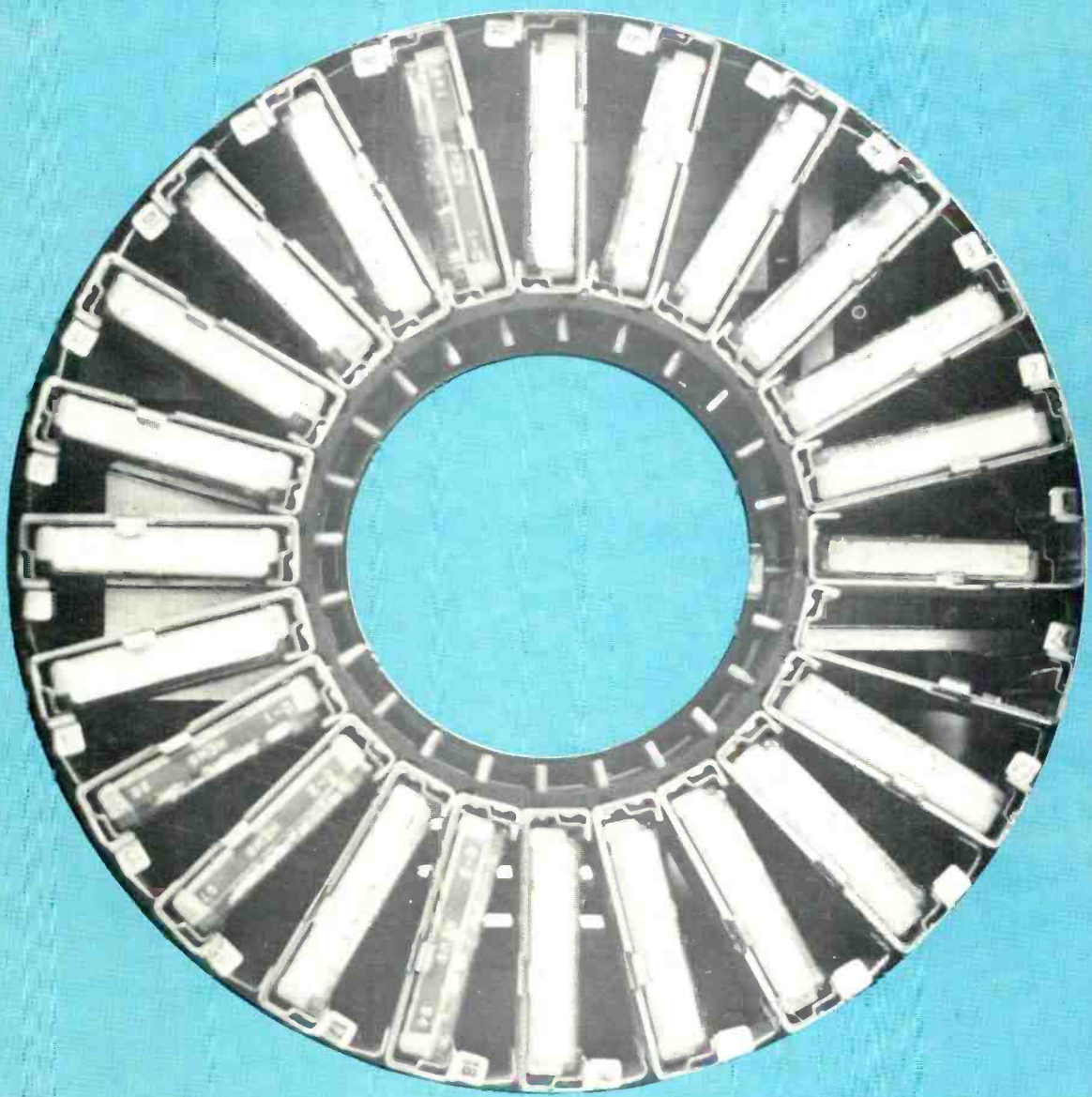
June, 1971/75 cents

Broadcast Engineering®

the technical journal of the broadcast-communications industry

A HOWARD W. SAMS PUBLICATION



1971 AUTOMATION REVIEW

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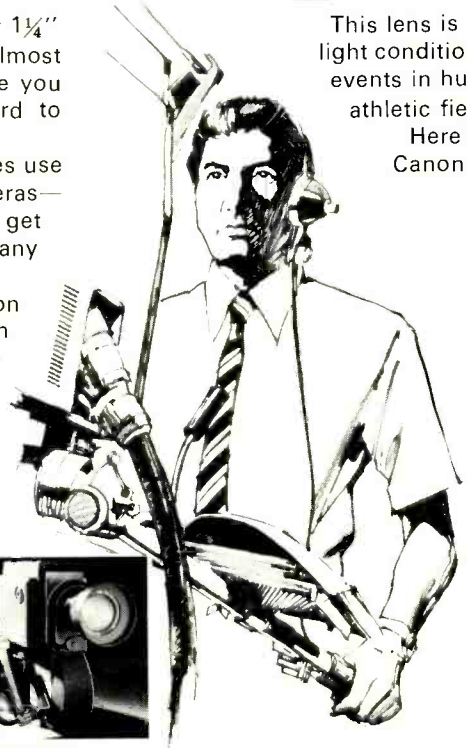

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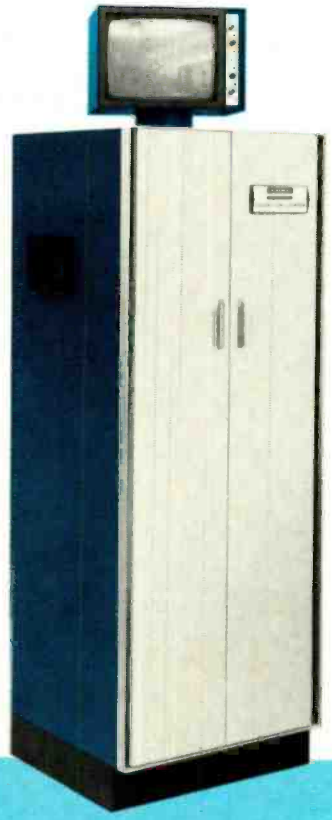

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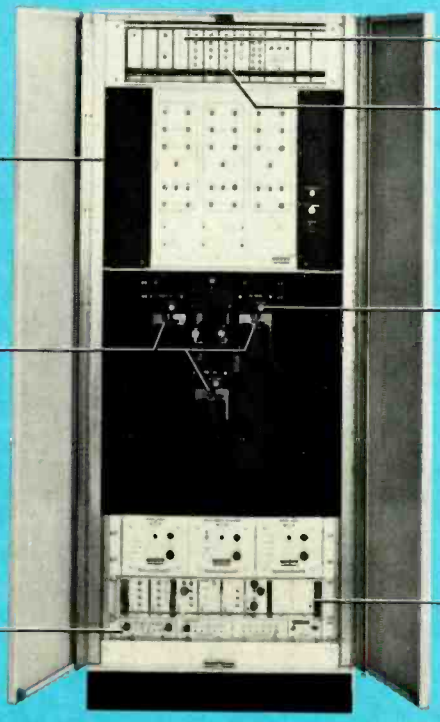

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June, 1971 • Volume 13, No. 6

Broadcast Engineering

The technical journal of the broadcast-communications industry

in this issue...

ABOUT THE COVER

This month's cover kicks off our special emphasis on automation. Issue covers areas of station operation currently under fire from automation. Industry perspective begins on page 20. Cover by courtesy of KUDL staff and BE Artist Webb Streit.

DEPARTMENTS

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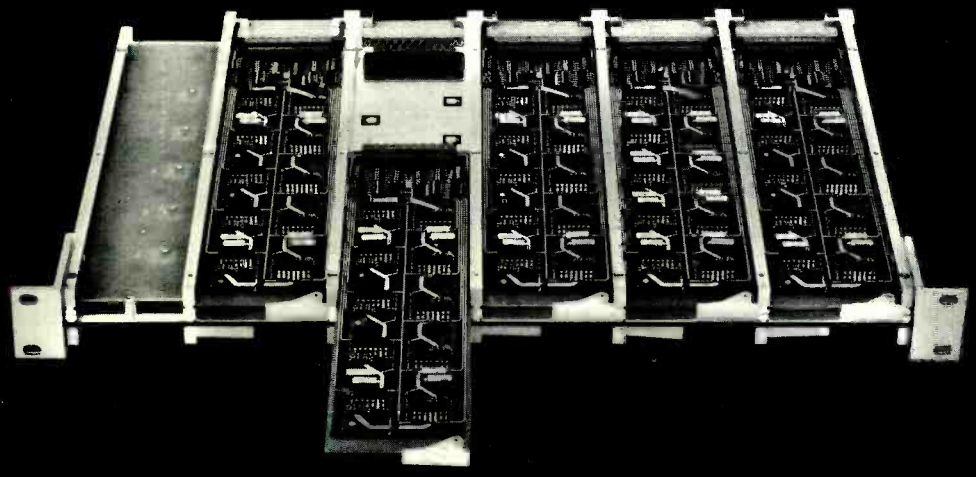

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DIRECT CURRENT FROM D. C.

June, 1971

Howard T. Head

Commission Proposes New Television Contour Signal Levels

As predicted (March, 1971 Pompous Predictions), the Commission has proposed to reduce the values of median field strength in the determination of Grade B television coverage. The proposed reductions are as follows:

	Ch. 2-6	Ch. 7-13	Ch. 14-69
Present Grade B	47 dBu	56 dBu	64 dBu
Proposed Grade B	46	50	60

The Commission bases the new proposal on receiver performance data obtained from receiver manufacturers and other sources which indicate lower noise figures than those used in deriving the present Grade B signal levels in 1952. An exception is Channels 2-6, where data compiled by ESSA indicate the limitation on rural television service to arise from cosmic and man-made noise rather than receiver input noise. Grade A signal levels, which are established in terms of ambient urban noise, would not be changed.

The Commission's Notice states that the Commission is ready to adopt earlier proposals for new field strength vs. distance curves and the permissive use of field strength measurements in the FM and TV bands (see 6/67 and 5/68 Bulletins). However, the Commission is now proposing the inclusion of the changed Grade B signal levels as part of an overall "package".

These proposals would change the Grade A and Grade B contours of all television broadcast stations. Most contours would be smaller under the new curves and definitions, except on Channels 7-13 where Grade B contours would be increased in size.

The new field strength curves, which would apply to FM as well as TV, would also change the size of the predicted FM service area, reducing the 1 mv/m (60 dBu) coverage for all except the lowest antenna heights.

The Commission has also called for comments on a proposal to show co-channel and adjacent-channel interference within Grade B contours. Such showings are not now presently required, although most stations are subject to such interference.

A special article in the July issue of Broadcast Engineering will describe the proposals and their history in detail.

(Continued on page 6)

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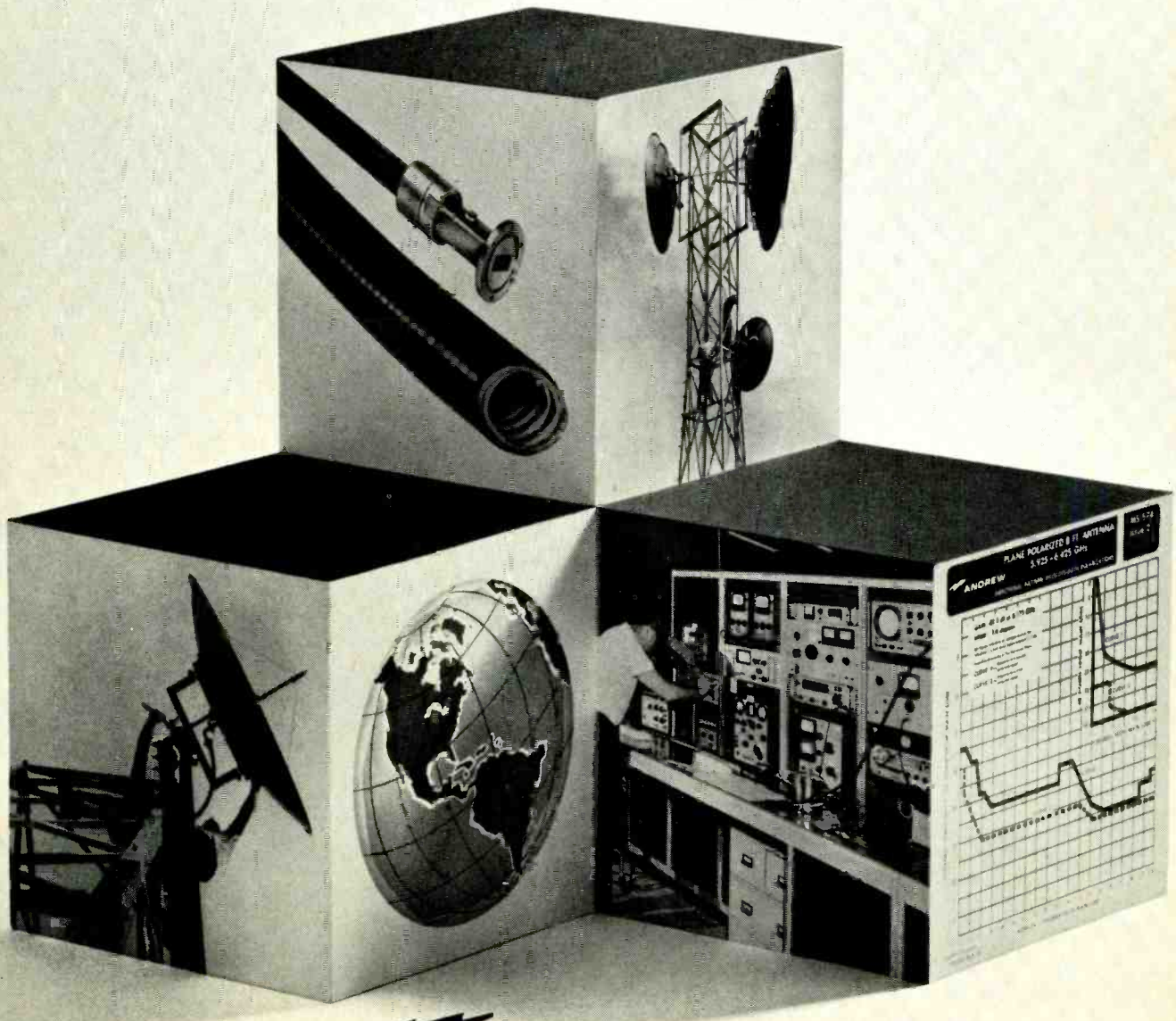

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2-69

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(Continued from page 4)

NAB Proposes Relaxed Transmitter Visibility Rules

The National Association of Broadcasters (NAB) has petitioned the Commission to relax the present rules requiring that broadcast transmitters now operated by remote control be visible from the operating position. Under the NAB proposal, transmitters would merely be required to be "on the same premises" as the operating position and readily accessible to the operator. Extension meters would be provided at the control location to indicate all essential transmitter parameters.

The present rule requiring transmitter visibility for the control position has led to some remarkable combinations of mirrors, holes in walls, and closed-circuit television cameras. The only present alternative is a remote-control authorization, which often presents substantial complications in the case of AM stations employing a directional antenna.

Carrier-Current Campus Radio Stations Under Study

The Commission has initiated an inquiry into the operation of carrier-current systems such as those used on many college campuses for low-power, short-range broadcasting. This inquiry will also consider the problems raised by the interconnection of these systems and feeds to CATV systems, which have been protested in several instances by local broadcast stations. At least two carrier-current stations have been in networking and CATV operation since 1969, and the Commission recently authorized a third experimental authorization. The most recent authorization subjected the campus station to all programming requirements for licensed broadcast stations--political requirements, fairness doctrine, editorializing, sponsor identification, lotteries, dirty language--the works.

Digisonics Code Still Under Study

Also as predicted (March, 1971 Pompous Predictions), a special committee of the SMPTE has concluded in a filing with the Commission that the visual Digisonics code applied to television film material cannot be maintained within the present requirements. The present rule confines the coded area to the top three and bottom three lines of the television raster. NAB has also filed a report with the Commission reaching the same conclusion.

In the meantime, use of the code continues under a special waiver permitting the code to occupy six lines at both the top and bottom of the picture. Difficulties are being encountered in meeting even these relaxed requirements, and Digisonics has requested that the rule be permanently relaxed to permit a minimum of six lines at both the top and bottom, together with an added three lines at either the top or the bottom. The SMPTE and NAB reports, however, raise considerable doubt that even these relaxed tolerances can be met.

Short Circuits

A Washington, D.C. suburban radio station which was earlier subjected to a heavy fine for technical violations (January, 1969 Bulletin) has had its license revoked . . . The Commission has softened its requirements for comparable VHF-UHF receiver tuning (See March, 1970 D.C.) to the extent of permitting detent tuners to omit fine tuning memory of UHF while incorporating memory at VHF . . . The Commission has authorized the use of ITFS boosters and translators.

LETTERS TO THE EDITOR

More On Positive Modulation

Dear Editor:

I would like to sum up the summing up of the positive modulation discussions as it appeared in the March issue of BE.

My successful tests with positive modulation of up to 125 percent were carried out with transmitters manufactured prior to 1955, having at least 50 percent more power output capability than set out in their type approval and most certainly not with transmitters made since 1955.

The capability of high positive modulation goes along with conservatively rated final stages. This is borne out by the amazing Gates Company figures of 200 percent where they used a 100 kW transmitter operated at only 33 kW. Somewhat similar figures can be obtained by most any transmitter when operated in the "low power" mode where the power change is achieved by substantially lowering the applied final plate voltage.

Here is the big qualifier, no broadcaster should attempt to operate beyond 105 percent positive modulation peaks if his transmitter is equipped with two parallel tubes in the final stage of any type except 892's. If you have a single 3CX-2500F3 or 3CX2500A3, positive peaks of up to 110 percent are possible only if your final tube is less than 2,000 hours old and your transmitter and antenna system permits more than 79 percent efficiency operation, and there is a voltage regulated filament supply to the final stage. Otherwise just simply forget it, you will break FCC Rules.

In fact you may have the usual dog that even when fitted with new tubes, cannot produce positive peaks of the same percentage as the negative when modulated with a balanced signal. What we do need is an upgrade of type acceptance rules and tests where there is at least one third of the rated power available in reserve to meet aging tubes, low line voltage and unavoidable inefficient antenna systems. Some manufacturers are doing this, but most are laboring dead horses with "Solid State Devices" attached to old poor designs.

Alan L. Roycroft
Honolulu, Hawaii

Super Peaks Offer Real Advantages

Dear Editor:

In regard to the article in the March issue of BE, "An Update On Super Modulation", I have the following comments.

We are presently using an RCA BTA 5 H transmitter and a Gates Solidstatesman Limiter with a modification allowing positive modulation of 140 to 150 percent with no objectionable distortion or adjacent channel interference.

It will be noted if you read the manual for the solid statesman that it does not artificially alter program balance but allows use of the natural unbalance in the program content to the fullest advantage. Our transmitter uses two 5762's in both the modulator and the RF final and as we all know this is capable of considerably more than 5 kW. When the output waveform of an amplifier differs from the input waveform you have distortion.

With very few exceptions, limiters that offer high positive modulation do not alter the wave form, so the distortion at 140 percent positive modulation shouldn't be much more than that at 100 percent provided the transmitter is capable of the increased power demand. We are located in central Florida, have a daytime power of 5 kW and a ground conductivity of (2).

This produces a field intensity of 3 millivolts at a distance of 15 miles from our transmitter. The advantage of asymetrical limiting on the signal to noise ratio is particu-

larly noticeable in the rural areas of our primary coverage area.

I do not uphold peak clipping as is used by some stations to artificially alter the program content. We have a station here in town that uses this method and it sounds "muddy". I believe that placing a limit on positive peaks would not be in the best interest of all concerned as it would degrade the reception of radio stations such as us with poor ground conductivity, and it would not alleviate any of the problems that are blamed on, although not caused by, high positive modulation. But in reality are caused by equipment and/or operators that are not capable of meeting the requirements of broadcasting today.

Terry Reaves
Chief Engineer
WTMC
Ocala, Fla.

Station Gap Closed On Schedule Change

Dear Editor:

After reading the concluding article in the series, I am relieved to know that the management/engineering gap exists at other stations. I have spent 14 years in small market radio, gaps and all, and could never be happy any other way.

The letter from William Watson in the March issue bears a strange resemblance to the "once-upon-a-time" situation here . . .before I worked out a solution to the small-market engineer's dilema.

My presence was also demanded . . . six days a week during office hours. And it was the same problem: how to perform a good maintenance schedule while the station was off at night and still keep the boss happy.

The solution has proved to be an early morning maintenance schedule. Arriving at the station at 2 or 3 a.m. provides three or more hours for routine maintenance. Since the important phases of equipment maintenance are performed in the early hours of my work day. I know that I'm performing at my peak efficiency. Besides, I don't have to prop my eyelids open the way I did when I stayed up late . . . and I don't have to mumble some excuse about working late when the boss asks why I didn't get in until noon.

The PD . . . who signs six mornings a week . . . is impressed by walking in and finding me hard at it. The coffee's made, the control room is clean, the system is working great . . . and if something should go wrong, I'm right here. I'm also here to greet the sales staff, the boss and the girls in the office! And the hardest part of my day is long past when the boss wants me to dub the latest sales spec spot onto a cassette.

In addition, I'm here to help out with the hectic early morning local news . . . and I pull a couple of weekend board shifts. I've recently installed a new transmitter, limiter, modulation monitor, frequency monitor, antenna coax, built a new antenna tuning unit and a new engineering office and workshop.

There are several points that were made in the management/engineering gap article that I hope small-market engineers caught. The most important is the regular engineering report. A short paragraph on each of the major accomplishments during the past week, particularly those in which a management decision played a major role is all that's necessary. I like to end mine with a one-line paragraph, "Twenty hours technical maintenance, 126 hours broadcasting, no air time lost."

Richard E. Douglas
Chief Engineer
Stuart, Fla.

Exit, Stage Left

Dear Editor:

I have been following with interest the discussion of the gap between management and engineering that has been published in recent issues of BE. I spent 10 years in the broadcast engineering field in northwest Indiana and worked as assistant chief for a TV station, chief for an AM-FM and most recently built from scratch an automated FM station. In all cases it was most obvious that management has a definite hang-up so far as engineering is concerned. Long hours, relatively low pay, and a general attitude that "we tolerate you because the FCC says we have to

(Continued on page 10)

(Continued from page 9)

have you but really we wish you weren't here" make life of a typical engineer not the most desirable.

In only one case, a station where I handled part time duties to relieve the regular engineer, was engineering appreciated and welcomed. This station showed the belief management had in engineering, with its fine sound, modern, well-performing equipment, and the fact the chief engineer was able to invest in an interest in the station.

Having had all of that kind of treatment I could tolerate, I left active station engineering. No, I haven't left broadcast engineering but I now have a fine position where there is little pressure, the people are friendly and relaxed, and I am still able to maintain close contact with the broadcast engineering field. I am now the chief engineer for the country's largest supplier of new and used broadcast equipment, and frankly am having a ball. I wouldn't go back to station engineering again if you handed me the job on a silver platter. I know and like many fine station engineers and feel that they are doing a fantastic job against, in many cases, fantastic odds imposed by old and obsolete equipment, and management's usually disgusting attitude toward the people who keep them on the air and frankly, keep the place making money.

James D. Jones
Chief Engineer
The Maze Corp.
Birmingham, Ala.

Operator? Engineer? Technician? CE?

Dear Editor:

For some time I have noted in "help wanted" ads and in articles written for BE and other trade publications, a tendency to refer to Broadcast Engineers as "technicians." Now in the Letters section, I note the same downgrading by some other engineers.

The term technician started with the military where the only "engineers" were in the Army. It has become common in the manufacturing industry as referring to a person who works under the direct supervision of a foreman or a graduate engineer. The technician may do the work but he is just the "hands" for a slide rule pusher or a desk jockey.

In a broadcast station, both the law (FCC) and management hold any person with a First Phone ticket liable for his work. Most of the stations in the U.S. have only one engineer. He is designer, builder, installer, operator and "fixer," for every piece of equipment in the station. When things go "blooie", there is no supervisor to whom he can turn for advice. His management is not technically qualified to evaluate his job so . . . in effect . . . he works without supervision.

For almost a half century, we have been called Broadcast Engineers because our job requires Engineering level knowledge and ability even though few of us have attended formal Engineering schools.

One of our local carpet laying companies employ "technicians", all of the radio and TV stations I have ever been around employ Engineers.

I can not help but wonder if this is not a "put-down" attempt by a group who are trying to downgrade

our profession.

Just a point . . . I am not a "recent graduate". I have been an Engineer-Announcer . . . and proud of both jobs . . . for over 15 years.

Fred Chapman
Chief Engineer
WMCF
Stuart, Fla.

Pirating Can Be Stopped By Good Pay

Dear Editor:

I read the letter from George F. Sprague in the February issue of **Broadcast Engineering** and enjoyed it very much.

Having worked both sides of the street in commercial television and educational television, I would like to point out a few facts. (1) All educational television systems with which I am familiar operate with a very tight and strict engineering budget. (2) The money allocated to educational television is your money and Mr. Sprague's and we have to give you the very best product for your investment. (3) True, we do not have to show a profit, but we do recognize that broadcast engineers are professional people and are entitled to a liveable wage in the community in which the station is established. (4) We do not have to line the pockets of stockholders with profits. (5) You want your children to get the best education possible for every dollar spent on education and educational television is one of the best ways to teach your children. (6) If the owners of broadcast facilities would expend more money on technical help, the quality of television would improve tremendously.

Mr. Sprague evidently has not checked the scale of pay for technical help in other markets or he would have found that most educational television systems are in line on their pay scales with the current cost of living per market. Can he say that his station is in line with the pay for professional engineering for his market?

Charles J. Wingate, CE
Martin, Tenn.

Send Your Industry News

To Broadcast Engineering

Help

Dear Editor

We at T
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and the
The Blue C
by engaging th
through the uniselec
the studios (i.e. Red and
constant, however, at the
control room the levels from th
Blue Channel drop by itself. The peak-program meter (PPM) reads 3 instead of the normal 4.

We use detachable Marconi sound distribution-amplifiers, which have a knob to increase its gain. Even though the distribution-amplifiers are changed and the knob adjusted to maximum, no change is noticed at all. These distribution-amplifiers make use of metal-rectifiers. Could this fault develop due to the air-cooling system not functioning properly at times? What could possibly be done to boost the signal or to remedy this situation?

G. P. Pithawala
Box 2387
Kanpala, Ukanda

INDUSTRY NEWS

FCC Proposal Would Redefine FM, TV Grade B Contours

A proposal to redefine Grade B contours for TV stations has added to an FCC proceeding to revise FM and TV field strength curves (Docket 16004) and expand use of TV field strength measurement procedures (Docket 18052).

The Grade B contour is used to measure the strength of a signal at the outer limit of acceptable quality. Presently, Grade B contours are predicted by using mathematically derived curves with figures for antenna height above terrain, and power output. Measurement procedures presently authorized in the rules are considered unsatisfactory due to development of more advanced techniques.

FM Proposal

The Proposed Rule Making to revise Section 73.333 (dealing with FM broadcast stations) and Section 73.699 (dealing with TV stations was issued May 10, 1965 (Docket 16004). This proposal would adopt revised field strength curves and permit use of terrain roughness factors for modifying values derived from the curves. In Docket 18502, issued March 1, 1968, the Commission proposed to amend 73.686 of the Rules to make the results of field strength measurements acceptable, rather than relying exclusively on curves in proceedings in which accurate measurement of fields at specific locations becomes a matter of importance.

The Commission said the new proposal to modify signal levels defining Grade B contours should be considered in connection with tentative decisions to adopt new field strength curves and measurement procedures.

VHF Proposal

The proposed changes in the Grade B contours are: for VHF Channels 2 to 6 (present 47 dBu) proposed 46; VHF Channels 7 to 13 (present 56) proposed 50; and UHF Channels 14 to 69 (present 64) proposed 60. Primary justification for re-establishing these contours at generally lower field levels is the availability and use of improved television receivers, the Commission said.

The Commission said it had already received comments on Dockets 16004 and 1852 and did not believe any purpose would be served in accepting further pleadings on the engineering merits of these proposals. It said comments should be confined to the Grade B proposal, going into its intrinsic merits and its relationship to the other proposals in this proceeding.

Comments have also been invited on a proposal made by the Committee for the Full Development of All-Channel Broadcasting that all submissions of Grade B contours be required to include depictions of areas within these Contours subject to interference from cochannel and adjacent channel station.

Comments Requested

The FCC asked for comments on the following subjects pertinent to this proposal. Whether such showings should be kept current; if interference showings should be based on full channel occupancy or should show only the effect of existing stations, and whether stations should be considered as operating with actual or maximum permissible facilities. Also, what technical standards would be used to determine degree of interference; provisions to be made when greater than normal geographical separations are used to limit interference; the provisions for residual effects currently limited by UHF taboos; and provision for pairs or groups of stations operating with precise offset. The Commission said that a further rule making proceeding would be initiated if it was determined that the public interest required interference showings.

The Commission said that this

proposal will have no effect on the determinations made in Docket 18261 allowing land mobile radio to share UHF channels.

Interested parties may file comments on or before June 28, 1971, and replies by July 15, 1971.

FCC To Cut Off Use Of Antenna Power Resistors

Rules permitting certain standard broadcast stations—now required to employ dissipating resistors to reduce the power input to their antennas—to accomplish this by a reduction of transmitter power, have been proposed by the Commission. The rules would require a licensee who wants to reduce his transmitter output power in such instances to furnish a technical showing that the transmitter will perform satisfactorily at the reduced power level.

The proposed FCC action would amend Part 73 of the rules, and is in response to a request for rule making by Chesapeake Broadcasting Corporation, licensee of station WASA, Havre de Grace, Maryland (RM-1628). Chesapeake said that dissipating resistors waste power, are expensive and subject to failure.

The Commission noted that approximately 200 AM stations, most of them using non-directional antennas, are equipped with resistors for dissipating excessive transmitter output power.

AM transmitters are type accepted for operation at power output levels corresponding to the powers specified in FCC rules for the various classes of stations. The Commission said that, in a rather large number of instances, a station authorized for operation at one of these power levels cannot deliver the full output of its transmitter to its antenna without producing an excessively high radiated field that may cause interference to other stations. In such cases, the Commission requires that the transmitter be operated at its rated, or type accepted, power output, and that output power, in excess of what is needed by the antenna to produce the maximum permissible field, be dissipated in a resistor inserted in the feed line at the base of the antenna.

The Commission explained that use of dissipating resistors is a policy rather than a specific rule, and that this method of limiting power output has been used because measurements submitted, in applications for type acceptance, are made at the power levels specified in the rules. The Commission also pointed out that there is no assurance at present that these transmitters, operating at other power levels, could meet the maximum performance standards required by Section 73.40 of the rules.

The Commission proposed certain changes in the method of specifying antenna input power, which would make unnecessary a practice followed in many cases of arbitrarily adjusting measured antenna resistances to reach a desired result. The method of specifying power for AM stations, which it is proposing, is considerably more straightforward and informative than the present system and no more complicated than the method used in TV and FM broadcast services, the Commission pointed out.

The Commission stated that it was not proposing a wholesale modification of the licenses of existing stations, and, except in instances when applications for modification of permit are submitted, that station licenses would remain unchanged until renewal, at which time the new licenses would specify power and the parameters needed for the computation required by the proposed rules. The licensees of stations now using power dissipating resistors, and asking for authority for their removal, will be free to file applications for modification of license at anytime after the effective date of the rules.

"SOMETIMES I THINK THESE RATINGS WILL DRIVE ME MAD."

NAB Seeks Aural Service Space

The National Association of Broadcasters said it agrees with the Federal Communications Commission proposal to provide additional spectrum space for the aural auxiliary broadcast service.

In a recent filing, NAB said that while it is in "full accord" with the proposal, it urged that these points be considered:

(1) Applicants for either studio-transmitter-links (STL) or intercity relays be permitted to utilize facilities in either the 947-952 MHz bands or the 2150-2160 MHz band at the licensee's discretion.

(2) Auxiliary broadcast frequencies should be initially assigned to the upper and lower portions of the 2150-2160 MHz band in order to provide for the orderly expansion of the auxiliary broadcast service and the efficient distribution of the assignable frequencies.

(3) The 947-952 MHz band should be reserved for the aural broadcast service. However, existing authorizations in the 947-952 MHz band should continue under a grandfather provision.

(4) Intercity relay stations should be included in the 2150-2160 MHz band in order to permit flexibility in the design of interconnecting systems and to provide for future expansion of this service in the event of the lower frequencies become congested.

(5) The 250 kHz channel spacing and channel assignment concept in the 947-952 and 2150-2160 MHz band as proposed by Moseley Associates, Inc., will result in the efficient distribution of spectrum space.

(6) As proposed by NAB last January, additional frequencies must be allocated in the 947-952 MHz band for transmitter-studio-links on a secondary basis to provide telemetry information for remote controlled transmitter facilities.

AFCCE Elects Officers

The Association of Federal Communications Consulting Engineers (AFCCE) held its annual meeting late in April in Fort Lauderdale, Florida. The AFCCE includes in its membership many of the nation's broadcast stations.

Before the meeting was over, the Association had elected a new slate of officers. They are: President, John A. Moffet of Silliman, Moffet & Kowalski; Vice President, Alvin H. Andrus, of Steel, Andrus & Adair; Secretary, Elizabeth Dahlberg of Lohnes & Culver; and Treasurer, Paul L. Wimmer, Jules Cohen & Associates.

The new executive committee lineup will look like this: Ogden L. Prestholdt and Marvin Blumberg of A. D. Ring & Associates; Raymond E. Rohrer of Raymond Rohrer & Associates; and Carl E. Smith of Carl E. Smith, Consulting Radio Engineers.

New CE Appointed For Virginia TV Assn.

Raymond G. Harrison is appointed Chief Engineer for The Northern Virginia Educational Television Association (NVETA) at Annandale, Virginia. The NVETA was recently granted Channel 53 by the Federal Communications Commission for the construction of a new noncommercial educational television station to serve Northern Virginia. The announcement was made by Robert D. Smith, Vice President and General Manager of NVETA.

In addition to providing educational television services for Northern Virginia, NVETA will also cooperate with the Northern Virginia Community College in offering a new and unique two year curriculum in Broadcast Engineering Technology for young people planning to enter the technical side of the broadcast industry. Harrison and his staff of NVETA engineers will teach courses in the operation, theory and maintenance of broadcast equipment. The college faculty will teach courses in electronics and other subjects.

CATV-"Uncommon Carrier"

Application of common carrier principles to the CATV industry "remains a viable alternative" for the Federal Communications Commission, Commissioner Thomas J. Houser told a meeting of the National Cable TV Association in Chicago.

Commissioner Houser cautioned that his observations are "speculative" and do not represent the conclusions of a single Commissioner. He told his audience that he was raising the possibility of "uncommon carrier" status in order to "stimulate further thinking" and was restrained because the Commission is currently devising an appropriate CATV regulatory scheme.

A segment of feeling both within and without the Commission staff looks toward some sort of common carrier regulation of the CATV industry, Commissioner Houser commented. He said common carrier regulation is under consideration because cable systems, in the long run, will become "intrinsic monopolies."

He pointed out that while today CATV is presently viewed as an alternative to over-the-air broadcasting or as a supplemental service, "reasonable men recognize that we are only standing at the threshold of the development of a means of mass communications." Although, in theory, multiple cable systems in a geographic area are feasible as long as the level of market penetration is around 30 percent, Commissioner Houser noted that the "economics of the situation would seem to clearly point to merger rather than competition."

He cautioned against fears of standardized pricing policies or elaborate rate regulation saying it is too early to determine the need for such regulation.

Some aspects of a common carrier philosophy would be of particular benefit to cable operators, Commissioner Houser suggested, noting that problems with respect to multiple ownership would diminish as the responsibilities for hardware ownership and program decision-making are divorced and the fear of limited diversity of informational voices is substantially satisfied. This divorce would appear to require "only the most minimal amount of regulation in the multiple ownership area," he said.

"It may well be," Commissioner Houser said, "that a cablecasting requirement, as opposed to an open-end use of discretion constitutes an unreasonable and inappropriate mandate." This requirement could be reexamined if cable operators were required to provide origination studios and equipment through a system of leased channel access, he said.

Citing a recent Brookings Institution study, Houser noted that a typical leased channel would cost between $50 and $100 per hour for facilities with lessees paying for talent, direction, script and properties. It would cost $15 an hour to transmit video tapes and films for local organizations and, in the light of present charges for broadcast air time or lecture hall rental, "such a pricing policy would seem to be attractive to many of the local governmental, educational, social, cultural, and religious organizations," he said.

Commissioner Houser noted "entirely novel" programming possibilities such as a computerized program retrieval system permitting a subscriber to select a program for viewing from a program library. He said he could also envision "some kind of CATV programming network—a resource for the creation, production, and distribution of programming of both limited and mass appeal." This production network, he said, could lease time on individual affiliated cable systems and obtain profit from the advertising carried.

Plan Now
To Attend NCTA
Convention
July 6, 7, 8, 9

By Leo G. Sands

Dial-A-Program System Is Wired City Possibility

A step toward the "wired city" was made when the "Dial-A-Program" (DAP) cable television system in Dennis Port was put into service last September.

The new "pilot" system provides some 200 subscribers with access to 16 television programs. The system has 36-channel capacity and can be expanded readily, according to Cape Cod Cablevision, the system owner.

What is unique about the system, in addition to being bidirectional, is that it employs telephone-type switching. As in other CATV system, subscribers use conventional TV receivers. Channels are selected, however, with a telephone dial instead of with the channel selector of the receiver or channel converter.

As in Ameco's Discade system, only one program is delivered at a time to a subscriber receiver. The DAP system differs from Discade in that the transmission system is bidirectional. This makes it possible to transmit television both to and from a subscriber location.

The "wired city" concept was proposed by the Department of Housing and Urban Development (HUD) during the Johnson administration. During an interview with a HUD scientist, it was learned that the agency was studying the feasibility and advantages of wiring an entire city for total communications.

One of the HUD objectives was to utilize television for training the underprivileged. A survey revealed that many of the poorest of the poor had television sets even if they had to do without other comforts. Since even they have TV sets, it was logical to conclude that TV is the way to transmit information and amusement to almost everyone in a city.

In addition to being able to receive entertainment programs, any viewer in a wired city would be able to watch a "job opportunities" channel and then, by means of a telephone dial or pushbuttons, select an appropriate training film or tape. When asked how many channels he had in mind, the scientist said "perhaps 10,000 or even more".

Software is also the problem of the DAP system in Dennis Port on the southern shore of Cape Cod. The system provides 12 entertainment channels and four special purpose channels, one of which lets the viewer get weather information from Logan Airport in Boston. But, what else is there now?

Bi-directional

The bidirectional capabilities of the system make it possible for the police or a private security organization to dial the homes of subscribers who are away and take a periodic peek at what's going on.

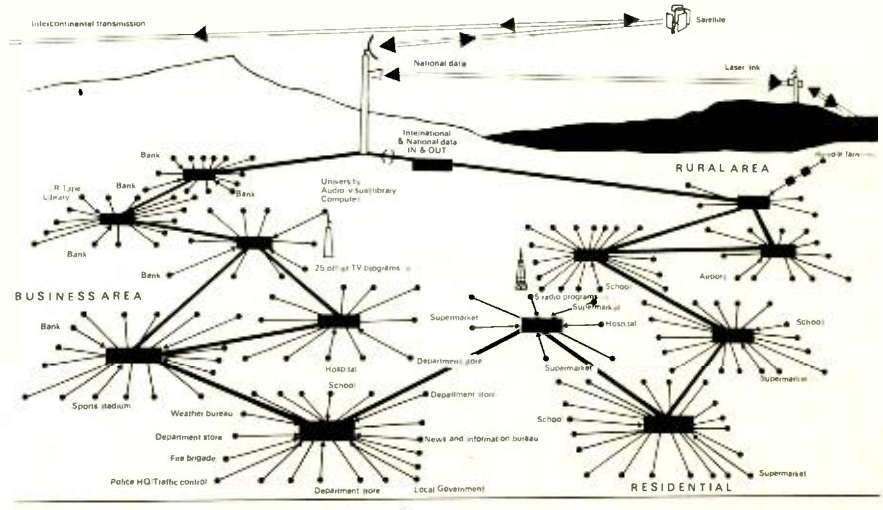
The Dennis Port system was developed by the Rediffusion Group of Companies headquartered in London. Company officials said that Dennis Port is a "pilot system" and that there are tentative plans for installation of much larger systems in the midwest and on the west coast.

Taking a leaf from the HUD book, Rediffusion officials indicate that DAP has potential as a means for expanding education. They point out that students would be able to dial any of a great many instructional programs and to gain access to a computer for answers to problems.

The Rediffusion people have combined telephone and television technology and have apparently worked out the hardware problems, but the bulk of the software remains to be developed.

Although Dennis Port subscribers currently use conventional TV sets, Rediffusion officials are quick to point out that receivers without

(Continued on page 18)



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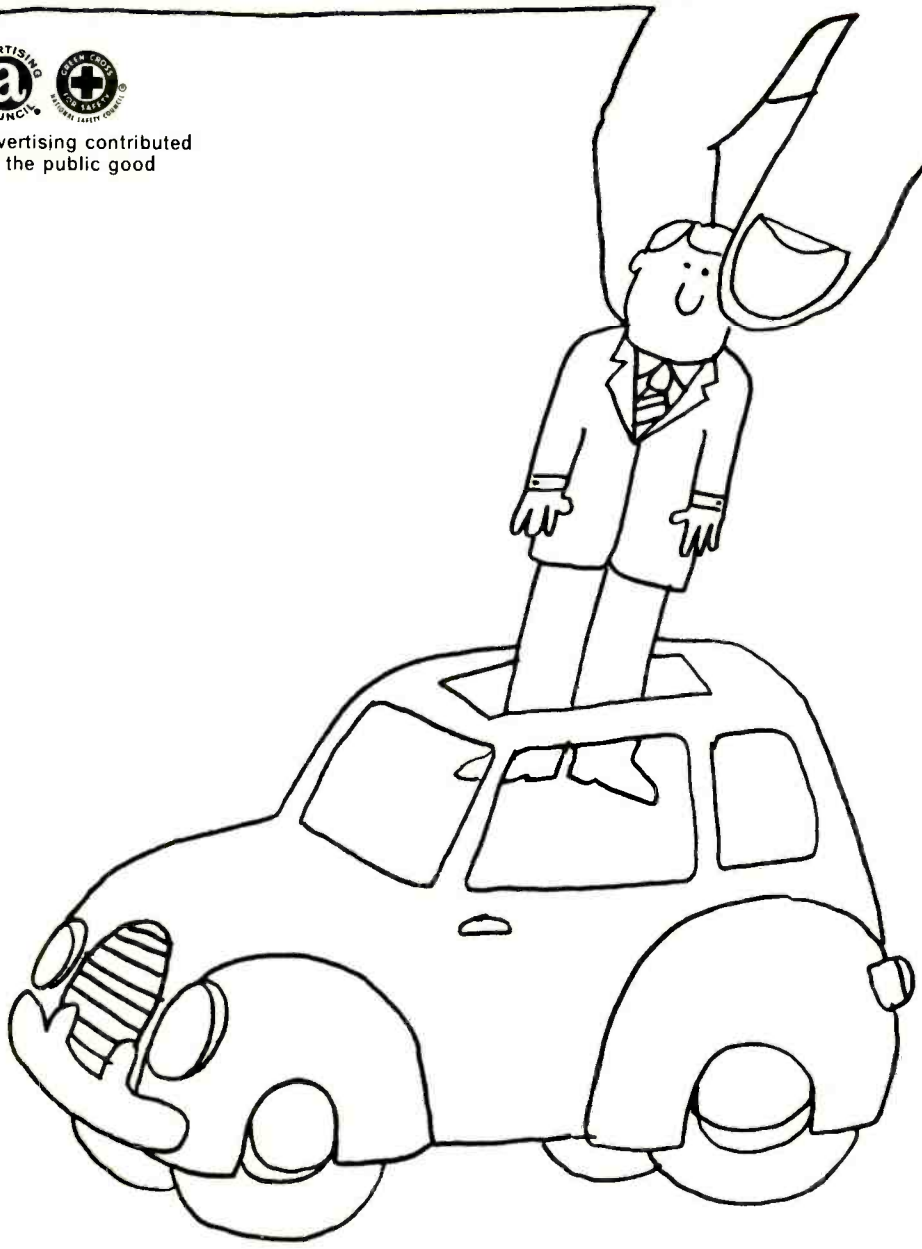

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Title_____

Firm or Organization_____

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channel-selection capability can be used since any selected program is always fed to the receiver at the same frequencies.

In addition to making it possible to select a television or audio program, a dial or Touch Tone encoder can be used at a home to summon police or other assistance, order merchandise or even vote by first dialing an access number and then the code number of a candidate. The caller can be identified by its circuit or by automatic transmission of an ID code.

In the other direction, the police or a private security organization, or even the CATV system operator, can dial to actuate an electric door lock at a vacant home or business establishment to prevent or permit entry as requested by the subscriber. The same technique can be used to turn a furnace or air conditioner on before a subscriber returns home. The possibilities are limited mainly by imagination.

The remote switching approach makes a lot of sense. It minimizes technical problems resulting from simultaneous transmission of a large number of channels over relatively long distances through a single cable as in conventional CATV systems. At the same time, however, it does increase system complexity because of the switching requirements. But, this should not hamper reliability since modern solid state and reed switches can be designed for very high reliability.

Two-way Cable Report Given At IEEE Meet

Tests of two-way cable transmission being conducted over four miles of cable TV system in Los Gatos, Calif., to point the way to Subscriber Response Services (SRS)

of all kinds were described by Hubert J. Schlafly, senior vice president of TelePrompTer, at the 1971 IEEE International Convention.

TelePrompTer's tests of upstream transmission on a coaxial cable distribution system are a necessary ingredient for SRS. In Los Gatos, Schlafly said, nearly four miles of CATV system have been equipped with crossover filters and subchannel amplifiers designed for a return upstream signal. The system was already carrying 18 channels of TV programming and its subscribers have been provided with 25-channel converters.

Under investigation are possible effects of upstream hardware on downstream signals, determination of optimum design specifications and installation techniques, and possible types of interference and their effects.

Eventual goal of the tests is two-way transmission capability for all CATV systems. Broadband data and video signals will be transmitted from any point in a community, upstream to the CATV headend or control point. There, data can be processed, stored, and/or forwarded, and video signals can be recorded, edited, played back or turned around for downstream transmission to all subscriber outlets.

Schlafly reported that he is conducting other parallel engineering studies on SRS systems and terminal equipments including computer center processing control. These combined studies gives him confidence that CATV systems can become total home information and computer assistance terminals as well as entertainment sources.

The SRS techniques offer the opportunity for a community-wide classroom with computers checking attendance and measuring attention and perception; a chance to reach everyone for job training and notification of job openings; use of the home TV set as point-of-sale as well as an advertising medium; instant political polling, TV program rating, or product preference surveys; and for the citizen at home, direct access to emergency aid, tickets and reservations, and to product and business information.

FCC Opens New Fee Office In Washington

A new FCC Fee Section, located in Room 217 of the FCC headquarters building at 1919 M Street, N. W., Washington, D.C., was scheduled to begin operation at 8:00 A.M., Monday, April 19, 1971. A part of the Finance Branch of the Budget and Fiscal Division of the FCC's Office of the Executive Director, the new Fee Section replaces the Fee Cage, which had been located in Room L-18.

The Fee Section will be responsible for collecting filings with fees, and for processing the filings to the proper FCC bureaus. Hours of operation are 8:00 A.M. to 5 P.M., Monday through Friday, except for legal holidays.

FCC Denies Petition

A joint petition by the National Cable Television Association, Inc. (NCTA) and the California Community Television Association, Inc. (CCTA) for stay of the effectiveness of the Commission's fee schedule relating to fees charged cable television (CATV) systems, pending court review of the matter, has been denied by the FCC.

The two organizations asked for the stay while the United States Court of Appeals for the Ninth Circuit considers their petition for review of the CATV fee schedule. They argued that if a stay is not issued, then CATV systems will suffer irreparable injury.

The request for stay was being denied, the Commission said, because the groups had failed to establish "irreparable injury to the CATV industry and because the paramount public interest would be adversely affected by a stay."

The Commission said that in orders issued August 6, 1970 (24 FCC 2d 614) and April 1, 1971 (36 FR 6056) it had set up a mechanism for repayment of fees, and it will maintain adequate records so that it can make refunds if judicial review results in a revision of the fee schedule.

An emergency warning system has been installed in the Streator TV Cable Co., Streator Ill. The Civil Defense and Police warning system is reviewed by Leo Wilkinson, Wib Beckendorf and Mayor Lux.

1971 Automation Review

By Ron Merrell

Despite the available definitions of automation, there are broadcasters who still don't understand the term. This is not because they are incapable of understanding, but rather, because at the present time confusion is obvious.

From television to radio to cable TV there are, naturally, widely varying approaches to automation. In some cases, the owner of a station may have automatic assistance circuits throughout his station. Yet he feels he is not automated. Reason? Because we most often want to think of automation as a kind of master program controller. So we may use a Philips camera with digital controls . . . a Power Optics remotely controlled camera system with preset shot positions . . . or a CBS automatic color corrector . . . or a host of other familiar automatic units and still not think we are automated.

On the flip side, we can automate accounting functions, traffic, and availabilities. We can even get into lighting automation, antenna icing warning, and power change-over.

Trouble is, we can fall into the belief that assistance from automation will always benefit the station in terms of program control and record keeping . . . that it will cut down the number of technical people required to operate the station . . . it requires no changes in present facilities . . . and that it saves the owner money mostly by saving time.

Some of these statements are not true. And suspecting this, **Broadcast Engineering** surveyed the over-the-air, closed circuit, and cable owners and engineers. The following, then reflects the feelings of the users and it shows to what extent they are automated in the major categories currently under fire from the technological volcano of the 1970's.

CATV Automation

So automation is many things to many people. To the CATV industry we're not quite sure what it means because there are still too many question marks in their various areas of special interest.

Yet to be settled are numerous technical aspects—not the least of which is logging—by the FCC. When technical standards have been met, when local origination is implemented, when the industry is more alert to equipment innovations than blue sky predictions, then automation will become even more important.

It would be no chore these days to run a FM channel or stereo channel with voice announcements and ads. And it could very well be a hands off operation on equipment similar to that used in radio and FM stations.

Our survey of the CATV industry indicates that their major interest

Automation In Perspective

By Morris Courtright

Semi-dozing on an airliner between jobs, relaxing before the fireplace or gazing across the ageless slopes of Northern Arizona my thoughts frequently wander across the spectrum of our chosen profession. What is the attraction of broadcasting? Why do good engineers leave and why do other good engineers stay? What does the future hold in store? What will be the place of automation in broadcasting? Invariably, when musing over broadcast automation two words come to mind—apathy and confusion.

The recent NAB convention reinforces the feeling that those who should be most concerned, the individual stations, are either completely snowed by the words "computer" and "automation", or they don't really care what they are spending thousands of dollars for as long as someone will say it automatically solves your problems. As any good engineer or manager will attest, problems do not get solved automatically.

This is disturbing because automation is becoming deeply enthrenched in many stations, and automation can dramatically help in solving some of the nagging problems currently plaguing the industry. Couched in many ways, talked around, or hinted at, the real kernel of most of the problems can probably be summed up in the recent words of a down-to-earth station owner: "If it doesn't make a few dollars I can't afford it".

Lightly dismissed and even blithely ignored by many engineers more concerned with obtaining that absolutely flat response curve, the profit motive, nevertheless, remains a fact of life. Ignore it and the management-engineering gap continues to widen. Salesmen become the source of technical advice for equipment selection and the engineer is stuck with the resulting system. So what does this have to do with automation? Simple, automation costs money to install, can improve the profit margin, and is really a function of the engineering department.

Amidst the howles of anguish rises the cry: "but we don't have a thing to say about it!". You may not have, but you should have. The question to ask yourself is, why not? Is it because of a lack of knowledge of automation, or is it a head in the sand attitude towards the cost trade-offs required by automation. Knowledge can be gained with a

today is in automated accounting systems. Obviously, this is especially true for the larger systems. However, there are about 20% who have already implemented some form of program automation control. Also, it should be interesting to manufacturers that time keeping and equipment control systems are gaining interest among cable operators.

As in other fields, cable operators are finding that adding automated systems has not cut down their engineering staff. If anything, it should be growing, because they reported that they are having problems with automation. At the top of their troubles are faulty inputs and errors of operating personnel. Also, they see a high incidence of equipment failures. While automated accounting systems outnumber automated programming systems three to one, most of the problems come in the programming area.

TECHNICAL OPERATION REAL TIME		BUSINESS OPERATION ROUTINE		 BATCH PROCESSING
Time Keeping -true time -program duration		**Traffic** -schedules -sales -equip. status -inventories		**Accounting** -invoices -profit & loss -cash flow -depreciation -payables
Equip. Control -source switching -source control -transmitter control -display control		**Operations** -programming -avails -edit schedule -film, tape sched. -staff schedule -sales reports		**Personnel** -payroll -work schedules -taxes
Equip. Monitoring -switch confirmation -source monitor -transmitter monitor		**Sales** -availabilities -contracts -schedules -make goods		**Sales** -confirmations -discounts -commissions -histories -forecasts
Operations Log -on air				**Operations** -equip. usage -maintenance -cost control -crew schedule
				Legal -contracts -logs -tax statements

Fig. 1 The tasks that automation can perform at a station are generally divided into technical and business operations. These are further sub-divided by time priority. The real-time tasks require on-line instantly available equipment.

little effort and study, but understanding of cost factors may require a re-orienting of attitudes.

Develop an objective approach, as well as the technical knowledge, to show management how automation can increase the station profit margin through improved efficiency.

Perhaps you are worried that automation will replace you. Well, if you are merely a log writer, that is probably true. The Commission will one day fully recognize automated technical logging as being far superior to trade school logging. This will not only improve technical operation, but also it will remove a ridiculous economic burden from the back of the owner. True engineers will be in high demand to maintain and certify operation of the equipment instead of running up and down a remote hilltop just to fill out an inspection log. And, will be doing so at a far better salary because the owner can now afford to pay enough to attract the talent he needs.

Ah, but why pick on the poor, misunderstood engineer when it's management that makes the decision. First, because we are engineers it is incumbent on us that we upgrade our profession ourselves, and second, automation belongs in the engineering department, not programming or management by default. Who is better qualified to evaluate technical validity of a salesman's claims? All departments must definitely have a say in establishing requirements for the automation, but the engineering department is the one that should determine what system or combination really meets the established criteria.

Maverick thoughts? Perhaps, but it seems clear that the automation confusion, as well as some other broadcast problems, can be alleviated if:

(1) Engineers insist upon upgrading their profession and become qualified as members of the decision making team for the station.

(2) Management recognizes, uses and compensates good engineers, or brings in consultants, particularly when planning changes such as automation.

(3) The Commission, NAB and industry in general recognize the true value and place of automation and establishes common sense standards. ▲

Special Considerations for TV Automation

Source Equipment FILM CHAINS, VIDEOTAPE RECORDERS and CASSETTE VIDEOTAPE RECORDERS	1. A computer/manual machine control unit is required for each film projector, slide projector, multiplexer and videotape transport. 2. A small keyboard or thumbwheel set for each projector or videotape recorder is required to provide a means for inputting identification numbers to the computer for verification of material and for machine acquisition. The verification system should include "go"/"no-go" lights at machine. 3. A control delegation terminal to permit either computer control, local control, or remote-manual control is also required.
Pulse and Signal Routing Equipment MASTER (OR STATION) SWITCHER	1. Must be capable of automatic (computer) control of rate and type of transition, as well as selection of sources. 2. Must be capable of manual operation. (Both momentary computer over-ride and full manual.) 3. A regular TV monitor display device for control supervision is required. 4. An alphanumeric character generator (at least one) is required. 5. Must have both audio-follow and separate audio facilities. 6. An output printer is required for automatic logging. 7. A keyboard input terminal (to computer) for access to event storage and editing of schedule is a recommended item at the switcher position.
AUDIO-VIDEO ROUTING SWITCHER (where patch panels are to be replaced)	1. Capable of automatic (computer) or manual control. 2. Must provide both a source and destination readout for manual control.
Control Devices COMPUTER	1. General purpose type (mini-computer size is adequate). 2. Required are input devices such as a keyboard terminal, card reader and disk memory. 3. Output devices are also required: one or more printers, and TV monitor-type display devices. 4. An alphanumeric character generator is required. One for traffic (scheduling) and one for the operational control keyboard terminal. These can feed many monitors. Special activities may require more than one. 5. Program (instructions) for computer. Called "software" by the computer industry.
MACHINE CONTROL UNITS	1. Provides for both computer and manual control. 2. Accounts for all operating control functions for any device with which it is used. 3. Provides both command output and verification return to control point.
DELEGATION CONTROLS	1. Provides for delegation of control to the computer, local manual or remote manual stations. 2. Provides readout verification of control acquisition. 3. Provides inhibit if conflicting machine is on same remote manual bus.
MACHINE DATA INPUT TERMINAL	1. Small keyboard or thumbwheel type. 2. Must be computer compatible for identification of material and verification. 3. Includes "go"/"no-go" tally lights.
Transmitting Equipment	1. All transmitter operations are subject to FCC regulation. New VHF transmitters should be capable of remote-control. Metering may be logged by the automation system. 2. A-D converters to convert measurements from analog values (voltages, power levels, etc.) to digital equivalents for automatic logging.

Fig. 2 Moving up into full TV automation will require special equipment considerations. Here are some of the areas that command special attention.

At least at this point in time, cable systems who have stepped into automation have not needed to make any changes in existing facilities. And their returned questionnaires show that those who intend to use a computer in their system will do so by sharing one, not by leasing or owning.

Commercial FM

Because of current popular formats and their SCA accounts, commercial FM is probably one of the easier operations to automate. And quite naturally, the emphasis is on program automation.

Yet FM owners, managers and engineers indicated that, especially in the top 100 market stations, the bulk of their future automation equipment purchases will be in the areas of equipment control, equipment monitoring, and operations logging.

As in other markets, this group says that their major automation problems stem from operating personnel. Yet, unlike cable systems, they report few equipment failures. However, there are indications that some systems in use had lower capabilities than suspected, and this showed up mostly when stations changed formats.

While most of these systems were installed by suppliers' reps with the help of the engineering staff, nearly all of the maintenance on these systems is done by the station staff. So FM stations also found that adding automation systems has not effectively decreased the size of their staffs.

At the present time, there is little interest in automated sales and accounting systems. And there is no interest in computers.

Stations below the top 100 markets indicated more problems with equipment, and this is directly related to operating personnel. Incidentally, this kind of problem (faulty inputs and operating personnel) showed up in all categories for all types of operations. Obviously, there is a gap here that should be taken seriously by equipment manufacturers. In fact, in some of the smaller systems, there are stations that do not want to even consider automation. There are stations who have backed out of automation, but we have no record or statistics that indicate the reasons for pulling out.

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RCA

Over-The-Air Automation Report

	Automation Status			Emphasis	Engineering Staff		Problem
	% Now	% Will	% Will not	Is On	% Increase	% Decrease	Areas
AM Top 100	33%	55%	45%	Equip. Control Programming Accounting	10%	24%	System Capabilities Equipment
AM Below Top 100	20%	40%	60%	Programming	0%	0%	Personnel
FM Top 100	57%	56%	44%	Programming Equip. Control	4%	4%	Personnel
FM Below Top 100	60%	52%	48%	Programming Equip. Control	4%	0%	Personnel
TV Top 100	46%	63%	37%	Equip. Control Accounting Sales	8%	23%	Inputs Personnel Format
TV Below Top 100	15%	48%	52%	Equip. Control Accounting	5%	0%	Inputs Personnel

Fig. 3 This summary shows that despite the economic state of the industry, automation continues to advance on the industry. However, the problem areas of faulty inputs and operating personnel must command attention.

According to our survey, 52% of the FM stations below the top 100 markets not automated will consider purchase of automated equipment in the early 1970's, with the emphasis on program control. However, in the top 100 category, stations not currently automated are interested mainly in equipment control and the operations log. Few indicate that station automation has required internal remodeling or facility rebuilding.

TV Automation

Opening the door on television automation is like opening the door on Fibber McGee's closet. To be fully automated is to require a number of equipments that can be interfaced with computer controls.

In television the question should not be are you automated, but to what extent are you automated. You can use the Hokushin cassette loading 16mm projector. Then you can add the RCA or the Ampex video cart machine. But these are only scratching at the surface. Video tape sources, switching consoles, time control, equipment control and monitoring and logging can be added. And yet we could go on into lighting, remote camera control, remote transmitter control, and . . .

Figure 1 and Figure 2 give some detail to what is possible and what equipments are needed in television automation.

The current leaders for automation are equipment control and accounting services, followed closely by sales/availabilities. But according to our survey, the highest intent to buy category is operations logging. In fact, 82% of those stations who have started into automation will continue to expand their systems in the early 1970's. All categories in Figure 1 will be their targets.

TV Problem Areas

Most TV stations have smoothed out their accounting operation, and for this survey they indicated their major problems after automation have come in traffic, logging, and programming. And according to their replies, 57% of their troubles after automating falls onto operating personnel and faulty inputs, 19% on changing format, and 12% on low system capabilities. Only 3% reported excessive equipment failures.

Understandably, the TV stations are requiring more maintenance assistance from supplier's field reps, but the station staff still is doing most of the maintenance work on automated units. However, there has been a reduction of staff at some stations after automating. But most staffs remain about the same size.

Because of the unique differences in the TV automation operation, TV stations moving in this direction often must consider facility remodeling and rebuilding. Some 38% of the stations in our survey indicated they had bought (23%) a computer or leased (15%) one. Elaborate systems, especially in TV will make demands on the facility, but, fortunate for some, they already had plenty of space to work with. If the system were treated as major business treats its automation system, it probably would operate better, longer. Jam it all into existing space and you may have problems. Station temperatures and clean air systems are becoming more and more important.

AM Radio

About 33% of the AM stations in the top 100 markets have gone into automation, and their replies to our survey show that they have given equal time to equipment control, equipment monitoring, programming and accounting. Sales and

Cable TV Automation Report

System Size	Automation Status % Now	% Others Will	% Others Will Not	Emphasis Is On	Engineering Staff % Increase	% Decrease	Problem Areas
10,000	74%	60%	40%	Accounting Equip. Control	4%	21%	Personnel Inputs Equipment
5,000	59%	41%	59%	Accounting Programming	4%	4%	Inputs Equipment
3,500	37%	22%	78%	Accounting Programming	0%	0%	Inputs Personnel
2,500	29%	32%	68%	Accounting Programming	0%	4%	Equipment
1,000	17%	14%	86%	Accounting Equip. Control	0%	0%	Inputs Personnel Equipment

Fig. 4 In the cable industry there are too many unsettled technical questions for automation to make headway. But already it is affecting their business operation.

traffic run close behind. These stations also indicate that they will continue toward total automation.

However, of the remaining 67% of the stations in this classification, 55% report that they will be in the market for automation in the same areas as those top 100 stations already automated.

Unlike other station categories, AM radio reports numerous problems after automating. But the point that is important is that of the 85% who mentioned some kind of problem (ranging from operating personnel to changing format), 23% said low system capabilities was a major problem. This percentage was equalled by equipment failures. Undoubtedly, the two can become synonymous. In fairness to the manufacturers, if you consider that all types of operations in the survey reported problems with faulty inputs, operating personnel, changing format and routine maintenance, you're going to come up with excessive equipment failures.

There is every indication that a better station automation educational program is needed. This program should not be handled by the station alone. After all, there is strong resistance to automation among some broadcast groups. Undoubtedly, the word is passed along at the local and state level by those who have had their share of problems. Now, if the manufacturers intend to improve market conditions, they must do something (along with the users) to improve operating conditions.

Depending upon the station, the engineering staff has made some changes. About 66% of the staffs have remained the same size, 24% have decreased, yet 10% have increased. It is apparent that automation will cause some shifting of engineers as automation pentrates the media.

AM Below Top 100

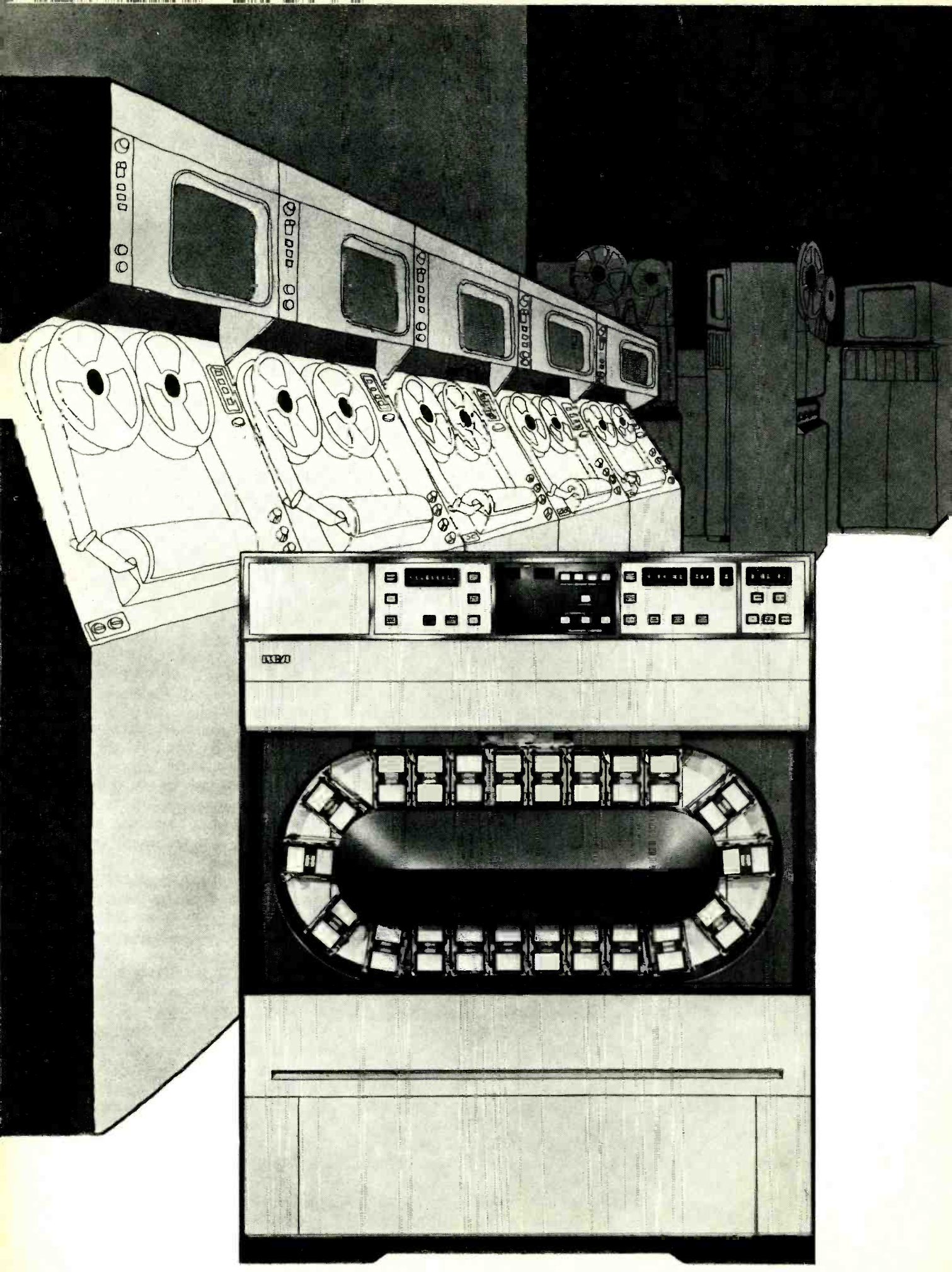
In this market group, 80% have not gone into automation. Out of this percentage, 60% say they have no intention of automating during the early 1970's. Of the 40% that will, they are looking seriously at programming, equipment control, operations logging, and equipment monitoring . . . in that order.

Those who have automated reported almost no change in staff size. And those looking to automate are anticipating no staff (engineering) changes.

Once again, operating personnel are involved in system problems. But in this category, the replies show that they are almost solely the cause of system problems. Some 70% of those with automation complaints attribute their problems to operating personnel.

If we are to put station automation into perspective, we can not cover up the fact that some stations have reversed their course and gotten out of automation. And considering the cost vs. profit, it is not wise for every station in this country to automate.

One question that interests a great many owners and managers: what are we talking about when we say that automation can relieve the engineer for more creative tasks? Well creative tasks will fall into those areas where system modifications and revision are made. Where assistance circuits improve the operation. Where human engineering enters and haywire makes its exit. What it really does for the engineer (when its all running properly) is to give him more time to improve signal quality and work on CP's or Proofs. However, our survey shows that station engineers pull the majority of the maintenance on the automation equipment. And the record shows that they're doing a pretty good job. ▲



Should you put the 'cart' before the reels?

When a new piece of equipment creates as much excitement in today's cost-conscious broadcast industry as our "cart" machine has done, you know it's got a big potential for both saving and making money. The big question is how much can it do to make your operation more efficient, and what new profit opportunities will it bring? We suggest you take this little quiz and see for yourself what the "cart" machine can do, compared to the tape system you're now using.

1. How long does it take an operator to load, optimize and cue a tape commercial on a "cart" machine?
   a. ☐ 3 sec. b. ☐ 30 sec. c. ☐ 3 min.
2. If you schedule 4 tape commercials during a break, how many "cart" machines would be needed to play them back?
   a. ☐ four b. ☐ two c. ☐ one
3. How many cartridges can be loaded into the TCR-100 at one time?
   a. ☐ 12 b. ☐ 22 c. ☐ 100
4. How many times can a cartridge message be replayed before it starts to deteriorate?
   a. ☐ 25 b. ☐ 50 c. ☐ 100 d. ☐ 200 or more
5. What about tape costs, compared to a reel-to-reel video tape recorder?
   a. ☐ about twice as much
   b. ☐ about half as much
   c. ☐ about the same
6. The "cart" machine can free up your reel VTR's for which of the following tasks?
   a. ☐ teleproduction b. ☐ promos
   c. ☐ previews
7. What can the "cart" machine do about rebates?
   a. ☐ virtually eliminate them
   b. ☐ cut down on them drastically
   c. ☐ nothing much

As you'll see when you've got all the right answers (upside-down, below), the "cart" machine is more than just a piece of hardware. It's a whole new system for saving time and money when you're airing commercials, promos, and ID's. And it opens up new avenues for making additional profits.

If you got more than five answers wrong, we'd say you need a "cart" machine right now. If you got them all right, you probably just ordered one.

And if you haven't already ordered one, ask yourself why not.

RCA

1)a 2)c 3)b 4)d 5)b 6)a,b&c 7)a

Circle Number 19 on Reader Reply Card

Automatic switching simplified

By Morris Courtright

Discussion of broadcast automation frequently centers on program source control and switching. Though only one part of the total automation picture, this emphasis is understandable since technical switching directly influences that commodity dear to the broadcasters heart; the program.

The engineer is highly concerned with the performance of the switching equipment because a malfunction immediately affects the programming and results in a panic call regardless of the time of day or night. Switching systems of diverse composition and operation long have been in use, and the real point of this discussion is the switching control which is where automation enters the scene.

From the earliest form of automated switching where a cartridge machine stop cue tone was used to start the next machine to today's complex computer driven switcher, the goal has been to build a controlling device both reliable and versatile that will minimize the incidence of real-time switching error. The switch itself may be a relay, stepper, reed or logic gate, and these are fairly well known.

When grouped into functional blocks, the switches are referred to as crosspoints, the group a matrix, and the capability by a number such as 18x5 showing inputs and outputs. A common eight input two bus audio console, for example, is an 8x2 switch matrix. In any case, it is the control of the crosspoints that establishes a sequence to make up the particular station's program. Figure 1 is a typical block diagram of a switcher showing the relationship of the controlling element.

The best known and oldest method of control is the human operator. A rather remarkable computer himself, man does have a few well known drawbacks and is rapidly making use of machines to take over the routine or repetitive tasks in many fields, and broadcasting is no exception. In fact, the diversity of broadcast automation equipment has grown so large it seems to be approaching the point of mass confusion. A little investigation will disclose, though, that most systems fall into two basic categories: hardware controlled and software controlled.

These categories are further subdivided into sequential, elapsed time, or a combination thereof. In a sequential system the technical or continuity switching follows a preset pattern, generally with the end of one event initiating the switch to the next.

Familiar examples of hardware systems are those using a multitude of knobs, thumbwheels, slide switches or pin boards to establish the sequence of events. In a software system the events, represented by digital computer words, are loaded into a core, MOS memory, or disk and the controller then moves from event to event.

The length of time that can be established in advance with either software or hardware control is often, somewhat erroneously, called "walk away time". No one, however, really walks away from a station for very long. Perhaps of even more significance is the question: "How far in advance can a station prepare its **exact** program content including commercial matter?". The answer to that question is your true "walk away time" and determines the size and flexibility actually needed in an automation system.

Normally, in a sequential system when the end of the preset sequence is reached it will be repeated exactly as before as long as program material is loaded in the source equipment. Should a malfunction occur, the system usually advances to the next event or switches to a standby fill tape. The choice of which happens depends on your decision at time of system selection.

Elapsed Time Systems

Elapsed time systems operate under control of a built-in clock which will initiate switching to specified events on the basis of time regardless of the status of the preceeding event. In most cases music is used as fill between these specified events. The specified events will normally play to completion, unless another specified event over-rides, and music selections are then played until time for the next commercial, ID, talk show, etc. The music itself is merely faded up or down to transition into the specified events. Elapsed time is also frequently used

About The Author

Morris Courtright has some unique qualifications in the vast field of automation. The author of the Gemini "Network Controller Handbook", he planned, developed and operated instrumentation systems for Mercury, Gemini and Apollo flights. He merited the JCS Commendation Medal for developing a data processing system to predict the re-entry landing point of the Gemini flights, and he earned the Air Force Commendation Medal for developing a computerized system to place radar systems on track after a period of no-track.

Before retiring from the Air Force, Courtright was the Chief of Computer Operations at the Air Force Satellite Test Center.

Over the years he has served as a combo man, transmitter engineer, and chief engineer at various radio stations. A licensed professional engineer, Courtright is a consulting engineer and the automation editor of **Broadcast Engineering.** His home now is in Flagstaff, Arizona.

with sequential systems to provide a network join feature, time announcement, or similar event.

The choice of hardware or software control is often a choice of degree of flexibility desired or needed. If 15 thumbwheels are set up for program sequence and it is desired to add an event between the 4th and 5th, for example, all those following must also be changed. On the other hand a software system can be designed so that inserting an event into the sequence automatically moves the following events. Note that some of the simpler systems require the loading of zeroes at points throughout the sequence to provide room for later additions. It is very important to choose a system that gives you the flexibility to make program changes, but it is very easy to go overboard in this direction.

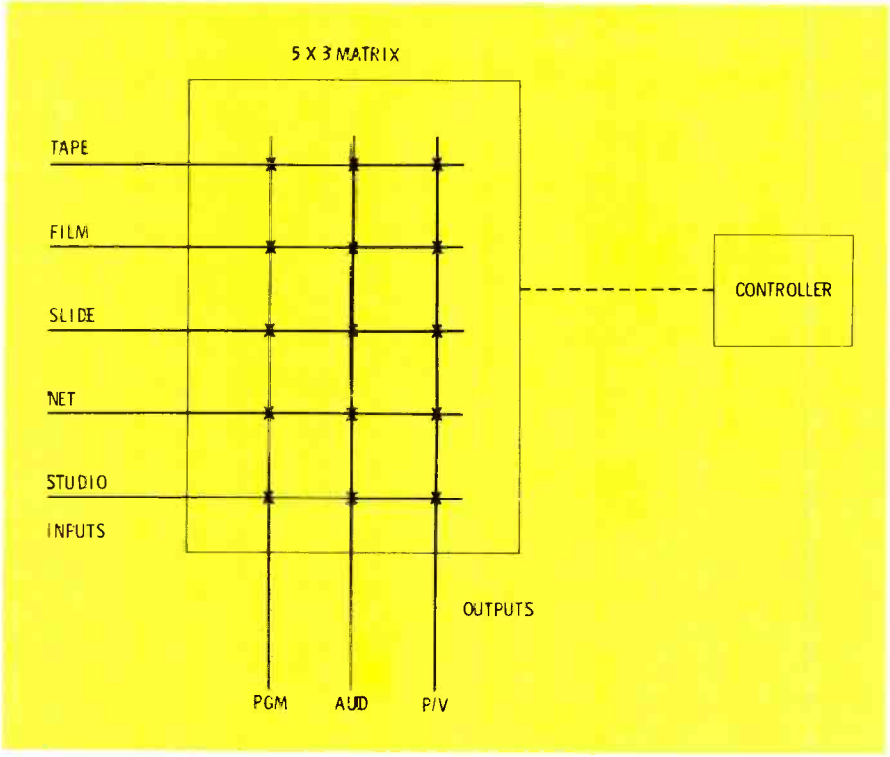


Fig. 1 A simple switch configuration showing the relationship of the controlling and switching functions. The control function is rapidly being automated.

Sequential System

Figure 2 is a simplified block diagram of a typical hardware controlled sequential system. Events are fed into memory by use of plastic cards, switch settings, punch cards, typewriter or keyboard and, in some cases, the desired selections set up on the random access memory. The control unit reads an event from memory, starts the appropriate source equipment and switches the audio to the transmitting equipment.

The identifying code is read from the source material (if the system is so equipped) and logged along with the time. While this has been going on, the random access units have cued up the next desired spot and the other music machines readied themselves. At the end of the current event the control unit reads the next event from memory, starts it, switches the audio, and continues this process over and over.

Of course there are many variations and refinements of this basic system. Automatic dead rolls to bypass clicks and pops, displays of

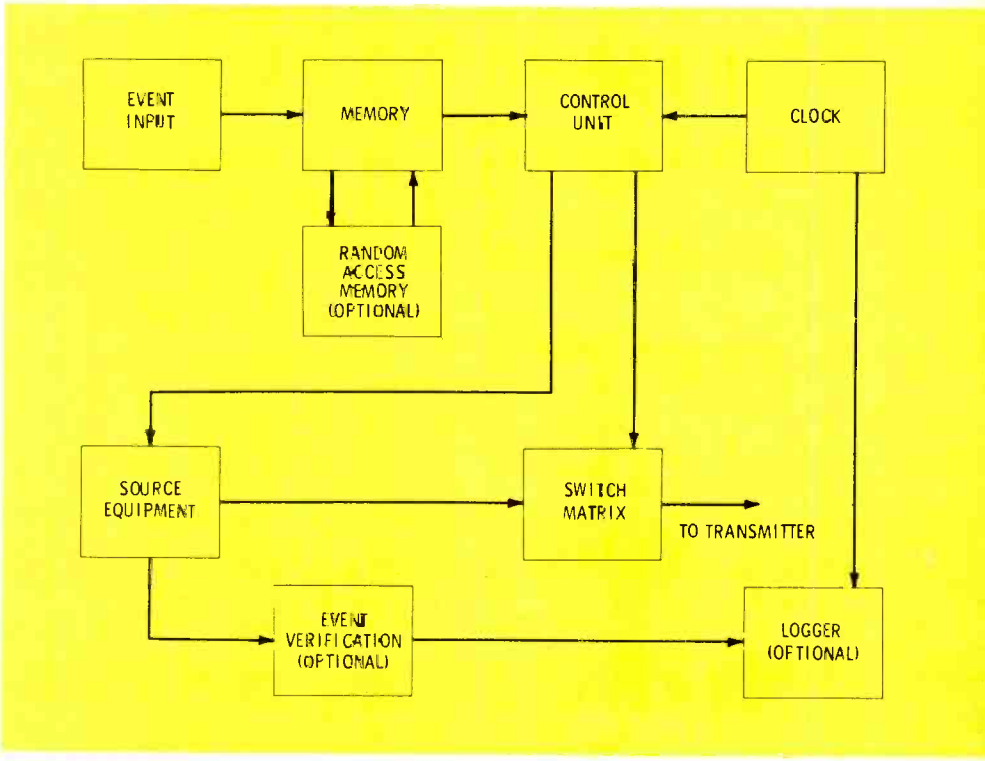


Fig. 2 A typical hardware controlled automation system. The switching control is really the automation that puts together the on air program.

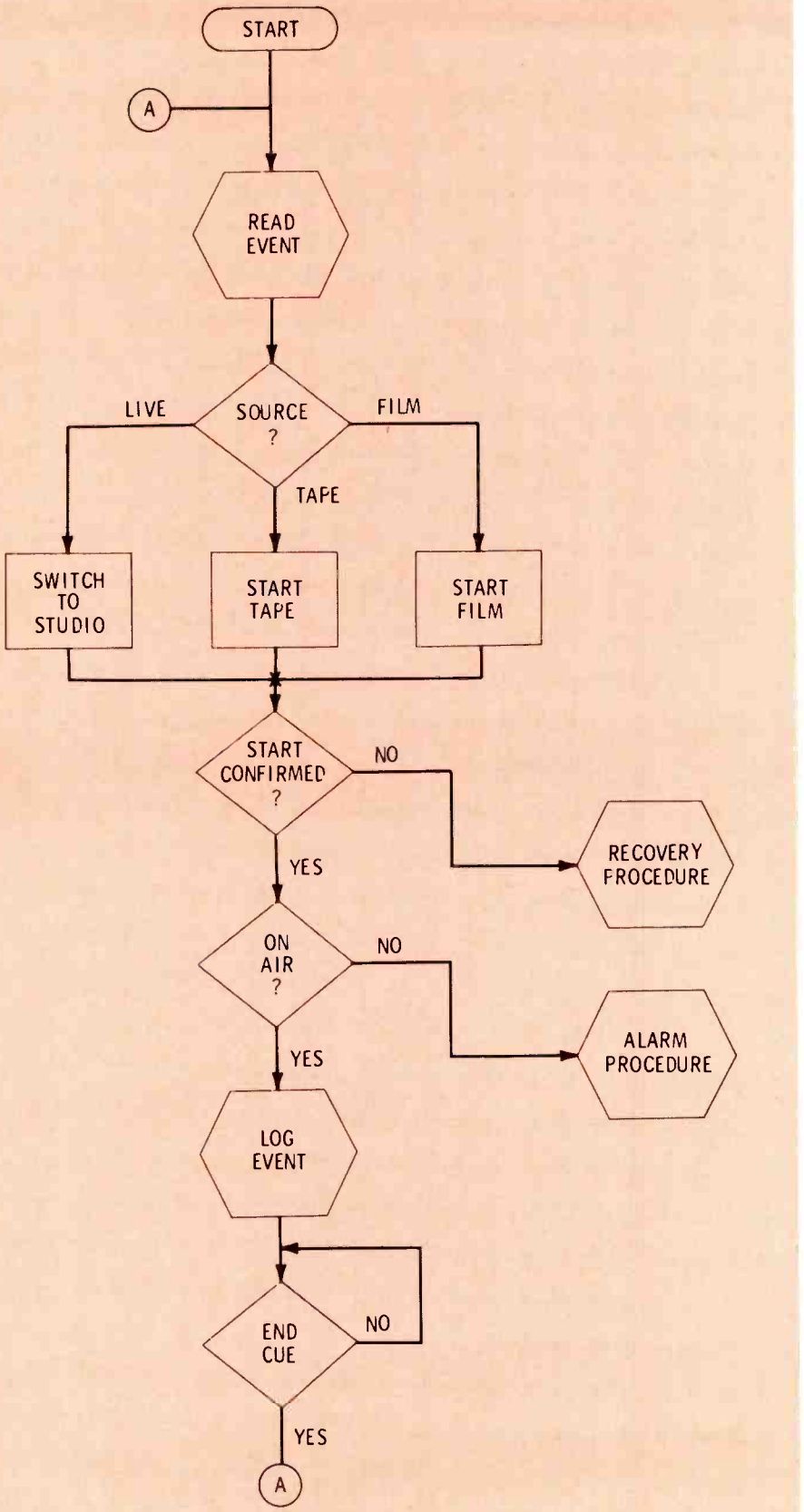


Fig. 3 A typical flow chart for broadcast automation. Flow charts are used to define the process to be automated.

current and next event, silence sensors, elapsed time event override, and so on ad infinitum. Stripped of all the chrome glitter and glamorous phrases the hardware systems will invariably turn out to be a sequencer in most cases, and it is the method of controlling the sequence that is important to the individual station.

Software Systems

Software controlled systems can be identified easily by a simple test. They are dependent on a control program furnished by the manufacturer. Program in this case being the computer type (software) not the broadcast product. It can be in many forms, but is usually a punched paper tape that must be read into the system before any broadcast programming can be done.

It is the computer program that establishes the capabilities of the system, and the broadcaster can do only those things the computer programmer has given him the capability to do.

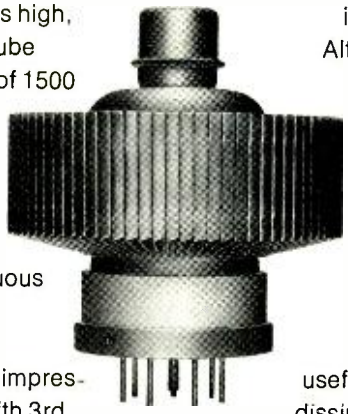
A flow chart example is shown in Figure 3 and is typical of the decision making process the machine must go through. As can be easily seen, many of these would be needed to fully show the entire automation process. These exist, because any halfway qualified computer programmer would not undertake to write a program without reference to such flow charts; they are basic to his trade.

Any program written without them is a sure source of many troubles. These should be provided with any software system contemplated, because a little study of them will help you define exactly what the system is doing, and is capable of doing.

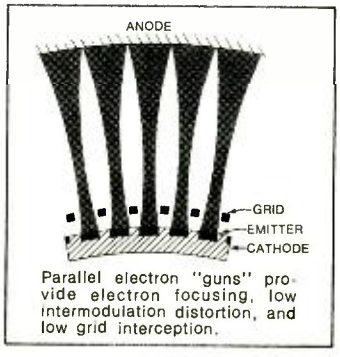
The important point for the broadcaster is not just to insist on the kind of flow chart shown, this merely defines the broadcast process. He should require those that show what the system will allow him to do with the basic process. The software will certainly allow event data to be entered, but what can the operator do with it after it has been entered? Must spaces be left in memory for later inser-

EIMAC's new 8877 high-mu triode delivers over 1500 watts output at 220 MHz. (2000 watts output at 30 MHz is easy)

On your right is the new, rugged, ceramic/metal 8877 high-mu power triode by EIMAC. Another state-of-the-art tube. Only three and one-half inches high, this low-profile, heavy-duty tube has a plate dissipation rating of 1500 watts, a maximum plate voltage rating of 4000 and a maximum plate current rating of one ampere. In the HF region, typically, the 8877 coasts along at a continuous duty level of 3500 watts PEP input. A peak drive signal of only 65 watts is required. This impressive power gain is achieved with 3rd order intermodulation distortion products —38 decibels below one tone of a two equal-tone drive signal.



This magnificent power triode is rated at full input to 250 MHz. The low impedance grid structure is terminated in a contact ring about the base of the tube, permitting very effective intrastage isolation to be achieved up to the outer frequency limit of operation. The close tolerance grid, moreover, is composed of aligned, rectangular bars to achieve maximum grid dissipation and controlled transconductance. This aligned grid, plus the EIMAC segmented, self-focusing cathode provide low grid interception and the low grid drive requirement; both of paramount importance in the VHF region. Although primarily designed for superlative linear amplifier service demanding low intermodulation distortion, the 8877's high efficiency permits effective operation as a class C power amplifier or oscillator, or as a plate modulated amplifier. The zero bias characteristic is useful for these services, as plate dissipation is held to a safe level if drive power fails, up to an anode potential of 3 kV.



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Circle Number 20 on Reader Reply Card

tion of last minute changes and additions, or does the software allow events to be entered at any point in the sequence with automatic adjustment to all following events? What is the format of entry and can the format be changed as your needs change?

System Protection

A technique called "software protection" can be used to prevent inadvertent erasure (loss of data) of certain areas in memory. The column headings shown on CRT displays and the standard word in the formats used are actually coming from memory, and if these are not protected they can be erased or overwritten. If this is possible, it will happen sooner or later and you must then live with results or re-enter the operating software, if you have it.

Another feature is called "terminal lockout." Again, part of the software, this feature controls which entry devices are allowed to change data in memory and under what conditions This can be very important in multi-terminal systems to preclude the possibility of changes being made to the switching sequence at inappropriate times or from inappropriate places. Without terminal lockout it is entirely possible for someone at a remote terminal to alter or wipe out the switching instructions just prior to air time, or to alter future instructions that will not be detected without a continual detailed check of upcoming events. Software protection should also be used so that only those at the proper terminals and with the proper codes can display or extract data from memory.

Software protection is a general term that can mean many things to many different computer programmers. Thus, it is not enough to know that you have it. You must find out what it is that you have; what does it really do. Most programmers will include protection for the area of memory used for the operating program, but this is no guarantee that it has been done in your particular system. While it may seem relatively easy to re-load the operating program, to do so in the middle of prime time can be rather disconcerting.

Programming

The major danger of all software controlled systems is the fact that they are dependent entirely on a program written by a computer man, not a broadcast man. Depending on the amount of research the individual programmer has done to learn something about the job of broadcasting, the resulting operating system may suit your station. Or, it may be a marvelous piece of software that will require you to completely change your ways.

Don't be misled, changes will be required, but the changes should be based on the benefits to the broadcasters. Software can be written in many different ways to make the machines do many marvelous things; make sure the way selected is based on the broadcast task and designed to be used by broadcasters not computer operators.

As you may be well aware by now, the variety of automation systems for technical switching is almost unlimited, and is growing still larger everyday. The word automation often brings visions of a panacea that will automatically cure existing problems. Neither is the case; automation is not a panacea, nor will it automatically solve problems. Automation is a controlling device rapidly replacing man in the performance of technical switching, and as with other machines it is subject to the control of man.

The task in selecting automation is to find one that fits your operation, and to assure adequate control of the machine controlling switching. Ask questions, require proof of performance, insist that the machine will do the tasks you want done, and demand they be done in a manner most useful to your operation. ▲

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TRAFFIC	—schedules —continuity —availabilities —log conflicts —verification —adjacencies
SALES	—sales plans —demographics —ratings —contract status
ACCOUNTING	—invoices —billing discrepancies —make-goods —contracts —accounts receivable —profit & loss —aging accounts
PROGRAM	—billing summaries
MANAGEMENT	—operating log —account status —sales reports —financial reports —management reports

Fig. 2 Typical reports that can be produced by a broadcast administrative system.

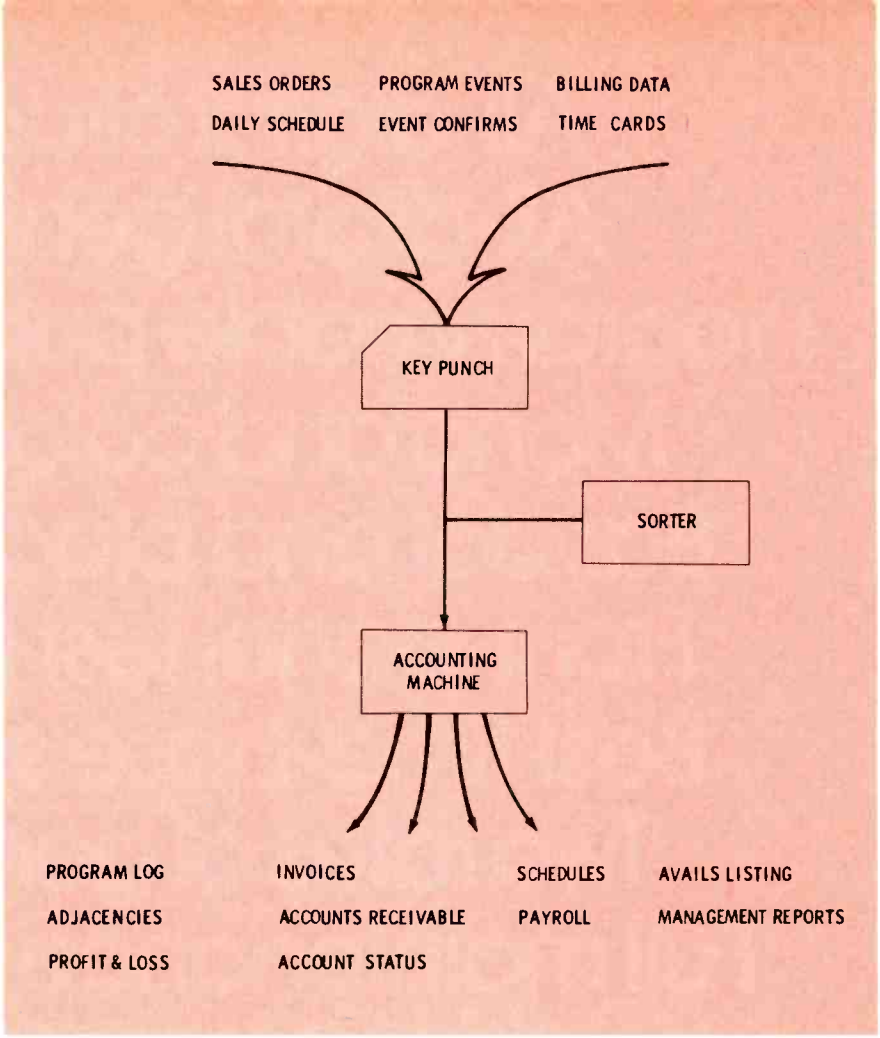


Fig. 3 Keypunch and accounting machine equipment can do many of the broadcast recordkeeping tasks.

mercial systems fall short for broadcasting.

Punchcard Equipment

A step forward in bringing order from chaos for many stations is the use of simple punchcard equipment. Designed for business and statistical application, the equipment can readily be used to assist in the accounting tasks and with minimal additional effort can handle many of the traffic functions. The only basic change required is that all data must be in a punchcard form rather than any handy scrap of paper. This imposed discipline can by itself bring much improvement to the records keeping process. Figure 3 is a typical application. The accounting machine equipment may be replaced by a small digital computer if the need for faster processing time so dictates. Though punchcard systems are often considered archaic by data processing standards, they are reliable machines that can faithfully provide service in maintaining the records of a broadcast operation.

As an example, consider program log preparation. A good keypunch operator can produce 300-500 cards per hour and a complete hamhand about 50-100. Thus, 100 program events can be punched into card form in under 1 hour. The cards do not need to be punched in sequence since a sorter will arrange them in order in about 3-5 minutes.

The deck of cards will then be printed into a log in about one minute by the accounting machine. Compare this with present station practice. The major time savings is yet to come, however, since all cards do not need to be repunched; only those with changes. As a result, the subsequent days logs are produced in just a few minutes. One to six copies are printed at one time and if more are needed, just run the deck again.

Computer System

From the simple punchcard operation, automation of the administrative side of broadcasting can grow into a very complex, highly sophisticated computer system. A station may choose to go it alone and buy or lease its own computer, or it may lease part of a computer through a data processing service.

Leasing seems to be a popular route since the station is spared the trauma of a large capital expenditure and the headaches of becoming data processors as well as broadcasters. It is entirely feasible, though, that a broadcaster can become proficient enough with his own system to lease time to other users, in effect, establishing a data service of his own. In any case,

even with leased service, it is necessary for the broadcaster to develop a speaking acquaintance with the methods of data processing while leaving the details to the parent service.

Leased or owned, a full fledged broadcast administrative system will be similar to that in Figure 4. All computing may be done in the central computer so the station has only terminal equipment, or a small computer may be used locally for routine work with the bulk data processing performed in the large machine. The latter situation is normally the case when the automation also performs the real time technical switching as well as doing the administrative work. A variety of terminal equipment is shown in the diagram, while in reality only one or two may be sufficient for a particular station. The type terminal used in a particular department also depends on the station's operating requirements.

Typically, sales orders and contract information is entered via the input terminal equipment. Regardless of the unit used, two basic methods are involved. In a real time system the units are continually connected to the computer and data is entered directly into the station file. However, this means telco lines must be leased to provide continuous service. The alternative method is use of active terminal devices which contain limited memory and storage capability, or a small local computer. In this manner data can be batched locally and periodically transmitted to the central computer by high speed transmission using normal dialed phone lines. A relatively simple technique is to batch data locally on tape and transmit the taped information at high speed during minimum toll periods.

Checking For Errors

Whichever method is used, data can be entered with or without checks for errors. Most users of automation will readily agree error checks are a necessity before entering the data into permanent storage. Probably the handiest device for data entry and checking is the active CRT terminal consisting of a typewriter keyboard, CRT, and limited memory/computing capability.

Programmed to display the desired format for a particular entry, the operator merely types in the contract information to fill the blank spots in the CRT display. The completed display is then read and compared to the source contract to detect errors. If necessary, the keyboard is backspaced and correct information typed directly over the error. Once the displayed entry is correct it is transmitted to a central

Hallway view of the businesslike WTMJ-TV computer complex.

The compact Starcom system for contract records control.

computer memory or recorded on tape for later transmission.

Do not take these capabilities for granted when considering a system. Considerable cost savings and maximum efficiency are dependent on the technique used for error checking and data transmission. It also is imperative that terminal devices be selected for their ease of use by broadcast personnel.

Administrative Automation

Once the sales has been entered the real job of administrative automation begins. For it is the central computer that remembers and juggles all the information to produce the output products. A requirement is that the computer also perform at least rudimentary error checking of the data. It can easily compare duration of the contract with beginning and ending times or check for missing information, but it must be programmed to do so.

The broadcaster must be prepared, however, to adapt to the data format requirements of the system. As with any computer system, especially shared ones, the user must conform to standard input/output formats.

Shared systems also raise another point which is very important to broadcasters: security. There are many software and hardware techniques that can be used to control entry to specified areas of memory in a computer. While the actual techniques are of more interest to computer programmers and operators than broadcasters, it is obvious that the broadcaster must assure himself that he has security provisions in the system and how they actually operate. The security should be built-in to the software or the hardware and not be "people-dependent" or someday the stations confidential sales information will assuredly wind up in the hands of a competitor.

What happens to the data after entry into computer storage is entirely a function of what computer people have programmed the machine to do. For example, cost summaries for the contract can be computed immediately, entered into storage with the initial contract data and included in the next output to the station as part of the contract verification. Obvious manipulations needed are updating of the stations' operating log, production of an updated avails listing, provision for verification that the spots actually ran, and, finally, billing. Other important tasks are adjacency checks, conflict resolution, timing error detection, contract expiration and discrepancy reports.

Broadcast administrative automation systems having most of the capabilities noted here are currently available; however, the frequency of outputs, exact content and range of options vary widely from system to system. The system may include accounting programs for accounts receivable, profit and loss and similar tasks, it may only produce raw data for use in another computer, or it may be completely incompatible.

Just as in the choice of automation to perform the technical switching functions, selection of an administrative system must be based on station needs to minimize the chance of disaster. Look beyond the claims of what a particular system will do. Compare it to what needs to be done and find out what will still have to be done in the same old way. Broadcast data processing is continually growing and broadcaster demands will assure the growth is oriented to solution of broadcast problems.

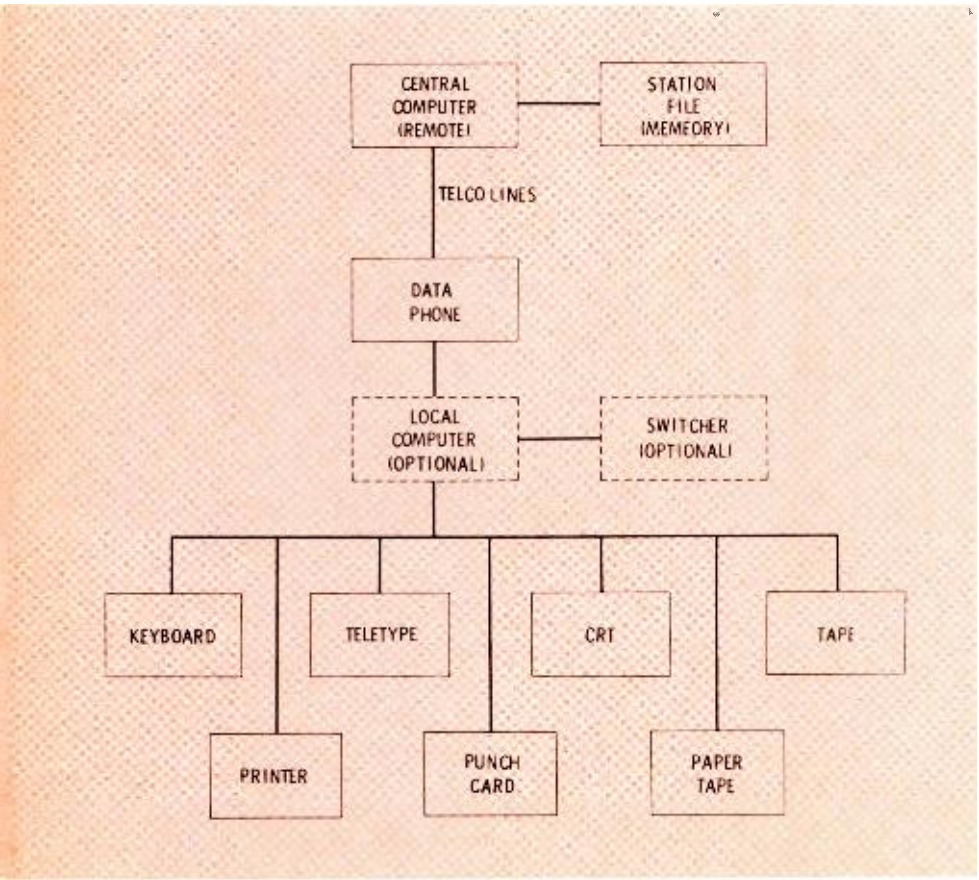
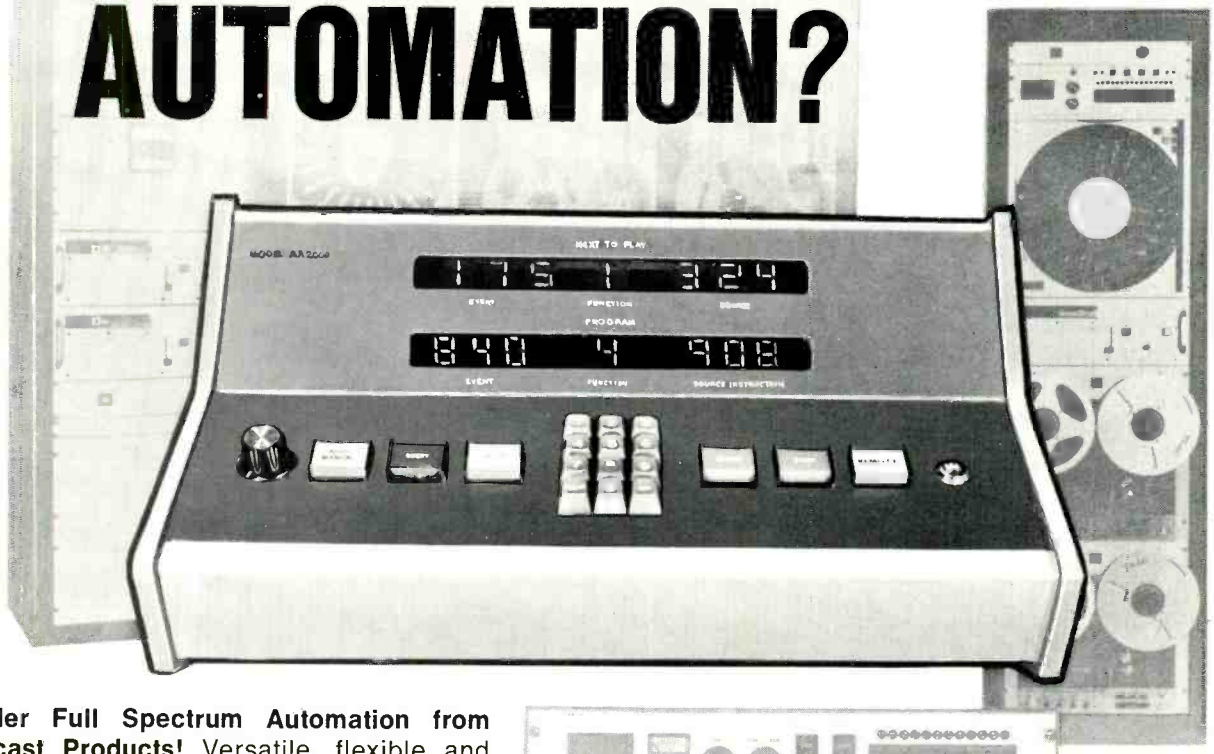


Fig. 4 Typical broadcast administrative system using a shared central computer. The actual terminal equipment used depends upon station requirements.

CONSIDERING AUTOMATION?



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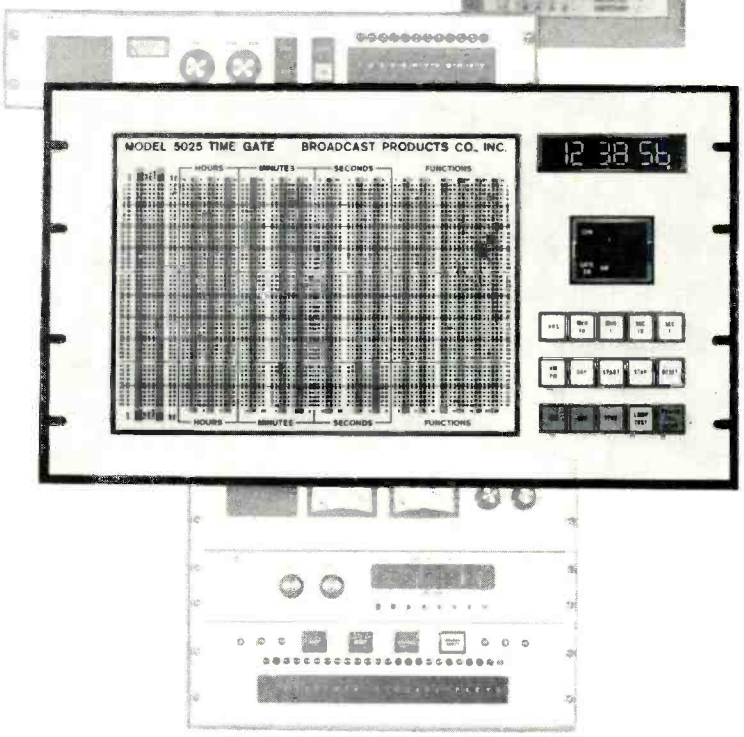

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Circle Number 23 on Reader Reply Card

Automatic Logging

By Morris Courtright

Neatly typed pages, columns of coded digits, reels of magnetic tape, teletype print-out or illegibly scrawled sheets; all are part of a common broadcast problem called logging.

One of the most necessary tasks in any station, logging can be one of the most tedious jobs. And it is fraught with possibility for error, as any chief engineer or general manager will readily agree. Then it is costly.

How then can automation help? Can a machine take over this repetitive but so very important task? At first glance a simple "yes" would seem to be the obvious answer. Automation, by definition, is the use of machines to do routine or repetitive tasks. A second, closer look reveals the question to be much deeper, however. How can a machine recognize what program material is on the air or what the transmitter is doing, interpret the results and then make a decision?

It becomes readily apparent that there two facets to the problem of logging: Program and Technical. The latter can be accomplished relatively easy by sampling appropriate voltages and currents, but the program logging requires identification and verification of audio or video information going on-the-air. Thus, each should be considered separately.

Program Logging

Program logging has received the lion's share of attention for various reasons, and most current automation systems offer some sort of print-out. The existence of a clattering teletype machine or a stuttering computer printer does not, however, guarantee a satisfactory system. The method of deriving the information being so neatly displayed must be closely investigated. The most important point is to determine what is being logged; the actual program event or merely the one that was scheduled to run. It has only been within the past year or two that systems have been really logging the event occurring rather than the event scheduled. This can be most crucial, particularly at billing time. It is quite easy for someone to load the wrong cartridge, slide or reel of film and have it flawlessly aired by automation while the scheduled event is just as flawlessly logged as having occurred instead.

Figure 1 is a simplified flow chart of a typical broadcast operation showing the general steps involved in getting material on the air. Logging can occur at any point in this process; however, it is readily apparent that verified logging can only occur in the latter steps. In general, four methods of logging are in common usage:

1) Manual or written entry logs
2) Logging on tape
3) Coded digital print-out
4) Plain English print-out

In evaluating these methods two prime criteria must be firmly kept in mind:

1) The log should be in a form that is readily usable by anyone on the station staff.
2) The log must show what actually occurred, not what was supposed to occur.

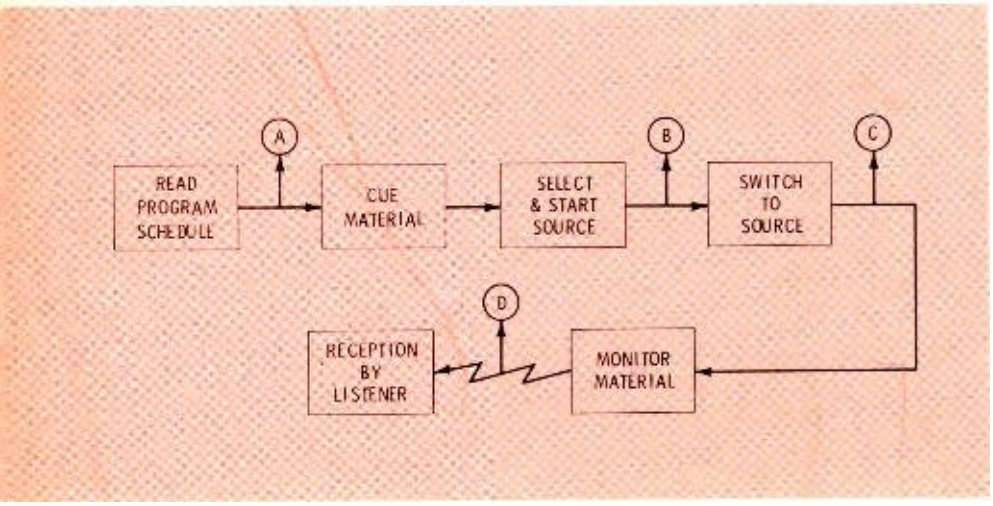


Fig. 1 Typical broadcast operation showing the possible points for logging to take place.

Manual Entry

The first method, manual entry, is the oldest and best known form of logging and well known to all in broadcasting. Common to all stations, the manual log has always been rife with mistakes and confusion resulting from the old bug-a-boo called human error. Who can forget the joys and trauma of compiling the composite week logs? Purchase of an automation system does not always diminish this problem since many systems have no provision for automatic logging, or the event logged is the one scheduled rather than the one occurring. As a consequence the station may still be dependent on the manual log, which is randomly prepared at any point

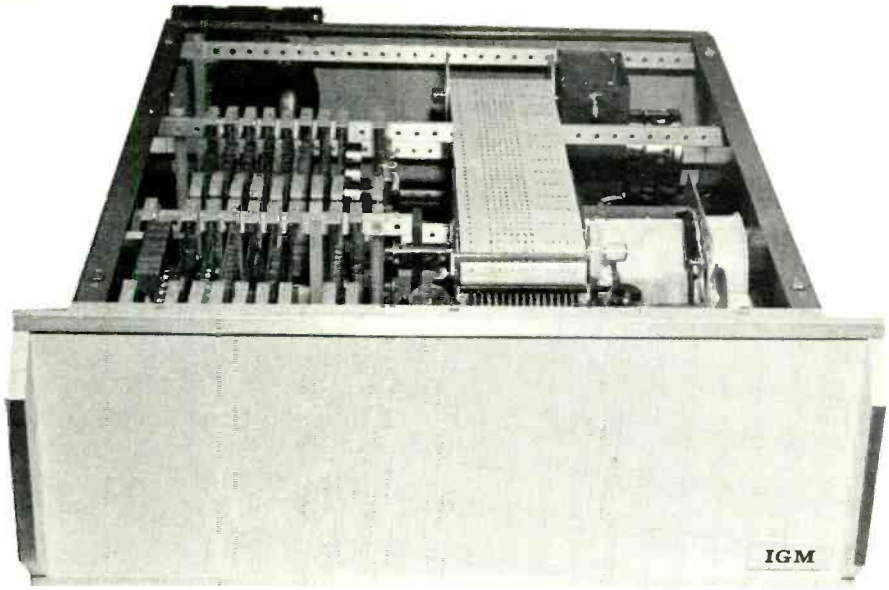


Fig. 2 With the top open you can see into the IGM model 364 program logger. The unit prints out audio source, time, and five-digit code for cart identification.

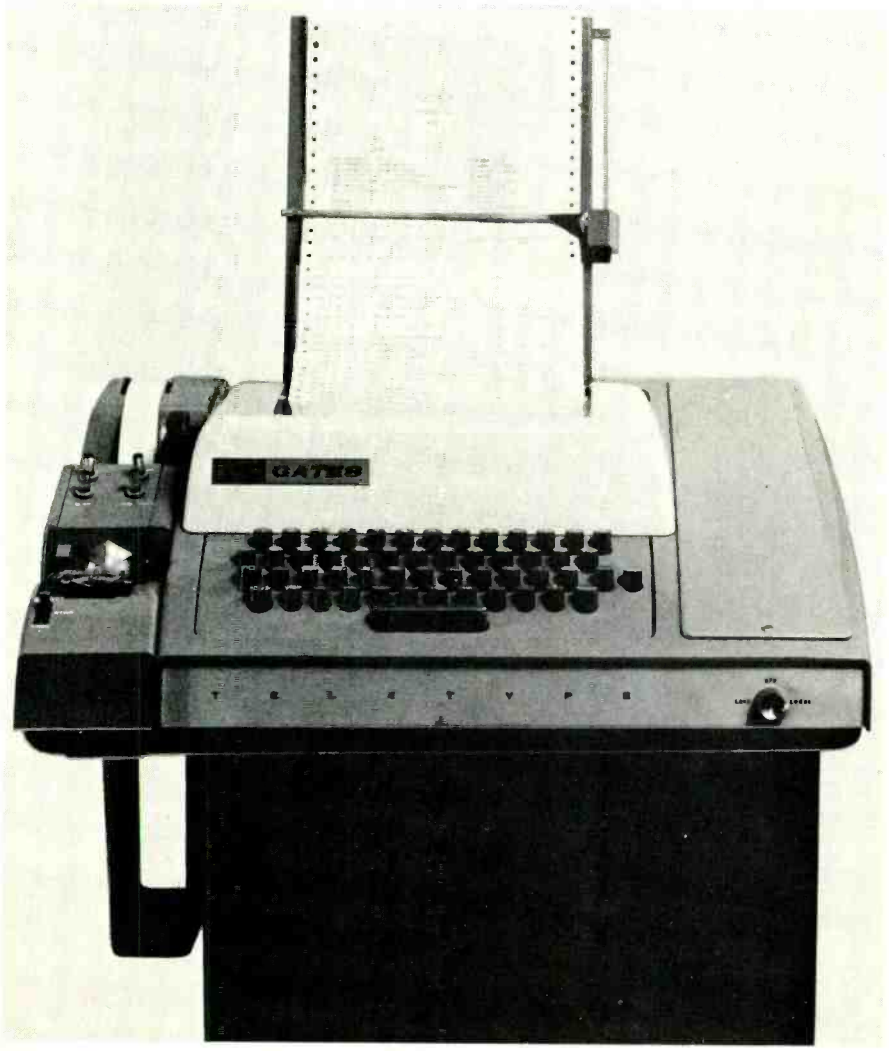


Fig. 3 Part of the Gates Radio automation system, this logger spells out rather than codes the program material.

in the broadcast operation depending on who is on duty.

Slow Speed Tape

Another common logging method, especially in Public Safety Radio and various other communications networks, is the use of a slow speed tape recorder as an audio logger. Many times used merely as a backup to the manual log, audio logging only delays the preparation of the written log to some later time. Even though instrumentation recorders have been recording a time code along with the measured data for many years now, how many audio loggers have time recorded along with the program material?

A big advantage of tape logging, however, is that it is normally taken off-the-air (Point D in the flow chart) to provide a verified record of what actually happened. A record that can be replayed as often as needed to settle any doubts as to what occurred.

Tape Logging can also be used for video program information, but most such recorders operate off a camera synced to the recorder not off the air. One manufacturer does offer a video tape logger that records the off air signal and provides time tag information on the log.

Digital Coded Logs

Digital coded logs that resemble adding machine output are one of the earlier forms of automatic logging and are still in use. This method records a code identifying the source along with the time when the source is started or switched (Point B or C in the flow chart).

A significant improvement over the manual log, the digital record provides a confirmed record of source selection which, barring equipment failures further along the chain, is a record of what events ac-

Fig. 4 The printout on this Moseley ADP 220 data printer is giving a record of equipment readings.

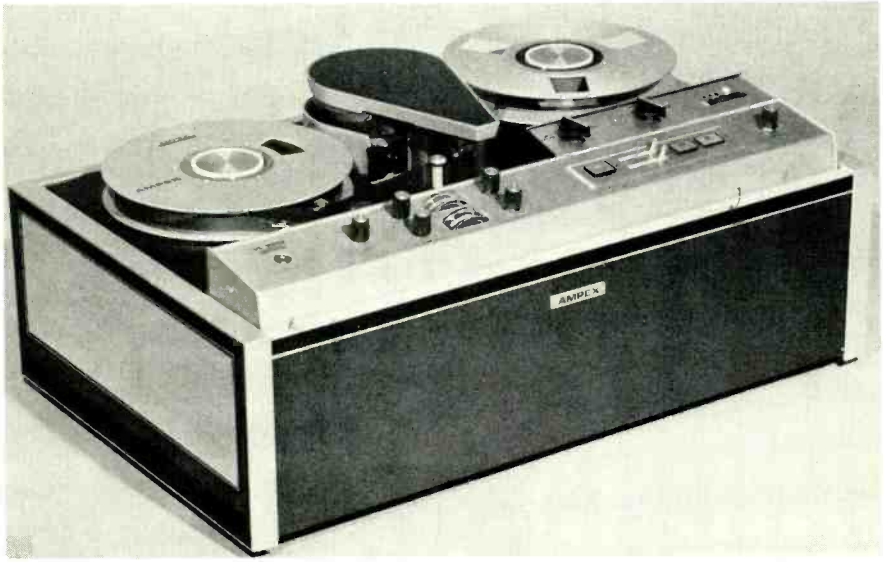


Fig. 5 Ampex's VL-7404 is the first videotape recorder designed for program logging and verification. It can log up to 38 hours of video, audio, and time information on a standard 9¾-inch reel of 1-inch tape.

tually occurred. It does require that anyone who uses the log must memorize the many, many codes that can be involved or continuously consult a code key. Needless to say, the chance of human error and misinterpretation remains quite high at this point.

The next logical step in the development of automated logging was the inclusion of decoders and character generators to convert the coded digital information to plain english printouts. This then is the present state-of-the-art in program logging and most larger systems offer some sort of plain English printout.

Evaluation of these logging systems centers on the source of the information logged. Depending on the manufacturer, the logging may take place when the next event is read (Point A in the flow chart), when the source is started (Point B), or when the source is placed on the air (Point C). The first two will, of course, yield a log of what was scheduled to happen rather than what really happened. Unless the identifying code is part of or directly associated with the program material, and read at the time it goes on the air, a truly verified log is impossible. It is on this point that broadcasters must become firm, if not adamant, and insist that the system provide the log they need, the one they want, and one they can rely on.

This becomes particularly true in television with its myriad of sources and source material. Four or more automation systems for radio stations offer a log compiled from coded information contained along with the recorded material; however, with only one exception none of the source equipment used in television have provisions for such identifying codes.

Accurate Logging

Audio equipment that is currently available places the coded identify-

ing information on the cue track of cartridges and, new this year, even on reel-to-reel tape. It is mandatory that these techniques be expanded to include all video sources as well before truly automated logging can become standard throughout the industry. Logging of the source selected or started is of little value if the wrong tape or film has been loaded in the source equipment. The identifying code and program material must be irrevocably associated to fully minimize the possibility of error.

Present techniques for identifying audio material involve the recording of coded information along with the program material. The code may be the standard ASCII computer compatible code, the telephone touch tone dial code, or any other code for that matter. In the case of cartridge material, the code is placed directly on, and read from, the cue track. As long as this code is read and logged at the time of play, the resulting log will be a true record of what actually happened. For reel-to-reel tape, a slightly different technique is needed since not many machines have a third track for cueing. A method introduced by one manufacturer this year involves placing the code on a frequency just above the audible range and recording it on one of the program tracks along with the program material.

Interface

The choice of code, ASCII or touch tone, is important to the individual station only as it relates to plans for interfacing with other data processing equipment. ASCII is a standard computer code that can be entered directly into other computer equipment such as that employed in business data processing. Touch tone code would require decoders or converters to provide a computer compatible code. What is really important is the need for broadcasters and broadcaster organizations such as the NAB to develop standards for common use. Only then can program material be freely interchanged between systems employing automated logging.

Development of techniques and equipment for automated logging of transmitter plant operation has been handicapped primarily by the FCC requirement to keep a manual entry log. Actually the technical logging is far easier to accomplish than the program logging and could easily be in common use today if the appropriate blessings were forthcoming. If battery voltage, oxygen consumption and a multitude of other parameters can be reliably measured on the moon from earth, how easy it should be to measure transmitter operation in the next room or on a neighboring hilltop.

Remote control of most transmitters has been authorized for years, and now even for VHF. These systems depend entirely on the accuracy of sampling voltages derived from key points in the transmitter and this sampled data can quite easily be printed out automatically rather than looked at and written down.

Technical Logs

At least two systems are now on the market that not only measure and log the parameters, but provide alarms if the sampled values exceed pre-established limits. The next, easy step is to provide automatic shutdown if legal limits are exceeded.

Automated technical logging can not only free operating personnel for more creative tasks, it eventually can remove the need for trade school log writers and daily visits to remote transmitter sites. Even at this point in time, automated technical logging will provide a far more accurate, reliable log than the manual version. Transmitter operation, modulation level, directional array status, even tower light and de-icer operation can be measured more reliably and at more frequent intervals than the required half-hour or daily observations. The resultant print-out is free of both the eyeball parallax and fudge factor that sooner or later creeps into most manual logs, and as a result, will faithfully record the slow deterioration of a transmitter final or directional array long before it becomes catastrophic. Apply this to other key points in the transmitter plant and it becomes much easier to meet the goal of good engineering: detect and correct impending failures before they become catastrophic, and keep a quality signal on the air.

Similar to program logging, technical logs can be the well known manual, digital code or plain English print-out and the methods are subject to the same advantages and disadvantages. The verification of events that is so important in program logging is a built-in facet of technical logging. The system measures actual conditions and sounds an alarm if preset limits are exceeded.

Thus, has logging grown during the Sixties. How it matures during the Seventies is largely dependent upon the demands of the broadcast community. Growing by leaps and bounds, broadcast automation is dramatically improving the efficiency of station operation, but is also producing an era of "automation watchers" who write logs. The goal of total automation with the full benefits possible can be obtained only by closing the loop with automated logging of both the program and technical operation. To achieve this, three demands must be recognized and met:

(1) Acceptance of automated technical logging in place of manually kept logs; (2) Provision for automatic verification of video program events; and (3) Industry standards for logging codes, methods and techniques.

The challenge is now with us and the benefits await only our acceptance of the challenge. ▲

AUTOMATION for the Smaller Station

There is resistance at the small station to automation. Is automation needed? Especially in a depressed industry? *By Morris Courtright*

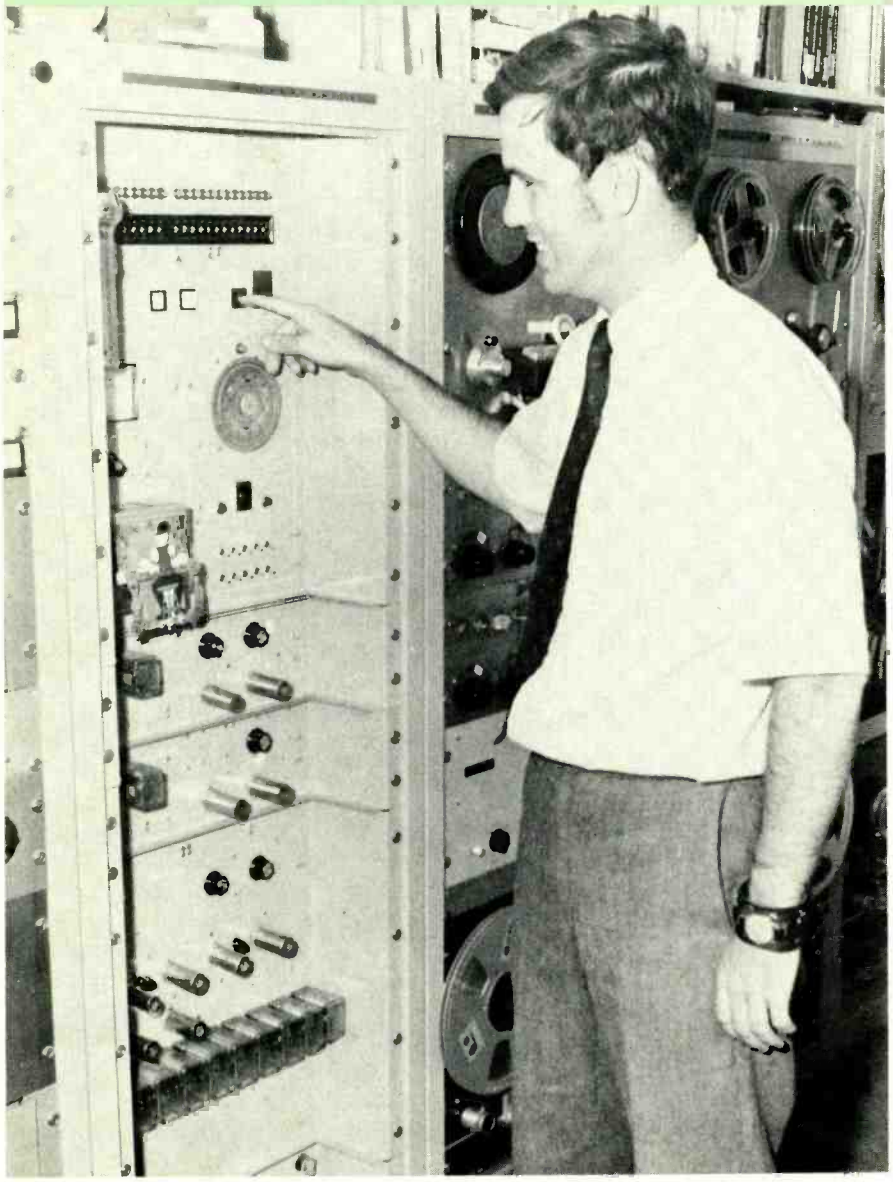
TIME KEEPING
—true time
—program duration

EQUIPMENT MONITORING
—switch confirmation
—source monitor

EQUIPMENT CONTROL
—source switching
—source control

OPERATIONS LOG
—on air

Figure 1. The real time technical operating tasks performed at all stations. These "switch throwing" tasks lend themselves to automation.



Operator points to panic button. Actually, most system complaints concern the operating personnel and faulty inputs. (Photo courtesy of KPEN)

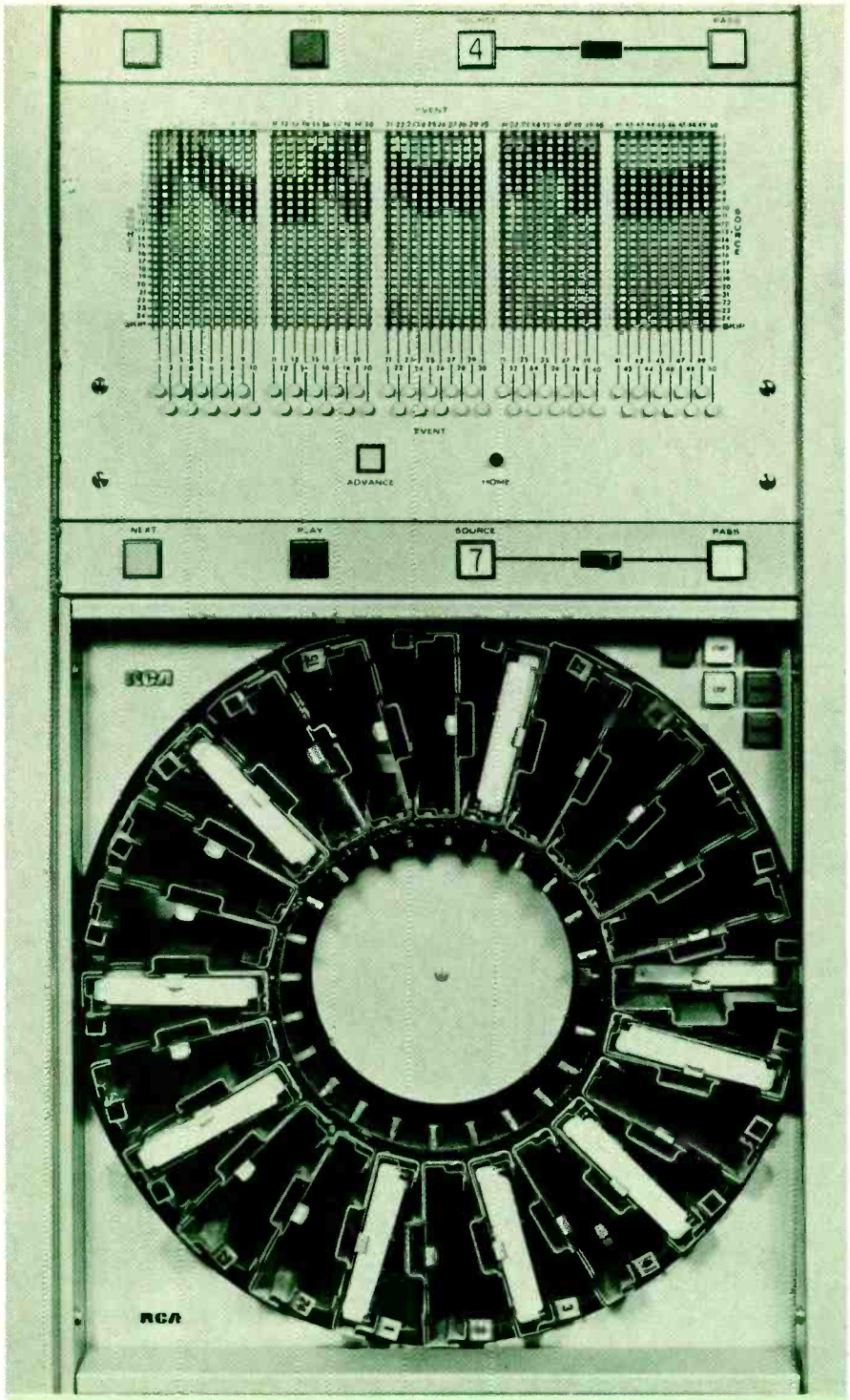
One of the most controversial subjects in small to medium market radio, particularly in these austere days, is that of automation.

Besieged by glowing claims and conflicting methods, some stations have simply thrown in the towel as far as automation is concerned.

While a few stations have relegated an expensive automation system to a dim, dust collecting corner in favor of live operation, others are watching their system program an on-air sound that is increasing profit margin, revenues, or both.

One engineer considers automation the most cantankerous, panic producing beast he has ever confronted, while another blesses his for giving him the time to tweak and polish his equipment, work on CP's, run proofs, and make sure FCC citations and fines are eliminated. No wonder, then, that at many stations confusion reigns supreme when automation is mentioned.

Though the arguments between car owners have gone on for years, very few have retained the horse and buggy as a prime mode of transportation. As with automobiles, so with automation; the secret of happy ownership is in picking the one that suits you. This, of course is the heart of the problem: how to pick



At top of this assembly is the automatic pass unit, followed by the carousel programmer, indicator and pass assembly, and the carousel cart unit.

the one that suits you.

Define Your Format

The first rule of success is to truly know and define your stations format and on-air sound. In short, what is to be produced by automation? This can be a most traumatic experience, accompanied by breast beating, wailing and wounded pride on the part of personalities and engineering talent alike. However, a thorough, objective analysis is essential before automation, particularly a brand name, can be realistically evaluated for your station.

A chrome plated, option loaded sedan is as unsatisfactory for hauling building materials as a stripped pick-up truck is for taking an important client to lunch. Both will get you where you are going, but leave much to be desired in the process. The key to choice of vehicle is its intended use, and so it is with automation.

Assigning Tasks

The starting point in defining intended use is to list the tasks you want performed. Generally these can be divided into technical and business operations that are further subdivided by time priority (BE, Sept. 1970, Automation: A Means To An End).

For small to medium market operation, the tasks to be performed rapidly reduce to those of equipment control, time keeping, equipment monitoring, and log keeping. (See Figure 1). You will note that while all these tasks are real time operations, they also fall primarily into the mundane category of "switch-throwing" and can be easily automated.

While it is possible to automate many other tasks in station operation, doing so rapidly increases the complexity of the system out of the small to medium market price range. Deletion of such tasks as schedule preparation, availability listing, and sales forecasts from the automation task list is a matter of economics. If your particular station operation designates those tasks as ones for automation, they should be included as part of your automation planning. For our purposes at this time, however, only the basic technical tasks will be considered.

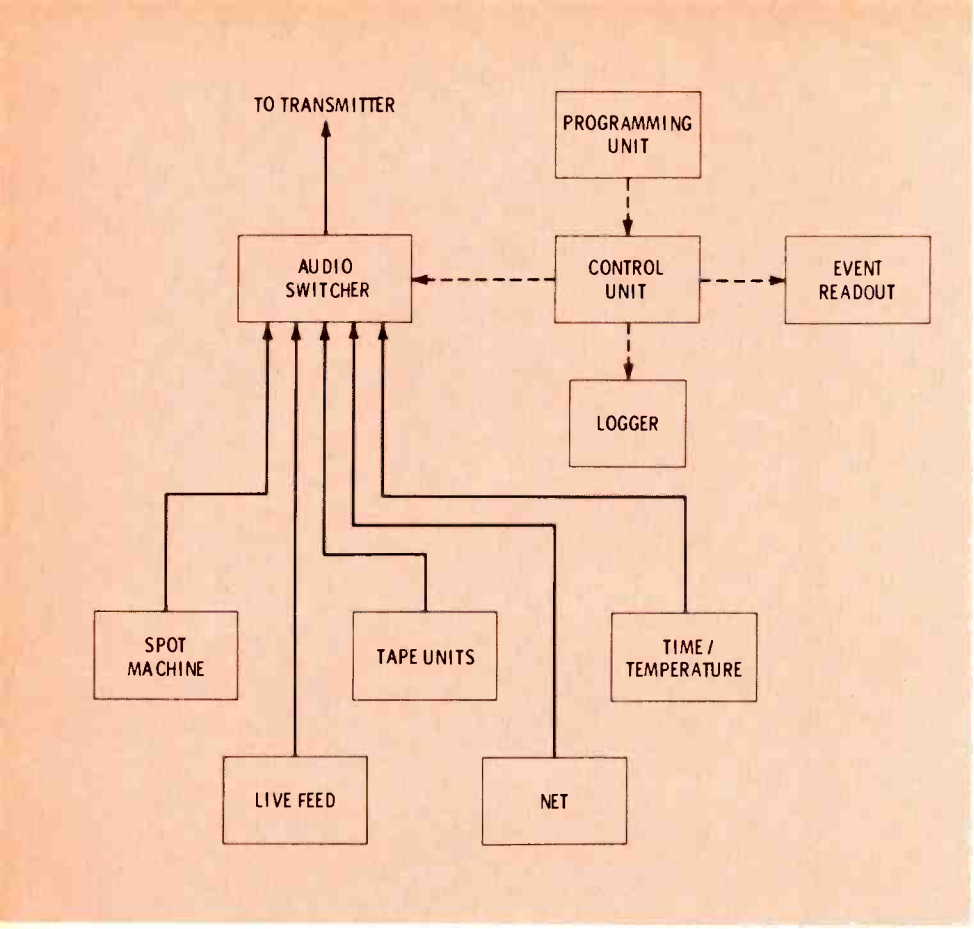


Fig. 3 Block diagram of a typical automation system. The selection of a typical model depends on the specific requirements of your station.

Source Switching

The next step is to objectively analyze your on-air format to establish a source switching requirement. The type of source equipment used in the majority of AM and FM operations is fairly standard and varies primarily in numbers of units and sequence of use (See Figure 2). The danger at this point is in being sidetracked into discussion of how different systems perform the tasks. It is not yet time to weigh carousel against random access tape.

The real questions to be answered here concern your actual, or desired, format which determines your switching sequence. Do you have a net to join at specified times? Is there an established sequence of music play? Must a particular spot be played at a precise time? Does your format repeat itself over a period of time? Do you fade selections to meet specific time events or do you dead roll to time out the event?

The real trauma occurs in this step of format definition. This is where the decisions are made that you must live with when an automation system is finally installed. Failure to truly define your sound is a sure step to dissatisfaction with automation. The most common fault is to build in such a limited flexibility that every day on the air sounds like the last, and the next, and the next, and so on. However, this can be a valid format. If the market is one that wants a particular type music played consistently with spots, ID's and news inserted at routine intervals, then that is your format and a simple clock controlled system will be adequate. This same system would be completely unsatisfactory for a market with varying tastes and demands.

Thus, the importance of taking a real hard nosed look at your format and programming desires. For it is this that primarily determines the flexibility you need in your automation system. The cost of a system varies directly with the flexibility and a decision based on cost alone can be disastrous.

Making A Choice

Armed with a true picture of your technical operating requirements, the choice of system now becomes a task of matching the various system claims and methods to your requirements. That, plus a few decisions based on preference such as the choice of random access tape versus random access cartridge for spots. No question about needing spots, just what method you prefer. Such a decision by itself may decide the type system you need, and all that remains is to pick the options.

The first choice you must make is determined by the flexibility you need and that sets the general price range for the system. Primarily a choice of control methods, it is a case of software controlled versus hardwired system.

Software controlled systems are the most flexible, and the most expensive. A variety of program input methods is used: punched cards, metal plates, even typewriter input. This means the format is as flexible as shuffling a deck of cards or punching a few typewriter keys, and the format can be changed almost at random by changing the input.

A hardwired system depends on the setting of thumb wheel switches, knobs, or even pins in a rotating disc to establish the sequence of source selection.

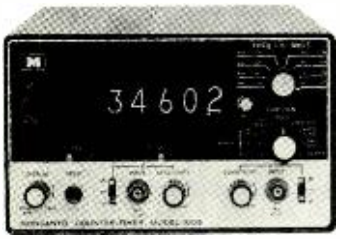
This sequence of source selection is, of course, your format and your on-air sound. It is the hardwired system that is of most interest to the small to medium market station because these are the ones that fall in the feasible price range.

The degree of flexibility of the system is a function of the number of these devices to be set. It is obvious that the sequence established will eventually repeat itself. How many hours of programming will the system allow you to program in advance before it repeats itself? This determines the degree of flexibilty of the system. How many tape units are in the system? This determines how many types of music you may call up to vary the sequence.

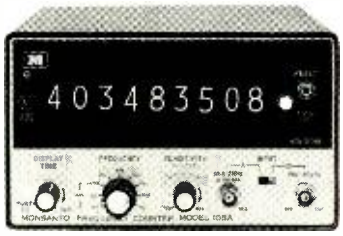
Music To Tapes

Sound simple so far? Not really. There are a few other basic factors to consider. One real concern is

Know your exact frequency at a glance.



Model 100B (FCC No. 3-172)
For standard broadcast
Freq. range: 5 Hz-40 MHz
5 or 7-digit display
Price: 5-digit, $575



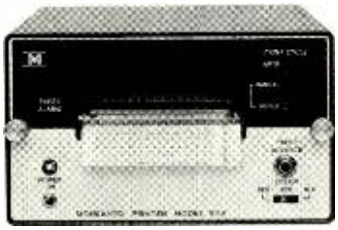
Model 105A (FCC No. 3-185)
For AM, FM, TV (all ch.), VHF
Freq. range: 5 Hz-512 MHz
7 or 9-digit display
BCD output
Price: 7-digit, $1550

Model 101B (FCC No. 3-174)
For standard broadcast
Freq. range: 5 Hz-50 MHz
5 or 7-digit display
BCD output
Price: 5-digit, $695

Model 114A (FCC No. 3-186)
For AM, FM, VHF, TV (Ch. 2-6)
7 or 9-digit display
BCD output
Price: 7-digit, $995

Frequency monitoring with a Monsanto digital counter is not just faster and easier than with analog instruments—it's instant and effortless. And more precise. Monsanto counters are FCC Type Approved for frequency monitoring. In addition, they can provide a full range of counter functions for other test and measurement jobs at the station. Crystal controlled clocks and extensive use of ICs insure accuracy and long-term reliability. Automatic positioning of decimal point takes the element of human error out of measurements. Finally, Monsanto counters are modestly priced. For complete details, mail the coupon today. For a demonstration, call your local Monsanto representative.

What was your frequency at 10:35:27 last Tuesday?



Counter Models 101B, 105A and 114A provide BCD output. In combination with our 511A Printer and 505B Digital Clock, frequency and time are printed on paper tape at any desired interval, giving you a permanent record.

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music. Your record library must now be on tape. Are you going to record your own tapes for a locally oriented sound, or use a recording service? Three tape units can be loaded with male vocal, female vocal and instrumental and a desired sequence established on the control unit or mixed selections can be loaded for a random sequence.

Another factor is maintenance. Not so much which system is most reliable, but can your technical staff maintain the system and keep it operating as it should? Conscientious maintenance is a must. Simple dust and dirt can raise havoc in any automation system. All are familiar with the effect of oxide build-up on tape heads and dirty contacts in cart machines, but you haven't lived until confronted with an out-of-sync spot locator caused by dirt covered windows in your spotter tape or cue obliterating oxide on carousel heads.

How Much, How Soon?

The factor that strikes the most responsive chord throughout the country is that of money. Can we afford automation? Perhaps the question should be rephrased: can we afford not to automate? Such a question is often posed first, when actually it should be last. You don't really know what automation will cost until you have determined what system you need, and you can not determine the system until you know your programming needs and the tasks to be performed by automation. Assuming all the homework has been diligently finished and you know the system that truly meets your need, the question of affording is a real one. Will the system replace any shift people, or will they merely be relegated to a position of automation watching at the same salary? The answer to such a question varies widely throughout the country. If air talent is hard to come by, then automation easily can be the solution. Combined AM/FM operations invariably achieve significant cost savings by automating one of the programs.

Among the factors more difficult to evaluate are improvements in program quality, reduction in the number of missed spots, and freedom for the station staff to do more creative work. Program quality can be stringently controlled with automation. The type, sequence and duration of musical selection is established in advance and can be rigidly controlled rather than left to chance. Audio levels can be held more uniform and pleasing without depending solely on the response of an AGC unit.

Spot quality can be one of the biggest improvements, and revenue increasing aspects of automation. No longer read "live" with delivery subject to the mood of the particular operator on duty, the spot can be worked over, produced and recorded for consistent high quality delivery. The air talent, freed from the routine of switch throwing, is now available to do truly creative production.

Automation is an important choice, and is a difficult decision for the small to medium market station. It is not something to be considered only in passing since it can be the factor that builds a favorable profit margin. The important point is to base the decision on fact, not fancy.

Automation is not a panacea, it is a worker. A most diligent, reliable worker that will faithfully deliver up to its capabilities. But, it can not second guess, create, or work beyond its limits. Automation can be the greatest boon to hit your station, or the biggest disaster. The result depends on the realistic planning put into the choice of the system to install. ▲

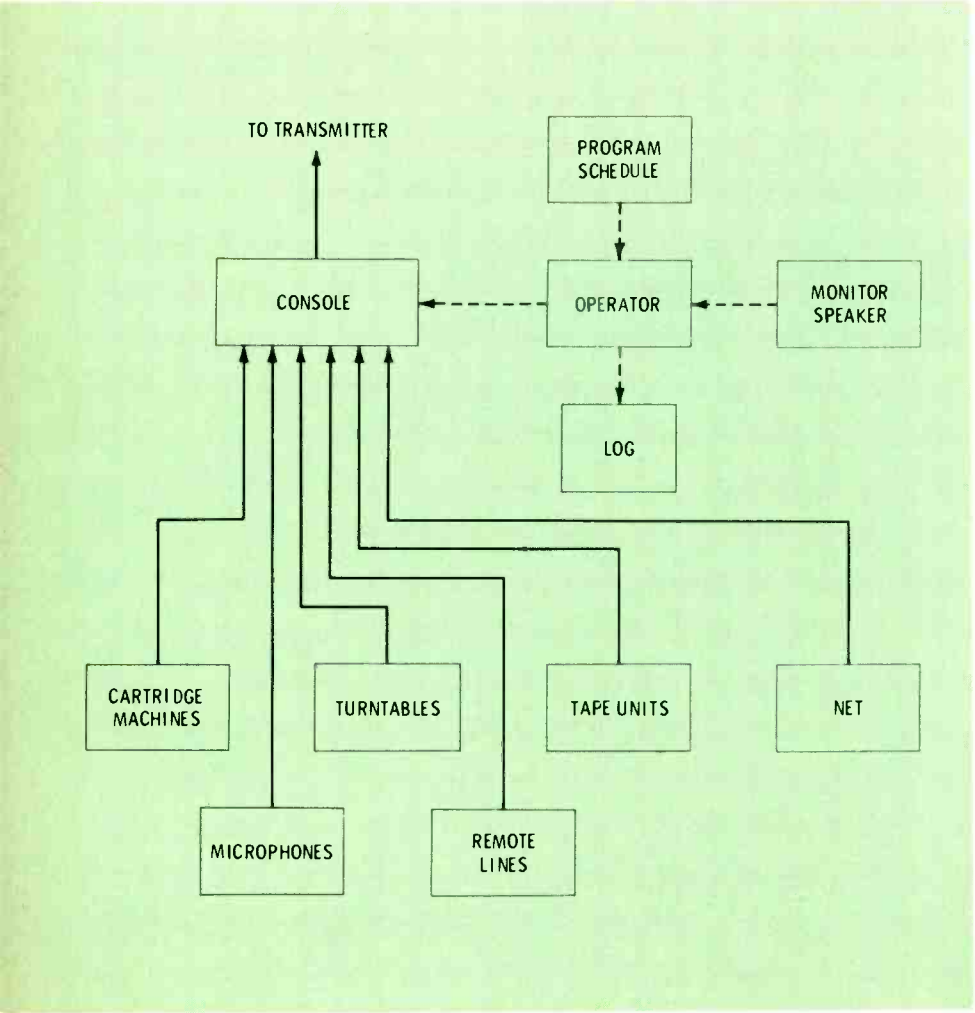

Fig. 2 Varying in the numbers of equipments and sequence of usage, most small to medium market "live" radio operations are similarly configured.

Automatic assistance circuits

A Review of some key assistance circuits that can help improve your operation and format.

*By Pat Finnegan**

Many opportunities arise where the techniques in use in major automation systems are used with everyday studio equipment. A circuit here, a control there, can do much to increase the effectiveness of the operator and make his job easier. Many of these circuits can be designed by the station engineer and put together at minimum expense, often with parts from the junk or spare parts drawer.

The use of these automatic techniques, when applied at appropriate places in the system, can have the effect of extending the operator's reach, multiplying his hands, warn him when things must be done or are out of tolerance and even tighten up the programming. This article is not proposing junior automation systems, but rather the use of some automatic circuits and techniques on present equipment for a more efficient operation.

When setting out to improve the system through automation techniques, it is well to set a basic policy first. The end objective should be kept in mind, that is, what these circuits are intended to accomplish. Simplicity should be the rule. Circuits should not be added unless there is a justifiable need; these should not cause confusion to the people operating the equipment, such circuits should be defeatable.

Remember, the more the number of circuits, the greater the complexity added, and this raises the possible opportunities for increased equipment breakdowns. Gadgetry for the sake of gadgetry should be avoided. There are engineers who delight in gadgetry. To these people, the more circuits, the greater complexity that can be introduced, the more relays, gadgets and blinking lights added to the equipment, the happier they are. Such gadetry often creates more problems and confusion than worthwhile results.

*BE Maintenance Editor

Remote Controls and Functions

Many equipment items are designed to be run by remote control, such as a transmitter. A station which will run its transmitter by remote control will either buy a factory remote control unit or build its own and install it. This article will not concern itself with such major remote controls.

Many items of equipment have remote control capability, for example tape machines. Many of the functions of the recorder can be operated at a remote location and if desired, the manufacturer will sell you a standard unit designed for that machine. Such factory control units will supply all the functions remotable on the recorder. In some instances, all the available functions are not desired at the remote location. The factory unit then will supply all these functions at the remote location and the cost of the unit is the same whether all functions are used or not. Here is where the concepts of this article come into play.

By building your own remote panel, only these desired functions can be added with a savings in cost and confusion.

Consider a standard reel to reel tape recorder. The machine may only be a few feet away from the operator, but it is desirable that he can start and stop the machine from the console. Two simple switches and two pair of wires will do the job. The switches can be small ones and installed on the console panel itself. If it is necessary to record a program, he can set the input levels and put it in the record mode right at the machine. He has to be there to lace up the tape anyway.

Naturally, each installation would dictate what remote functions would be needed for the use the machine gets. In the example given, a full remote control unit could be installed, even though the only necessary functions of starting and stopping are desired. The full unit would contain several buttons, lights, a multiconductor cable and plug, and the panel would be outboarded somewhere near the console. With only the start and stop button mounted on the console panel itself, there would be no confusion when in operation as there are simply two buttons. Thus, less expense for materials, less confusion when operating.

While an equipment item may have many remote functions available, there are times when none of these particular functions are what is desired. In most cases, a study of the circuit will provide clues where such functions can be added by modification. When study of the circuit operation is done, look for some control circuit or bus that is "going in the direction" of the function desired. That is, a control bus or relay may be "on" during the period the new function is desired, and "off" when the function is desired off. This bus voltage can be picked up and used to operate the additional function or equipment.

Care must be observed when making such modifications so as not to upset normal circuit operation, introduce spurious noise and hum, and if drawing current from the unit, not overload the bus power supply or lower the bus voltage. Much depends upon the circuit and the manufacturer. If the designer operates everything at or very near maximum load, there will be little room for extra circuit loading.

In the area of modifications, do not overlook the physical construction and location of the unit parts. The schematic diagram does not always tell all. Often, a relay will have unused contacts available on it, and these most likely would not

show on the diagram. If there is a relay with unused contacts of the action desired and the relay operates when you would want the external circuit to operate, the modification can be most simple and no circuit loading or interaction will occur. Thus, we need not purchase full remote control units when only a few remote functions are desired. In other cases, circuit modification is often possible to provide the necessary remote functions, although it will require a few external parts.

Control Assistance

The first area where automatic functions provide the greatest assistance is remote starting and stopping of equipment.

Next in order would be remote cueing. This is done automatically inside the audio cartridge equipment, but it is not to difficult to add to reel machines.

Tighter programming by faster switching can be accomplished by making use of many automatic functions already built into equipment. For example, cartridge tape has switching functions available at external terminals when the appropriate cue, auxiliary and tertiary tones are added to the tape. By wiring these switching actions to external circuits, these can be made to accomplish many things that will assist the operator, such as, starting the next tape, a timer on a recorder, etc. Such external circuits and switching pulses will free the operator or combo man from some switching function and at the same time produce tighter programming.

Pre-sets are another assistance area. Turntables and tape machines may be pre-set to run when another function occurs, such as turning on the channel key. Without the pre-set, it would take two actions—one two turn on the channel key, and another to turn on the turntable.

Timers can be of great assistance especially in the recording booth. One or two timers can be run from

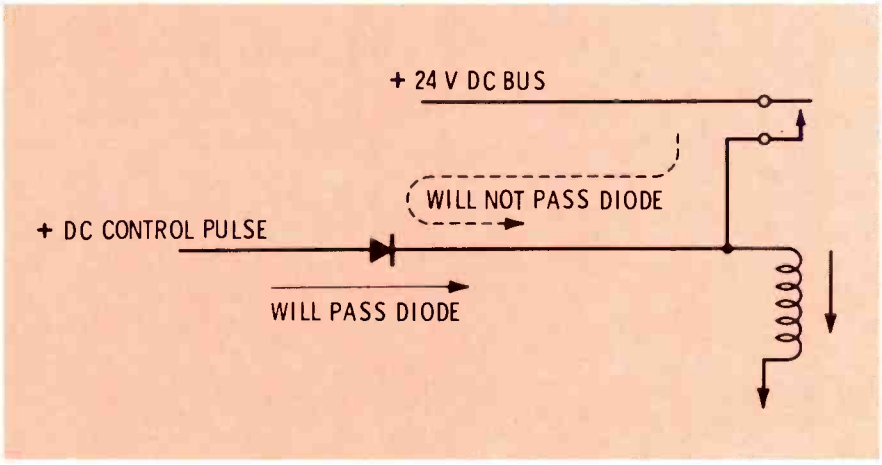

Fig. 1 The diode as a one-way gate. Polarity is important. Control pulse will pass through diode into relay, but voltage from holding contacts will not pass back through diode.

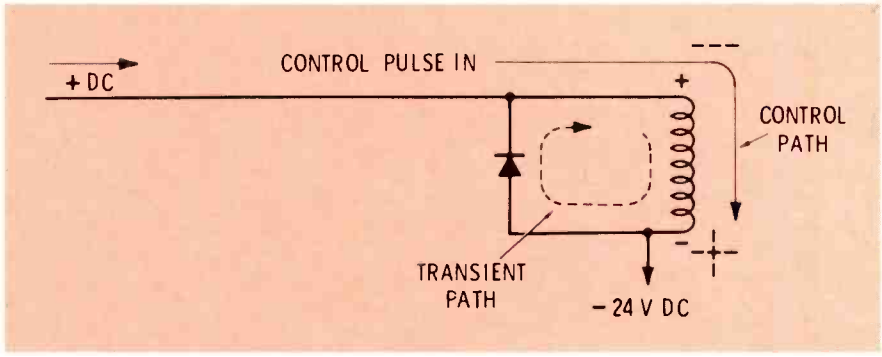

Fig. 2 The diode as a transient suppressor. Again, polarity is important. Control voltage will not pass through the diode. Transient voltage developed when control voltage is removed will be of opposite polarity, causing diode to conduct and short out the transient.

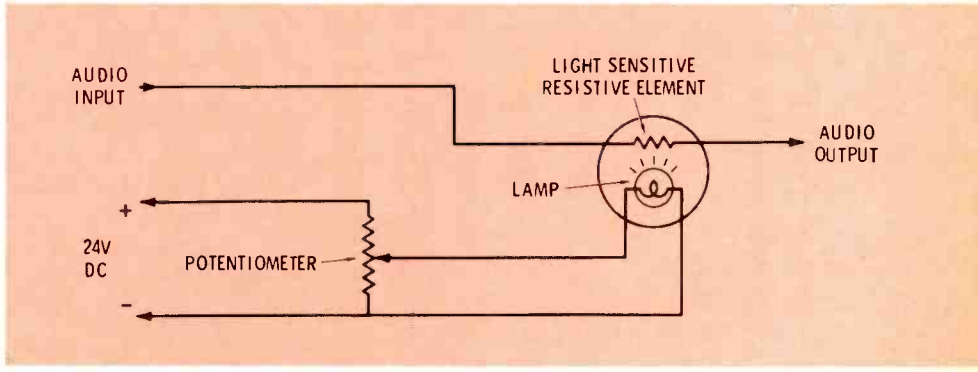

Fig. 3 The light sensitive resistor as a remote fader. Lamp voltage is run through a pot which will control the intensity of the lamp. Lamp intensity, in turn, will control the amount of resistance in the circuit.

a recorder, the first to show message recording time and the second to total recording time. This is advantageous, especially when recording several cuts on a cartridge tape. Cartridge recorders are not basically designed to provide such features, but by appropriate use of the cue and auxiliary tone functions in the recorder, and on occasion, some slight modification (depending upon machine), these switching pulses can operate external timers and relays.

Alarms are another useful asset to the operator. Generally, alarm functions are not provided, so the engineer will need to study the circuit of the equipment in question and discover what modifications need be made or where "borrowing of functions" is applicable. A few examples where alarms assist the operator: transmitter carrier failure, teletype bulletins or alerts, end of tape supply on a machine, program silence sensors, clock alarms to warn of power change times at sunset or sunrise, and clock alarms to warn of upcoming program recording times.

When wiring in or modifying a circuit to provide an alarm, the basic cautions should always be observed. Study the circuit, do not upset or overload it. This is especially important with bells, buzzers, lights as these draw relatively high currents and can introduce interference.

Which came first, the automatic techniques or the automatic systems? Actually, the automatic techniques were the forerunners of the automation systems. The techniques have been refined in automation systems, but most are still applicable to everyday equipment items. The following are but a few of the circuits that can be put to use.

Diode As A DC Gate

The lowly diode can do more than be a rectifier. It can be operated as a gate to allow a DC pulse in one direction, but not in reverse. The diode must be positioned in the circuit correctly. The anode should be placed on the positive initiating pulse side, while the cathode is placed facing the operating side of the circuit. Remember the schematic symbol for the diode. Think of the anode symbol as an arrowhead pointing in the direction the start pulse is moving into the circuit. With the diode so positioned, when the positive pulse is applied, conduction will take place and the pulse will move into the circuit, relay, or whatever is being driven and the circuit will be turned on. Once the circuit comes on, there will most likely be circuit DC voltage either from relay holding contacts or circuit operation. This circuit DC voltage, however, is facing the cathode of the diode, so no conduction will take place through the diode. Without the gate, this circuit voltage would feed back into the start circuit and lock it up. The gate will keep the circuits apart.

Diode As Transient Suppressor

Relay coils are notorious transient generators when the relay is relaxed. A diode across the coil will short circuit this transient and reduce or eliminate any problem from it. Polarity of the diode across the circuit is most important. The cathode of the diode must be placed on the positive side of the circuit control or run voltage (DC voltage).

As the control DC pulse turns on the relay, the diode will not conduct because the cathode is facing that side of the circuit. When the control or circuit voltage is removed to allow the relay to drop out, the back voltage created by the collapsing field will generate a voltage in the opposite polarity in an effort to maintain the field. As the back voltage is now of the correct polarity, the diode will conduct and cause a short circuit path for the currents to flow, rather than back through the control circuit. If the diode is placed in the circuit incorrectly, it will conduct on the control voltage and the relay won't operate at all.

Use high current rated and high peak inverse voltage rating for the diode as transients can cause failure to low rated units. For normal +24 volt DC circuits, 600PIV, 1 amp diodes will last indefinitely.

Light Sensitive Resistors

These are interesting items and are available at reasonable cost that go under different brand names. They made their debut a few years ago and you can find many applications where they simplify the circuit.

The device is made of a light sensitive resistance material, a lamp, sealed in a small plug-in container, something on the order of a minature relay. when a DC voltage is applied to the lamp to bring it to full brilliance, the resistance of the material drops to practically zero, but with the lamp out (darkness), the material resistance is almost infinity. There is no physical connection between the control circuit and the signal circuit except the light from the lamp. The device, then, can be used as a switch by turning the light on or off and it is often used in this manner. When in such use, it will perform signal switching functions but without physical making or breaking of contacts, as in a relay.

As a remote audio fader, its simplicity is one of its best features. Instead of switching the light on and off as in the previous discussion, the lamp control voltage can be run through a simple potentiometer at some remote location. There is no signal connection except at the resistance element, the remote circuit is a DC control voltage. The units are available as dual units for stereo, or a pair of singles may be ganged for stereo use. There is still only one remote potentiometer, as it can control the voltage to both the lamps. The fading action is very smooth, and there is no noise from dirty audio fader contacts as could happen with the regular fader circuit.

Capacitors

As a delay technique, the charge and discharge of a large value capacitor can be used effectively. A few seconds delay can be obtained this way. A resistor in series with the capacitor can increase the lag effect.

The History Savers at work.

David Hall and Sam Sanders discuss a fine point.

Deep inside a building at New York's Lincoln Center for the Performing Arts, recorded history is being recorded again. At the Rodgers and Hammerstein Archives of Recorded Sound, technician Sam Sanders is busy continually transcribing all sorts of old recordings, transcriptions and acetates. Not only will there then be a more permanent record of this valuable material, but access to it is made easy through a sophisticated catalogue system, by which interested persons can hear material that was otherwise unavailable.

The Rodgers and Hammerstein Archives of Recorded Sound are part of the New York Public Library, Research Library of the Performing Arts, and encompass virtually the entire history of recorded sound. But to get these early (and often irreplaceable) discs onto tape wasn't easy. Because until the recording industry established its own standards, playing speeds, groove widths and depths were widely varied.

Stanton engineers worked closely with Archive Head David Hall and engineer Sam Sanders when the Archive Preservation Laboratory was being set up. Standard Stanton 681 cartridge bodies were chosen for their superior reproduction characteristics. However, some 30 different stylus types had to be prepared to give the tape transfer operation the variety needed to match the various old groove specifications. Each was hand-made by Stanton engineers to fit a particular disc's requirements. So when Sam Sanders begins the careful disc-to-tape transfer, he must first match the stylus to the record. Both microscope and trial-and-error techniques must be often used together. But one of the special styli will enable every last bit of material to be extracted from these recorded rarities.

It goes without saying that a company willing to take such care in helping to preserve recorded history must also be interested in superior reproduction of today's high fidelity pressings. Which is one reason why Stanton cartridges remain the choice of professionals the world over.

For an informative brochure about our professional-quality cartridges, write to Stanton Magnetics, Inc., Terminal Drive, Plainview, N.Y. 11803.

STANTON

Circle Number 26 on Reader Reply Card

There are occasions when it is desired that a certain relay be delayed before it pulls in after the initiating pulse is introduced. It is not difficult to accomplish this. Insert a resistor in series with the DC pulse lead to the relay coil and add a large value capacitor across the relay coil. As the pulse is turned into the circuit, the current will surge into the capacitor causing a voltage drop across the resistor. This drop in voltage will be sufficient to lower the voltage below the point the relay can operate. As the capacitor charges, the current will be less and the voltage will rise enough to allow the relay pull in. Resistor value of 200 ohms, and 300 mfd. will produce about two seconds delay. The delay can be changed by changing the values of resistance or capacitance.

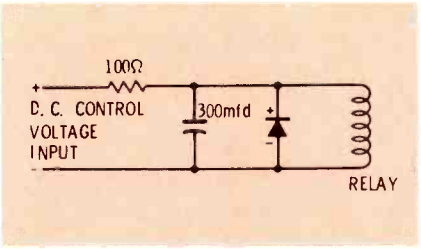

Fig. 4 A capacitor and a resistor are used here to delay the pull-in of a relay. The values shown will give about a two second delay.

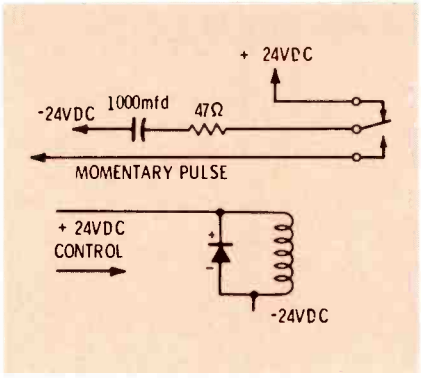

Fig. 6 The capacitor is used here as a momentary starter. While relay is idle, the capacitor will charge from the DC bus. When the relay pulls in, the charge on the capacitor will be "dumped" into the circuit to be started, producing a momentary DC starting pulse.

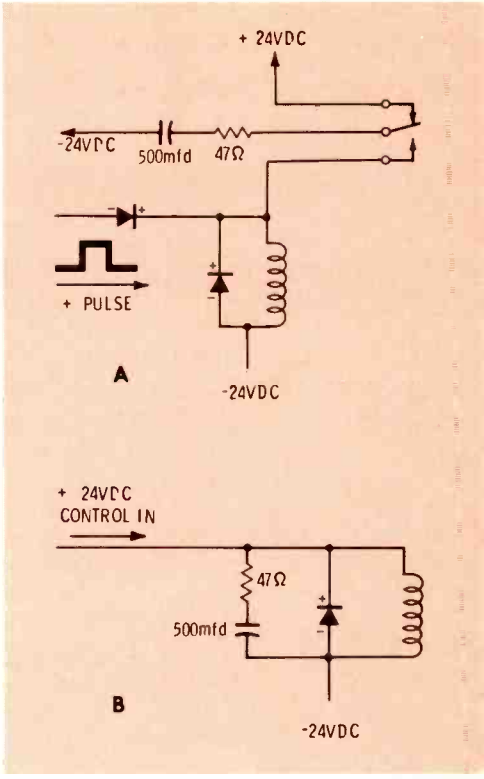

Fig. 5 A capacitor used here delays the relay drop out. Circuit A will work for a pulse input when the relay is non-latching, but is on only during pulse time. Capacitor has the effect of lengthing the pulse. Circuit B will work with a constant control voltage. With values shown. it will give about a 1 second delay.

Relay Delay Dropout

There are other occasions when it is desired that the relay stay in the on position for a second or so after it has been released. Or it could be that the initiating pulse is more brief than desired for the particular case when the relay is triggered on. This would be the case of a pulse turning on a relay and the relay dropping out as soon as the pulse passes.

Delay is achieved by switching across the coil of the relay a previously fully charged large value capacitor. This charge will hold the relay in the on position for a second or so after it normally would have dropped out. Capacitor values of 500 or 1,000 mfd. will provide about 1 or 2 seconds of delay.

If the relay has holding contacts and is released only by switching action, the capacitor can be across the coil all the time without switching it in or out of the circuit. In either case, a small value resistor of 50 to 100 ohms should be placed in series with the capacitor to limit the surge of current into the capacitor. This surge could be hard on the power supply.

Capacitor Starter

A large value capacitor when full charged can release this energy if given the opportunity and with a jolt. Anyone who has had his hand across one with a high voltage charge can attest to that. The capacitor can be allowed to charge from the power supply while the circuit is idle. When called for, the capacitor is switched into the start circuit, releasing its charge as a control pulse. This will work only for a circuit that requires a momentary pulse to start it.

The voltage charge on the capacitor is the same as that used throughout the system. For example, if the other control pulses are +24 VDC, the capacitor would be charged from the +24 VDC bus. This circuit will be found very useful. Capacitor values of 1,000 mfd. will do the job. A small series resistor of 50 ohms should be placed in series with the capacitor because the "empty" capacitor when placed back on the bus to recharge will draw heavy surge current, so the current needs some limiting.

Voltage Transformation

There are occasions when it is not possible to add a circuit to a switch because all the contacts are in use and it is undesirable to replace the switch with one having more contacts. There may be a voltage circuit available on the switch that could do the job, except it is of the wrong voltage. For example, only 6.3 VAC is available on the switch, but the circuit to be switched (new circuit) must be on 24 volts DC. There will be no problem if a relay is used to "transform" the 6.3 AC voltage to the 24 VDC. The added relay coil will be one that is rated for 6.3 VAC, and the 24 VDC will be switched by the relay contacts. Thus, the relay is performing a "voltage transformation" function.

Talley Lights

Many equipment items have various talley lights which go on or off as certain functions take place.

Many times this talley light voltage can be used to operate an additional circuit. If voltage differences are present, a relay can be used for "voltage transformations" as described earlier.

Whenever the circuit from which you are "borrowing" functions cannot supply the additional load for some reason, a small external power supply of the correct voltage can be built. All that will be needed from the original circuit will be enough power to operate a relay and this relay's contacts will switch the external load. If an external load is to be used, look for spare, unused contacts on some relay or switch that is operating in the manner and at the time you desire. Borrow these unused contacts to switch the external load. No extra relay would need be added in this case.

Many equipments use 24 VDC for switching and relay control functions. A small 24 VDC power supply is not difficult to build. A filament transformer with 25 VAC end-to-end secondary winding and 1 amp rating is easily obtainable. A couple of diodes (4 diodes if a bridge rectifier is desired), a filter capacitor and resistor for filter, and a husky little relay power supply is available.

Alarms

There are many ways to produce alarms and there are also many reasons why alarms are desirable. The meter relay can prove useful in this area. This is a unit which not only measures the normal circuit current, as for example the transmitter power output, but also includes contacts within the meter that are adjustable to provide a switching contact when the preset point has been passed or reached. The older styles were more delicate and would allow only small current switching through the contacts. Newer versions are now available that have no actual contact between the circuit measured and the alarm circuit. Photosensitive elements are used within the meter to operate an internal relay. This relay can handle 10 amps at 120 V on its contacts. The only connection between circuits is the light from the special lamp element.

For alarms circuits where a switch contact occurs (such as teletype alarms, weather alarms and EBS alerts) power in some of these cases can be taken to operate a remote alarm directly. Some precautions should be taken, especially if multiple alarms are to operate from a single source. This would be the case if it is desired to locate alarms at various locations in a building. Bells and lights use relatively higher currents, so stacking several of those on one circuit can seriously overload it, and it may actually fail.

When multiple alarms are to be operated from one source, it is better to use a relay for circuit isolation, allowing the equipment pulse be nothing more than a trigger pulse which operates an external relay. This relay then can operate the lights, bells etc., through its contacts, applying power from a separate source.

When a number of different functions have alarms attached, such as EBS, teletype bulletins, or carrier off, these can in themselves provide confusion. There may be several different bells, buzzers and chimes in the control room to warn the operator. When one of those goes off, unless he is very attuned to the particular sound of the alarm device, he must stop and try to decide

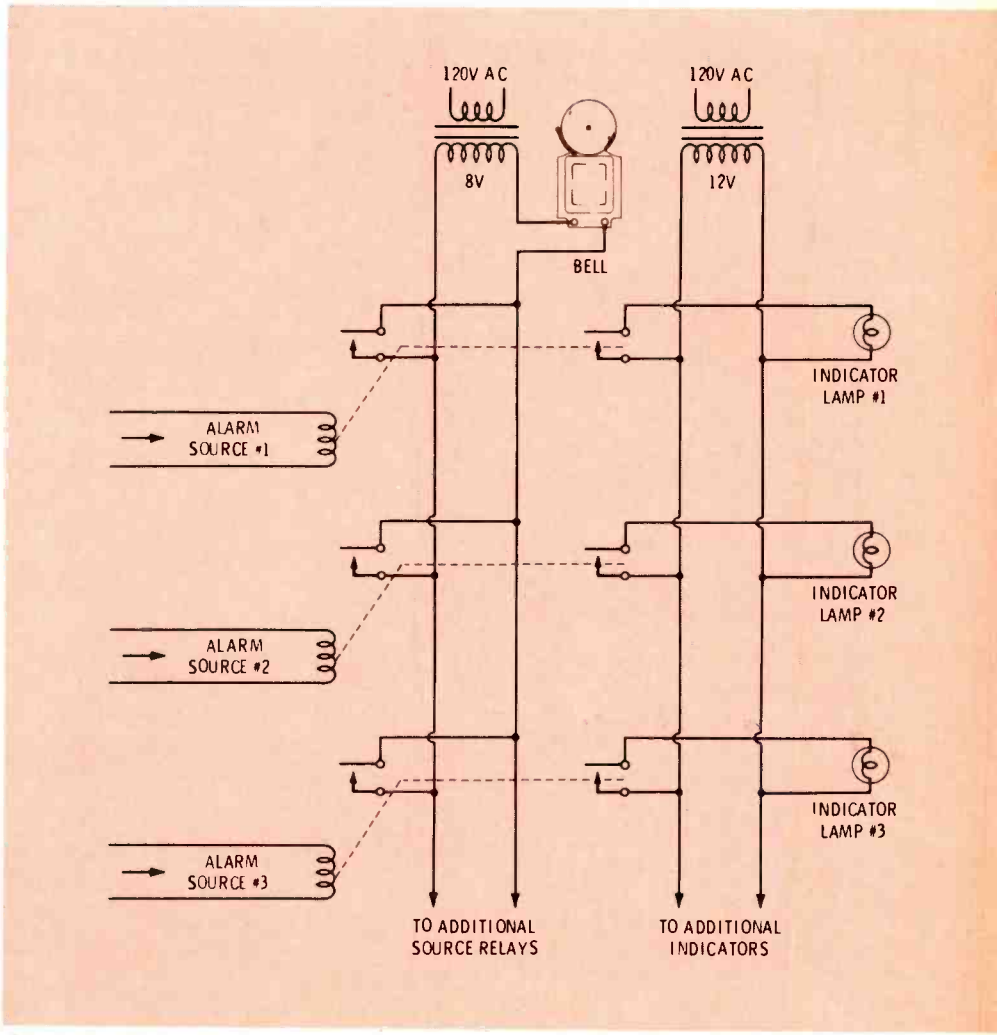

Fig. 7 An alarm circuit using one bell for several circuits. Each circuit has an indicator light to alert the operator that a particular circuit needs attention.

what has happened. To avoid the confusion, a 'readout' of some type should be used to quickly identify what went off. Individual lights, properly labeled can do this.

Whenever such a location requires several alarms, a single bell or buzzer can be used, but a light properly labeled for each alarm, will simplify the whole thing and do the job of providing the necessary alarms. The line up is made with one bell, one bell transformer, a small transformer for the lights and a relay for each of the circuits that has an alarm attached. The relay for each circuit will pick up the transformer voltage and apply it to the bell, while another contact will pick up the voltage and apply it to the correct lamp. Thus, when an alarm goes off, the bell will ring and the operator needs only look at the bank of labeled lights to tell him what alarm it is.

In setting up the multiple system, the relays also will provide "voltage transformation" as the circuits from individual equipments are seldom the same. This allows the bell and lights to have a common low voltage, rather than a mixed bag of various light and bell voltages and currents. At the same time, these relays can be selected and the source voltages corralled into a relatively similar voltage range. For example, some teletype alarms provide 120 VAC for the alarm circuit, others 18 VAC, others just a switching contact.

Whenever possible, shipping 120 AC around the building should be avoided. This can cause hum problems, and shock hazards. This voltage should be stepped down to a low voltage and better still, rectified to provide low voltage DC switching to the remote relays. When stepping voltages down, try to settle on a common value so that the relays will be the same. For example, one teletype may provide 120 VAC for the alarm, while the other may provide 18 volt AC for the alarm. If the 120 volt AC is stepped down to 12 volts and rectified, a 12 DC pulse can be supplied and the remote relay 12 volt DC. The 18 volts can be rectified directly and with proper resistors, dropped to 12 volts DC. Thus all the relays can be 12 volts, and only one spare replacement need be kept in the spare parts.

Tighter Programming

The switching actions available on cartridge tape machines can produce tighter programming, as well as drive other sources, such as timers, when they are wired up properly. A simple sequencer can be built with toggle switches which allow the end of message cue on the tape to start the next tape deck. This does have some drawbacks in that the sequencer becomes inoperative if one of the machines is out of commission.

A better sequencer can be built using lever switches that incorporate more contacts. The center position should be off; that is, they should be three position switches. With all the switches in the down position, the normal sequencing from one machine to another can take place. If a machine becomes defective, its switch can be placed in the up position and this will bypass that machine, so normal sequencing can take place around the defective machine. If the sequencing action needs to be stopped at any machine, the switch can be put in off.

Now if a more elaborate sequencer is desired, a rotary switch can be used for each machine with enough positions to take care of all machines in the system. Always leave one position as an off position. Also, do not wire the start input and the start output of that machine on the same switch as trouble will be experienced when rotating the switch to "off".

This article has attempted to point out some of the many automatic techniques that can be applied to present manual equipment so that operation for the operator will be made easier and the program can be tightened up. Simplicity should be the rule and gadgetry and frills should be avoided. Only circuits that will produce results without confusion to the operator should be applied. Always keep in mind the circuit which is being adapted or modified. Avoid overloads and interfercence with the normal circuit functions. ▲

Ohio Stations' Channels Are Reassigned

Rules reassigning television Channel 45 from Youngstown to Alliance with an educational reservation, Channel *27 from Bryan to Bowling Green and Channel *44 from Woodsfield to Cambridge, all in Ohio, have been adopted by the Commission, effective May 28, 1971 (Docket 19139). The Commission said the purpose of the changes is to permit the Ohio Educational Television Network Commission (OETNC), a state agency, to implement an overall plan for an educational television network in Ohio.

The Commission action amends Section 73.606(b) of the rules, the Television Table of Assignments. It was initiated in a rule making proposal adopted January 20, 1971, in response to a petition from OETNC.

Because the reassignments are within 250 miles of the United States-Canadian border, the Commission stated, it had obtained Canadian approval of the changes under the Canadian-U.S.A. Television Agreement of 1952.

One of OETNC's goals is to make available at least one educational television service for each person in Ohio. Eight operating educational television stations in Ohio are affiliated with OETNC—WVIZ-TV, Cleveland; WCET-TV, Cincinnati; WGTE-TV, Toledo; WOUB-TV, Athens; WBGU-TV, Bowling Green; WOSU-TV, Columbus; WMUB-TV, Oxford; and WGSF, Newark. OETNC's request for rule making is part of a plan to extend the operational facilities at the network's Columbus distribution center and to activate TV stations at Dayton, Portsmouth, Alliance, Bryan and Woodsfield.

Action by the Commission April 14, 1971, by Report and Order. Commissioners Burch (Chairman), Bartley, Robert E. Lee, Johnson, H. Rex Lee, Wells and Houser.

High Speed Computer At World Communications

Teleprinter messages between domestic and overseas points are moving with increased speed and efficiency as a result of a high-speed computer system now in operation at ITT World Communications Inc., a subsidiary of International Telephone and Telegraph Corporation.

Serving as an "interface" between the domestic TWX and international telex networks, the new solid-state computer equipment completely automates the process of converting teleprinter speeds and formats peculiar to each network into that of the other. Previously, this function was carried out by electro-mechanical devices which occupied considerably more space and required a much higher degree of maintenance.

The new TWX-to-telex translator substantially reduces the connection time between the two networks by narrowing the time required to shift from one mode of operation to the other—a process involving the conversion of teleprinter speeds of 110 bauds of 100 words a minute for TWX operation to 50 bauds or 66 words a minute for telex and the modification of an eight-level or four-row keyboard format for TWX to the standard five-level, three-row telex keyboard.

FCC Proposes Rule On Nondiscrimination

Rules requiring nondiscrimination in employment practices by operators of Community Antenna Television Systems (CATV) and Community Antenna Relay Stations (CARS) licensees have been proposed by the Commission.

Citing similar rules for broadcast licensees and common carriers, the Commission said it believed that the same considerations of public policy are applicable to community antenna television systems and community antenna relay stations.

The national policy against discrimination in employment on the basis of race, religion, sex, or national origin is clear, the Commission said. It pointed out that Title VII of the Civil Rights Act of 1964, as amended, makes it unlawful for employees in an industry affecting interstate commerce who employ at least 25 persons to discriminate because of race, color, religion, sex or national origin in the hiring, discharging, or training of employees, or in fixing their terms and conditions of employment, including compensation, privileges and classification.

In addition to the Civil Rights Act, a number of States and cities have laws and ordinances prohibiting discrimination on the grounds of sex, race, color, religion, or national origin. In most cases the minimum number of employees which bring the employer within the State statutes is less than 25 and in many cases less than 8.

The Commission said it may well be that a substantial percentage of community CATV and CARS systems or stations are subject to Federal, State, or local antidiscrimination laws. It pointed out that the national policy against discrimination is applicable to all CATV systems and CAR stations, whether or not they are subject to the specific provisions of the Civil Rights Act.

The proposed rules would require that each CATV or CARS operation establish and maintain a program designed to assure equal opportunity. They also provide for FCC reporting forms to give the Commission yearly statistical and substantive information on compliance by CATV and CARS operations. Forms would also be filed by each CATV system operator, CAR station licensee or permittee, or applicant for a CATV system authorization or CAR station CP, giving information regarding the system's or station's nondiscrimination program. The Commission said it would take the statement into consideration in passing upon an application. The rules relating to the filing of reports and forms would be limited to operators and licensees having 5 or more employees. The requirement that each CATV or CARS operation maintain a program designed to insure equal employment opportunity would apply to all CATV and CARS operations, regardless of the number of employees, the Commission said.

The proposed rule would amend Part 74.

Comments are requested by June 11, 1971, and replies by June 21, 1971.

Commission Releases Latest Reference Report

A wide variety of new reference materials and a series of comprehensive new summary articles highlight the 36th Annual Report of the Federal Communications Commission, has been released.

Included in the 278-page report, the most extensive ever released by the Commission, are articles on multiple ownership, prime time and pay-TV actions, new land mobile radio channels and satellite communications.

There are also special reports on the new fee schedule, the research and policies program and the activities of the Procedure Review Committee.

The Broadcasting section includes an analysis of the effect of the land mobile radio decisions on television and comprehensive reports on Commission actions affecting broadcasting administration, programming and educational broadcasting.

A detailed review of the Commission actions providing additional channels for land mobile use is included in the section on Safety and Special Radio Services. It includes background details, a breakdown of specific provisions and reports on associated activities involving research projects and the Spectrum Management Task Force.

The Common Carrier section includes a complete review of all major hearing cases and discussions of specialized common carriers, domestic satellites and jurisdictional separations among other current topics.

The entire area of cable television has been brought completely up-to-date in a chapter that reviews the background and development of CATV, summarizes all proposals currently before the Commission and details all recently adopted rules and regulations.

Reference and statistical material included in the Annual Report for the first time includes a breakdown of complaints handled by the Broadcast Bureau, a listing of newspaper-broadcasting joint interests, a compilation of the highest television towers in the United States, and the new FCC fee schedule.

Directory of Automation Manufacturers

A

Aitken Communications Inc.
701 S. 10th St.
Taft, Calif. 93268

Alto Fonic Programing Inc.
6362 Hollywood Blvd.
Hollywood, Calif. 90028

American Data Corp.
4306 Govners Dr., SW
Huntsville, Ala. 35805

Ampex Corp.
401 Broadway
Redwood City, Calif. 94063

Arbor Systems, Inc.
Box 1325
Ann Arbor, Mich. 48106

Arrow Electronics Inc.
900 Broad Hollow Rd.
Farmingdale, N.Y. 11735

Automatic Tape Control Inc.
1107 East Croxton Ave.
Bloomington, Ill.

B

Bauer/Sparta Trans. Prod.
5851 Florin-Perkins Rd.
Sacramento, Calif. 95828

B&K Instrument, Inc.
5111 W. 164th St.
Cleveland, Ohio 44142

Broadcast Computer Services
Box 966
Colorado Springs, Colo. 80901

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

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

C

CBS Laboratories
227 High Ridge Road
Stamford, Conn. 06905

CCA Electronics Corp.
716 Jersey Ave.
Gloucester, N.J. 08030

Chrono-Log Corp.
2583 W. Chester Pike
Broomall, Pa. 19008

Don W. Clark & Associates
6362 Hollywood Blvd.
Hollywood, Calif. 90028

Collins Radio Co.
Mail Stop 407 023
Dallas, Tex. 75207

Cybrix Corporation
5633 Topanga Canyon Blvd.
Woodland Hills, Calif. 91364

D

Datatron, Inc.
1562 Reynolds Ave.
Santa Ana, Calif. 92705

Disan Engineering Corp.
516 E. Cherokee
Nowata, Okla. 74048

Dynasciences, CMC
9601 Conoga Ave.
Chatsworth, Calif. 91311

G

Gates Radio Co.
123 Hampshire Street
Quincy, Ill. 62301

General Electric Co.
Visual Comm. Prods. Dept.
#7 Electronics Park, Room 345
Syracuse, N.Y. 13201

Gravco Sales Inc.
6515 Sunset Blvd.
Los Angeles, Calif. 90028

H

Hickok Electrical Instrument Co.
10514 Dupont Ave.
Cleveland, Ohio 44108

Highland Associates Inc.
1380 West Midway Blvd.
P.O. Box 99
Broomfield, Colo. 80020

Humphrey Electronics Inc.
P.O. Box 9143
Raleigh, N.C. 27603

I

IBM Data Processing Division
112 East Post Road
White Plains, N.Y. 10601

Information Control Systems Inc.
109 E. Madison
Ann Arbor, Mich. 48104

Insta-Tape/Div. of Ampro Corp.
2220 Maplewood Ave.
Willow Grove, Pa. 19090

International Good Music
3950 Home Rd.
Bellingham, Wash. 98225

International Nuclear Corp.
608 Norris Ave.
Nashville 4, Tenn.

L

Listec Television Equip. Corp.
35 Cain Drive
Plainview, N.Y. 11803

M

MaCarTa Inc.
709 Railroad Ave.
W. Des Moines, Iowa 50265

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

Marconi Comm. Systems Ltd.
Marconi House
New Street
Chelmsford, Essex, England

Maze Corporation
P.O. Box 6636
Birmingham, Ala. 35210

Kenneth R. Meades
P.O. Box 3884
Anaheim, Calif. 92803

Mechtron Corp.
1730 Diplomacy Row
Orlando, Fla. 32809

Moseley Assoc. Inc.
111 Castillian Dr.
Goleta, Calif. 93017

O

Orbit Radio and Video
1863 Arlington, Box 1644
Louisville, Ky. 40201

P

Pembrex Theatre Supply
Div. of John P. Filbert Co., Inc.
1100 Flower St.
Box 5085
Glendale, Calif. 91201

Philips Broadcast Equip. Corp.
One Philips Parkway
Montvale, N.J. 07645

Power Optics, Inc.
1055 W. Germantown Pike
Fairview Village, Pa. 19409

Presearch, Inc.
8720 Georgia Ave.
Silver Spring, Md. 20910

Programmed Material Inc.
816 Charles Drive
Charleston, W. Va. 25303

R

RCA Broadcast Comm. Prd.
Front & Copper St.
Camden, N.J. 08102

RFE Labs
Box 535
Berkeley, Calif. 94701

Riker Video Industries
Ward Electronic Industries
142 Central Ave.
Clar, N.J. 07066

Rust Corporation
168 Tremont St.
Everett, Mass. 02149

S

Sarkes Tarzian, Inc.
East Hillside Dr.
Bloomington, Ind. 47401

Schafer Electronics
9119 DeSoto Ave.
Chatsworth, Calif. 91311

Seiden Sound Inc.
79 Central Ave.
Albany, N.Y.

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

Sono-Mag Corp.
1011 W. Washington St.
Bloomington, Ill. 61701

Sparta Electronic Corp.
5851 Florin-Perkins Rd.
Sacramento, Calif. 95828

Special System, Inc.
10419 Fawcett St.
Kensington, Md. 20795

Standard Electronics Corp.
Rt. 33 Manalapan Township
Box 677
Freehold, N.J. 07728

T

Tape-Athon Corp.
502 S. Iris St.
P.O. Box 814
Inglewood, Calif. 90307

Tapecaster TCM Inc.
12326 Wilkins Ave.
Box 662
Rockville, Md. 20851

Tape Networks Inc.
12148 Victory Blvd.
No. Hollywood, Calif. 91606

Tech Laboratories, Inc.
Bergen & Edsall Blvds.
Palisades Park, N.J. 07650

Telemation Sales Inc.
2275 South West Temple
Salt Lake City, Utah 84115

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

Television and Computer Corp.
2056 U.S. Highway 22
Scotch Plains, N.J.

Tracor Ind. Inst. Div.
6500 Tracor Lane
Austin, Tex. 78721

U

Ultimation Systems
510 23rd Street
Sacramento, Calif. 95816

V

Visual Electronics Corp.
356 W. 40th St.
New York, N.Y. 10018

W

Ward Electronic Industries
142 Central Ave.
Clark, N.J. 07066

Z

Zoomar Inc.
870 High Ridge Rd.
Stamford, Conn. 06905

BE's Latest Book Reviews See Page 68

RCA Offers Free Station Layout Guide

Designed for convenience in planning equipment placement for new installations or modernization of existing facilities, this oversize booklet includes two-dimensional scaled cut-outs for a variety of RCA Audio and AM-FM Transmitting equipment. Grid-lined floor plan areas, printed on heavy stock, are provided for mounting the scaled cut-outs in desired configurations.

Among the major equipment cut-outs are: AM Transmitters of 1, 5, 10, 50 and 100 kW; FM Transmitters of 1, 5, 10, 20, 40 kW; and Audio consoles, turntables, cartridge and reel tape recorders, speakers and studio furniture. Helpful information on arrangement of rack-mounted equipment is also provided.

Copies of this useful planning aid may be obtained from **RCA Broadcast Systems Sales Services,** Building 15-5, Camden, N.J. 08102. Request booklet 3J5625.

TECHNICAL DATA

For further information, circle data identification number on reader service card.

100. AMERICAN PAMCOR, INC.—An expanded series of crimp-type gas line fittings is described in the L-94 Folder now available. This 18-page packet includes completely updated specifications, plus application and dimensional data for over 60 different items of the AMP-FIT gas tube fitting family for gaslights, outdoor grills, service and distribution lines. With these crimp-type plastic fittings, gas line connections can be made in less than 60 seconds. The unique installation method eliminates the problems associated with cross-threading, solder, sealing compounds, and improper torque. The tubing is simply cut to length, and inserted into the fitting until it reaches a stop. The crimping tool is then positioned and the handles closed to complete the connection. The crimping action compresses the plastic fitting beneath a steel band that maintains constant and uniform pressure on the tubing. The resultant connection is leak-proof and withstands up to 1500 pounds tensile pull (depending on fitting size and tubing material). Since the plastic fittings are inert, they permit joining dissimilar tubing materials such as copper, aluminum, and plastic in any combination.

101. BELDEN CORPORATION—A new catalog featuring 134 new electronic wire and cable products is now available. Most of the new items are designed for the communications, data processing and instrumentation and control fields. Included among the new items described in the 60-page catalog is a shielded 102-pair cable (#9753) for computers and telemetering applications. Other new cables for data processing include low-loss, balanced Twinax® cables and low-loss 6-pair cables. Cables are grouped by type and principal application throughout the catalog. Detailed performance characteristics, including signal loss and distributed capacitance, impedance, and working voltage for each cable are given. Cutaway drawings of each cable type show the physical configuration, including shielding and cabling (twisting of balanced pairs). Complete information on shielding, insulation, and jacketing is provided for all cables. An audio cable selection guide in the communications section of the catalog gives maximum cable length in feet for different wire sizes and standard load impedances.

102. CHANNEL MASTER—A new 32-page catalog describing Channel Master's TV and FM antennas and accessories is now available. The catalog features five complete lines of outdoor VHF, UHF, FM and combination broadband antennas; single channel yagis; and 15 types of UHF-only antennas. A wide variety of indoor antennas are shown, including the new amplified Chroma 1 and three UHF-only models. Included are Channel Master antenna rotators, UHF converters and all types of miscellaneous antenna hardware. For antenna mounting, masts, push-up towers, chimney mounts, tripod mounts, base mounts, wall and eave mounts are shown, along with aluminum, steel and vinyl clad guy wires. Lightning protection is provided for by inclusion of lightning arrestors and heavy aluminum ground wires. The new catalog depicts a full range of twin-lead and coaxial transmission lines, rotator wire, and stand-off insulators for all kinds of installations.

103. SYSTEMS RESOURCES CORP.—A two-page brochure describing Systems Resources Model 600 Effects Module is now available. The module enables electronic titling systems to present word-by-

word color; all-around character edging control and other features. The module can be used with any existing A. B. Dick Model 9901 Videograph Character Generator.

104. CHRONO-LOG CORP.—A new bulletin describing the Chrono-Log Series 4,000 Integrated Circuit Time Code Generator is now available.

The bulletin includes operating details and specifications for this unique instrument which can provide time code information in an IRIG or NASA format in both modulated carrier and level shift codes simultaneously. The Series 4,000 provides both parallel 8-4-2-1 BCD outputs and visual indication of hours, minutes and seconds in BCD or NIXIE type readouts.

105. COHU ELECTRONICS, INC.—A new color sync generator for broadcast television stations that provides jitter-free sync from a digitally-generated time base is described in data sheet 6-534. The data sheet includes a complete description of the sync generator and its options including BNC or UHF connectors.

106. COMPUTER LABS—A new four-page brochure describing Computer Labs Model VHS-630 A/D Converter is now available. The Model VHS-630 is a high-speed analog-to-digital converter capable of six-bit resolution at any random or periodic word rate from DC through 30 MHz. It can digitize any point on the wavefront for analog input frequencies from DC through 15 MHz with less than 0.8% ±½ LSB error. Inputs greater than 15 MHz can be digitized with some degradation in accuracy, since the input analog bandwidth is greater than 100 MHz.

107. EDISON ELECTRONICS DIVISION—McGraw-Edison Co. A Daven Delay Line Buyer's Guide (DL270) has been developed to assist system and circuit designers in specifying high performance minimum cost delay lines for their systems and circuits. This brochure provides a valuable glossary of terms and formulas. It also offers technical and cost application details.

108. ELCO—The 1971 edition of this 56-page guide describes 26 separate series of VARICON™ metal-to-metal PC connectors (which conform to the newest requirements of MIL-E-5400, MIL-E-8189, and MIL-T-21200), as well as IC and test probe sockets. A 3-page illustrated foldout index simplifies connector selection. Also included is a cross reference between Elco part numbers and their government designation. The connectors are available with contact spacings of .050″, .075″, .100″, .156″, and .200″, while standard connector sizes range from 2 to 152 contacts. The connectors are compatible with solder, wire-wrapping, crimp, taper tab, and taper pin terminating techniques.

109. GRALEX INDUSTRIES, INC.—A new four-page product brochure describing the Gralex Series 35 Digital Panel Meters is now available. The new units are precision, low-cost replacements for pointer-and-scale instruments. They are ideal for original equipment or systems applications demanding ease of installation, simplicity of calibration and compatibility with modern digital data acquisition systems.

110. GRAYHILL, INC.—The latest Grayhill new products are now contained in the 16-page New Products Bulletin #S-307, which is a supplement to the G-306A Engineering Catalog. The new products include Solid State Switches, a complete new line of Decorator Pushbutton Switches, and Rotary Switches with such features as 18° and 22½° angles of throw, economical keylock adapters, pull-to-turn or push-to-turn functions, and terminals for PC board mounting. Each new product description contains dimensions, electrical ratings, materials, prices, and delivery.

111. GTE LENKURT INC.—An eight-page product brochure describing the new 74-channel 36A Multiplex System is now available. The type 36A system is the result of a major advancement in filter technology through the development of a polylithic crystal filter, which allows the system to set new standards of size, cost, performance and

(Continued on page 66)

(Continued from page 65)

reliability for light-route multiplex equipment. Stackable in single-channel increments, the 36A utilizes the new filtering component which is significantly smaller than its bulky inductor-capacitor filter network counterpart. With the crystal filter, it is now practical to incorporate integrated and miniaturized circuitry for the remaining active portions of the system to realize substantial size and cost economies.

112. HEWLETT-PACKARD—How to measure the amplitude and flatness of low-frequency pulses and square waves is outlined in a new Hewlett-Packard application note. Amplitude of square waves to 500 Hz is measured using a combination of the Hewlett-Packard Model 3480A/B and the Model 180A Oscilloscope. Directions are given showing how to check the flatness of a square wave or pulse using the delayed trigger from the Model 180A. This four-page Application Note 133-1 also contains diagrams of the measuring circuit and a triggering circuit.

113. INTERDESIGN—A brochure is available from Interdesign, describing the company's custom integrated circuit design and engineering activities. This four-page brochure explains a novel approach to the integration of specialized circuits. Interdesign is the first company specializing in the interface between users and manufacturers of integrated circuits. In addition to the development of custom circuits, the company arranges for small quantity production.

114. INTERSWITCH—A new 16-page, two-color applications bulletin, "Programming Techniques and Circuits for Electronic Controls, Instruments and Systems", is now available. The central section of the bulletin describes 12 classes of programming applications: Setting Circuit Values, Encoding and Decoding, Multiplexing, Commutating, Programming Character Generation, Mode/Function Range Setting, Establishing Real-Time Sequence Programs, Programming Process Parameters, Programming Test & Process Limits Simultaneous Multiprogramming, Programming Machine Tools, and Patchboarding. Each class is discussed in some detail and illustrated with circuit block-diagrams. In each case, programming devices (hardware and software) appropriate to the application are recommended. The bulletin begins with brief definitions or discussions of certain fundamentals. The five basic kinds of programming are Function Selection, Value Setting, Mode Determination, Formatting, and Distribution. The six basic types of hardware are Switches, Matrices, Data Modules, Tapes, Cards, and Electronic Memories.

115. ALTEC DIVISION OF LTV LING ALTEC, INC.—A new Sound and Communications Equipment catalog covering industrial sound products is now available. The 16-page, two-color catalog illustrates and provides basic technical information on sound equipment and Altec's exclusive "Acousta-Voicing®" process for theatres, recording studies, convention centers, stadiums, airports, churches, business and industry. Altec telephone products are detailed along with Altecom intercom systems for schools, hospitals and nursing homes.

116. PAMOTOR—A new 12-page, two-color, short-form catalog, listing and describing the company's complete lines of standard and premium grade fans is now available. The fans described in the catalog will satisfy over 90% of all cooling requirements in electrical and electronic equipment, business machines, and similar high-density equipment. Under "Design Characteristics," the catalog discusses the advantages of Pamotor all-metal construction, which makes the fans sturdier, longer-lived, and more reliable than fans made in whole or in part of plastic. They cannot break, warp, or burn, and the metal construction, along with the specially designed "inside-out" motors, helps reduce noise and vibration, electromagnetic field, and operating temperatures. For each of the nineteen standard fans, the catalog presents a list of salient features, specifications, a half-tone illustration, and, usually, performance curves. The fans are grouped under three head-

ings: "General Purpose," which includes both shaded-pole and induction motor types; "Special Purpose" —including 400 Hz designs for airborne operation, designs without venturi housing, and all ball-bearing designs for use in high ambient temperatures; "Premium Grade"— the Pentaflow series, with 5-year warranty. The fans range in size from 3⅛″ square to 6″ in diameter, and provide air delivery as high as 250 cfm and noise levels as low as 18 dB SIL (Speech Interference Level).

117. PHELPS DODGE COMM. CO.—A new catalog fully describing the company's series of rigid transmission line and related products is now available. The 24-page catalog covers rigid transmission line, rigid line components, supporting hardware and custom rigid line assemblies. Also included is performance data, curves and nomographs plus helpful information on rigid line installation.

118. RAYTHEON CO.—High power waveguide junction circulators are described in a new short-form catalog. Sixty-three devices are detailed for applications at UHF and at L, S, C, X, and Ku Band frequencies. Among the compact, light weight devices are isolators and 3 and 4-port circulators. In many cases these junction circulators replace differential phase-shift circulators previously required for high peak and average power levels. Waveguide junction circulators can reliably handle power levels not presently attainable with coaxial designs. In many cases, the size and weight of the Raytheon waveguide type device is only slightly greater than that of coaxial devices.

119. RCA SOLID STATE DIV.—A five-page application note, "General Application Considerations for the RCA-HC1000 Hybrid Linear Power Amplifier", is now available from RCA. Because hybrid power circuits consist of combinations of different types of devices which may be fabricated by different technologies, the effect of a changing environment is not as simple as in the case of discrete devices.

bookreview

Troubleshooting Audio

Troubleshooting Audio Equipment, a new book out of the Sams Company, is a practical guide for those who must be concerned with tracing down troubles in solid state and tube audio circuits.

The author's practical approach to power amplifiers, tone controls, preamps and equalization, distortion and hum should be especially helpful.

The book covers a wide range of equipment, including tape recorders, stereo systems, power supplies, amps, inverters and drivers.

It is available by book number 20525, Howard W. Sams & Company, Inc., 4300 West 62nd Street, Indianapolis, Ind. 46206.

Integrated Circuits

The **RCA COS/MOS Integrated Circuits Manual** has been prepared to provide an understanding of the basic principles involved in the design and application of COS/MOS (Complementary-Symmetry/Metal-Oxide-Semiconductor) devices, monolithic integrated circuits containing p-channel and n-channel MOS transistors.

The Manual includes a brief introduction to device physics as well as descriptions of construction, theory of operation, and important ratings and parameters for each type of device. Specific design criteria and procedures are presented for applications involving counters and registers, astable and monostable oscillators, adders, linear biasing for COS/MOS inverters, and low-voltage crystal oscillators. Consideration is given to noise immunity, power-supply considerations, and the interfacing of COS/MOS devices with other logic forms.

Although this Manual is intended primarily for circuit and system designers working with solid-state circuits, it will also be useful to educators, students, radio amateurs, hobbyists, and others interested in the use of semiconductor devices and circuits.

The Manual is available through RCA, Solid State Division, Somerville, N.J. 08876.

Digital Computers

Understanding Digital Computers is an introductory guide for everyone who wants an understanding of digital computers and their operation without trudging through an excess of technical detail. It is intended to bridge the gap between college level textbooks and the over-simplified treatments of computers in print.

Digital computers are discussed in terms of similar, and simple, building blocks that make up the system. The function of these building blocks is stressed, rather than their actual electronic construction.

The reader is first introduced to computers from the viewpoint that they are machines that do arithmetic. He is then shown how electronic circuitry is designed to do arithmetic, and how these arithmetic circuits are eventually combined, with suitable control circuits, to produce a computer. Programming, binary numbers, logical design and other vital aspects are fully covered.

This book is available through Hayden Book Company, Inc., New York, N.Y.

Scopes And Transistors

The usefulness of the scope in troubleshooting and analyzing vacuum-tube circuits is well known; **Using Scopes in Transistor Circuits** demonstrates that it can be equally effective in the study of transistor circuits. The author, Robert G. Middleton, uses diagrams and waveforms to illustrate clearly the theoretical and practical discussions in the text. Topics included are: rise time, square-wave response, boost circuits, waveform analysis, signal tracing, limiting, clipping, wave-shaping, tuned and untuned transformers, black-and-white TV, color TV, computers, machine logic, and many others.

For intelligent use of the scope a good understanding of transistor action is necessary. Therefore, circuits are explained wherever they have a direct bearing on waveform analysis. The reader is assumed to be familiar with the operation of service scopes; this allows the book to be devoted entirely to the transistor circuits themselves.

The text treatment presents a combination of the practical and the theoretical that will make the book valuable alike to the practicing electronic technician or to the serious minded student.

This book is available through Howard W. Sams Co. 4300 W 62nd Street, Indianapolis, Ind. 46206.

"NOW WE'LL TRY TO STOP THAT NASTY ROLL ON THE MONITOR."

SECA Open Mike

Convention Panelists Ask For Emergency Planning

Earlier this year we all had a chance to see how many holes there are in our national emergency warning system. The dust still hasn't settled on that one.

Definite progress has been made by stations using weather audio feeds to alert a city of impending severe weather conditions. That's encouraging.

Trouble is, we find a real gap in the emergency communications plans for operations after a disaster strikes. That was apparent after Camille hit the Gulf Coast. For nearly a day after the storm hit, there were virtually no communications in Biloxi.

You had to see the Gulf Coast to understand what that meant. It wasn't like having no power . . . or no gas. It was quite like what we might expect to see after an attack upon the coast. And no communications.

Speaking on a panel for emergency broadcasting at the Southeastern Educational Communications Association in New Orleans, Ray Butterfield (WLOX-TV-AM) described a unique plan. He suggested a government airplane, outfitted with AM equipment capable of transmitting on the frequency of a local station. The plane would be on call to originate and coordinate communications until the local station(s) were back on the air. This same kind of aircraft would be available in case there were ever a major disaster after an attack. What have we now?

It couldn't happen to this radio station, but obviously, it did.

Speaking on the same panel, which was arranged by Dr. David E. Platts of Florida State University, were representatives of WDSU-TV and **Broadcast Engineering magazine.** They covered station facility planning for emergency operations.

Some of the major points brought out were that the staff needs to plan the facility from the ground up for emergency communications. A good place to start is

to get the high water records for the location of the new site. While building the station, the staff should: (1) plan for alternate power lines, (2) vent the generator fuel supply well above expected high water levels, (3) vent the building to compensate for the great difference of inside-outside pressure during a storm, (4) put a sump pump in the generator room, (5) plan so that if the city water system is out the generator cooling system will still function, and (6) be prepared to hang a temporary antenna and know how to load it up.

Nothing could stop this kind of damage. But the station, staff, and signal can be saved, making it possible to save other lives.

All panel members called for further study and action by the SECA, NAEB, NAB, NAFMB, IEEE, NCTA, and other groups who are in a position to air the problem and add something to resolving it.

"Selling The Pentagon" Letters Hit Commission

A total of 3,010 complaints from the public were received by the FCC during the month of March, an increase of 1,188 over the month of February. Other comments and inquiries totaled 5,087, an increase of 3,463 over the previous month. The combined total of complaints, comments and inquiries was 8,124, the highest in FCC history, compared to the previous record of 6,740 in November, 1969.

Spotlight On Selling The Pentagon

Letters concerning the program "The Selling of the Pentagon," the Commission's Public Notice of March 5, 1971 on "Licensee Responsibility to Review Recordings Before Their Broadcast," the announced cancellation of the Lawrence Welk program and other well-known network programs, and complaints alleging cruelty to animals during the broadcast of rodeos accounted for the heaviest increase in complaints.

Most letters regarding "The Selling of the Pentagon" alleged misrepresentation or distortion of the news, although some defended the program. The majority of letters about the public notice on song lyrics were concerned with possible censorship, although some applauded the Commission. All letters concerning future network program cancellation were critical.

Rules Approved For Low Power ITFS Relay

New rules to permit the use of simple low power relay stations (translators or boosters) to relay the signals of an Instructional Television Fixed Service (ITFS) station to receiving locations shielded from direct reception by intervening obstructions, have been adopted by the FCC (Docket 18940). The action amends Part 74, Subpart I of the Rules.

Under the new rules, ITFS licensees will be able to use either translators or boosters to meet their needs. Translators retransmit the originating station's signal on a different frequency; boosters are repeating devises that amplify and retransmit a signal on the originating station's channel.

The changes were proposed in a rule making notice adopted August 5, 1970 (FCC 70-858). Comments were received from the Secretary of Education, Commonwealth of Pennsylvania; Joint Council on Educational Telecommunications; National Association of Educational Broadcasters; Micro-Ling Varian Associates; Jerrold Electronics Corporation; and the Chairman, Southeastern Wisconsin Committee for the Full Utilization of ITFS.

Among the changes adopted by the Commission are provisions that equipment with an output of 50 milliwatts or less need not be equipped with automatic gain circuitry but should be designed so that the authorized output power of the transmitter cannot increase more than 3 dB if the input signal is increased; that the isolation between the input and output circuits of the booster, including the receiving and transmitting antenna systems, shall be at least 20 dB greater than the maximum overall gain of the booster amplifier; the unit must turn off automatically when the last channel leaves the air. FCC Form 330P was modified to handle the authorization of the low power relay stations in the same manner as the response stations for the service; and a "Section VII" was added to the form to list the site of the low power relay station with the necessary associated information.

The new rules become effective June 22, 1971.

Renew Your Subscription By Sending In Our Reader Service Card

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ENGINEER'S EXCHANGE

Delayed Dropout EAN Unit

If you have never had trouble with your EANS receiver, consider yourself one of the fortunate few. FCC Regulations state that this is the one item of equipment which **must** be operable anytime the station is on the air with no provision for 'out of service' conditions. I have found that it is just about impossible to design a 'universal' receiver which will serve in all situations. Therefore, I set about designing a universal control adapter which could be used with any receiver, AM or FM (or TV for that matter), which could be quickly shifted from one receiver to another in case of failure. This philosophy also required the control unit to have long service life.

Figure 1 shows the result. The 'carrier-break' system was discarded as it is prone to trip on short interruptions due to AC line blips. In a high noise area it often is almost impossible to set the sensitivity to differentiate between the noise and a true RF signal. It also is hard to design into a universal adapter as it requires several connections to the receiver circuit. A simple form of audio-failure-alarm with a delayed drop out is used in our adapter. Relay K is a sensitive plate circuit type designed to operate at 50 milliwatts.

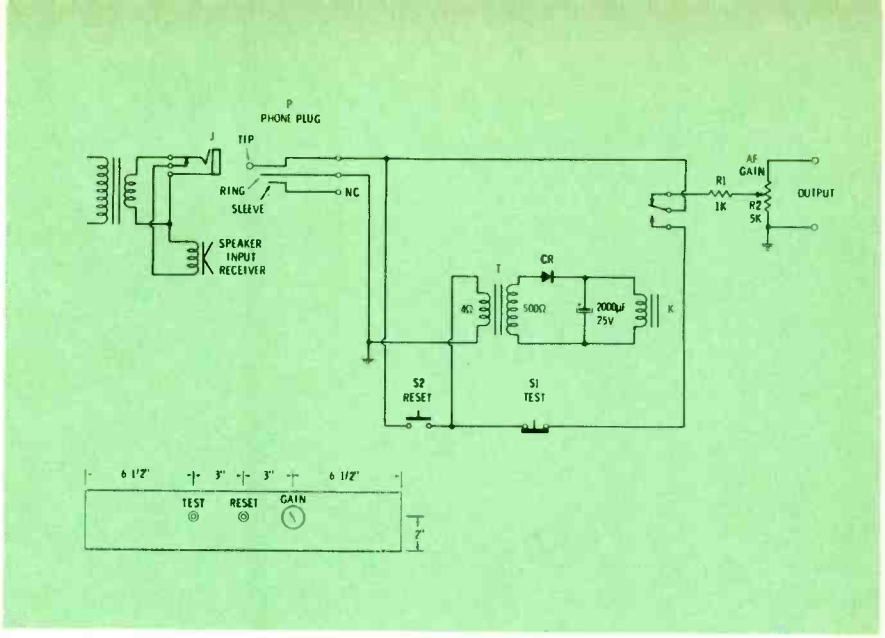
In operation, the receiver is tuned to the desired station and the receiver volume control advanced to a point where K will pull in about five seconds after S2 (RESET) is pushed and held down. This delay is caused by the charging time of the 2000 μf capacitor. A quick test of the system may then be made by depressing and holding S1 (TEST). After 10 to 12 seconds, the relay should drop out and allow the audio to feed to the output. In our station, this output circuit is fed to our cueing amplifier in the control room at a point after the normal gain control. R2 adjusts the input to the amplifier to insure a signal loud enough to be audible anywhere near the control room when the receiver trips.

You will note that a 3-circuit or stereo phone plug is used. This allows us to use the unit with our regular AM EANS receiver or with our Heathkit AM-FM relay receiver in the control rack (which has a stereo output jack) without shorting one output channel.

As shown, the unit can be used with any receiver that has a 4-16 ohm output by adding a closed circuit jack as shown. The 1000 ohm resistor R1, prevents shorting the output of the receiver or dropping the AC voltage level to too

low a value when the AF GAIN control is turned way down for a strong audio signal.

Don't forget to shield the leads running in and out of this unit, not only from everything else but also to each other. You would be amazed at the amount of crosstalk you can get from speaker level signals into the cue amp input. Also, do not attempt to connect this unit to an AC-DC type receiver unless the ground is removed from the secondary of the receiver's output



transformer . . . it could result in blue-and-white flashes all over the place.

Our control unit is mounted on a 3½ inch rack panel which also serves as a reel spacer for our Magnacord 1024 recorder. It can, however, be mounted on a 1¾ inch panel or in a box by the console.

Fred Chapman, CE
Station WMCF
Stuart, Florida

KARB Award To Cobb

Grover C. Cobb, executive vice president for station relations of the National Association of Broadcasters, has been named "Broadcaster of the Year" by the Kansas Association of Radio Broadcasters.

He was honored at the KARB annual convention in Wichita, May 21-22.

NEW PRODUCTS

(Use circle number on reader service card for further information)

Solid State Antenna Preamps

The **Acrodyne** TP series of preamplifiers, deliverable from stock, covers single or multiple frequencies in the 40 MHz and 900 MHz range. Although primarily aimed at the television broadcast industry, other applications cover a great many commercial and industrial uses where signal amplification is needed at the receive antenna, prior to processing.

The TP series preamplifiers include pole-mounting hardware, are impervious to the weather, and are cable-powered from the regulated DC power supply provided with each unit.

The outstanding characteristic of these preamplifiers is their noise figure: about 2.5 dB from 40 MHz, to 25 MHz, and typically 3.5 dB from there to 900 MHz.

In small quantities, the price varies from $250 to $300, depending on the frequency or band of frequencies to be covered. The Acrodyne TP series preamplifiers are guaranteed for three years.

Circle Number 65 on Reader Reply Card

6 GHz Antennas

Andrew Corporation has completed development of the 6 GHz dual polarized line of Ultra High Performance (UHK series) microwave antennas. UHX antennas are specifically designed to meet the critical sidelobe requirements imposed by increased crowding of the frequency spectrum.

The manufacture says the front-to-back ratio for 8, 10, and 12-foot diameter 6 GHz types is 75 dB at 180 degrees ± 80 degrees. The improved radiation patterns are achieved without underilluminating and are the result of the new "shaped pattern feed" (U.S. patent

(Continued on page 76)

(Continued from page 75)

3553707, U.K. patent 1199226, and pending in Canada, Australia, and West Germany).

Mid band gain is 41.3 dBi for the 8-ft., 43.2 dBi for the 10-ft., and 44.8 dBi for the 12-ft. antennas, all guaranteed ± 0.2 dBi; maximum VSWR is 1.06.

UHX antennas are similar in mechanical configuration to the high performance line except standard pipe mounts are used. "A" frame mounts are optional.

Circle Number 66 on Reader Reply Card

PC-70 Modified

Current **Philips** models of the widely used PC-70, now designated the PC-70S-2, have new update features that included automatic centering and variable matrixing. Automatic centering is a technique Philips engineers, working with the BBC on circuits designed by the BBC, have developed for adaptation to any current or earlier PC-70 camera. The modification maintains precise registration throughout remote color TV pickups where changing temperatures tend to throw registration off.

Variable matrixing is a means of allowing video operators to "paint" pictures to suit special situations, as in commercials where special color effects are sometimes desired. This update feature is also available for any model of the Norelco PC-70 camera.

Circle Number 67 on Reader Reply Card

Vidicon Camera Zoom Lens

Two new manual zoom lenses for institutional/industrial television are available from **Canon U.S.A., Inc.**

Designed for use on ⅔" vidicon cameras, Canon J4X12 and Canon J5X15 manual zoom lenses achieve the maximum in brightness: a speed of f1.8 within entire 12.4mm-50mm zooming range for J4X12; a speed of f2.1 within entire 15mm-75mm zooming range for J5X15.

Both lenses assure constant focus and high resolving power through entire focal length. Color correction is also achieved by patented "spectra" coating with amber and magenta colors. Moreover, distortion is minimized and quality of marginal light beam greatly improved.

Suggested retail price $160. for Canon J4X12; $195. for Canon J5X15.

Circle Number 68 on Reader Reply Card

Akai Electric has introduced two solid state stereo tape decks that use an Akai innovation: a GX (glass and crystal ferrite) head.

The manufacturer says this new head is guaranteed for a service life of 150,000 hours. Under heavy, daily usage, this means the new head should outlast the deck itself.

The head core is made of crystal ferrite and the inner circumference of the head shield is mounted and set in glass. The manufacturer claims that this lowers wear and abrasion, and keeps the head dust free while maintaining sound quality . . . even when subjected to high temperatures and dense humidity.

One deck, the GX-280D is a four-track 2-channel mono/stereo system that will take 7-inch reels. Wow and flutter is less than 0.08% RMS at 7½ ips and 0.12% RMS at 3¾ ips. Signal to noise ratio is better than 50 dB, and the manufacturer says the cross-talk is better than 70 dB monaural, 50 dB stereo.

The unit uses a three-head system which allows simultaneous monitoring, and three motors (one for servo control of direct capstan drive and two for eddy current outer rotor motors for supply and takeup reel drive.

Circuitry includes 34 transistors, 18 diodes, and 2 IC's.

Circle Number 69 on Reader Reply Card

Wire Ties, Cable Clamps

Grayhill, Inc., La Grange, Illinois, has available a complete line of cable and wire ties and clamps. The

cable and wire ties are available in the permanent installation strap-type which provides secure one-time installation, or the beaded chain wire tie which can be refastened to allow repair of wires in a bundle or the addition of wires to a bundle.

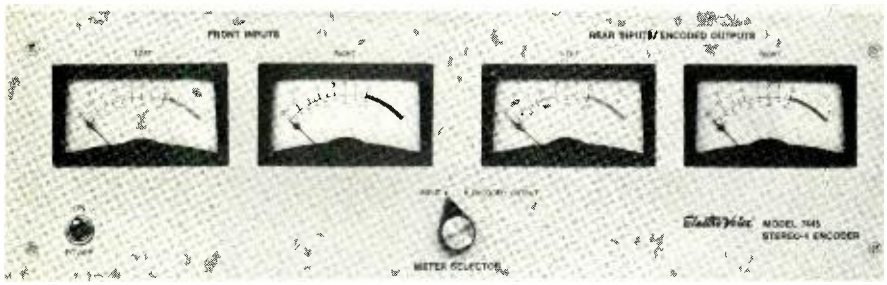
This complete line of cable or wire ties offers a choice of materials, colors, and lengths to accommodate bundles up to 4″ in diameter. The cable clamps are available in two thicknesses, two screw hole sizes, and several materials. The cable clamps can accommodate diameters as small as ⅛″ or as large as 1½″.

Circle Number 70 on Reader Reply Card

Stereo Encoder

Electro-Voice, Inc., a subsidiary of Gulton Industries, reports that their professional model Encoder, part of the company's "Stereo-4" 4-to-2 channel processing system, is in full production and being marketed direct to studios and stations.

The Encoder, model 7445, is standard 19-inch rack-mounted and takes only 5¼ inches of space. Input and output lines are 600 ohm with zero insertion loss. The Encoder causes virtually no degradation of signal response, distortion, or noise level.



The E-V Stereo-4 system makes possible and practical the manufacture of compatible four-channel records and the broadcasting of four-channel sound by FM stereo stations by encoding any original 4-channel program (from tape, live source, etc.) into a 2-channel signal which contains both two- and four-channel material. Records are then cut and manufactured in the identical way and with the same equipment now in regular use for standard two-channel dics. Broadcasters can be on the air immediately with four-channel stereo information as existing stereo transmission equipment is used. No change in bandwidth or standards is required, and blanket approval has been received from the FCC for the system to be used by any station. Compatible 2/4-channel tape cartridges and cassettes are easier to produce using the Stereo-4 system than separate tracks, and playback equipment is less complicated and not as expensive.

Circle Number 71 on Reader Reply Card

Condenser Studio Mic

The Special Application Products Division of **Superscope, Inc.** has announced the addition of the C-37P to the line of Sony Condenser Studio Microphones.

The C-37P variable-directivity condenser studio microphone is an improved version of the Sony C-37A. Most significant is the incorporation of a new low-noise FET amplifier which provides a dynamic range of 130 dB. Noise level has been reduced by 10 dB (C-37A=34 dB SPL equivalent, C-37P=24 dB SPL equivalent) and the overload point has been increased by 20

(Continued on page 78)

Heavy Duty Pan & Tilt Head

The new **Power-Optics, Inc.,** Type 230 Servo-Driven Pan and Tilt Head is completely weatherized for outdoor or indoor applications. It may be mounted vertically, inverted or on a suitable pedestal. Operating temperature range is –20°C to +40°C. Pan and Tilt speeds are infinitely variable 0° to 40° per second.

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(Continued from page 77)

dB (C-37A=134 dB SPL equivalent, C-37P=154 dB SPL equivalent.)

In addition, the C-37P utilizes standard phantom powering, and may be used with any 48 Volt phantom supply with 2.5 mA or greater capacity.

Frequency response and directional characteristics remain unchanged in the new microphone.

Other features include a built-in shock mount which effectively prevents vibrations from the microphone stand being transmitted to the microphone.

Circle Number 73 on Reader Reply Card

Film Chain Projector

A new **Eastman** television film projector featuring the latest in film chain projector design, such as channel threading, solid-state cueing and solid-state sound reproduction, has been introduced by **Eastman Kodak Company.**

Among the CT-500's convenience features are rapid film transport in forward and reverse modes, reverse projection at 24 frames per second, automatic shut down of the projector at end of film or in case of film breakage, variable lamp voltage control, automatic projection lamp and exciter lamp changers in case of burn-out, lighted push-button control panel, and a Geneva intermittent-type drive providing unexcelled image steadiness.

The automatic shut-down mechanism is activated at the end of the film and in case of a film break. It operates in both forward and reverse operation and at any speed.

The CT-500's separate shutter motor runs continuously, eliminating the need for a separate brightness filter in the still projection mode. In addition, light output and color temperature remain constant whether projecting in the dynamic or still mode.

Circle Number 74 on Reader Reply Card

Pre-fab Studio Scenery

Feller Vacuum Form Studio is now offering pre-fabricated scenery for commercial, non-commercial and cable operations.

Basically, this material is a series of fully scaled, three dimensional scenic units which authentically reproduce such things as wood paneling, library settings, stone walls, bricks, shingles, barn siding, etc. These units fabricated of vacuum formed vinyl are relatively inexpensive. They come ready-to-use.

Actually, all a studio has to do is prop them up, attach them together and start shooting. This efficiency allows local stations to achieve savings in time, money and manpower.

Another unique aspect of these pre-fab sets is that they can be custom designed to meet any specifications. For example, they can be fabricated to show a station's call letters or its logo as the overall design. These customized settings therefore serve as both interesting, graphic type backgrounds and also as excellent identification vehicles for either the station or the program.

Circle Number 75 on Reader Reply Card

Filing Dates Changed On License Renewal Dockets

Time for filing comments and reply comments in two proceedings —formulation of rules and policies relating to the renewal of broadcast licenses (Docket 19153), and formulation of policies relating to the Broadcast renewal applicant (Docket 19154)—have been extended for sixty days by the FCC. The original dates for filing comments and replies were May 3 and June 3, 1971, respectively. Comments are now due by July 2, and replies by August 2, 1971.

The Commission granted the extensions in response to a request from the National Association of Broadcasters (NAB). The inquiry and rule making notices in both proceedings were adopted on February 17, 1971.

ADVERTISERS' INDEX

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Advertising rates in Classified Section are 15¢ per word, each insertion, and must be accompanied by cash to insure publication.

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For ads on which replies are sent to us for forwarding, there is an additional charge of $2.00 to cover department number, etc., which is printed in advertising copy, and processing of replies.

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

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CRYSTAL & MONITOR SERVICE. Frequency change, repair or replacement of oven type broadcast crystals. Also frequency change and recalibration or repair of AM frequency monitors, and H-P FM monitors. Fast service at reasonable prices. 30 years experience! Call or write: Eidson Electronic Co. Box 96, Temple, Tx. 76501. Pho. 817 773-3901. 9-70-12t

B. F. CUSTOM CASSETTE CARTRIDGE DUPLICATION. In cassette duplicating one to four channels. Editing master tape and pulsing for slide films. Storycraft Service Corporation, 18630 Detroit Avenue, Lakewood, Ohio 44107. (216) 221-4722. 1-71-6t

Equipment for Sale

AUDIMAX 111s, Model 445. First offer over $1075! CnB Studios 3415 Beresford Avenue, Belmont, California 94002. 5-71-2t

FOR SALE: 5000 watt Westinghouse transmitter—1949 model—modulators and final 891-R and 892-R tubes, make offer—must see to appreciate. P. O. box 26064 Los Angeles, California. Zip 90026. 5-71-2t

Complete Tape Duplicating System, Convertible 8-track/4-track. 1" Master and Bin with Ten ¼" Slaves. Reliable, Trouble-free Operation. Some Support Equipment Available. Greatly Reduced Price. P. O. Box 65856, Los Angeles, Calif. 90065. Stn. 967 3-71-4t

For Sale—two Gates model SA-39 limiters, excellent condition—$225 each. One Hewlett-Packard model 335 FM frequency modulation monitor — $275. WSOM, Salem, Ohio 44460—Phone 222-1011, area code 216. 4-71-2t

Surplus audio and video patch panels and patch cords, 500 to 500 ohm repeat coils flat to 20,000 cycles. Send for list. Gulf Electro-Sales, Inc., 6325 Beverly Hill, Houston, Texas 77027. 9-70-tf

HELIAX—STYROFLEX, Large stocks — bargain price — tested and certified. Write/call for price and stock list. Sierra-Western Electric, Box 23872, Oakland, Calif. 94623. Tele: (415) 832-3527. 1-71-tf

"New & Used Towers, Buy, Sell or Trade, Erect, Bill Angle, 919-752-3040, Box 55, Greenville, N.C. 27834." 2-71-tf

Six-bay bat-wing T-V antenna, tuned for Channel-10. Dept. 254, Broadcast Engineering, 1014 Wyandotte Street, Kansas City, Missouri 64105. 6-71-1t

Sony, Panasonic cctv monitors, vtr's, cameras, accessories. Demonstrators in fine condition. Write for list. Telaudio, 634 S. Victory, Burbank, California. 6-71-1t

For Sale: Complete IGM Automation with Model 500 Control for 6 channels. Including 3 carousels, 2 channel random select, 2 Scully Model 270-01 reel to reel playback with 22.5 Hz control, 4 McCarta Model 10A cartridge playback units, 1 McCarta Model 382 Time announcer, 1 Model 90A Record Center. Except for one older model carousel, this equipment is less than 2 years old and is in daily use. Write Tom Weir, KXXL Radio, Route #2, Box 42, Bozeman Montana or call 406-587-3188. 6-71-1t

TAPEX CARTRIDGES — High performance. No pressure pads. No brakes. 4 years successful use by selected stations. Eliminate your cartridge problems. New easy labeling. Write today for brochure and price on Tapex Cartridges. Mastertone Company, Dept. BE, 8101 University Blvd., Des Moines, Iowa 50311. 6-71-1t

Good reconditioned and recalibrated to standard accuracy, G. R. and Gates AM frequency monitors; to your frequency at reasonable prices. Monitor tradeins accepted. Eidson Electronic Co. Box 96, Temple Texas, 76501, phone 817-773-3901. 6-71-1t

MICROWAVE EQUIPMENT—3-KTR 1000 Ratheon Microwave Receivers — 6000 MGH range. Also, 6' Andrew Dish with 5' wave guides. For more information contact Twin Village Co., Inc., Milton-Freewater, Oregon 97862—938-3388. 6-71-1t

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New & Used Towers, Buy & Sell, Erect. Have used towers on hand. Contact New England Tower Const. Co., RFD #2, Brandon, Vt. 05733. Phone 802-247-5725. 6-71-1t

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4CX5000R/8170W new, late sealed tubes. Ruggedized 4CX5000A directly interchangeable. Special $389.50. The Ted Dames Co., 308 Hickory Street, Arlington, New Jersey 07032. (201) 998-4246. 6-71-1t

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FOR SALE: The Dallas/Fort Worth Regional Airport Board offers for sale the following equipment:

RCA BTA-50F1 50 KW AM Transmitter. Complete with control console, audio input, monitoring equipment, output and transmission line tuning equipment. Very complete stock of spare parts and tubes (excluding 5671's) for BTA-50F1. Present operating frequency 820 kHz.

RCA BTA-5F 5 KW AM Transmitter. Complete with control console, audio input, monitoring equipment, output and transmission line tuning equipment. Very complete stock of spare parts and tubes for BTA-5F. Present operating frequency 570 kHz. 5,000' $1\frac{5}{8}$" rigid transmission line. 18,000' $\frac{3}{8}$" copper sampling loop transmission line.

Both transmitters have been used by stations WFAA/WBAP in the Dallas/Fort Worth region. The stations are being relocated due to construction work at the new Regional Airport and have caused this equipment to be regarded as surplus. Inquiries regarding this equipment or visits to the site to examine the transmitters may be obtained from the Regional Airport Board and should be directed to Mr. William H. Leder. Proposals will be received by letter through the 20th day of July 1971. The Board will then select the highest proposal and notify all bidders. The proposal should include provisions for the bidders disconnecting the equipment and removal from the premises within 60 days after notification that the equipment is available. It is anticipated that the equipment will be available on or before July 20, 1971. Proposals should be accompanied by a certified cashier's check in 25% of the amount of the bid. Until a proposal is accepted, the Board reserves the right to reject any or all proposals, to waive technicalities or to advertise for new proposals. Dallas/Fort Worth Regional Airport Board, Deputy Executive Director, Engineering, 600 Avenue H East Suite 107, Arlington, Texas 76011. 6-71-1t

Radio Station For Sale

5,000 Watt RADIO STATION, EASTERN ARIZONA. $195,000 . . 29% down. P. O. Box 880, Willcox, Arizona. 3-71-4t

Help Wanted

HELP WANTED: Experienced announcer with first phone, contact Fred Hepner Radio KCNO Alturas, California 916-233-2713. 5-71-2t

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Job Headquarters for all Radio and Television Engineers. Immediate openings exist in 9 western states and elsewhere for qualified engineer and technical personnel. All categories from trainees to experienced transmitter maintenance, chief, assistant chief, live color video maintenance and technical operations. Send us your complete resume now. The AMPS Agency, 3924 Wilshire Blvd., Los Angeles, California 90005. Telephone DU 8-3116. By Broadcasters—For Broadcasters. 11-68-tf

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WANTED, TV studio technicians . . . experience preferred. Union Shop . . . fringe benefits . . . Equal Opportunity Employer . . . Send resume to Engineering Department, WNAC-TV, RKO General Building, Government Center . . . Boston, Mass. 3-71-4t

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TelePrompTer Corporation is selecting personnel for the following positions in both operating CATV systems and new systems beginning construction:

Chief Technician: Minimum of 7 years direct experience in CATV system test, maintenance, operation, layout, head-end work, customer service, management of personnel and vehicles, and construction practices. Radio-telephone license desirable but not necessary.

Construction Manager: Minimum of 5 years experience in CATV system construction, customer service installations, plant rearrangements, strand mapping, pole line engineering, to supervise contractors during new plant construction, provide liason with engineering, coordinating flow of materials, etc.

Maintenance Technician: Minimum of 4 years direct experience in CATV system test, maintenance, operation, head-end work, customer service and service installation.

Join TelePrompTer, the largest and most active CATV operator for the best opportunities!

Send resume to Roger Wilson, TelePrompTer Corporation, 50 West 44th Street, New York, New York, 10036. 6-71-tf

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TelePrompter of Mobile Cable TV is looking for technical personnel with electronics background. Experience preferred in CATV, television stations, or radio. Other experience in the electronic industry will be considered. Mail resume' to Leo O. Levisay, 3257 Moffat Road, Mobile, Alabama 36607 or call 471-6236. 6-71-1t

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Amherst Cablevision, the largest CATV operator in Western New York, has several openings in all categories — chief technician - installers - television studio technicians - 200 mile system. All replies, held in strict confidence, should be sent to the attention of Mr. Charles C. Monde, Amherst Cablevision, 602 Grover Cleveland Highway, Amherst, New York 14226. (716) 837-1120. 6-71-1t

For Sale

"PIEZOELECTRIC" LIGHTERS! No Flint! Lights "Every" Time! $12.50 Now! Regularly $15.00! Don Bush, 639-E, Rosemont, Pasadena, California 91103. 6-71-1t

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IMMEDIATE OPENINGS: Qualify for any of the following positions: RCA CCTV Equipment, monochrome or color. Salesmen — TV Systems Engineers — Project Engineers — Supervisors — Managers — Maintenance Technicians — Video Engineers — to work either New York, Pennsylvania, New Jersey or California area. Write: RCA Rep., P. O Box 268, New Hyde Park, New York 11040. 4-70-tf

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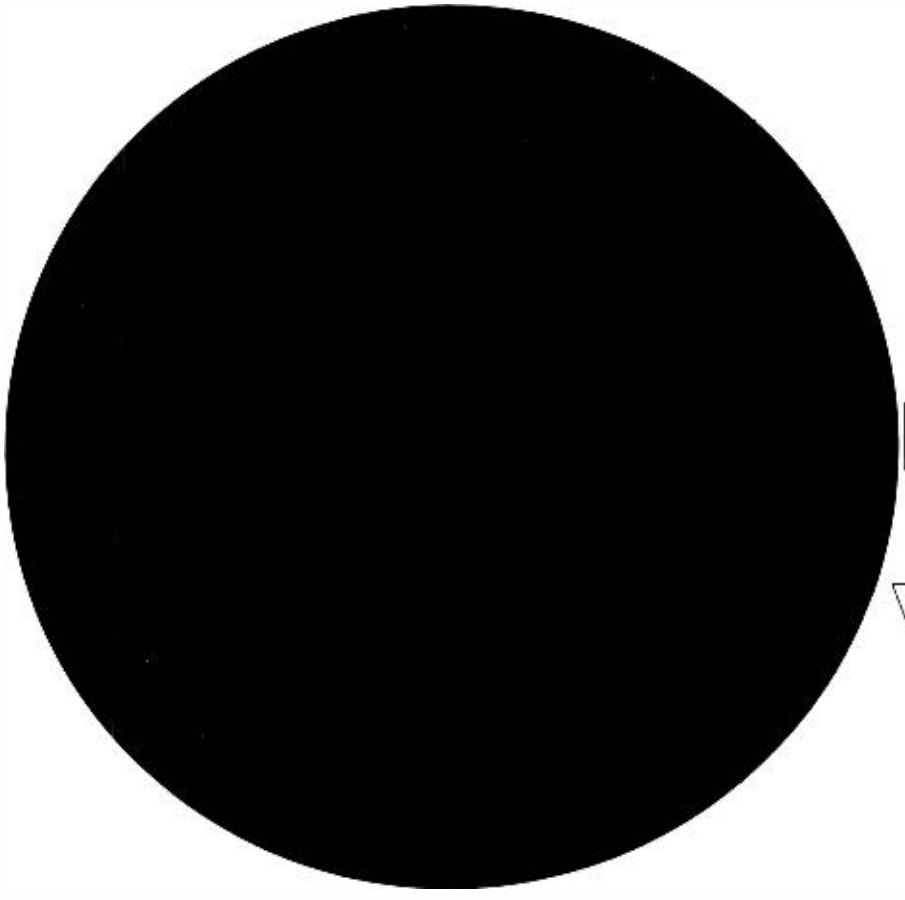

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