

Studio Control Room Design

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Technical details of an efficient control-room layout.

FOLLOWING World War II, almost every broadcaster considered the advent of FM in the design of new studios and control rooms. In this connection, nearly all manufacturers of studio consoles designed them to incorporate two output channels, so that programs could be fed to both AM and FM transmitters. The design of these consoles was such that in most cases they fit the over-all requirements of an average control room. Without question, however, each installation is a case by itself and must be considered as such.

In the design of the control room and studios at WRRN, four studios were considered. The requirements were such that it had to be possible to feed the output of any of these four studios to either AM-FM-Recorder or audition. In considering economy, it was decided to situate two General Electric consoles, four turntables, two racks, a high fidelity AM-FM all-band receiver and recording tables in the control room. To effect an operation such as this, careful consideration must be given to the acoustics of the control room. This design had to permit operation of two or more loudspeakers at a level consistent with good operation.

As shown in *Figs. 1 and 2*, the consoles in the master control room are arranged facing each other. Each console is situated so that the control operator may easily see into studios A-B from console 1, and studios C-D from console 2. Two turntables are wired to each console. All microphones, speakers, turntables and other circuits affecting flexibility, are brought out to jacks on the two racks. It is therefore a simple procedure to cross-patch any microphone or microphones, and the speaker, to the opposite console. Mounted on the wall and directly in back of each turntable are cueing amplifiers in the speaker cabinets. There are circuits built into each console to cue-in transcriptions; however, their use necessitates momentarily disconnecting the monitor amplifier from

its normal position. To avoid this, separate cueing amplifiers were installed. These amplifiers are placed across the output of the pre-amplifiers, located within the turntables, by the operation of a spring return switch.

Remote Line Inputs

There are eight remote line inputs on each console. Associated with these remote inputs are also eight cue buttons. It is therefore possible to feed program or cue to any of the remote lines. A console with a remote input selector is quite convenient as it eliminates patching-up remotes provided there are a sufficient number of selectors when there are more remote pickups than remote inputs. Of course, there is a circuit allowing talk-back with remotes, as well as the conventional override circuit.

Remote line (1) on both consoles, is used for the incoming network circuit. It might be interesting to point out just how the network is brought into both consoles. It is desirable to have both consoles symmetrical, so a net-

work program in progress may be moved from one console to the other without interrupting the program. Two isolation amplifiers were bridged across the output of the network line-equalizer. Any desired level up to 0 vu can therefore be obtained. One of these outputs is fed to each console, appearing as Remote One. It is then possible to feed a network program to the same line, either AM or FM simultaneously, and switch from one console to the other.

As mentioned, there is a high-fidelity AM-FM all-band communications receiver in the control room. This receiver is used to monitor AM or FM operation, as well as for many other applications. The output of the receiver appears on jacks at 500 ohms, and when adjusted to the correct level may be fed to any console as a remote.

It is interesting to note something new in broadcasting technique for this area. It is planned to broadcast a sports program over a key station over both their AM and FM transmitters

Fig. 1—The Master Control Room of WRRN, Warren, Ohio, showing the location of the control consoles, equipment racks, turntables and other facilities.



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highest distortion occurred at 400 cycles and was measured at .82%. This measurement was made with an output level of +16 db. The lowest distortion measured .6% at 30 cycles with an output of +16 db. A frequency run indicated each channel flat to ± 1 db, 30-15,000 cycles. Measurements were made using a Hewlett-Packard audio oscillator, and noise and distortion meter.

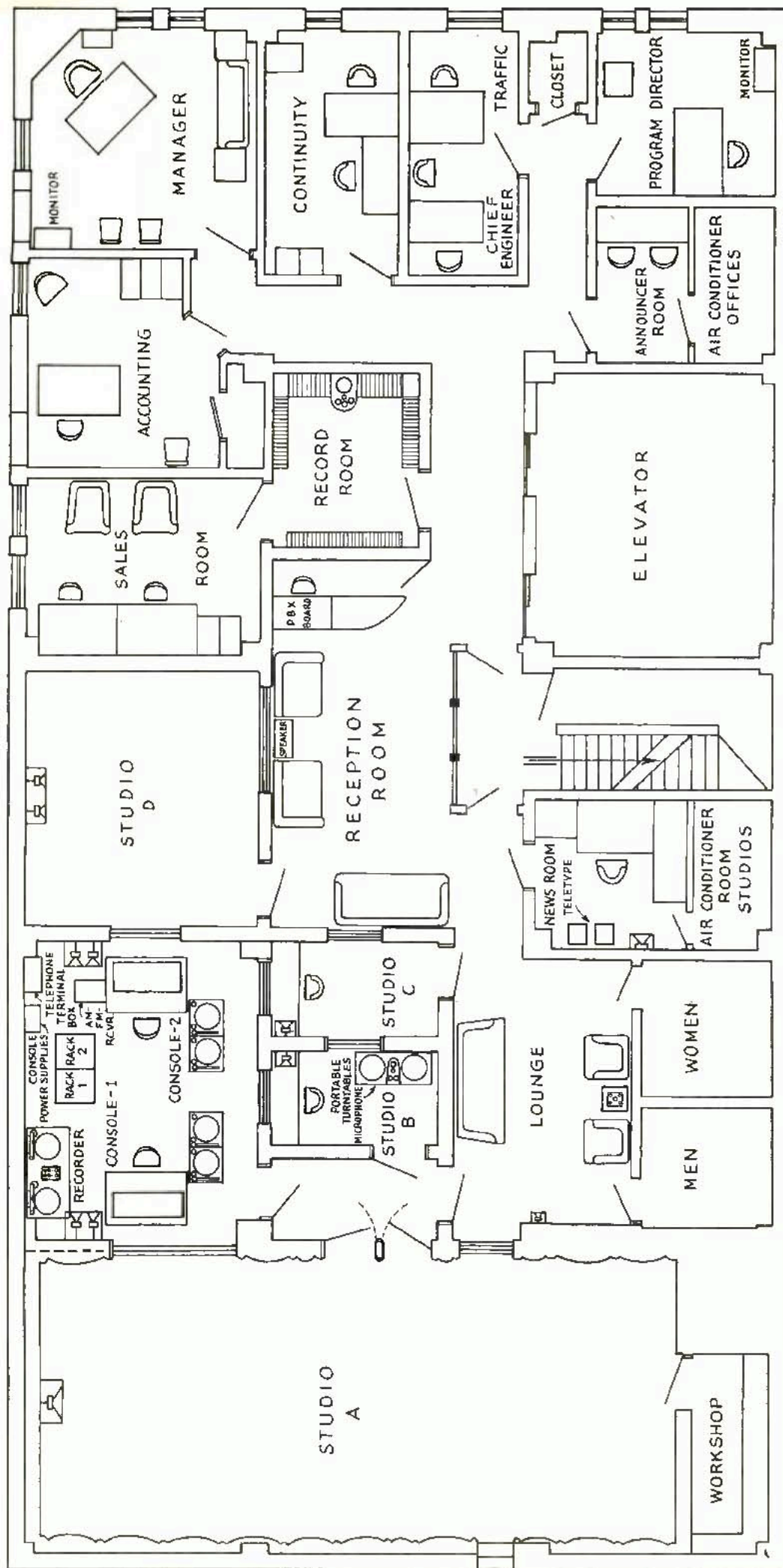
In summing up the capabilities of this control room, the following operations are possible:

1. Feeding four different programs to different lines and recording one of the programs.
2. Feeding the network with one console and recording it. Receiving network program through the second console feeding both transmitters with a minimum of operating personnel and with one spare channel.
3. Feeding the network with one console and receiving this network program back through the second channel of the same console, recording and feeding it to either the AM or FM transmitter. This can be accomplished with no difficulty by one control operator. In this operation the second console would not be used.
4. Duplicating programming to both AM and FM transmitters and splitting up the station break so that "FM" after the call letters would be fed to the FM transmitter only. This can be accomplished utilizing one announcer and one control operator.
5. Complete flexibility whereby any of the four studios can be operated into any of the two consoles with a minimum of effort on the part of the control operator.
6. Duplicate systems in which the operation of any one of the two systems is not dependent upon the other thereby eliminating extended off-the-air periods.

One of the important items in considering facilities for a studio control room is total initial cost as well as operating cost. The total initial cost of the installation described averaged 60% of the quotation for custom-built equipment. Operating costs require

serious consideration as they are continual. Here again it is at a minimum without any sacrifice in operational requirements. This installation has been operating for the past ten months. Other than tube replacements, and these have occurred within the maintenance schedule, no electrical or operational difficulties have occurred.

After this extended, continual experience with the facilities described herein, we feel that this is an answer to the constantly increasing demand for an efficient, low-cost, flexible studio control room design where the demand is to feed one or more programs to one or more channels. The compactness of the design makes it obvious in a quick glance that operating costs, both in the technical and announcing departments, are cut to a minimum. Aside from the purely technical standpoint, this design is very attractive, giving the impression of spaciousness without waste space.



STUDIOS - WRRN

SCALE 1/8" = 1'

Fig. 2—Floor plan for WRRN, Warren, Ohio. This compact, efficient layout will be of interest to AM-FM broadcast station operators. A single Master Control Room services the four studios grouped around it.

Other stations located in other markets, but which are within the service area of the FM transmitter, will feed the output of a high-fidelity FM receiver into the console as a remote. The program may then be fed to their AM and FM transmitters. This operation should be extremely effective.

On each console, there are four monitor cue buttons. These are used to monitor the network, AM, FM and one which is a spare input which could be used to continuously monitor a remote line, output of a receiver, or any other circuit of suitable level. It is thus possible to allow any studio to monitor any facility at loud speaker level. For most purposes it is used as a monitor cue for either AM or FM when the following program is to be moved to an opposite console.

Talk-back facilities, so necessary in good operation, are built into the console. With every loud speaker in the studios, lounge, reception room, news and record library available through jacks, it is a simple procedure to cross-patch speakers to talk through any of these loud speakers. Cross-patching speakers is also possible to allow talk-back between any studios.

The four studios are so arranged that the control operators have unobstructed vision into two studios from each console. Studio *A*, Fig. 3, the largest of the four studios, is used for audience participation, seating about 100 people. Studios *B* and *C* are large enough to accommodate three announcers. Studio *D*, smaller than Studio *A*, is used for small groups. Four microphone outlets appear in each studio. In studios *A* and *D*, there are four utility outlets used for monitoring and additional microphone outlets if ever required. The utilities are also used to feed the output of a portable

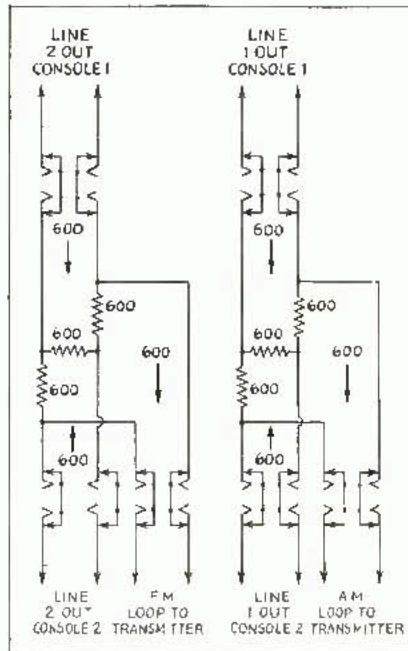


Fig. —This special output circuit arrangement is used to permit transmission to either the AM or the FM transmitter from either one of two program consoles. The circuit is actually a Wheatstone Bridge that provides a high degree of isolation between the two input circuits provided all legs are of exactly the same resistance value. The outgoing line, which constitutes the fourth leg, will not meet this requirement unless a large pad is used to isolate line impedance variations from the bridge. Isolation coils would be needed.

set of two turntables, one microphone and respective amplifiers, at 0 vu to the control room where it may be entered as a remote. This unit is invaluable for sound effects or for record programs where the announcer wishes to cue and operate the turntables.

Isolation Amplifiers

Bridged across the AM-FM and network lines are three isolation amplifiers. The output of these amplifiers forms a cable of the three pairs which run to each of the studios and all of the business offices. These outputs appear on wall receptacles. A small amplifier is bridged across any one of the three lines by a selector switch allowing any office to monitor AM, FM, or the network. In the case of the studios, a selector switch picks up any one of the three lines and connects it to a headphone jack. It is then possible to monitor any one of the three lines.

Upon considering the outputs of the program amplifiers of the two consoles, it was decided at first to utilize relays. These relays would connect a selected program amplifier to the AM or FM loop. Such design, while adhering to sound principles, was not the answer. The use of relays would allow lock-outs, increase maintenance and cause a subsequent increase in the over-all cost of the installation. The answer to this problem was the use of impedance-matching resistor networks. One of each of the two program amplifier outputs was fed to either end of the pad, the output of the network being connected to the line as shown in Fig. 4. This arrangement eliminated all complications. The outputs of the program amplifiers can well stand the loss caused by the use of the pads.

When the control room installation was completed, distortion and frequency runs were made on the equipment. Padding down the output of an audio oscillator to simulate the output level of a microphone and attaching a noise and distortion meter to the output pad, measurements were made. The

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Fig. 3—This studio at WRRN is approximately 16 x 36 feet and can accommodate an audience of 100 people. Reference to Fig. 1 shows the relation of this studio to the associated control room and its convenient relation to the entrance lobby of the station.

