

WTCN

AM • FM • TV



FIG. 1. The Foshay Tower Building, which is the tallest building in the Minneapolis-St. Paul area, houses the WTCN transmitters for FM and TV. The top of the tower is an ideal location for the stacked transmitting antennas and for the microwave relay receivers.

by **JOHN M. SHERMAN**
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On July 1, 1949 WTCN-TV staged its "T" day from a new studio plant in the Radio City Theater Building, Minneapolis, and on the same day WTCN's AM and FM operations were moved from their former home in the Wesley Temple Building to the new Radio City location. From the viewpoint of the WTCN Engineering Department any remark to summarize the pressure of work during the preceding weeks would be an understatement.

The opening of the new studio-TV-FM plant was the culmination of planning

which began immediately following the war. The first step in carrying out WTCN's extensive plans was the procurement of what was considered to be the two most valuable radio properties for FM and TV in the Minneapolis-Saint Paul area. The first of these, the Foshay Tower Building (Fig. 1) is the highest in the Twin Cities (and in Minnesota) and was leased in 1945 for the FM-TV antenna site and the location of the FM-TV transmitters. The second, the commercial addition to the Radio City Theater Building, Minneapolis' lar-

gest and most popular theater (Fig. 3), was leased in 1948 so that its four floors could be modernized for the studios and offices of WTCN's entire AM-FM-TV operations.

The initial installation of antenna tower and FM transmitting equipment in the Foshay Tower Building was made in October of 1946. April of 1949 saw the first WTCN-TV test pattern from the RCA TT-5A TV Transmitter and Superturnstile TV Antenna. Reception of WTCN-TV was immediately reported "solid" for 60 miles

with many satisfactory reception reports to 100 miles and more, when proper receiving antennas were employed. This coverage was predicted after the experience of WTCN-FM in initially serving a radius of well over 100 miles with an interim FM transmitter power of 3 KW and a high gain antenna. Work on the new studios in the Radio City Theater Building started on January 15, 1949, with completion and joint initial operations of AM-FM and TV from this location on July 1, 1949.

WTCN is the basis affiliate for the American Broadcasting Company for AM and for ABC, CBS and Dumont Networks for TV. The WTCN facilities are licensed to the Minnesota Broadcasting Corporation, which is owned jointly by The St. Paul Dispatch-Pioneer Press and the Minnesota Tribune Company, former publishers of the Minneapolis Tribune. Mr. William J. McNally is President and Mr. Robert B. Ridder is Vice President of WTCN. Mr. F. Van Konynenburg is Vice President and General Manager and directed the planning of the new WTCN studio, FM and TV transmitting plants. Details were worked out by the author. Installation of the master control equipment, as well as the AM and TV studio equipment, was entirely accomplished by WTCN engineering personnel; including Jim Kelly, Audio Supervisor—assisted by M. N. Fleming, veteran WTCN technician, and Irvin Stratton, formerly of Lockheed Aircraft engineering and KEX, Portland, who did the layout work. Bill McGinnis, assisted by the TV technical staff, installed the TV studio and remote equipment. Bert Coil, the WTCN transmitter supervisor, handled the installation of the FM and TV transmitters and was assisted by Jerry Ellison, Clyde Green and other technical staff members.

AM-FM Studio Facilities

The AM studios (also provided with wiring facilities for TV later) are located on the second floor (Fig. 9) and consist of Studio "A" (Fig. 13), which is 30 feet by 50 feet plus a 30 foot by 20 foot stage and 25 foot ceiling; Studio "B", which is 18 feet by 25 feet; the control room for Studios "A" and "B"; the TWX News Room and News Studio; and an Announce Booth adjacent to Studio "A." Studio "A" is of the brighter type acoustically with poly diffusers on the ceiling, walls, and adjacent to the stage. Double thickness tile walls are used throughout and panels of standard rock wool treatment where necessary behind transite provide acceptable acoustics in various studios. The remainder of the sec-

ond floor consists of production and technical offices, as well as the program and bookkeeping departments. One additional feature on the second floor is the second floor lounge of the theater, which is actually part of the WTCN space. The elaborate decorations of this part of the WTCN space, with its beautiful lighting fixtures, is a perfect tie between the theater and television.

For large shows from either Studio "A" or "B," where a number of microphones are used, the "A-B" Control Room is used where talkback and sound reinforcement equipment can be controlled. Where only one or two microphones are required for smaller shows, control of these studios is possible from the Master Control Room on the third floor, which has overhanging visibility to these studios.

The third floor houses the Master Control Room, Announce Studio No. 1, Engineering Shop, an office for technicians and announcers, and air conditioning rooms and equipment. Additional air-conditioning equipment for the basement and first floor television offices and studios is located in the basement.

Master control is provided with facilities to handle four utility channels needed for remotes, recordings, and studio shows fed or repeated to the nine ABC affiliated stations in Minnesota, Wisconsin and North

Dakota. The network service for these stations is all repeated, fed and switched by WTCN Master Control. The audio channels from the other AM and TV Studio Control Rooms are also fed to the MC program switching and pre-set system. The pictures (Figs. 14 and 15), show the MC equipment. Master control also has talkback and cue selection for the various studios and remote lines; monitoring and level control facilities for the many outgoing feeds and studio channels; tape and disc recording equipment; and ring-down equipment with permanent "drops" for various control rooms and other local radio stations; as well as the AM and TV transmitters. All of the WTCN audio facilities, including the Master Control Console, were designed and assembled by the WTCN engineering staff. The racks and amplifier equipment are standard RCA units.

The need for such an elaborate control and switching system can be appreciated when it is noted that a "routine" operation for WTCN Master Control may include a local show origination for half of the Dairyland-ABC network, with simultaneous repeats of tapes or disc shows to one or two of these regional stations. Also TV studio shows and perhaps an ABC Coast-to-Coast origination, which might not be carried locally due to time differences during daylight-saving time. In addi-



FIG. 2. View from the top of the Foshay Tower Building shows engineers adjusting one of the RCA microwave relay receiver for line-of-sight reception from the Lexington Ballpark across the river in St. Paul.



FIG. 3. The WTCN broadcasting studios are situated in the Radio City Theater Building which is in the heart of downtown Minneapolis. Window at lower right gives the public a view of the television studio.

tion, several times each day, local remotes are fed to a portion of the regional net and not carried locally.

With the 4-channel custom console it is possible to break into any show, wherever originated, with local announcements or studio sign-on or off.

TV Studio Facilities

The Radio City Theater Building, which houses the largest and most popular theater in the Twin Cities, was chosen as the "ideal" studio site because of the allied interests of the theater and television. The Theater Building is in the heart of the Minneapolis business district and in close proximity to advertising agencies, department stores, etc. The commercial addition to the theater, which formerly housed stores and shops on the first floor and another radio station on the second floor, was completely remodeled from the Master Control Room on the third floor, to the Dressing Rooms, Telecine Processing and Scenery Shops, Artists' Lounge and Producers' and Directors' offices on the basement floor so that the interior of the plant has the appearance of a new building.

The first floor (Fig. 9) contains the 30 foot by 60 foot TV studio, which has garage-type doors opening out to an alley so that automobiles, heavy equipment and scenery can be readily moved into the studio. Adjacent to the studio is the TV Studio Control Room (Fig. 7) with a director's desk and light control switch panels on a level raised above the camera controls and audio console. On the other side of the TV Studio Control Room is a TV Announce Booth, which is used to handle commercials and other commentary for films, remotes or studio shows. The announce booth, as well as the TV Master Control and Equipment Rooms, have RCA receiver-monitors so that the staff may see the pictures in rehearsal or on-the-air. A room adjacent to the TV Master Control Room has been provided with steel wiring ducts so that 35mm film projectors can be accommodated—at present only 16mm films are being used. The remainder of the first floor contains the main lobby and executive offices.

The TV studio (Fig. 6) was equipped with a 1½ inch pipe grid work on which were hung the Kleigl lights of various types. For general studio lighting, 36 six-tube fluorescent fixtures with downward

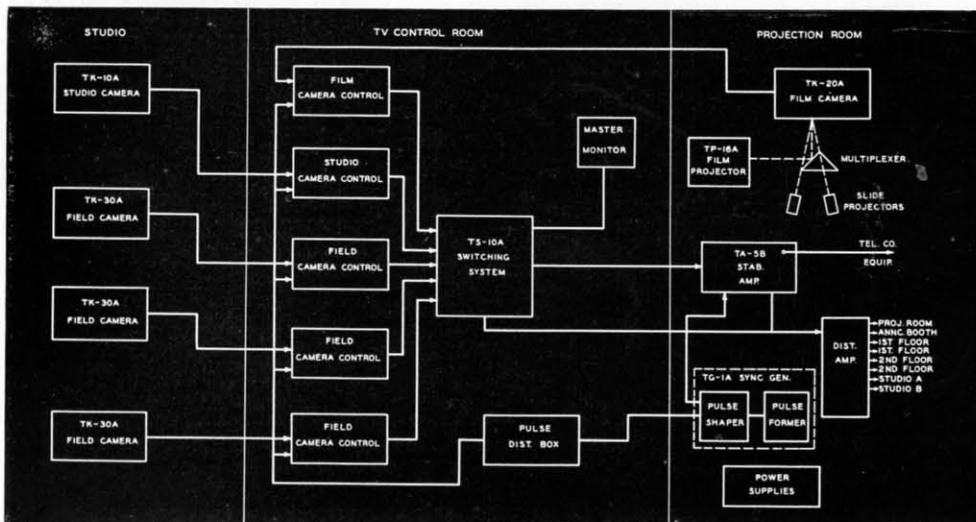


FIG. 4. Simplified block diagram above graphically shows the layout of the WTCN video facilities from the television studios to the coaxial lines going to the transmitter.

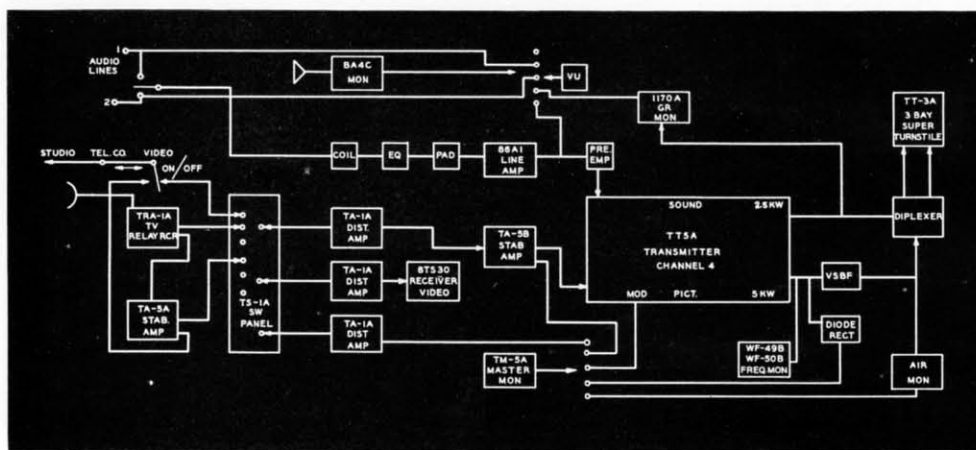


FIG. 5. This drawing shows the facilities at the transmitter. Audio comes in on lines at upper left; video is fed from the studio to tower by coax; remote programs are picked up by microwave relay.

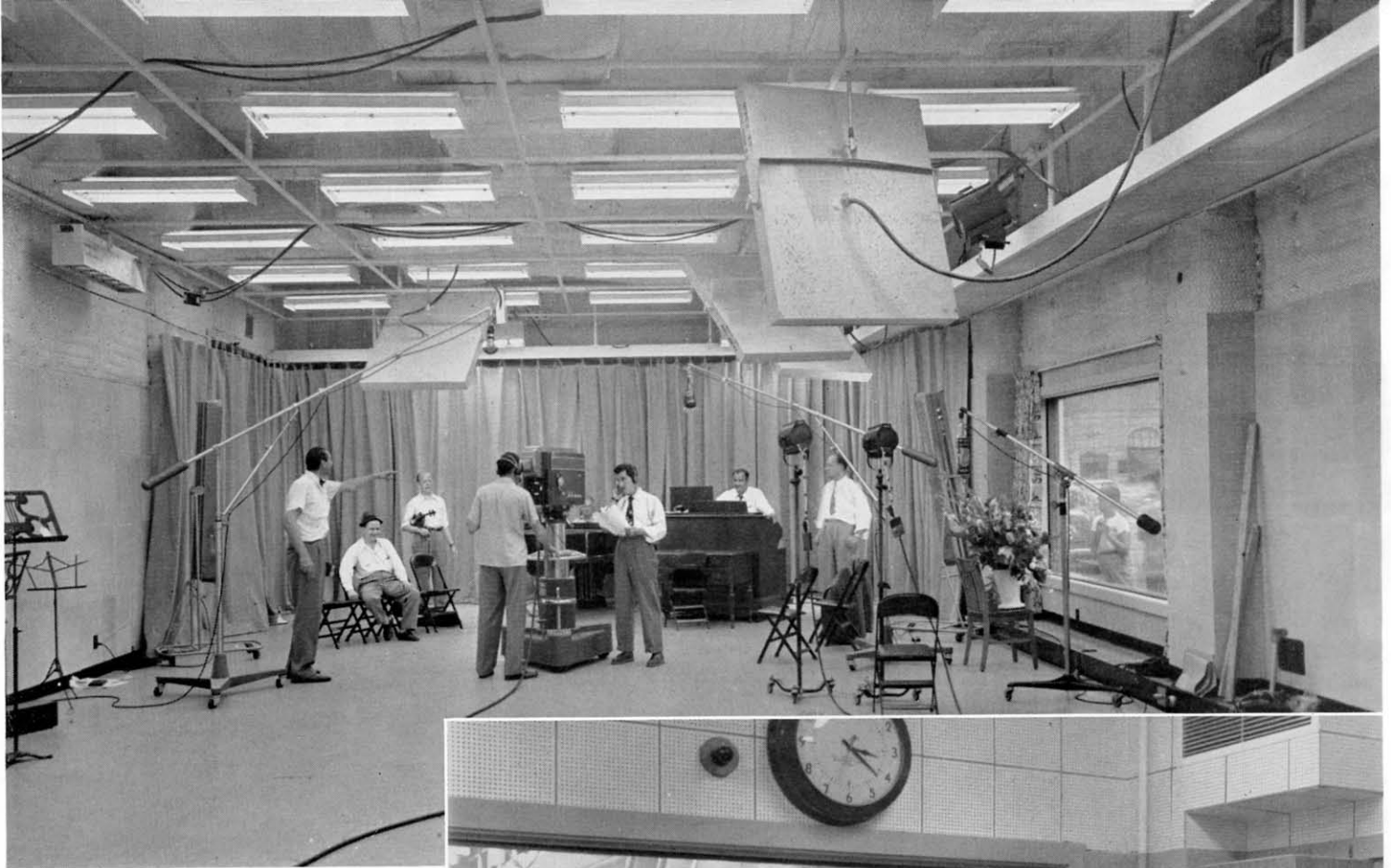


FIG. 6. The photo above shows the lighting facilities of WTCN's television studio which measures 30 by 90 feet. Garage-type doors, in rear, make it a simple matter to move scenery and equipment into the studio. Window at right, which is at street level, permits public to catch a glimpse of rehearsals.



FIG. 7. The television control room has unrestricted view of the studio. Camera controls are flush with window while the director's desk, not shown, is on a raised level overlooking the monitors and the studio. Mr. F. Van Konyenburg, Vice President and General Manager of WTCN, standing at right, and Mr. John M. Sherman, Technical Director, right foreground, watch the rehearsal with great interest.

reflectors were installed. Each fixture is on a 3-phase circuit. The cat-walk down one side and across the back of the TV studio facilitates control and adjustment of strip and spot lights. A portable scaffold on casters is used for other light adjustments and for changing fluorescent tubes when necessary.

All the TV equipment including cameras, transmitter, antenna, as well as the remote unit, is RCA. The Studio Control Room is equipped with a TS-10A Switching Unit and camera controls for three studio cameras and the iconoscope film camera, which is located in the TV Master Control Room. An RCA Type 76-C Console is used for audio control of the TV

studio. All audio lines feed through the AM master control so that the TV studios may be used for AM shows when necessary.

The TV master control, also on the first floor and connected with the TV studio and its control room by 6 inch by 12 inch steel wiring ducts, houses the studio sync generator, the power supplies for the camera controls, the RCA TP-16A 16mm projector, the stabilizing amplifier for the TS-10A Switcher, and the slide projectors and iconoscope film camera. An RCA multiplexer permits the use of two 16mm projectors, two 2 inch by 2 inch slide projectors with one film camera. Also located in the TV master control are the terminal facilities of the telephone company for the video

circuits between the studio and transmitter. This circuit is "flat" to 5.0 megacycles and has a noise level 50 db below the 2-volt (p-p) video signal received at the transmitter.

Throughout all control rooms and studios steel ducts and trenches are installed to house wire and cable requirements. Where both a-c and program circuits are contained in the same trenches, steel separators divide the trench areas to isolate these circuits.

FM-TV Transmitter Facilities

The accompanying illustrations show the facilities installed on the 28th floor of

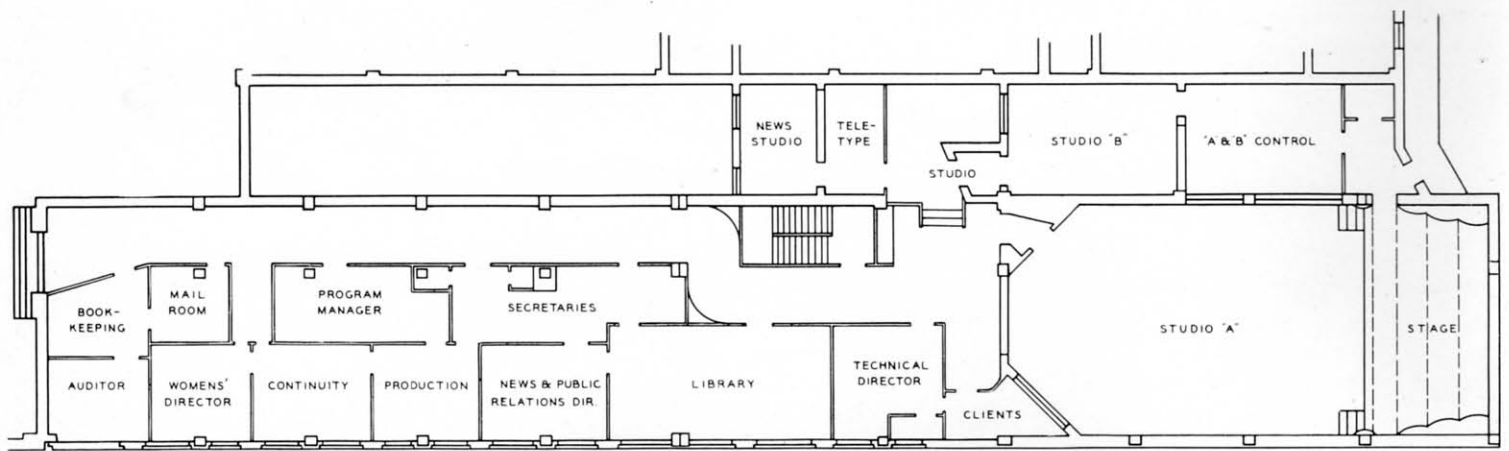


FIG. 8. The second floor plan of WTCN shows layout of offices and the two broadcasting studios.

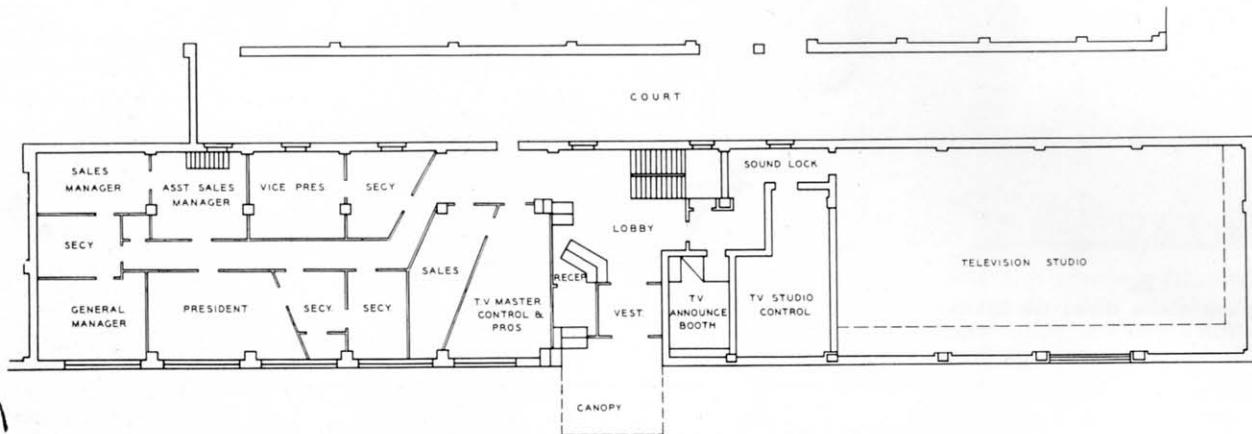


FIG. 9. This plan of the studios, at street level, shows the TV studio, the control room, the announcer's room and the offices.

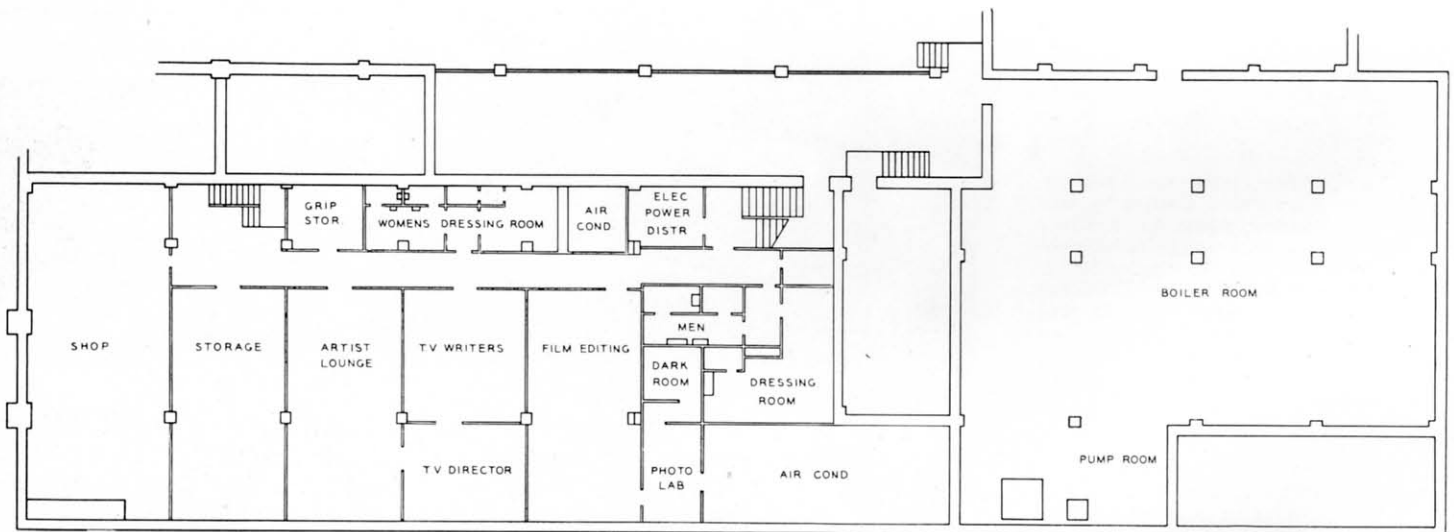


FIG. 10. Basement is used to advantage for shop, storage, film labs, and offices.

the Foshay Tower Building. Before the FM transmitter and antenna were installed for initial operation in 1946, it was necessary to provide a power bus from the transmitter floor to the Utility Company vault under the street, a run of some 700 feet. Four half-million cm cables were installed in anticipation of the FM and TV transmitter loads. The TV and FM transmitters are connected to the antennas on the single mast atop the building by coaxial, gas-

filled lines approximately 125 feet long. The installation of the antenna transmission lines was a problem since "straight" runs were not possible and off-sets had to be provided to obtain clearance around steam lines, elevator machinery, beams, etc.

The TV transmitter is an RCA Type TT-5A. WTCN is licensed for a 50 KW RCA FM transmitter, but is operating with interim power with an RCA Type

BTF-3B FM transmitter. Separate steel ducts for power and program circuits were channeled into the concrete floors to take care of requirements for both TV and FM transmitters and later expansion. Because of limited clearance of door heights and widths, all transmitter equipment had to be moved up into the transmitter space in units and assembled. The RCA Transmitter's mechanical design was ideally suited to meet this requirement. In fact,



FIG. 11. WTCN's television transmitter, TT-5A at left, and the 3 KW FM transmitter in background at right, are located on the 28th floor of the Foshay Building. Mr. Bert Coil, Transmitter Supervisor, is at the transmitter control console.

RCA transmitter design engineers visited the WTCN Foshay Tower transmitter space to be sure that their designs would be satisfactory to meet the limited clearances.

Also installed in this transmitter space is the TV terminal equipment of the Telephone Company, a 50-watt cue transmitter for "talk" to the 153.53 mc FM mobile unit, and receivers for reception from the Mobile Unit. In addition there is the RCA Type TTR/TRR Relay Receiver for the TV microwave system which feeds into an RCA Type TS-1A Switcher and TA-1A Distribution Amplifier so that the remote pix program can be fed to the transmitter, studio, and monitors for pre-checking.

FM-TV Antenna Facilities

The steel tower (Fig. 1) atop the Foshay Tower Building extends 86 feet above the top of the building and 23 feet below the top of the building where it is welded and bolted to central beams and columns. Immediately inside the top of the building a solid concrete ring holds the steel tower rigid so that no strain is placed on the



FIG. 12. Audio racks and patching system are conveniently located within reach of the operator. Messrs. Bert Coil, at left, John M. Sherman, at controls, and Paul Clark, RCA Representative, check video picture at different points in transmitter system. Converted RCA TV receiver, at left, is used to monitor microwave relay receiver.

FIG. 13. Studio A, used for AM broadcasting, measures 30 by 50 feet and has a stage which is 30 by 20 feet. Control room near stage, monitors programs from Studio A and Studio B, shown at extreme left.



special "flashing" on top of the building. The RCA 3-Bay Superturnstile TV antenna is secured to the tower by a special welded section and pedestal. The lower portion of the tower, under the TV antenna, supports the 4-bay FM antenna. On the top of the tower is installed a 153 megacycle receiving antenna for the FM mobile unit. Also on the top of the tower is a lightning rod with voltage divider. A range of 30-40 miles for audio remotes is obtained with the mobile unit. With the two microwave parabolas on opposite corners of the building, and an AM relay medium-frequency transmitting antenna supported on the tower, it is possible for 7 simultaneous radio operations to take place from this single installation.

All of the transmitter, studio and remote equipment was pre-checked and in-

stalled by the staff technicians of the WTCN Engineering Department. The co-operation of the RCA field representatives, factory, sales and engineering personnel,

RCA Service Company, and the WTCN engineering staff, and various local architectural and contractual firms has been deeply appreciated during the planning



FIG. 14. Broadcast master control position is located on the third floor. Mr. Lee Neuman is shown seated at console built by WTCN. Preset program switching system, behind Newman, was also built by the station. Note bank of RCA LC-1A loudspeakers overhead for checking local and network audio quality.



FIG. 15. Located behind the control console, are the racks of audio equipment. Mr. John M. Sherman points to the meters used to monitor regional and network AM lines.



FIG. 16. The WTCN Mobile Television Unit is shown outside the Lexington "Saints" Ballpark in St. Paul. Saints' Manager, Mel Jones, extreme right, distributes passes to group for opening game. From left to right, they are: John M. Sherman and Bob Ridder, of WTCN; Paul Clark, of RCA; and Cully Bloomquist, Manager of WDSM, Duluth Superior, a Ridder Station.

and installation stages of WTCN's TV-FM and studio facilities.

TV Mobile Unit

The television mobile field unit (Fig. 16) is an RCA Type PJ-50 with three remote cameras mounted and used. RCA microwave equipment is used daily on TV remotes and is picked up by one of the two parabolas (Fig. 2). The Saint Paul "Saints" Baseball carried on TV from Lexington Park is an 8-mile hop. A fortunate feature of the Foshay Tower Building is its centralized location for microwave reception and its dominance from almost any point in the Twin Cities.



FIG. 17. Interior of WTCN's Mobile Unit shows Bill McGinnis (at left), TV Supervisor, at master monitor, and Ray Hird, at the remote camera controls. Unit at upper left is used to monitor the microwave relay transmitter.