNTY-TV, WNOT-TV.

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June, 1970
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Intermittent Nuclear Corp.
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McMartin Industries, Inc.
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FB Ceco, Inc.
Fairchild Industrial
Filmline Corp.
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Cotter Corp.
FB Cego, Inc.
Filmline Corp.
Houston Fearless Corp.
Houston Photo Prod.
Jamieson Film Co.
Mincos Div., 3M Co.
Tech Film Labs, Inc.
Trisse

Projectors, Film

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Du Val & Fit Corp.
Eastman Kodak Co.
FB Cego, Inc.
GAF Corp.
The Kalart Co., Inc.
L & W Photo, Inc.
Lissner-Smith
Listec TV Eqpt. Corp.
Phillips Broadcast Equipment
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Traid Corp.
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Projectors, Film, Rear

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Fairchild Industrial
The Kalart Co., Inc.
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For a little guy, the Jamieson Mark IV color processor sure turns out the film.

The Jamieson Mark IV color processor may be small in size, but there's nothing small about its performance. It is the easiest of all machines to operate. It is fully instrumented and automatically controlled. It has a warm-up time of just 10 minutes, a put-through time of just 23 minutes. At that rate the Jamieson Mark IV color processor for 16mm and 8mm Ekta-chrome at 30 F.P.M. delivers processed film at a rate twice that of other machines its size.

But there's more to our Mark IV than just speed.

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The Mark IV is no bigger than a standard office desk so you can easily install it in existing space.

It costs less to own than any other color processor in its class.

It is completely self-contained and its simplicity of design reduces maintenance requirements and makes servicing a breeze.

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The reduced volume gives you more stable chemical balance and finer temperature control. You get highest color quality, freedom from scratch hazards, lower day-to-day chemical costs and the gentlest, most reliable film transport system available.

The Mark IV is available in two versions. The fixed installation for TV stations and small commercial labs and in an air-transportable model with special electrical features that make it adaptable to any electrical conditions you may find.

For more information on the Mark IV color processor and the names of current users, write us.

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A singular light seems on the threshold of a major contribution to audio transducer design. This light is the laser, and its unique properties are opening up new techniques for the development of many audio products.

A laser beam is a very special kind of light. It can be described as a monochromatic coherent light source. This means it is a single frequency (wave length) with all parts of the beam in strict phase relationship in contrast to the broad bandwidth and random phase relationship of ordinary light.

A special technique developed at the Cooley Electronic Laboratory of the University of Michigan, laser beam can be used to "wedge" and vibration. Moving as small a fraction of the wave length of the light being used can be revealed. This technique is based on holographic interferometry. E-V engineers recognized the potential importance of this research as applied to audio products, and the company supported further study. Thus E-V is now able to analyze the motion of such things as microphone or speaker diaphragms without interfering with their operation.

Using the laser, the engineer can see whether the diaphragm is operating as a piston, or whether it is simultaneously vibrating in more than one mode. He can locate the nodal points of the diaphragms at any specific frequency, and observe as they shift with changing frequency.

The precision afforded by the laser permits the measurement of the amplitude of vibration at any point on the diaphragm in comparison with other parts of the moving surface. In this respect it is a vast improvement over all other art.

While it would be impossible to explain the operation of the laser in this brief discussion, basically a hologram of the face of the diaphragm is made, using a CO2 continuous gas laser with the unit at rest. A second hologram is made through the first, with the diaphragm driven at the desired frequency. Finally, a photograph is taken of the interference patterns displayed as a result of slight image displacement between the two holograms.

The laser and the hologram hold out great promise as unique new tools for basic investigation into all kinds of audio transducers. Study of the first photographs reveals aspects of diaphragm behavior impossible to reveal by any other method. Further discussions in this column will detail some of the findings of these new techniques.

For reprints of other discussions in this series, or technical data on any E-V product, write:

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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.

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For example:
You're on the air. It's late, a tube fails. You're low on replacements. Too low for comfort. So you call your RCA Broadcast Tube Distributor. To keep you on the air, he'll get out of bed to fill your order!
There are more reasons.
Experience. He talks your language, knows your needs. Some of our distributors have been in the business of supplying broadcasters for as long as we have—40 years!
Engineering service. He has a "hot line" to RCA's Field Engineers. Call him any time you need their services. Call even if you need help in servicing our competitor's equipment!
Quality. You know the story. He stocks the finest.

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P.S. Your RCA Broadcast Tube Distributor is also the man to call for RCA Starmaker Microphones.
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608 Norris Ave. • Nashville, Tenn. 37204 • Ph: (615) 254-3365

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**MODEL TPC2 TRANSISTORIZED BURST PHASE CORRECTOR**

The TPC2 permits rotation of the color burst phase signal driving a TV transmitter, without the necessity for extensive transmitter investigation and possible modification. It permits advancement or retardation of the color burst by 20 degrees, without affecting the amplitude or other characteristics of transmission. This completely transistorized unit has its own internal regulated power supply, and is constructed on a 1¾" by 19" panel. $575.00 FOB Nashville.

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**TC1 CLAMPING AMPLIFIER**

The TC1 Clamping Amplifier employs tip clamping to remove low frequency signal deficiencies without disturbing burst and other chrominance information in or about back porch levels. The clamped stage utilizes a field effect transistor driven by a balanced bridge circuit. This advanced design technique produces highly effective and stable clamping. The TC1 Clamping Amplifier sells for $325.00 FOB Nashville.

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**TBG2 BLACK BURST GENERATOR**

The brand new TBG2 Black Burst Generator allows you to go black and back with perfection. The TBG2 has two outputs available for added versatility, and each has burst phase and burst amplitude adjustments so the two feeds can be matched under any condition. The TBG2 has the industry's only continuously rotatable phase control, and is accurate to within one degree. All the controls are on the front panel and can be locked. The unit is small, compact and lightweight. So is the price . . . $475.00 FOB Nashville.

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608 Norris Ave • Nashville, Tenn. 37204 • Ph: (615) 254-3365
The SM60 cannot be stereotyped—is equally at home in the studio or in the field—stand-mounted or handheld—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 omnidirectional 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.

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VERSATILE OMNIDIRECTIONAL DYNAMIC MICROPHONE

SHURE PROFESSIONAL MICROPHONES...FOR BETTER AUDIO

MODEL SM60
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
1/2" OMNIDIRECTIONAL 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 SM10
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.

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