

McDOWELL ELECTRONICS, Inc.

105 FORREST STREET, METUCHEN, N. J. • (Area Code 201) 548-9109

CERTIFICATION OF COMPLIANCE RULES AND REGULATIONS, VOL. II, PART 15, F.C.C.

The student Radio Transmitting Station of Rutgers University, New Brunswick, New Jersey (WRSU), consists of 14 individual transmitters operating on a fixed frequency of 680 Kilocycles per second.

The (WRSU) Studio incorporates a crystal oscillator and associated circuitry which provides a stable radio frequency signal at 42.5 Kilocycles per second at a level of 1.0 to 1.5 volts. This signal is fed to the individual transmitters through telephone lease lines along with a high level audio signal supplied from a channel amplifier. The audio is controlled from a master control console through a series of jacks which permits the audio to be switched to each individual transmitter separately.

The individual transmitters are connected to the telephone lease lines on the input side. The 42.5 Kilocycles per second signal is fed to a (x16) frequency multiplier through a hi-pass filter. The 680 kilocycles per second (42.5×16) is fed to a driver, then to a 1625 final amplifier.

The audio signal from the telephone lease lines is fed to a modulator through a 42.5 Kc/s trap, and the output of the modulator, (push-pull 6L6's) is fed to the 1625 final R.F. Amplifier, providing amplitude modulation.

Thirteen of these transmitters are located in New Brunswick as follows:

- 1 - Campbell Dormitory, George Street, New Brunswick
- 2 - Hardenbergh Dormitory, George Street, New Brunswick
- 3 - Frelinghuysen Dormitory, George Street, New Brunswick
- 4 - Clothier, Corner of George Street, & Bishop Pl, New Brunswick
- 5 - Wessells, George Street, New Brunswick
- 6 - Tinsley, Corner of College Ave. and Bishop Pl, New Brunswick
- 7 - Arts Building, Nichol Avenue, New Brunswick
- 8 - Jameson Dormitory, Corner of Jones Ave. and Suydam Street, New Brunswick
- 9 - Lippencott Hall, Nielson Campus, New Brunswick
- 10 - Nicholas Hall, Nielson Campus, New Brunswick
- ✓ 11 - (AZØ) Not Tested - Out of Service
- ✓ 12 - (ZBT) Not Tested - Out of Service
- 13 - The Cabin, Gibbons Campus - Not Tested - Out of Service

The fourteenth transmitter is located in the cafeteria of Davidson Dorms at University Heights in Piscataway Township. This transmitter differs from the other 13, in that it has its own crystal and operates at 680 Kilocycles per second, Crystal Frequency.

Each of the transmitters feeds its output into the power lines in each building, on the building side of the power transformers through three coupling capacitors, one capacitor for each phase. Several of the transmitters incorporate a series output resistor to attenuate the output into the power lines.

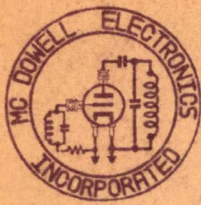
The transmitters are capable of running between 15 and 20 watts, as they now stand. The largest single limiting factor is the antenna matching circuit. The average D.C. input to the 1625 final amplifier is between 8 and 10 watts. The 6L6 modulator is capable of providing sufficient audio for 100% modulation.

The transmitters are periodically tuned-up by the students operating same, by means of oscilloscope checks on each transmitter to assure maximum undistorted modulation. Peak modulation levels are on the order of 95 to 98%. Average levels vary depending upon the channel amplifier used to supply program audio. For normal programming, a compressed amplifier is employed maintaining audio levels at a maximum of 0 Vu. The average level with the compressor is -1 to -2 Vu. This corresponds to a modulation percentage of approximately 85%.

The channel without the compressor, which is used for classical music programming, provides an average audio level considerably lower than that of the compressed amplifier, depending on the program material.

All components are conservatively rated and in most cases are run at half their CCS ratings. The final efficiency, with 350 volts on the plate of the final tube, is estimated to be between 60 and 65%.

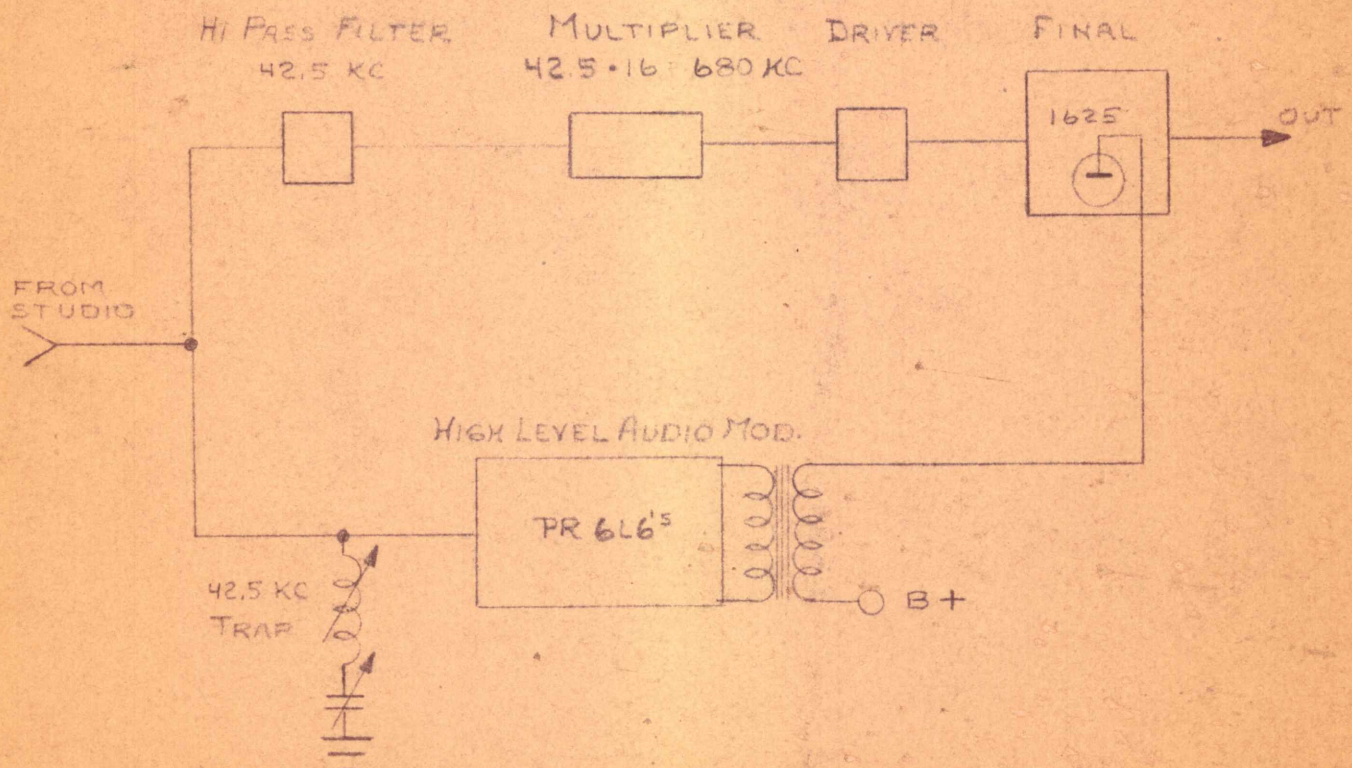
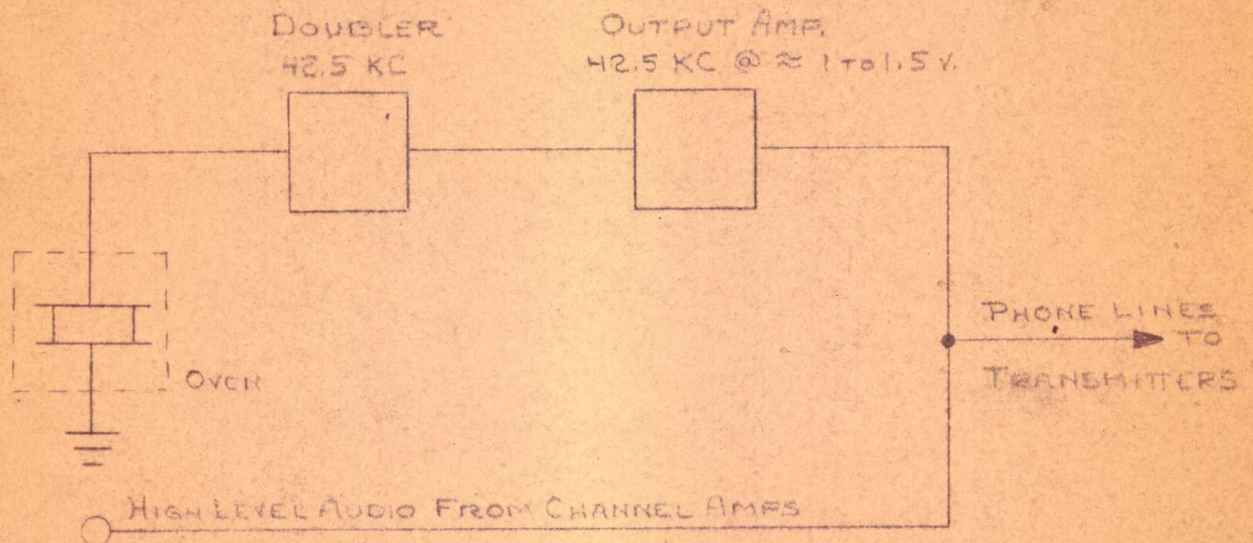
For block diagram of this system, see Figure (1).



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Field intensity measurements were made in the City of New Brunswick, New Jersey and on all Rutgers University properties on December 2nd, December 3rd, December 6th and December 8th of 1966.

The equipment used is the Stoddart Model NM20B RIFI Meter and a Mackay Radio Marine Radio Receiver, Type 128-A.

Tests were made at all transmitter locations with the Mackay 128-A Receiver for the purpose of detecting radiation at 42.5 Kilocycles per second. In all cases, no signal above the ambient noise level could be detected with a half-wave long wire antenna. The final test was that of a direct connection into the telephone line carrying the crystal amplifier output signal of 42.5 Kc/s. In this case the signal was detected.

The final fundamental frequency of Radio Station WRSU is 680 Kilocycles per second. At this frequency the allowable radiation must not exceed 15 microvolts per meter at a distance of 231 feet from the power lines, which in this case is the antenna. (157,000/680)

All transmitters were tested for excessive radiation and all were found to be within the tolerance specified. The Campbell Dormitory, Hardenbergh Dormitory and the Frelinghuysen Dormitory are all located on the Raritan River Bank along George Street. Tests were made at twenty-three points along the opposite side of the river, an approximate distance of 420 feet from the George Street power lines, and no signal could be detected above the ambient noise level which varied between 10.5 and 24 micro-volts per meter. Individual test points in all directions were plotted on the enclosed maps and at an approximate distance of 100 feet, the signal strength varied between 37 and 58 micro-volts per meter. At a distance of 200 feet in all directions, the signal strength was below the ambient noise level which varied from 10.5 to 24 micro-volts per meter.

The power lines serving Lippencott Hall and Nicholas Hall, both located on the Neilson Campus, extend along N. J. Rt. 18 from New Brunswick to the entrance of the New Jersey Turnpike. Radiation from these power lines is detected, when measuring directly under the power lines, for a distance of 2.8 miles. Tests were made at four different locations and the radiation was found to be within all limitations. For example: Where U. S. Rt. #1 intersects N. J. Rt. #18, the reading directly under the power lines was found to be 520 microvolts per meter. At a distance of 100 feet in the southerly direction, the reading was 64 uv/m. At a distance of 200 feet in the same direction, the reading was 17.2 uv/m. At a distance of 230 feet in the same direction, the reading was 12.8 uv/m. At a distance of 100 feet to the north, the reading was 36 uv/m. At a distance of 200 feet to the north, the reading was 14 uv/m. At a distance of 230 feet to the north, the reading was 12.2 uv/m. The ambient noise level at this location, on a frequency of 680 Kc/s was 10.25 uv/m.

All transmitters were tested for harmonic radiation up to and including the tenth harmonic. These tests were made at a distance of 50 feet and in the direction that fundamental radiation was highest. No signal above the ambient noise level was detected on any harmonic frequency.

The second harmonic (1.36 Mc/s) could not be tested due to a carrier frequency, from another station, at a level of 480 uv/m. The ambient noise level of the third harmonic (2.04 Mc/s) had an average field intensity of 12 uv/m. The ambient noise level of the fourth harmonic (2.72 Mc/s) was at an average level of 11.2 uv/m. The ambient noise level of the fifth harmonic (3.4 Mc/s) was at an average level of 7.4 uv/m. The sixth harmonic (4.08 Mc/s) could not be tested due to a carrier frequency, from another station, at a level of 560 uv/m. The ambient noise level of the seventh harmonic (4.76 Mc/s) was at an average level of 9.2 uv/m. The ambient noise level of the eighth harmonic (5.44 Mc/s) was at an average level of 12.4 uv/m. The ninth harmonic (6.12 Mc/s) could not be tested due to a carrier frequency, from another station, at a signal strength of 240 uv/m. The ambient noise level of the tenth harmonic (6.8 Mc/s) was at an average level of 24.4 uv/m.

The power lines feeding Nielson Campus were tested every 500 feet along N. J. Rt. #18. Each reading was taken with the test antenna positioned directly under the power lines.

At a distance of 500 feet from the campus, the signal strength was 2200 uv/m. At 1000 feet, the reading was 320 uv/m. At 1500 feet, the reading was 1600 uv/m. At 2000 feet, the reading was 1200 uv/m. At 2500 feet, the reading was 2000 uv/m. At 3000 feet, the reading was 400 uv/m. At 3500 feet, the reading was 2200 uv/m. At 4000 feet, the reading was 1440 uv/m. At 4500 feet, the reading was 280 uv/m. At 5000 feet, the reading was 200 uv/m. At 5500 feet, the reading was 400 uv/m. At 6000 feet, the reading was 180 uv/m. At 6500 feet, the reading was 480 uv/m. At 7000 feet, the reading was 200 uv/m.

We certify, based on tests and measurements of field strength, that Radio Station WRSU, owned and operated by Rutgers University, New Brunswick, New Jersey, has incorporated sufficient suppression techniques, and is operating in full compliance with Part 15, Volume II of the Rules and Regulations of the Federal Communications Commission.

MC DOWELL ELECTRONICS, INC.



R. B. McDowell
President