

FIG. 1. Live production of "Pete the Pirate" is regularly scheduled for the after-school audience.

# TECHNICAL FACILITIES ARE A TOOL FOR EFFECTIVE PROGRAMMING AT WBAL-TV

by BRENT O. GUNTS, *Vice President and General Manager*

WBAL-TV's diverse programming, aimed at satisfying needs and desires of the Maryland community, places a heavy demand on the technical facilities of Maryland's Broadcast Center. Recognizing in advance the programming needs of an aggressive and progressive television station, construction of Maryland's Broadcast Center proved a challenge to the many engineers and technicians responsible for planning and designing its technical facilities.

From sign-on until sign-off, WBAL-TV is a nerve center of activity—providing our viewers dozens of live and video-taped locally-originated programs each week—running the gamut from eleven daily news

and sports shows to live symphony orchestra programs to seven weekly bowling shows. This requires the highest degree of flexibility and efficiency of design. Award-winning programs such as the "To Promote Good Will" panel show and the nationally recognized "The Dark Corner" are products of Maryland's Broadcast Center's technical proficiency. This kind of programming is a tribute to a plant designed for maximum operational effectiveness.

Technical facilities of WBAL-TV provide highly effective tools for programming. In talented hands these tools shape the programs which are the very life of Maryland's Broadcast Center.



FIG. 2. First programs from new studios are signalled by Brent O. Gunts, at master control.





FIG. 3. Another regularly scheduled live children's offering is "Rhea and Sunshine".



FIG. 4. Live presentation of local news plays an important part in the WBAL-TV program schedule.



FIG. 5. A local commercial, part of the "One O'Clock Show" is produced live.



FIG. 6. Daily "Sparetime Bowling" program originates from WBAL-TV's own bowling alleys installed in specially-equipped studio.





FIG. 7. New studios were constructed at the TV transmitter site.

## Some Advanced Technical Features of The New WBAL-TV Plant

by JOHN T. WILNER, *Director of Engineering, The Hearst Corporation*  
and RALPH MLASKA, *Chief Engineer, WBAL-TV*



FIG. 8. Engineering planning team includes (L to R) John Wilner, Harrison Brooks, Bill Bareham, and Ralph Mlaska.

The basic objective in the new WBAL-TV plant was to provide complete flexibility of technical equipment in a functional arrangement for utmost utility. It was desired to supply all the tools required to produce creative programming, tailored to client preferences.

This basic flexibility is achieved throughout the plant. For example, the studio lighting system was arranged to provide enough lights to eliminate continual relocation and adjustment. Groups of lights are earmarked for specific shows. Also any of three control rooms can be used with any of three studios. Complicated patch panels are eliminated since cameras, film machines, etc., are relay operated. Audio consoles have the ability to control any groups of microphones in any of the studios.

The master control switcher is designed to allow its operator to handle all of the live and film cameras in addition to his regular duties. The use of highly-stabilized TK-60 4½-inch I.O. cameras along with automatic sensitivity control of the TK-21 film cameras has made this possible.

Other specific improvements were achieved in these areas described in detail on the following pages: (1) a centralized master and camera control system, (2) transistorized control room switchers, (3) remote-control sync generator system, (4) delegate tv tape and film control systems, (5) a custom transmitter control center, and (6) studio lighting, maintenance, audio and house monitoring systems.



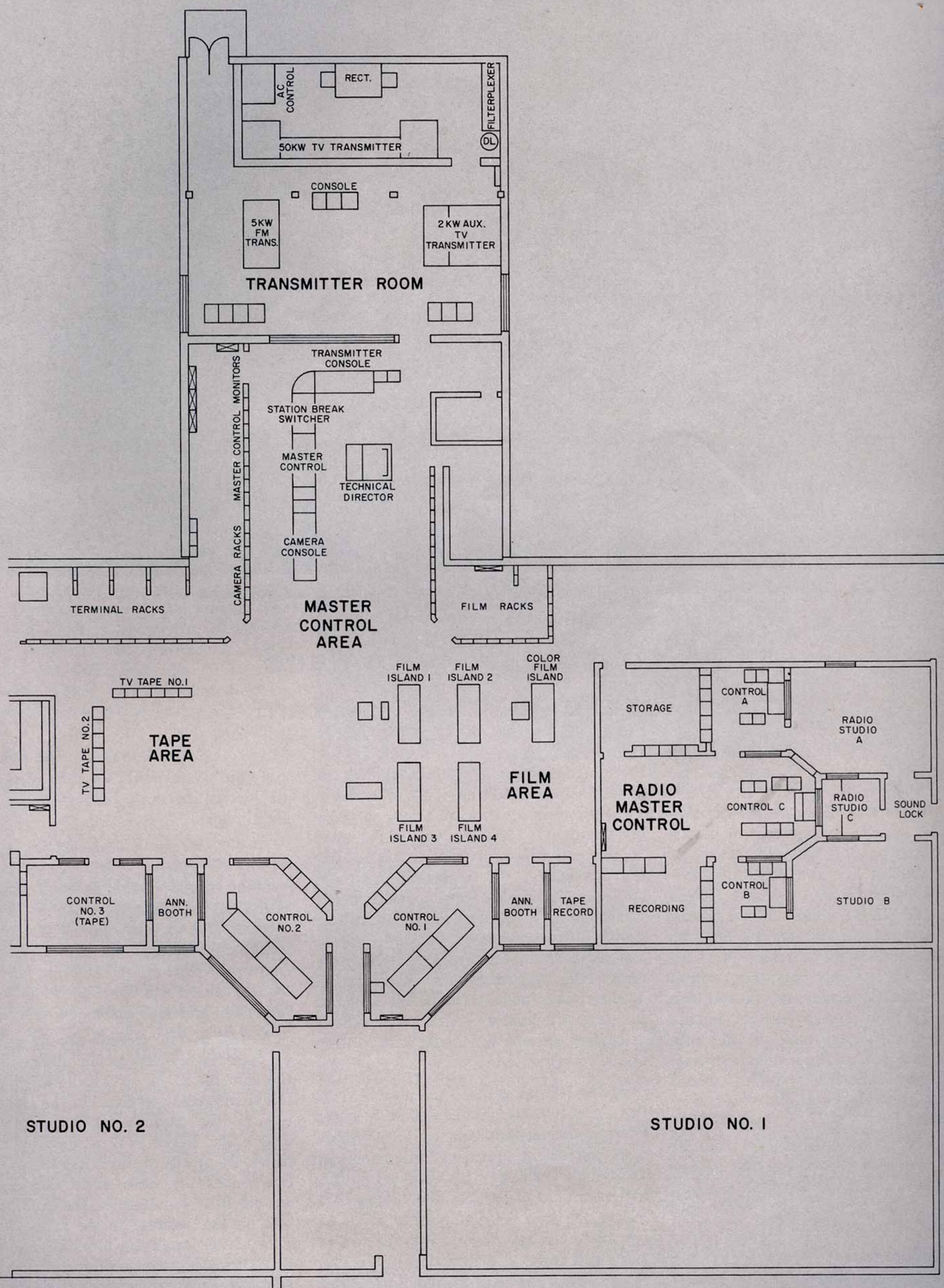


FIG. 9. Partial floor plan showing technical facilities of WBAL-TV.





FIG. 10. Master control with camera control monitor (left), master control board (center), and technical director's position (right).

## Centralized Master and Camera Control System

The master control position is designed so that a single video operator can handle control of live and film cameras in addition to his routine master control duties. This is made possible through the use of highly stabilized live and film cameras—TK-60 4½-inch image orthicon studio cameras and TK-21 vidicon film cameras. Results demonstrate that the TK-60 is so stable that, once aligned, “remote iris” becomes the one and only operating control. Use of automatic sensitivity control with the TK-21 film camera permits remote operation from a small panel having only pedestal and gain controls. Therefore we were able to make live and film camera control an integral part of our master control switcher.

Figure 10 pictures the master control. Camera master monitors and the master control panel are at the left. The elevated platform at the right of the photo is a technical directors position.

### Master Control Board

A closeup of the master control board is shown in Fig. 11. In the very center, along

the horizontal desk position, is the control panel for the TS-40 transistorized switcher. (There are six identical switchers throughout the plant). The lower part of the panel is conventional with special effects, lap dissolve banks, and engineering preview. At the right of the center panel are two vertical rows of buttons for the composite signals. The engineering preview buttons can serve as an emergency switcher or a direct take by pressing the lowest button at the right-hand row. Immediately above the composite buttons is the master control delegation system which can control any one of four lines.

At the left upper part of the panel is a feature we consider an innovation. In order to keep the physical size of the switcher to a convenient operating dimension, an additional switcher is assigned. This switcher allows selection of (1) any five test signals into the first vertical row, (2) any two of six live cameras into the second and third rows, (3) any two of six film islands into the fourth and fifth rows, (4) any two of four video tape machines

into the sixth and seventh rows, and (5) either network or remote into the eighth row.

On the extreme left—occupying a space of only 12½ inches wide by 19 inches high—is the camera control position with provision for handling as many as six live cameras and six film cameras. On the extreme right side of the panel is remote control for starting and stopping and controlling all of the film projectors, slide projectors and tape machines.

At left of the vertical sloping panel is an intercom system which allows any of the cameras to be switched into five different intercom circuits. To the right and top are the controls for audio cartridge tape units. Below is a monitor indicating panel. By means of this panel the operator can control the video signal that appears on the floor monitors in the studios and also his line monitor in the racks. To the right of this panel is a film delegation system with which the operator can select any two film islands. Indications from the other control rooms of film islands in use are also



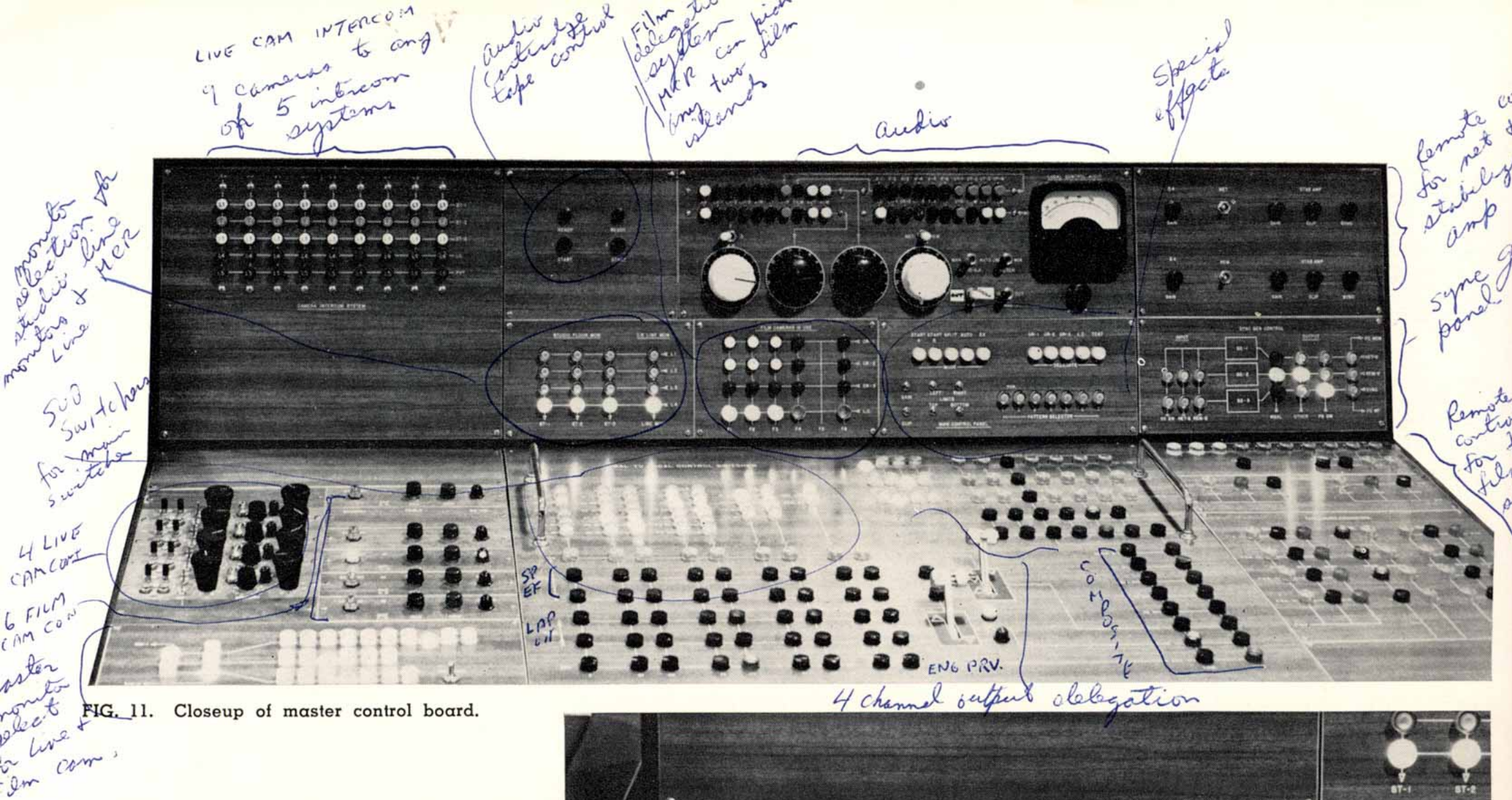


FIG. 11. Closeup of master control board.

included here. A special effects control panel is installed in the next right position. Next right is the sync generator indicator panel. Here the operator can select any one of three sync generators and genlock any two. Immediately above this panel is the stabilizing amplifier and remote gain control for network and remote. The remaining panel in the center of sloping section is another innovation—an audio control panel, which gives the operator the facility of either selecting a manual or completely automatic operation.

### Live and Film Camera Control

Figure 12 shows a closeup of live and film camera remote control panels. Figure 13 shows their arrangement in functional diagram form. Four TK-60 camera controls—iris, pedestal and contrast—are mounted at left in the photo. Any one of the four live cameras can be switched to either of the two monitors for critical viewing. Automatic sensitivity control permits video film chains to be treated in essentially the same manner. Only gain and pedestal controls are brought out for each film chain. Each of the film chains can also be critically monitored. Also available to the same monitors are the outputs of all studios, local control, network, remote and demodulation of the transmitter. The entire camera control unit at the master control position occupies a very small space, approximately 12½ inches wide and 19 inches deep.

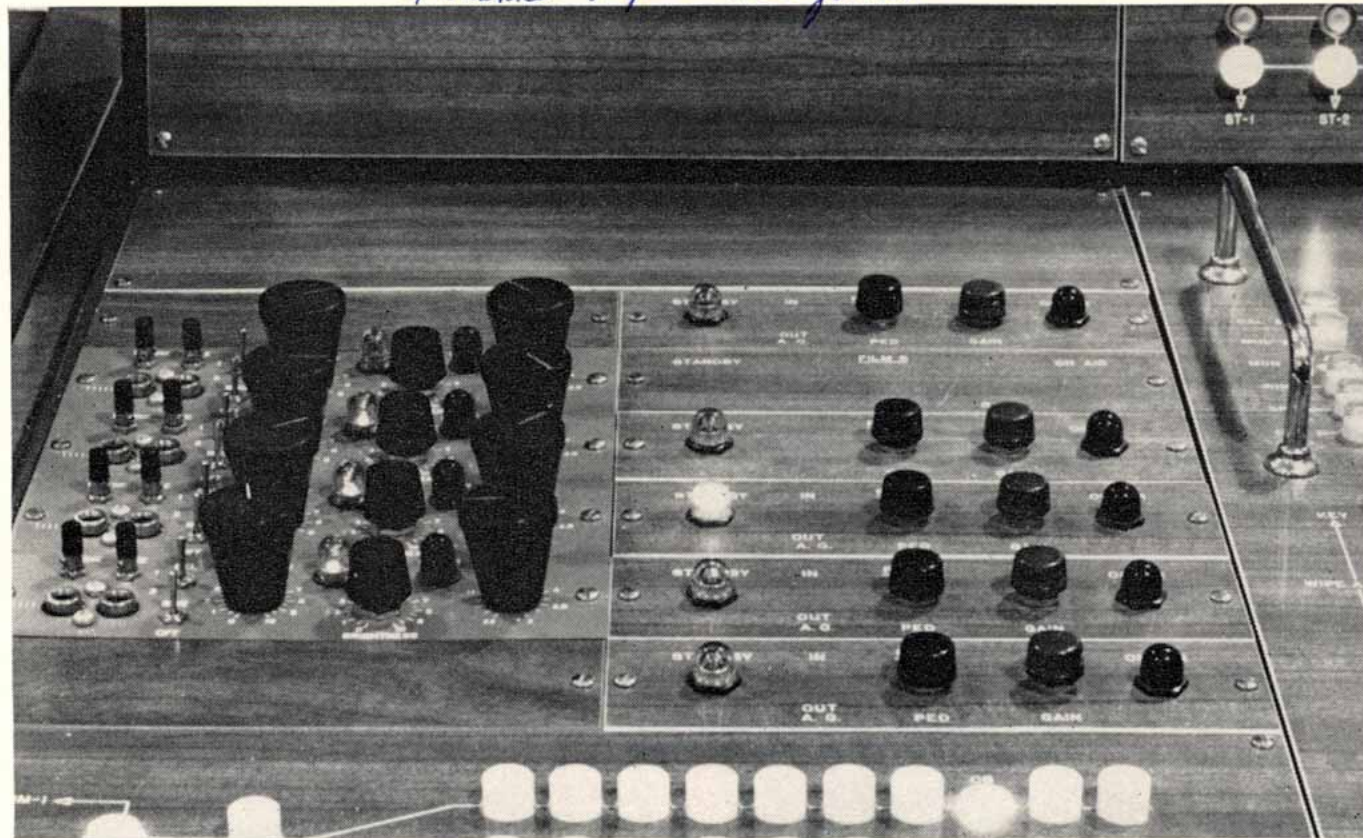


FIG. 12. Live and film camera controls as installed at the master control position.

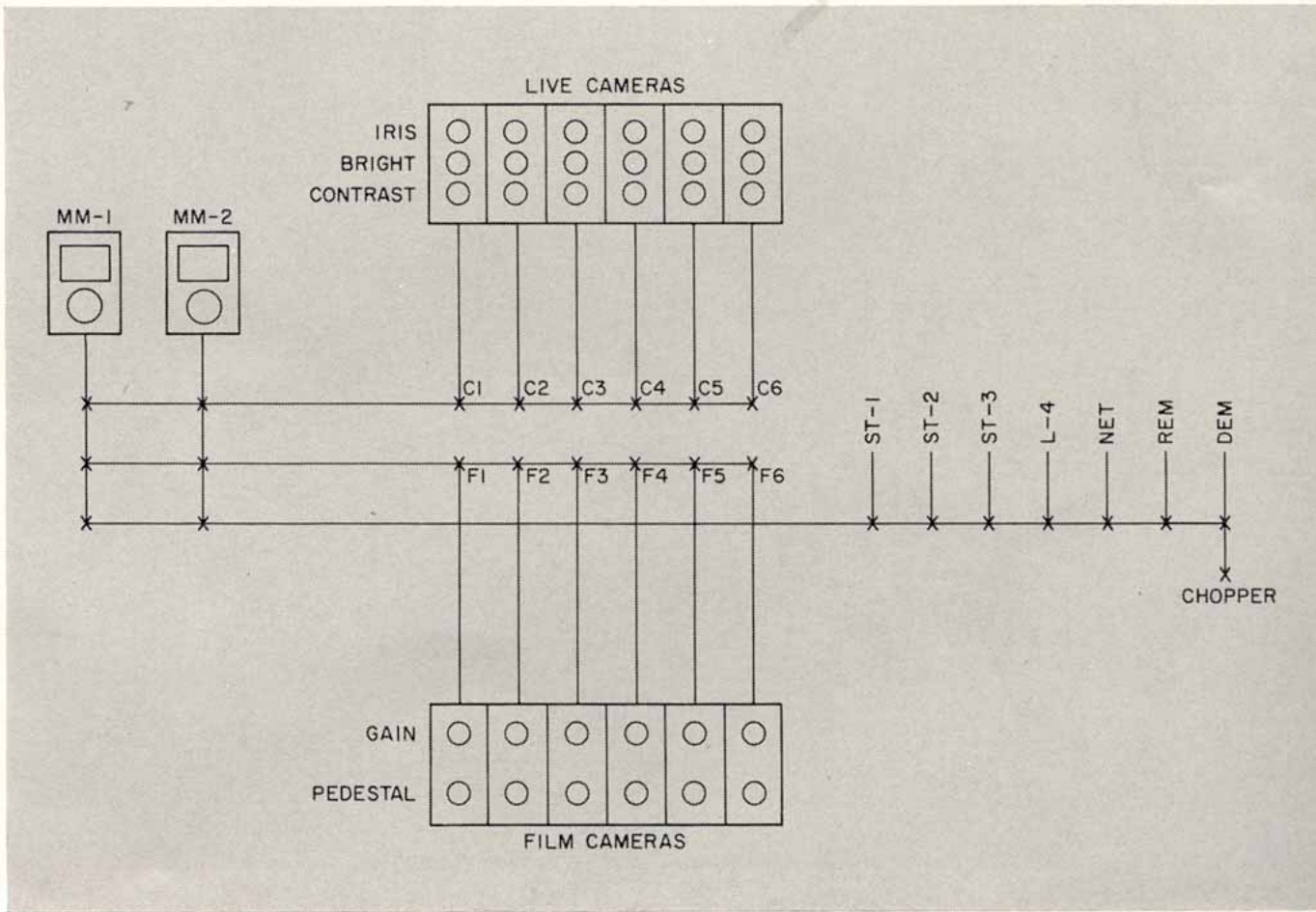
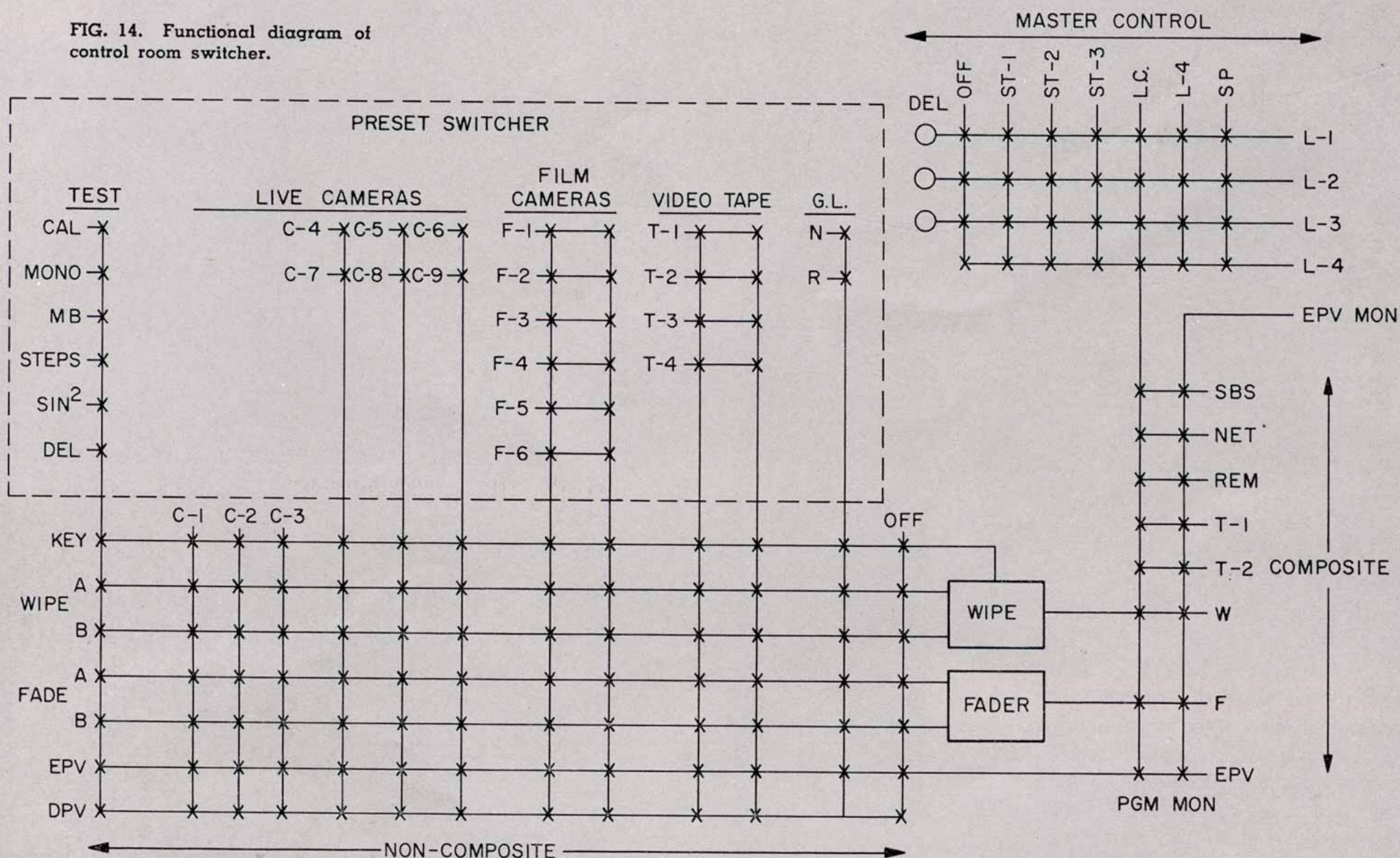


FIG. 13. Functional diagram of remote control for live and film cameras.



FIG. 14. Functional diagram of control room switcher.



## Transistorized Control Room Switchers



FIG. 15. Control room for Studio One. The control for Studio Two is identical in every respect.

The heart of the switching system is TS-40 transistorized equipment. The very first system was installed at WTAE in Pittsburgh, one of the Hearst group of stations. Because of the excellent results obtained with this switching system, it was also incorporated in the WBAL-TV plant. However, several important rearrangements were made. The switching system was divided into completely separate switchers, so that a failure in one switcher would not affect any of the others. Switchers for Control Room 1 and 2 are identical, Control Room 3 and Master Control Switchers have only two live camera inputs. Otherwise all the switchers are the same.

There is a separate switcher for master control, each of the control rooms, and special effects. In order to keep the size of the control switchers to a reasonable length, preset sub-switchers are installed. These allow the operator to select in advance which of the live cameras, the film cameras, and tape machines will be used for any given program. Thus, one control room can



operate any of three studios, or the three studios can be used for one program with complete integration. A test input to the switcher is also provided. These permanent test signals make possible a complete video check of the entire system.

Four output lines are available so that a rehearsal, a taping session, a network feed, and a local feed to the transmitter can take place simultaneously. Number 4 output line is always delegated to the local transmitter, whereas the other three lines are delegated from the master control position for use by any of the three studios.

In addition to the video switching, all of the controls for the film chains and video tape recorders are also located at this control position. See the functional diagram, Fig. 14. Other functions that can be initiated from the control panels are selection of studio floor and control room line monitors, delegation of film island to any of the four operating consoles, operation of any of the slide projectors, rear screen projectors or telop, and remote control of the studio lighting dimming panel.

## Sync Distribution System

Complete flexibility in sync distribution is achieved by installing two sync generators in a custom designed system. Input to the sync generators is remotely controlled. Inputs include stripped sync from both the network and remote as well as 60-cycle reference. The output drives from each sync generator feed into a sync generator switcher which in turn has three outputs. One output is the test position. This allows either of the sync generators to be displayed on both a waveform monitor and a pulse cross monitor in any combination of drives. See Fig. 16. Here we can also display stripped network video and the stripped remote video. Thus, for genlocking we can punch up, let us say, the stripped network video along with the sync of the sync generator we are trying to genlock. If the picture holds solid on the pulse cross monitor, we know that the system has been genlocked. The waveform monitor allows us to critically examine each drive, both in width and in amplitude.

The other two outputs of the sync generator switcher feed two separate and complete sync distribution channels. As shown in the functional diagram, Fig. 17, one sync distribution channel feeds a series of distribution amplifiers with undelayed drives as well as a second series of distribution amplifiers with a set of delayed drives. Each of the individual drives feed into a single 2 by 1 switcher DA. This enables switching the four drives from Sync Generator No. 1 to Sync Generator No. 2 for every live camera in the station—or film chain, control room, special effects, and others. In case of failure in the system, any equipment can be operated on either sync generator at the touch of a switch.

FIG. 16. Sync generator selector panel with associated picture and waveform monitor. ▶

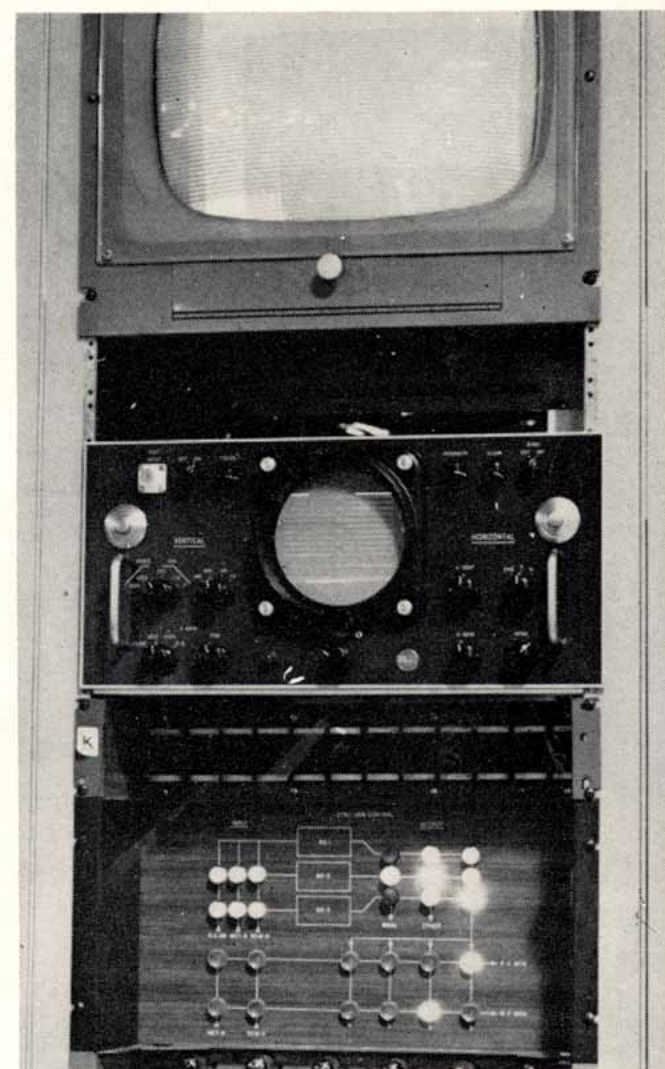
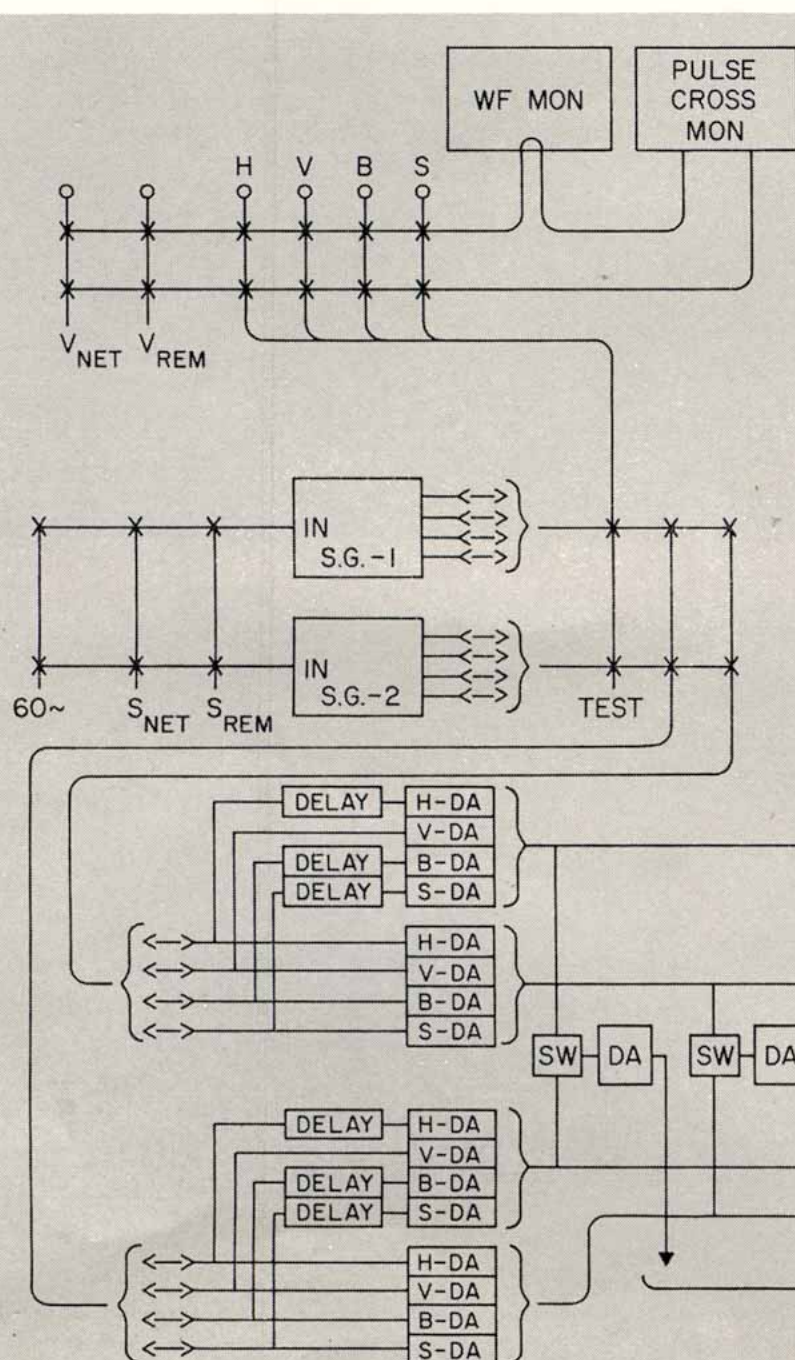
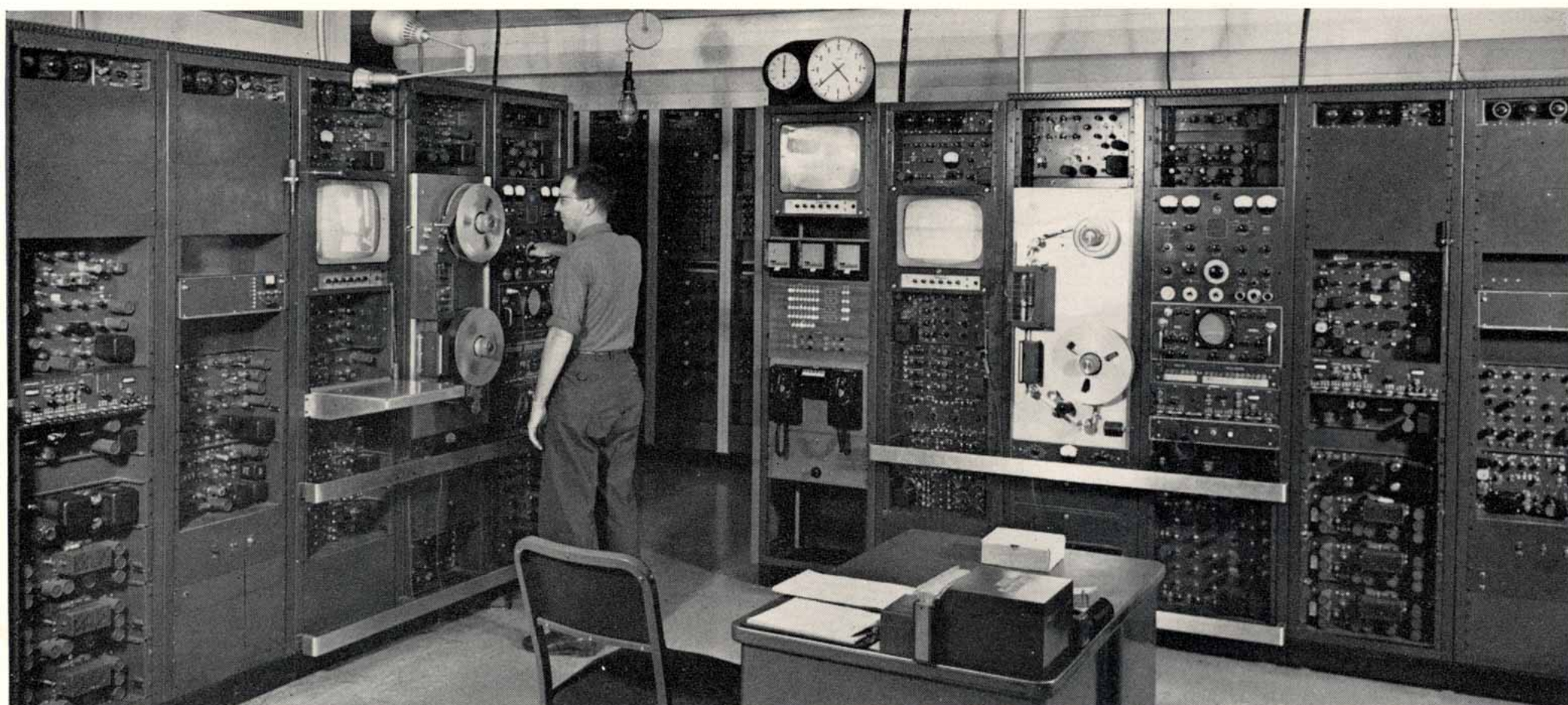


FIG. 17. Functional diagram of the sync distribution system.



# Delegate TV Tape and Film Control Systems



## Tape System

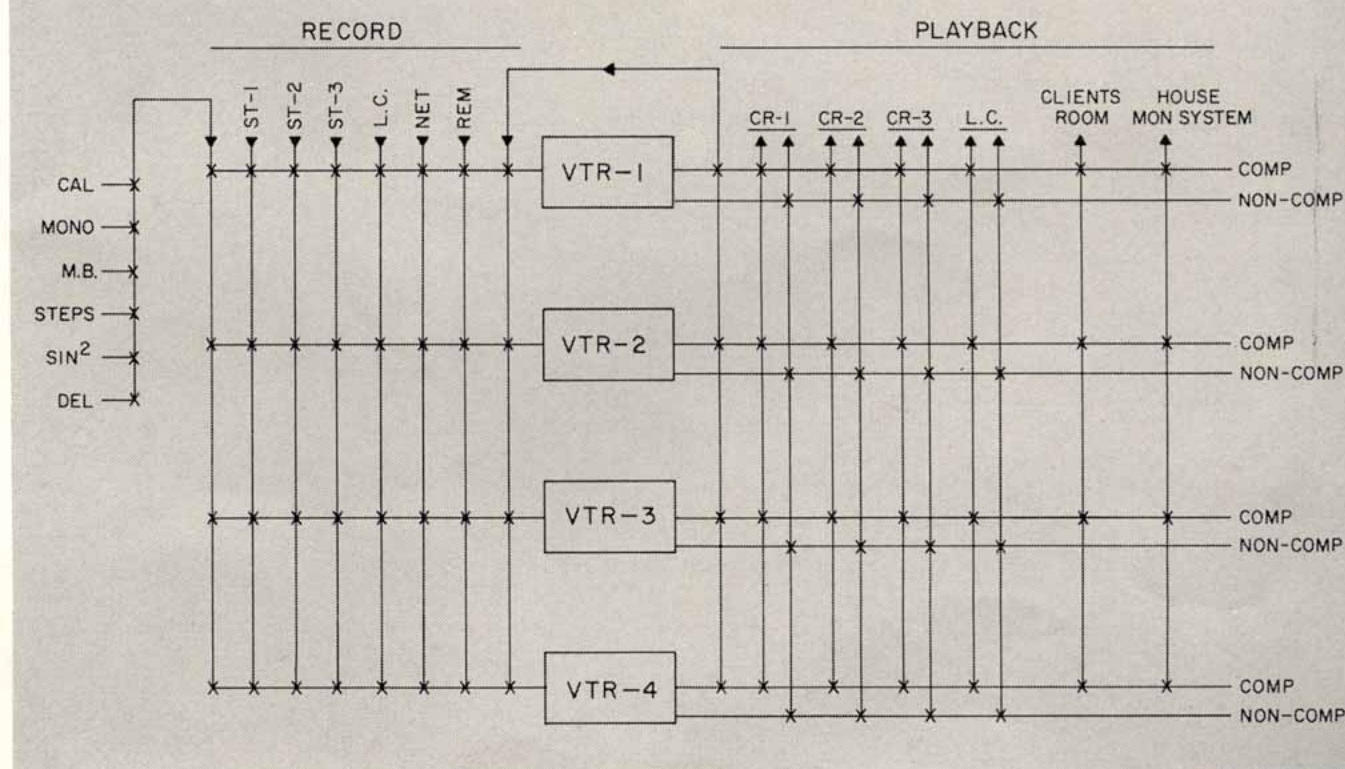
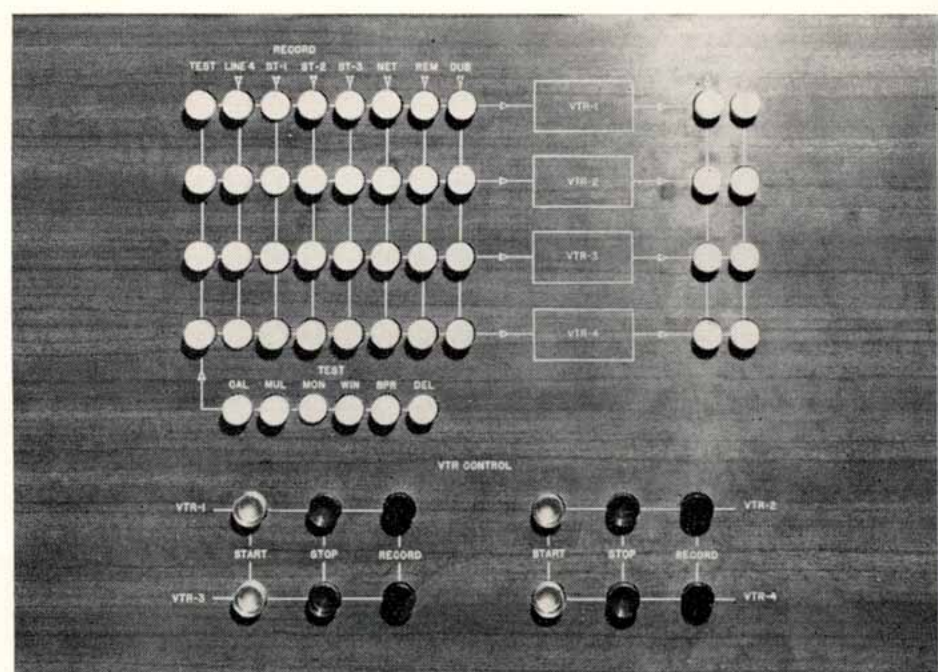
WBAL-TV had formerly installed serial Nos. 2 and 4 of the original TRT-1A tv tape equipment. These machines have been upgraded with a number of modifications—including Pix-lock, half-speed recording, and air bearing headwheels. It is planned to eventually convert them to handle color. Since the tape machines were installed in the old building as an afterthought, each time a tape recording session was held the entire system was thrown into confusion. In the new plant, a video tape switcher and control center was installed in a rack adjacent to the tape machines. From this center it is possible to record and dub without tying up any of the control rooms. However, it is also possible to control the tape machines from each of the four control locations.

Figure 20 is a functional diagram of the video tape system. The present system is comprised of two tape recorders, but it has been designed to handle an ultimate capacity of four. Inputs to the crossbar switcher include a Test Switcher, Studio 1, 2 and 3 inputs, Local Control, Network, Remote and Dubbing. Playback outputs include the dubbing output of each recorder, Control Rooms, Local Control, Clients' Room and House Monitoring System. Note that we have two outputs in the tape machines. One is a composite output and the other is a non-composite output. This permits the tapes to be used as a non-composite input.

FIG. 18. TV tape area includes two fully-modified TRT series TV Tape Recorders.

FIG. 19. Local control panel for TV tape system is designed to accommodate two more recorders.

FIG. 20. Functional diagram of the TV tape system.





## Film System

Present film facilities include three film islands for monochrome and one island for color. However, provision has been made to install and handle two additional film islands (monochrome or color).

The functional diagram, Fig. 21 shows the control system which will ultimately incorporate as many as six film chains along with their associated multiplexers, and film and slide projectors. At left in the diagram is the "film-in-use" panel located in each of the control rooms, at Local Control, and in the Film Area racks. Similarly a remote control panel, see Fig. 22, is also located in each of these areas.

A series of "film brains" funnel the proper information from the control panels to the film islands where the proper film projectors can be started, stopped, and showed; the proper slides changed; proper power turned on; and proper audio selected. All control circuits are of momentary-contact, normally-open type, so that any number of control panels can be paralleled (including a future station-break switcher).

FIG. 21. Functional diagram of the film control system.

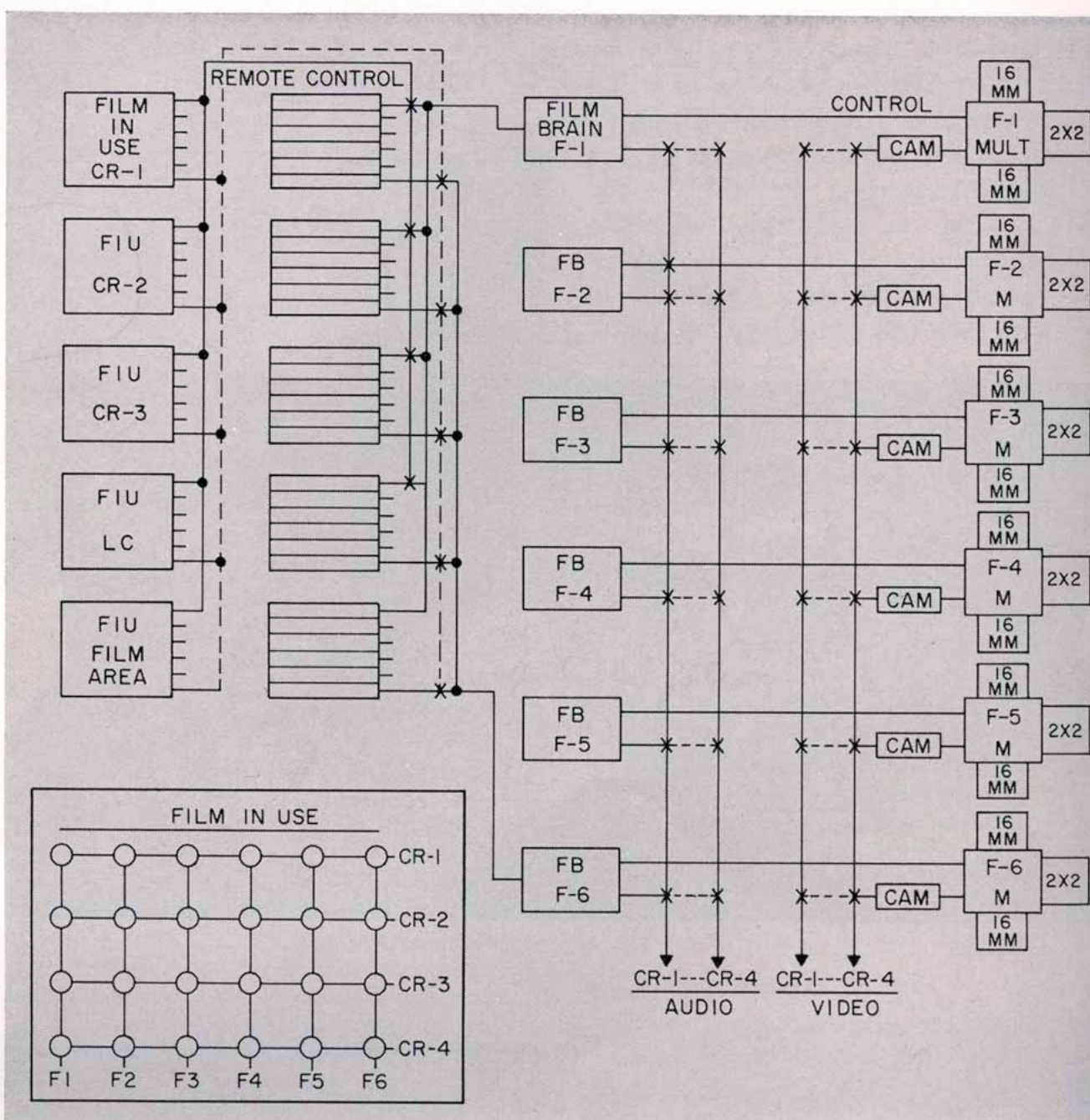


FIG. 22. Local control panel for the film system including remote control and film in-use indicators.

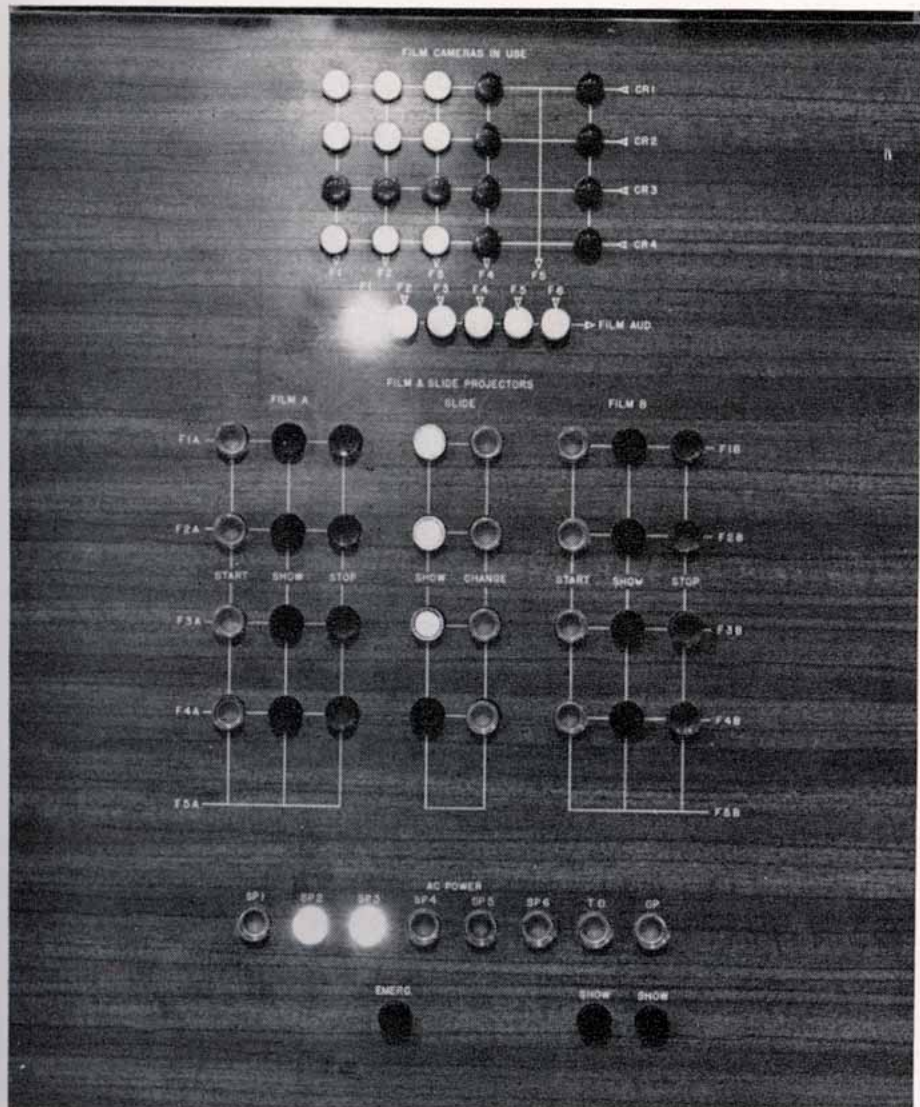
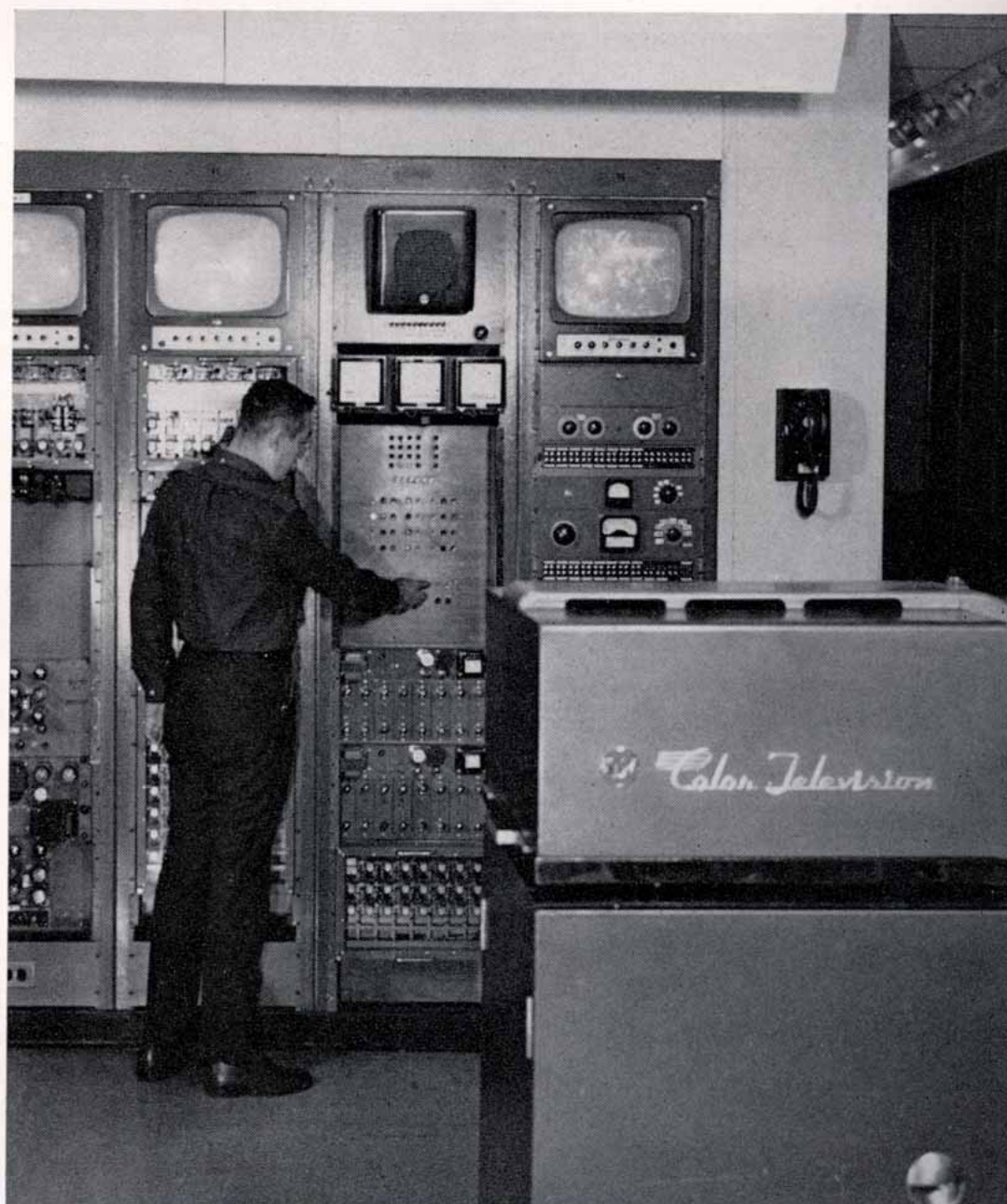


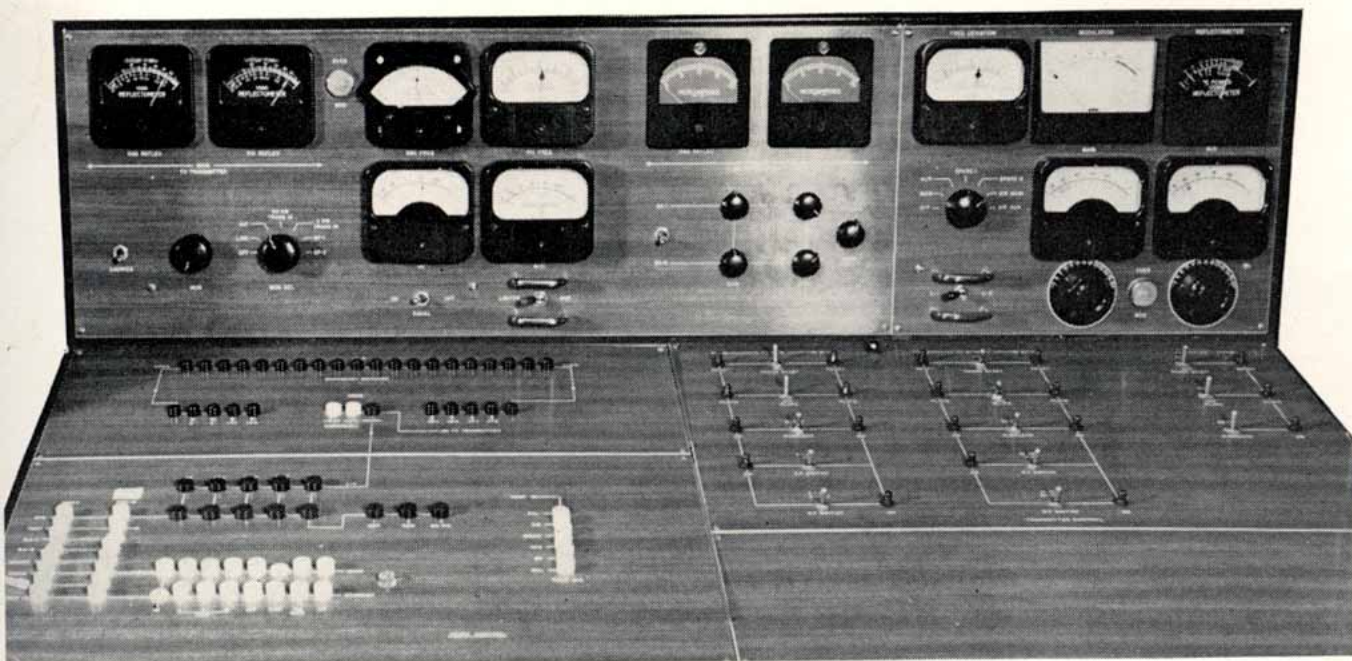
FIG. 23. Local control in the film area. Note color film camera in the foreground.





# Custom Transmitter Control System

FIG. 24. Custom transmitter control panel.

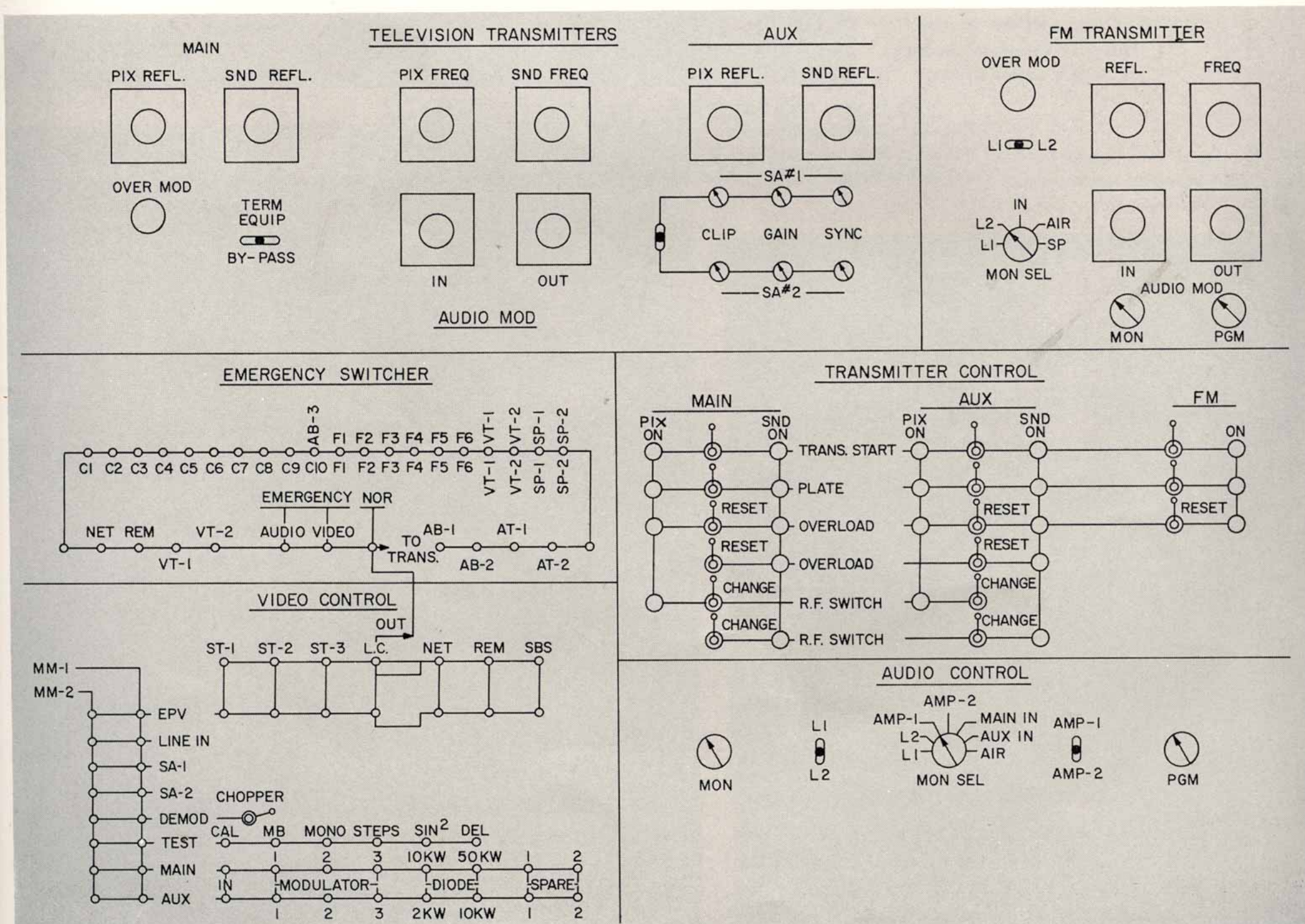


One of the reasons for locating new studios at the transmitter site was to take advantage of combining some of the functions of master and transmitter control. It was desired that the transmitter operator become part of a team with the master control man. To this end a custom transmitter control center was designed. The unit is located just outside the transmitter room in the quiet atmosphere of master control. The transmitter operator can monitor audio most efficiently, and still fulfill requirements for meter reading at proper intervals by making short trips into the transmitter room.

## Control Console

Figures 24 and 25 show details of the control console layout. The top panels enclose the various meters required to indicate reflectometers of both the sound and the picture on both the main and the auxiliary transmitter, as well as the various frequency and modulation readings. Gain controls for two stab amps and a switch to by-pass all of the terminal equipment is also incorporated here along with an

FIG. 25. Functional diagram of the transmitter control center.





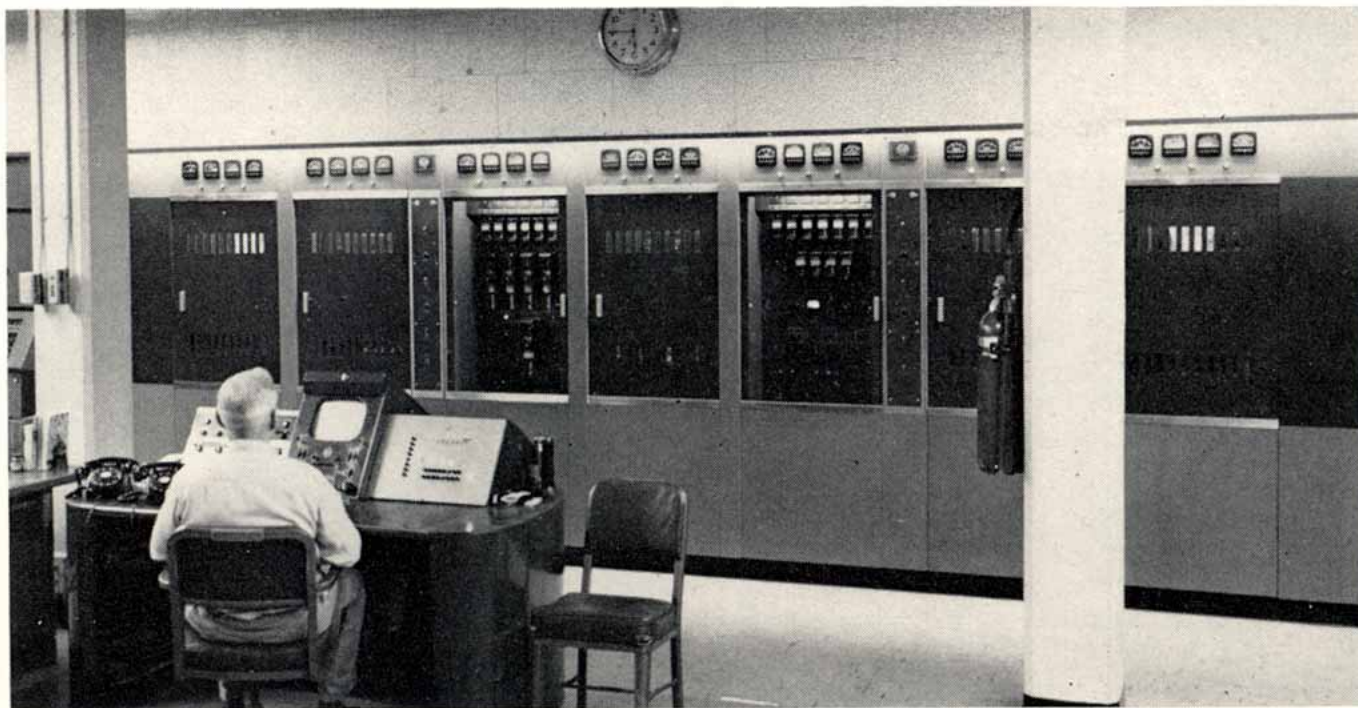


FIG. 26. Transmitter room at WBAL-TV.

over-modulation indicator. On the extreme right side is a meter panel for the FM transmitter. Immediately below the FM transmitter panel is the transmitter control panels for all five transmitters. The operator can start and stop, reset his overload, and change main and auxiliary tv transmitters as well as the FM transmitter from this point. Below is a small audio control panel for transmitter monitoring and for program level control.

To the left of the transmitter control panel is an emergency switcher. In the center of this switcher are three buttons. Normally the button on the right is depressed. This means that the emergency switcher is by-passed completely and everything is

operating normally. If we have an audio failure, the button on the left is punched first. By this action audio from any of the sources, with an audio counterpart, is placed directly on-air by punching up the proper source button. In the event there is only a video failure, the video button is punched up. Thereafter, any time a source button is punched up, this video counterpart of the signal is put directly on the air.

Finally, below the emergency switcher is a video control panel. Here various portions of both transmitters are monitored. The panel also provides control over each of the four operating centers. Thus, much of the master control panel can be operated from this position should the need arise.

## Audio, Maintenance, Lighting and House Monitoring System

### Audio System

The audio system is designed around the BC-7 transistorized dual-channel console. Six of these have been installed. The main advantage of this equipment is the consistent quality of its technical performance. In the control rooms the audio is interlocked to corresponding video buttons on the video switcher. However, the audio man can individually control any audio source he desires. Each of the announce booth microphones has an automatic gain control amplifier (always operated with about 15 db compression). This practically eliminates the need to ride audio level on the announce microphone. At the master control consoles, the announce booth microphones are connected so that the master control operator has the choice of having the announcer override the preceding audio or talk in place of the preceding audio. The audio at master control can be operated in a completely automatic mode if desired.

### Maintenance Aids

In a plant as complicated as WBAL-TV, every effort is made so that the equipment could be maintained properly and proof of performances made with the least expenditure of time and effort. A large, well-equipped maintenance shop is outfitted; equipment can be brought from the studio floors into the maintenance shop by means of an elevator, and enough test signals are incorporated into the switching system to make the proofs as painless as possible. The following test signals were made available at each switching control. Calibration pulse, multiburst, sine<sup>2</sup>, window, and stair-step. By simply pressing the appropriate button, these signals can be made to pass through the entire system, and results recorded by means of a polaroid camera.

### Studio Lighting

The studio lighting is divided into six separate sections for each studio. Each section consists of three 12-foot assemblies,

mounted on transverse rails, so that each assembly can be moved about ten feet in either direction. Each assembly holds three lamps. One assembly in each area is motor driven so that the groups of three lamps can be raised or lowered remotely. The other two assemblies in the group have their light individually adjusted by means of a Chinese finger-grip assembly. These nine lights constitute the "drop" lights.

In addition there are two pantographs assigned to each of six areas. Each accommodates a 2-kw support light for modeling use. These modeling lights also are mounted on tracks for ease of adjustment. Finally, there are a group of rear lights which can be moved as far as 6 feet away from the wall. These also operate on overhead tracks.

A dimming system, not yet in operation, will allow any 25 percent of the lights to be dimmed. Every lamp outlet has two 25 amp relays. A toggle switch selects whether that light will be turned on or off or delegated to the dimmer bus. The dimmers, themselves, consist of three 12-kw magnetic units, each of which is controlled with only 5 ma of control current.

### House Monitoring System

From the outset, a highly flexible house monitoring system was planned. We converted thirty monochrome television receivers by installing a completely new video amplifier (flat to 10 mc) in each of the cabinets. A combination audio and video switcher with a capacity of 24 outputs and 8 inputs is centrally installed. In addition, each of the monitors can be muted for viewing the picture only.

### Operational Results

What have we accomplished in this new plant? To sum up, we have a plant which has been specifically designed for future expansion and to take care of future developments with the least strain. We have plenty of space to install more film and tape machines if needed, or other new developments as they come along. We have used many of our old tube type power supplies. It is our intention to gradually replace these power supplies over the years with the new solid-state power supplies. The system has been designed for full color operation. Any of the control rooms can operate any of the cameras and film chains or tape machines. Any of the tape machines and film chains can be delegated to any portion of the operation. We have a test system so that daily checks of the entire system can be made by merely pushing the proper buttons. We have overcome many of the problems in our previous plant and have made operations more flexible, as well as more efficient and economical.



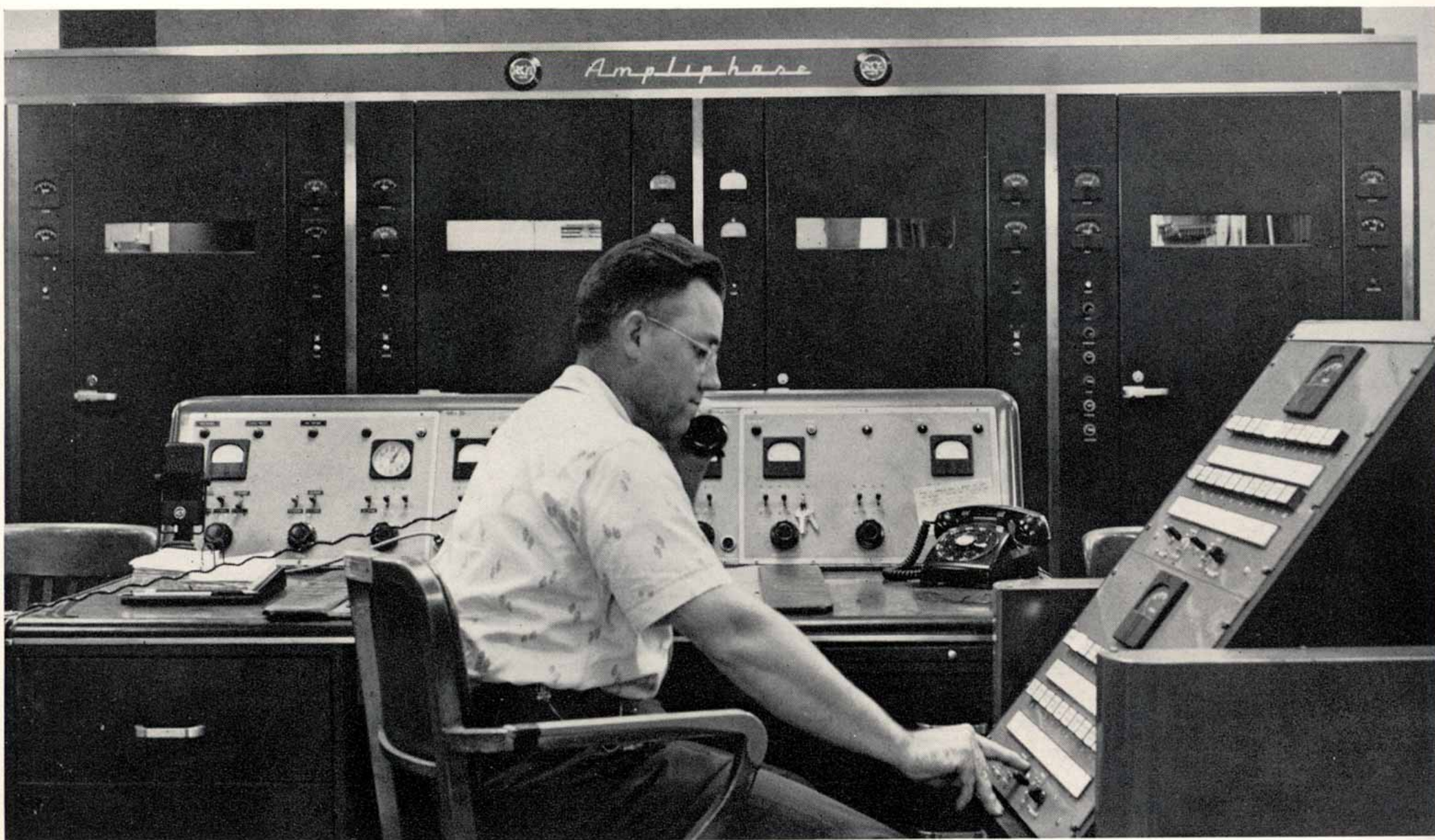


FIG. 27. A 50-kw Ampliphase transmitter provides a sparkling new voice for WBAL radio.

## Streamlined New Facilities For Powerful Voices of WBAL AM & FM

by THOMAS S. CARR, *Vice President and General Manager*  
and HARRISON BROOKS, *Chief Engineer, WBAL Radio*

Of the 70,000 square feet comprising Maryland's Broadcast Center — approximately 7,000 square feet is assigned to Radio—AM and FM. This total area is best described as a square, within a square. The outer square houses management and related departments and the inner square, the "heart" of the operation, houses studios and master control for both AM and FM. WBAL Radio has three functionally designed studios, all operable from master control. Also should the occasion arise when Radio might require the equivalent of the studio space once needed for "live" broadcasts, "TV Studio One" is equipped to feed radio master control.

All three studios use the latest in deluxe stereo consoles; audio tape recorders, and numerous cartridge tape playbacks. Studio and master control facilities are completely interchangeable. This permits following regular programming, while simultaneously

and automatically recording NBC network feeds; news flashes from the station's four radio-equipped news vehicles or mobile studio trailer, and even telephone interviews. In this manner technical facilities complement the fast-paced requirements of today's radio programming.

Special attention is paid to the design layout of the outer square—from the office of the Station Manager, the offices flow in a well defined pattern—Sales, Traffic, Engineering, Program, Music and lastly, the News Department with 16 newsmen providing a "round-the-clock" coverage. Management is never farther than 20 seconds away from the "heart" of the operation.

### Technical Facilities

Two moderately sized studios, each 15 by 20 feet, and one news-type studio, 10 feet square, fulfill AM and FM radio requirements. Control rooms for these studios

FIG. 28. Thomas S. Carr at one of Radio's three BC-7 dual-channel consolettes.





are arranged that the central control room (master control) can handle all of the microphone outlets in any of the three studios. However, to insure flexibility, one of the control rooms is set aside exclusively for FM. This control room is equipped with a BC-7 stereo, dual-channel console. Normally, FM is run from sign-on at 8:00 A.M. to 6:00 P.M. by an automatic tape program service. From 6:00 P.M. to sign-off, FM programming is handled through the BC-7 console. The third control room can also handle the second large radio studio, but it has been set up to be used primarily for audio tape recording. Therefore, three separate programs can be run simultaneously, if desired.

In master control all of the equipment is used either at the console desk position or in custom-made floor-to-ceiling racks. Tape machines of various types are conveniently controlled from one control panel adjacent to the console. Three of the tape machines are available for instant recording and assigned to the NBC hot line, to the output of radio telephone receivers in news vehicles, and to the beeper telephone. During the normal program day one man in master control can conveniently operate the radio technical facilities.

The WBAL radio transmitter site is located about 15 miles northwest of Baltimore City. This plant was originally constructed in 1940 and technological improvements since then have made it desirable to completely rebuild this plant—specifically to eliminate a severe harmonic problem and also to take advantage of remote control. A new Ampliphase 50-kw transmitter was installed along with a new 10-kw



FIG. 29. Radio master control looking into Studio C.

standby transmitter, new phasing equipment, transmission line and terminal equipment. This installation has resulted in a sparkling new voice for WBAL. The stability of the transmitter is such that the technical specifications are met week after week with very few adjustments. Other advantages resulting from the installation of the Ampliphase transmitter are consider-

able savings in power and space and a reduced inventory of tubes. It is largely responsible for the quality of WBAL Radio's new voice.

WBAL Radio today, in its new setting, represents almost four decades of continuous effort to serve the community with pride and professional "know-how" combined with taste and talent.

FIG. 30. Radio equipped news vehicles for WBAL-AM/FM/TV.

