SECRET

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TECHNICAL REPORT

WT-1 Transmitter Installation - Project UJDOWN

Contents:

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SUBJECT: General Technical Report

Specific WT-1 Transmitter Installation - Project UJDOWN

I PURPOSE:

The Project involved the installation of a transmitter in the living room of an apartment in Berlin, Germany.

II SURVEY INFORMATION:

The preliminary survey indicated that the apartment was located on the second floor above ground level in a four-story building. The building was one block off a busy thoroughfare and located in the midst of buildings of a similar nature. No exterior photographs were made for security reasons. Interior photographs are attached. An examination of the interior indicated quite definitely that only two points in the living room were amenable to the installation of a line-powered transmitter without extensive drilling and chipping in the concrete walls. These points were the radio broadcast receiver and the floor lamp. As the radio receiver could have been a source of interferring sound and might have been affected by a transmitter installed in its cabinet, it was rejected as a point of concealment. Due to the nature of the target and the uncertainty regarding the location of the listening post, the WT-1 transmitter was selected for the job.

In an attempt to determine a suitable frequency within the tuning range of the WT-1, the following steps were carried out:

A. The local KURIOT representative was questioned regarding his experiences in this field.

B. The local KUCLUB representatives were similarly questioned.

C. The FM broadcast band was determined to be within the range of 88 and 99.9 megacycles, the majority of broadcast receivers for the band have 10.7 megacycles intermediate frequencies and the local receiver oscillator normally operates above the signal frequency. Possible interferring image frequencies were calculated from this.

D. Four hours of monitoring on the selected frequency were carried out prior to the installation.

E. The WT-1 transmitter was tested in the proximity of a high-quality Grundig FM broadcast receiver.

F. Information on occupancy of frequencies in the Berlin area was requested from Headquarters by cable.

The steps above indicated that a frequency of 73.5 megacycles would be

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suitable. An interferring image signal occurred on the Grundig receiver at distances up to 12 feet but beyond this no trace of the transmitter could be found throughout the tuning range of the receiver. The information from Headquarters was requested too late to affect the installation but the transmitter can be shifted in frequency if Headquarters information subsequently indicates that this is necessary.

III INSTALLATION DETAILS:

Due to the newness of the WT-1 in KURIOT very little practical information existed which would have indicated the range that could have been expected from the installation contemplated. Therefore it was felt that every effort should be made to attain the best radiation efficiency from the installation. The best way to accomplish this appeared to be by making use of the lamp frame as the antenna. This would involve insulating the metal case of the transmitter (RF ground) from the metal frame of the lamp (antenna). This scheme was carried out but resulted in failure due to the excessive capacity which resulted between the lamp and the transmitter chassis. The problem basically was that the space available in the base of the lamp was very limited and this meant that the insulating material used had to be quite thin. With a spacing between the flat transmitter case and the lamp base of approximately .050 and an effective area of approximately 12 square inches per plate the capacity was sufficient to short circuit all RF energy from antenna to ground.

The final installation was made as follows:

A. The transmitter was placed in the base of the lamp and was grounded electrically to the lamp.

B. The transmitter power cord was passed through a hole in the steel pipe and up to the power switch at the top of the lamp.

C. The microphone was installed in the top of the lamp beneath the socket for the large bulb. The acoustic pickup should be good as decorative openings exist in the chamber of the lamp used for concealment and a direct air path to the microphone is available for the sound waves from the room. The cord to the transmitter passed through the steel support pipe in the center of the lamp.

D. The antenna consisted of a quarter-wave length of #32 Formvar copper wire "sewed" through the cloth braid covering of the power cord of the lamp. It is entirely invisible.

The photographs and pictorial diagrams attached illustrate the details mentioned above.

IV TEST RESULTS:

The modifications to the lamp were performed in the KURIOT shop at Berlin. The bench test of the modified lamp indicated satisfactory radiation of RF energy and sufficient modulation. A certain amount of hum existed in the

/audio output. It/

audio output. It was not prohibitive but was noticeable. In order to determine the cause of the hum the lamp was dis-assembled and the microphone case was grounded to the transmitter frame. This resulted in a slight increase in hum. The microphone was removed from the lamp entirely with no significant change in the hum level. As the hum did not appear by ear to modulate the audio signal and would not be sufficient to mask sounds picked up by the microphone under the conditions of the installation, the lamp was re-assembled.

The following day the lamp transmitter was actuated in the workshop and a radio broadcast receiver was left playing as a source of audio. A CRR-2 receiver was used in a vehicle to test the signal strength outside the headquarters. The transmitter and antenna was located approximately five feet below ground level in the headquarters building. With the CRR-2 receiver inside the vehicle (US passenger car) and the flexible antenna in the briefcase a good signal was received at a distance of three-hundred feet from the transmitter. The next test point was approximately 1000 yards from the transmitter in a third floor apartment room. The CRR-2 receiver with the flexible antenna did not pick up any signal from the transmitter. With a half-wave dipole the presence of the transmitter could be detected. A PFR-5 receiver and a half-wave dipole was substituted for the CRR-2 and the signal was received with good strength. Receiver noise quieting was excellent and the audio was of good quality and very little hum was present. It was necessary to use horizontal polarization of the antenna but the horizontal directivity was not critical except that pickup was lost off the ends of the dipole.

When installed in the target the Research Products field strength meter gave approximately one-quarter deflection along the antenna/power cord. When a signal strength test was performed from a vehicle using a PFR-5 receiver and an automobile antenna, it was found that an area of several blocks were covered by the transmitter. Some shadow effect was noted at the fringes and flutter was also apparent in some cases probably from reflections off buildings and the resulting interference effects caused by phasing. A map was made of the area covered by the transmitter under these test conditions. The preceeding test results would indicate that much greater range could be expected using a more suitable antenna and above the ground level, however local conditions made it impossible to carry out any more extensive tests to prove this.

9 February 1956