Putting a Station On the Air Is Often Quite a Job

250-kw Dickinson, North Dakota, Station Successfully Put On the Air Despite Hardships of an Extremely Cold Winter, Basic Equipment and Transportation Delays, Accessory Shortages, Incompetent Antenna Tower Work and a Telephone Strike.

by QUINTIN V. PROCHASKA
Chief Engineer, KDIX

WHEN WE received our cp some months we were faced with many shortage and installation problems.

The tower base and anchors for the guy wires of our three-hundred-foot tower had been put in during the winter. To thaw the earth for this operation straw had been placed on the ground, then covered with coal slack and allowed to burn for two days. Digging then followed, cement poured and then covered with an additional large quantity of straw.

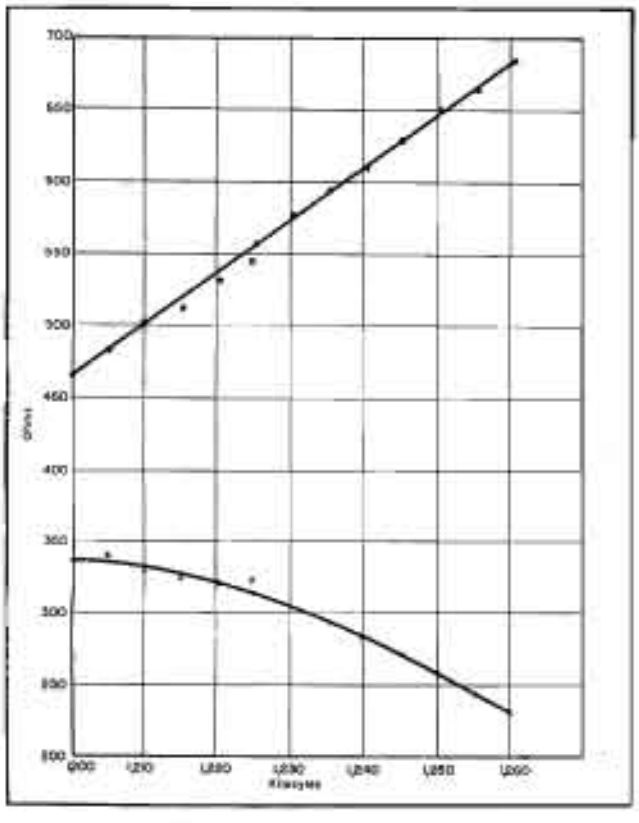
Due to the shortages of building materials, we were obliged to search for suitable housing and succeeded in locating a country school house which was moved in to serve for the transmitter building. The basement was dug by thawing the earth in the same manner used to prepare for the tower base and anchors.

While awaiting arrival of the tower we began planning of the studio. Space was leased on the second floor of a building in downtown Dickinson. Although we had not received our console or other equipment we did have the junction boxes and proceeded with this installation. Thus all the wiring was completed a long time before the arrival of the equipment.

As the spring of '47 neared the transmitter site was alternately frozen hard or muddy. The tower had arrived and then the tower construction crew began putting it up. As the ground thawed the laying of the radials for the ground system was begun.

To install the radials we used a tractor[1] with attached hydraulic lift plows. The mold-boards were removed and a narrow piece of steel was bolted on the beam. To the back of the point was placed a small steel pulley. By the use of the hydraulic lift and adjustments the steel rooter could be lowered into the ground about eight inches and also lifted clear of the ground. A wire reel was bolted on top of the plow and after a little experimenting we found the ideal approach; first reeling out one length of wire, going back and then running in the length laid out and at the same time running out another length of wire. By anchoring the wire at the tower base we were able to cut the wire into the ground with a narrow

[1]Ferguson.



KDIX antenna resistance and reactance measurements. Antenna measures 575 + j305 at 1230 kc; antenna current is 0.66 ampere for 250 watts.

Control room with the W.E. 40-A console. To the left of console is an announce booth for news broadcasts.

The author checking meter readings on the KDIX transmitter[2]. The regular transmission line is ⅝" and the spare ⅛" both filled with dry air. The open mounting of transmitter and racks facilitates servicing.

slit made in the ground and immediately closed serving to cover the wire and holding it in the ground.

The transmission lines were run above ground even though they were soft drawn copper and could have been safely put in underground. This was done because the best we could get for tower lights and remote meter circuits was ordinary lead-shielded cable. Since we wanted to run these cables above ground it was decided to run the transmission line similarly. There had been reports that gophers enjoyed eating lead shielding. We haven't had any experience with gophers eating the lead shield, but observations made in this section of the country have indicated that the lead does deteriorate in around five years, possibly due to some chemical content of the soil. The lead-shielded cable was not run in conduit due to its scarcity and expense. For economy sake we fed only 110-*v ac* to the tower for tower lighting. This does cause a considerable voltage drop, which if severe enough results in a slight dimming of side lights when the flashing beacon is operating. However, the procedure permits the use of a thermocouple instead of a diode rectifier for remote antenna current monitoring. The change in voltage between the time the tower lights are off and operating would be sufficient to alter the *dc* output of a rectifier. This could be corrected of course by running out a separate line for the rectifier. It would have been considerably better to have a 220-*v ac* line to the tower with an isolation stepdown transformer, since besides eliminating the voltage-drop, possibilities of feeding back *rf* into the power lines would have been minimized.

We were not too pleased with the construction gang work in installing the conduit and tower lighting circuits. Evidently to speed up their work the boys threaded the conduit lengths onto the wire until they had 100' lengths, the distance between the tower lights, then slipped in wood chips to hold the conduit from slipping, pulled up lengths and then turned each individual length to couple them together. They neglected to ream the ends of the conduit which naturally cut the wires. And the wood chips they had placed in the conduit made it exceedingly difficult to pull the wires out of the conduit when we were forced to replace them.

Another rush construction-gang item that caused us grief appeared in the tower where one side of the hot lead was shorted to the tower. This was not noticed until the construction gang were well on their way. The tower lights and the code beacon worked fine, but the tower of hot 110 *v ac* leading to ground was causing plenty of damage.

We were quite anxious to get started with our equipment test broadcasts and we thought that the hot lead problems could be solved by reversing the connections at the junction boxes and using the shorted wire as the common. This was tried, and even though the common was grounded immediately after leaving the tower lighting choke, enough *ac* voltage fed through the antenna tuning to cause the trans-

(Continued on page 31)

[2]Transmitter is a Gates 250C-1; modulation monitor, limiting amplifier and line amplifier are also Gates products. Frequency monitor is made by Doolittle.

Putting Station on Air

(Continued from page 7)

mission line meters and antenna current meter to burn out; there is always some voltage caused in this way but usually with negligible current. After pulling out the leads and replacing them, removing all grounds from the tower, our troubles disappeared. If this voltage had persisted, a large capacitor of sufficient voltage rating could have been placed in series with the antenna lead. This would not have affected the *rf* and yet blocked the low frequency *ac*.

The ground around the transmitter building was a complete mud hole, and the closest we could get to it with a truck with chains was still over a hundred feet. We had to carry the 250-w transmitter by hand from the truck to the building. The equipment racks were among some of the items that had not arrived, and thus temporary racks made of wooden two by fours were constructed and covered with galvanized tin. In these were placed the modulation monitor, limiting amplifier, line amplifier and frequency control unit of the transmitter.

As we could not obtain delivery of a frequency monitor we asked for and

(Continued on page 32)

Studio which has been treated with acoustic celotex, with the floor using linoleum for liveness. The windows can be used for ventilation by opening celotex covered doors.

Putting Station on Air

(*Continued from page 31*)

received authorization to operate without one with the requirement that we submit nightly frequency checks.[3]

After long delays we finally received our console for the studio and turntables and we were now ready to begin equipment tests. Only one problem still existed; we didn't have a telephone or program line. And at that time the telephone company was having a bit of a strike on their hands. After some pondering we managed to get the cooperation of two local amateurs who agreed to furnish us with a contact between the transmitter and a telephone to permit us to put our crystals on frequency via our temporary check service in Minneapolis.

An amateur portable rig was set up in the studio at the telephone and another at the transmitter. Contact was

[3]Phelps Precision Laboratory, Minneapolis, Minn., used for this measuring service.
[4]Wincharger.

Figure 2
View of 300' tower.[4] Ground system consists of 120 radials 400' long and 120 radials 50' long with a 48' square ground screen.

attempted but it was found that we couldn't get through due to a high hill between the studios and the transmitter. Time was passing and we were due on the air at 1 A.M. After a series of quick consultations we found that the city pump house in sight distance of the transmitter building had a phone which could be used. The equipment and phone calls were transferred, and at long last we were able to make contact.

Perhaps half of the population of our fair city were waiting to hear our initial broadcasts.

The first signals came in by phone from Minneapolis with the message: "You are coming in loud and clear, just a minute I'll adjust the loop . . . yes you're 48 cycles high." From the telephone in the pumphouse via amateur radio this message was relayed to me at the transmitter. We quickly adjusted the air gap on the crystal, Minneapolis took another measurement and reported by telephone via amateur radio: "You are now 16 cycles low." Another adjustment was made, the information routed through the unique circuit and the frequency was reported to be on the button. After a few congratulations we continued the procedure and installed the spare crystal exactly on frequency in the same way.

Negotiations had concluded the telephone strike and by the time we had finished our equipment tests the telephone workers had rushed in the program lines and we began our regular broadcast program tests.

Another station had been put on the air in spite of equipment shortages, winter handicaps, and a strike!

Tube Engineering

(*Continued from page* 15)

ceptance, and so changes the oscillator frequency. The amplitude of oscillation will also be affected if the transconductance changes.

Kurshan reported that the tube could also be used in an FM transmitting system. That is, by applying modulation to the reflector electrode, the tube can be used to generate a frequency-modulated signal directly. Although the modulation characteristic is not inherently linear, this device has the advantages of high sensitivity and high impedance. In checking on this application, the tube was connected in standard fashion except that the reflector was bypassed only for *rf* and connected directly (with no amplifier) to a microphone. The frequency deviation was estimated to be about 30 *kc* with negligible distortion, because of the limited portion of the characteristic used.