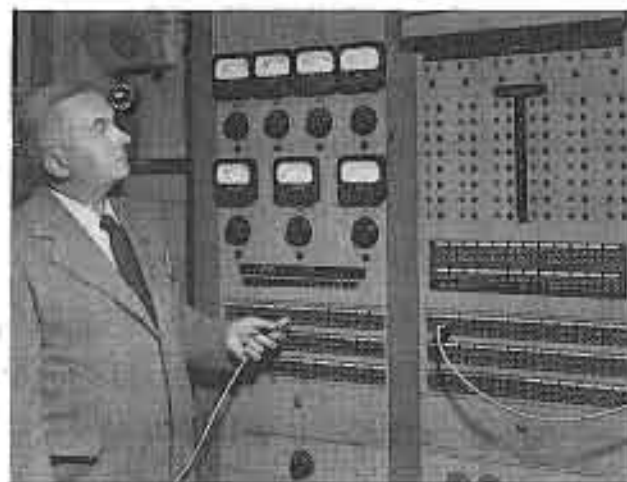


# Audio Facilities At the



Charles Vessell checking a meter circuit in the master control board of the audio system at the WBZ Radio and Television Center. The volume indicator panel (left) gives a visible and audible check for entire standard band and FM studio setup, while the right bay provides for switching at eight studios and six channels.



One of the two transcription studios, with announcer Carl deSuzo casing in a transcription on one of the triple turntables, while announcer Malcolm McCormack makes the station break. Studio console with channel switching unit is in foreground.

THE TENDENCY in many installations of recent years has been toward complicated switching arrangements, particularly in the design of master control facilities, which has resulted in duplication of functions and equipment, and has thus reduced efficiency of operation.

The studio facilities in the WBZ Center were designed to facilitate the origination and production of programs.

This system, basically, provides a channel switching unit, custom built to match a standard console, in each studio control room. Any one, or all of six, transmitting channels may be selected by the technician in a studio control room by depressing appropriate buttons. Signal lights adjacent to the channel switching buttons indicate whether or not the channel is in use in any other studio.

The studio technician may therefore, after receiving the cue, feed his program to the appropriate channel or channels without dependence on, or assistance from, any other personnel.

In a centralized equipment room are located master monitor and switching units, containing interlock relays by which the switching system is controlled, the transmitting channel amplifiers and monitoring facilities. Nine standard racks contain this equipment, as well as terminating and equalizing equipment for all incoming telephone lines, recording amplifiers

and measuring equipment. This array of apparatus is designed to be unattended. All regular circuits are normal through to each studio, so only when it is necessary to patch in a special line or check the operation of the equipment is a technician required.

The equipment room is linked to each studio by twenty-two pairs of shielded wire, carrying audio circuits, a twenty-six pair lead-covered cable, carrying channel switching and signal circuits, and a fifteen-pair cable, carrying talking and other signal circuits. Adequate spare conductors are provided in each cable for future use if required.

## Studio Layout

Six studios, designed primarily for sound broadcasting and varying in size, are provided to accommodate the diversified programs of a large metropolitan station.

Studios A, B and C are sufficiently large to accommodate orchestral and choral groups and studio audiences. They may also be used for television programming when required.

Studio A is an auditorium studio with a stage 25' by 28', and is provided with banked seats on the main floor, for an audience of 160 people. A balcony, located in the rear of this studio, may be used for motion picture projection, or as a television camera location. Ten microphone outlets are lo-

cated on the stage, with two of these outlets paralleled half-way down the auditorium on either side, to be used for audience participation programs. A selective public-address system, installed as an integral part of this studio, can be used to reinforce any portion of a program.

Studios E and F are smaller studios, each containing about 120 square feet of floor space, while D studio is 170 square feet.

We have found a very definite need exists for a small, well-appointed, intimate studio, from which to originate talks by individuals or discussions by two or three people. Studio D was designed for this purpose. Its size approximates that of a living room in the average home, and it is furnished in that manner. The feeling which accompanies *mime fright* tends to be dispelled in these surroundings, resulting in better production.

Studios E and F are designed and equipped to produce transcription programs, news programs, and to serve as stand-by studios. In addition to a normal complement of microphones, each of these studios contains a custom-built transcription turntable cabinet, housing three dual-speed turntables.<sup>1</sup>

At WBZ, the announcers operate the transcription turntables and the refinements which have been built into this equipment result from suggestions of the announcing and production



# WBZ Radio-TV Center

Radio-TV Center, on Banks of Charles River, Next to Harvard Stadium, Feeds Programs to 50-Kw WBZ, 20-kw WBZ-FM (92.9 Mc), WBZ-TV (Channel 4) and International Broadcast Station WBOS. Facilities Include Two Separate Monitoring Systems, Three-Dual-Speed Turntable Single-Unit Setups, and a 6-Channel Push-Button Switching System to Match Consolettes in Each Studio Control Room. Equipment Designed, in the Main, For Unattended Operation.

by CHARLES VASSALL

WBZ Audio Supervisor

staff, as well as the technical staff, in order to achieve a high order of satisfaction and efficient operation. In line with this policy, the use of three turntables in a single unit was decided upon. The three turntables are grouped in a semi-circle, with the pickup arms of both outside tables converging at a 90° angle, allowing the person operating the turntable to spot the stylus on the disc with greater ease.

The announcer is able to cue in three discs before a program begins, and thus is able to handle a transcribed program, consisting of theme, commercial announcements, and musical selections with the utmost ease, in contrast with the juggling of discs which often accompanies such programs.

Directly in front of the person operating the transcription turntables, and mounted at a 45° angle, is a small control panel, 5" by 9", on which are mounted three faders and three cue buttons. These controls facilitate cueing of records and transcriptions.

It occasionally becomes desirable to insert a transcribed theme, announcement or fill in a program originating in one of the larger studios where transcription facilities are not provided. Therefore, the output of studios E and F is permanently wired to push-button switches labelled *turntable*

1 and 2, respectively, in all studio control-room consolettes. By means of prearranged cues, a transcribed portion of a program may be inserted at will.

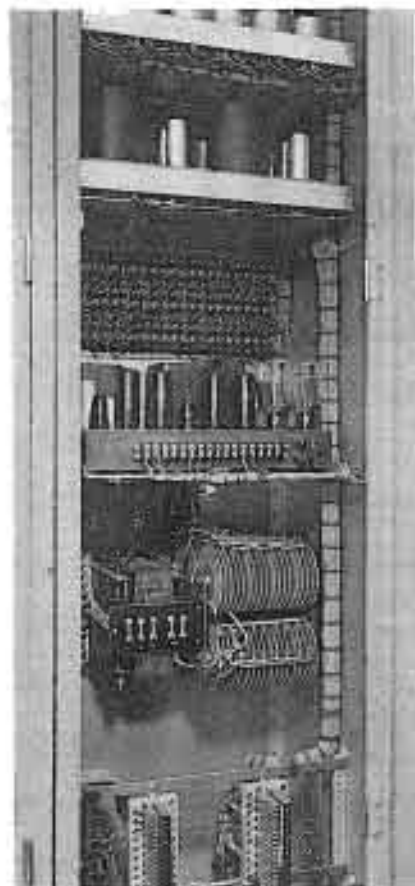
## Studio Control Rooms

Each of the studios has a control room adjacent to it. A large window, constructed with non-parallel surfaces of glass to eliminate reflection, affords an excellent view of the studio for technician and production man.

The control rooms vary in size: For studios D, E and F, 8' by 9'; for studios B and C, 13' by 10'; and for studio A, 14' by 15'. In the larger studios, where orchestral, choral, dramatic and other live programs are produced, sufficient space is made available in the associated control rooms for production men, agency representatives, etc.

The control-room equipment for all studios is basically similar. Some additional equipment has been provided for the larger studio for special purposes.

A custom-built operating table, surfaced with linoleum top, 36" wide and 27" high, has been designed to fit into the space along the control-room wall facing the studio. The control-room



Rear view of the WBZ master control racks with its six isolation amplifiers, two power supplies, jack layout, power amplifier for high-level speaker, bus and dual rectifier, 220-volt three-phase input and a 12-volt, 35 ampers output controlled in the primary by a three-phase variac. Lower section contains (l-r) power, signal and audio blocks. All racks have audio leads cabled in trip wire on right of each rack, signal circuits and power on left.

window is located just above this table. This table is built to provide adequate leg room for the technician and production man, who normally occupy this position. Cabinets are provided for housing associated electrical equipment and drawers allow space for necessary papers, etc.

An enclosed trough, with a hinged top, is provided along the full length of the cabinet for wiring. This trough is 4" deep by 14" wide, and allows adequate space for all interconnecting cables.

A standard consolette<sup>2</sup> is mounted on the operating table and beside it is mounted a custom-built channel switching unit designed with the same physical characteristics as the consolette to provide an appropriate matching piece of equipment.

Recessed in the wall on one side of

<sup>1</sup>Pratt 64-A. <sup>2</sup>RCA.

<sup>3</sup>RCA 76-C.



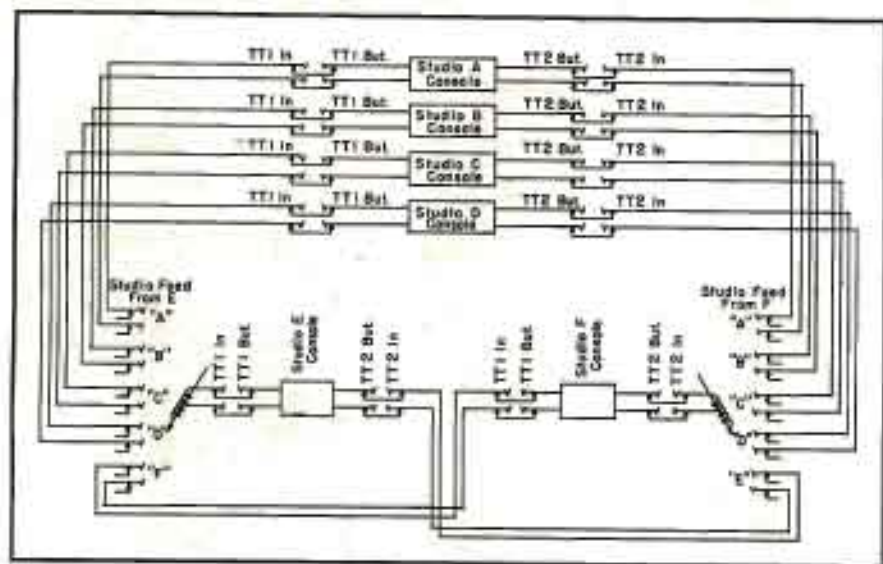


Figure 1

WBZ studio-rotatable feed system. Studio E transcription tables appear as TT1 and studio F tables as TT2. Setup permits one studio being on the air while the other is in rehearsal or standby.

the control table, and within convenient reach of the operating position, is a cabinet containing all jacks.

Located here are all microphone outputs normalled through to console incoming and outgoing trunks and all monitor circuits. Standardization of all booth equipment has been carried out so far as consistent with efficient operation. Each studio booth is supplied with power through a 15-amp arc circuit breaker from building mains, which affords protection in the event that anyone shorts any outlet in booth or studio. Only equipment used for program purposes is on the circuit breaker. An intercom<sup>8</sup> is installed in each booth.

Two telephones, one connecting to the main switchboard and the other connecting to remote pickup lines, together with a intercom unit, are provided on the operating table.

A monitoring loudspeaker<sup>9</sup> in a custom-built cabinet is mounted on the wall over the window, tilted toward the operating position.

It may thus be seen that all the necessary equipment is provided to permit a program to be fed to any outgoing channel from any studio control room without dependence on any other personnel.

The auditorium studio control room differs from the foregoing equipment layout, in that additional facilities are provided to accommodate the use of a larger number of microphones and control of the *pa* system used in connection with this studio. An auxiliary four-position mixer is supplied as a companion piece to the standard console, permitting the use of as many as ten microphones if the necessity arises. The custom-built channel

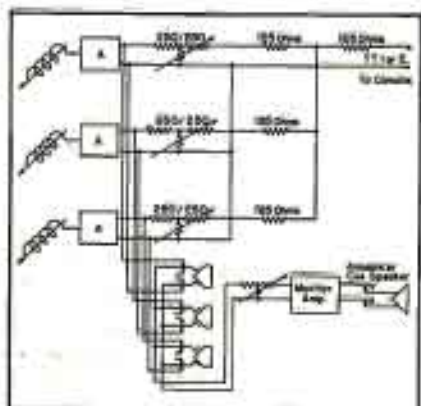
switching unit is expanded to incorporate volume controls, selectors, and switches, as well as a standard volume indicator for the studio *pa* system. The volume indicator is calibrated for proper sound levels for varying audience groups, which greatly facilitates the adjustment of sound reinforcing levels.

#### Audio System

Provision is made to observe and control, if necessary, the functioning of the channel switching system by means of master monitoring and switching units located in one of the racks in the *equipment room*. Audible and visual checking is possible at this one position.

The volume indicator circuits in the master unit may be transferred from the output of the channel amplifiers to their respective inputs by push-button switches. This affords a rapid means

Figure 2  
The rotatable pads and announcer cue-speaker setup in studios E and F of WBZ.



of checking studio output against channel amplifier output, and thus quickly detecting any trouble which may occur in the channel amplifiers.

Supplementing the visual check, a row of interlocked push-button switches mounted on the same panel, permits an audio check.

The master channel switching unit is located in the rack to the right of the master monitoring unit. This unit shows the operator, at a glance, which studios and channels are in use by means of appropriate signal lights. Normally, with no studio in use, all green lights are lit, indicating that all channels are available for use.

When a technician in a studio operates a push-button switch on his studio channel switching control unit, the green light opposite studio letter and channel number on the *master channel switching unit* goes out and a red light is illuminated. At the same time a red light at the top of the panel under the channel number is illuminated.

Push-button switches are provided in the *master channel switching unit*, which allows a technician in the *equipment room* to take control of the system and release any studio from any channel and likewise to set up any studio to any channel. This refinement is provided for emergency use primarily, affording a means of transferring program from one channel amplifier to another easily in the event of trouble, without disturbing the technician handling a program in a studio.

One of the primary requirements of a modern broadcasting plant is an adequate monitoring system. Means must be provided for making several program sources available in studio control rooms and offices throughout the building.

Two separate monitoring systems are provided. A high level system provides an air check to ten monitor positions in the building, utilizing a monitor amplifier located in the *equipment room*, while a low-level system provides nineteen program sources to nine monitor positions located in executive offices where dial selectors were installed. In these offices the loudspeakers have been provided with individual amplifiers and volume control.

The nineteen program sources fed to the monitor systems are the outputs of the six studios, the outputs of six transmitting amplifiers (or channels), six radio receivers and the NBC network. To isolate the monitor circuits from program circuits, isolation amplifiers have been inserted, which prevent any interaction which might adversely affect the program circuit.

The NBC network line feeds two separate buses, one for making the net-



work available at each studio control console, and the other to provide cue circuits. Since there is 10 db difference in the required signal level for these two services, it is desirable to feed on separate circuits. In the event of failure on the regular NBC program circuit to the studio control rooms, a technician may patch his monitor bus to the nemo circuit, in an emergency, providing protection until trouble is cleared. NBC nemo button and key are red for quick identification, and are located in same position<sup>8</sup> in each studio booth.

### Recording

Since recording plays a major part in the activities of a broadcast station, we have provided in this new installation recording equipment capable of excellent performance.

Two recording machines<sup>9</sup> are centrally located in the *equipment room*, where they may be operated efficiently and where they may be viewed by visitors through a wide observation window.

One of the eight racks in the *equipment room* contains the elements comprising the complete recording system. This system provides service as two separate recording chains, recording two programs simultaneously, or as a single chain utilizing one recording machine at a time, or both in parallel if necessary. A high degree of flexibility is thus obtained.

The recording system consists basically of program limiting amplifier<sup>7</sup> feeding two amplifiers,<sup>8</sup> which in turn feed the cutting heads<sup>8</sup> on the recording machines.

The recording-control unit located between the recorders houses 16" and 12" recording disks in the lower portion. In the top part a monitor speaker is mounted directly in front of the engineer operating recorders. Three switches are provided, one master which starts suction pump and closes power to switches for starting recorders. This arrangement obviates the trouble of engineer starting recording without air suction in operation. Terminal blocks are contained in the bottom of the unit.

### Equipment Room

The *equipment room* is 22' by 28'. Viewing the room from the corridor through the large observation window, a visitor would see on the right side of the room, nearest the window, the eight racks of equipment described heretofore. Directly in front of the

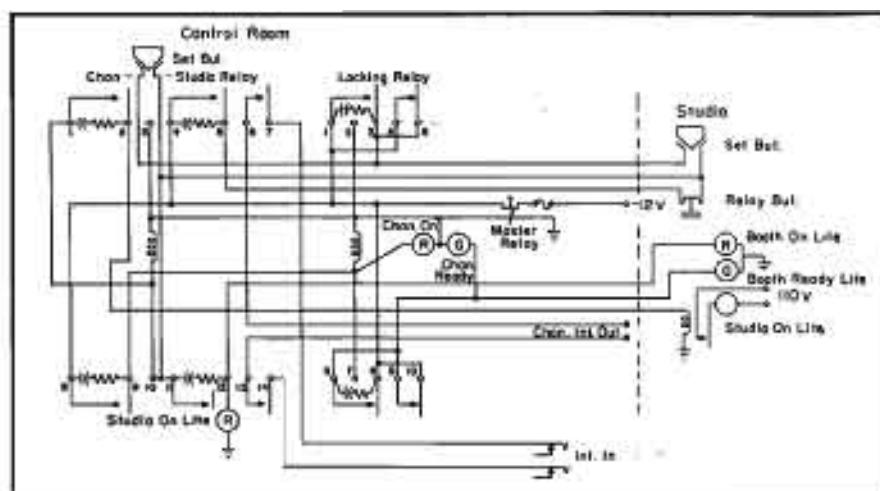


Figure 3  
Channel-studio switch layout at WBZ.

window, and about one-third of the distance to the rear of the room, are located the recording machines. To the left in the forefront is a small room utilized for storing recording discs and other accessories. This room also houses the suction equipment for the recording turntables.

In the rear of the room the 10-kw FM transmitter<sup>10</sup> is on the right, and directly across the room on the left side, is the TV transmitter.<sup>11</sup> The television transmitter operating console is directly behind the recording machines.

We know that the satisfactory operation of broadcasting equipment depends on proper maintenance, and therefore it seems appropriate to conclude this article with a brief discus-

sion of the facilities available for maintenance.

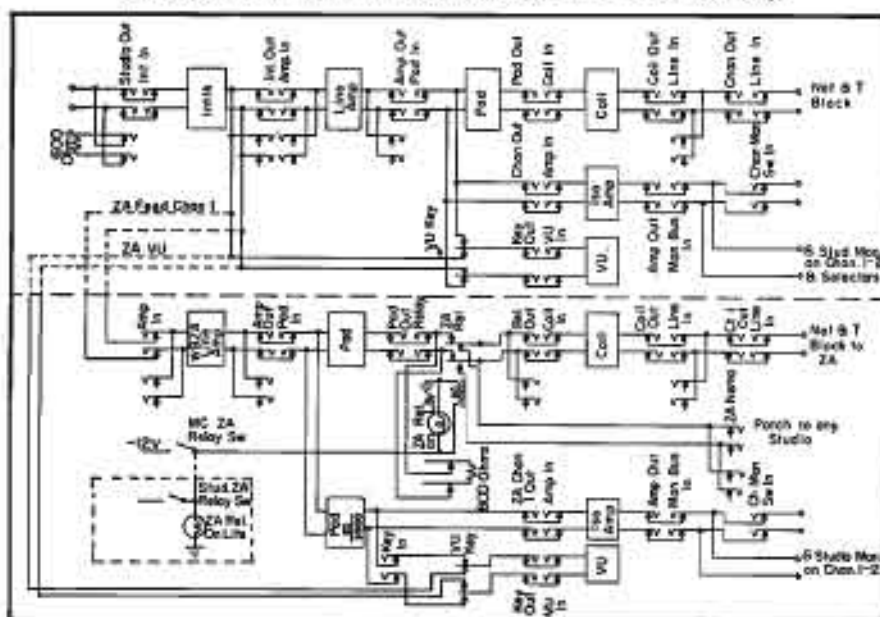
Directly adjacent to the *equipment room* a shop 24' by 18' has been provided to handle both minor and major repairs of the plant. In addition to tools, mobile transmitters and nemo equipment are stored here. Above a work bench is a wall mounting jack cabinet<sup>12</sup> with tie lines to *equipment room* so that test circuits may be set up to check any equipment in the process of repairs and afford rapid communication between all studios, *equipment room*, shop and supervisors and plant managers' offices.

This system was wired up for two talking channels; position 1 ties in all points and position 2 is used for recording. Between studio and recording feeding this method has worked out better than anticipated for cues, feeds, etc.

<sup>7</sup>RCA 86A1.  
<sup>8</sup>Franko 88A.  
<sup>9</sup>RCA.

<sup>10</sup>Westinghouse FM 10.  
<sup>11</sup>RCA TT-3.  
<sup>12</sup>RCA.

Figure 4  
Block layout of the 1-6 channel setup; WBZA feed and no on channel 2 only.



<sup>12</sup>Dalmatron.  
<sup>13</sup>Position 6 on RCA console.  
<sup>14</sup>W. E. 755A.  
<sup>15</sup>Scully.