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A Modern Amateur Transmitter

Using The Latest Tubes and Circuits Operates Over All Amateur Bands

By Stanley P. McMinn (W2WD)

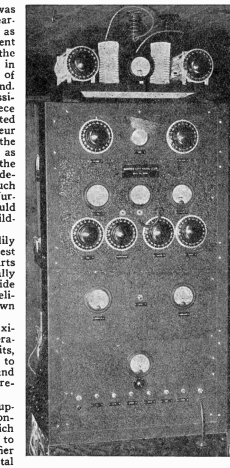
Builder of The Official Hudson Division A.R.R.L. Convention Transmitter

WHEN this transmitter which was built by the author for the Garden City Radio Club and installed as the official transmitter at the recent Hudson Division Convention of the A.R.R.L. at the Hotel Pennsylvania in New York, was projected, a number of important points were kept in mind. Principal among these was the necessity producing a genuinely reliable piece of equipment that could be shifted quickly to any one of the four amateur bands. It was decided to make the transmitter as thoroughly modern as possible by taking advantage of all the latest types of tubes and recently developed circuits, but to do so in such a way that subsequent changes to further modernize the equipment could be made with the minimum of rebuilding.

The first of these objects was readily achieved by using nothing but the best parts available. In most cases parts somewhat larger than would normally be specified were used so as to provide a sufficient margin of safety to eliminate the possibility of breakdown in service.

In order to achieve maximum flexibility in making possible further alterations or improvements in the circuits, the whole transmitter was made to consist of a number of separate and separable units, though they were carefully co-ordinated.

Thus, for example, the power supplies, which are three in number, consist of the main power supply which supplies 1150 volts at anything up to 500 mils for both the final amplifier and the Class B modulator. The total current drain for those two units, however, even at modulation peaks seldom exceeds 400 mils and is mostly in the neighborhood of 325. Thus, the considerable reserve available improves both stability and regulation.



Front view of transmitter showing panel arrangement and switches for individually controlling all circuits.

Of the other two power supplies, one is rated to give 200 mils at 350 volts and is used to feed the speech amplifier and driver tubes which actuate the Class B portion of the modulator. The other is rated to supply 250 mils at 525 volts and furnishes power for the '59 tri-tet oscillator, the following '46 doubler and the '41 neutralized buffer, the latter being link coupled to the pair of push-pull 800's in the final stage.

The main power supply employs Aerovox Type 1503 transmitting filter condensers while the others use Type E5 electrolytics.

For operation in the 14000KC fone band a 3560KC crystal is used, the frequency being doubled in the plate circuit of the tri-tet, doubled again in the '46, with the '41 operating as a straight neutralized amplifier.

For operation in the 80 meter fone band, the cathode circuit of the '59 is shorted, both grid and plate condensers are paralleled and a 160 meter crystal used in the resulting circuit which is a straight pentode oscillator. The following '46 then becomes a doubler requiring no neutralization, and the '41 is the straight buffer-amplifier.

For 40 meter CW operation the same arrangement may be used with the '41 doubling, or an 80 meter crystal may be used in a tri-tet circuit with the '46 functioning as a neutralized amplifier and the '41 as a neutralized buffer.

All these changes of frequency are very quickly and easily made through the use of plug-in inductances wound with relatively small wire (No 22) on National R-39 receiver type coil forms.

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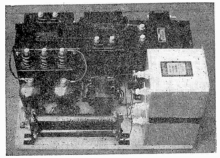
The main PA tank is a 3½ inch in diameter copper inductance for 20 or 40 meters and for 80 and 160 meters the inductance is wound on a National 2½ inch form.

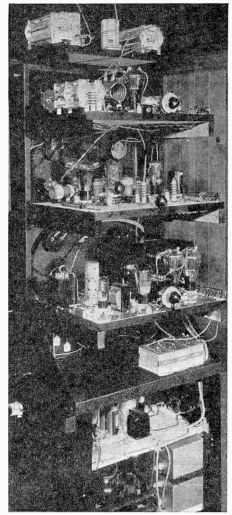


Main power supply unit which delivers 1150 volts at 500 mils full load.

With the '41 operating at 500 volts and 80 mils which is quite a load for that tube, although the plate shows no color, ample excitation is provided for the pair of 800's in the final stage on all frequencies.

Each of the units in the transmitter is built on an individual shelf, the main power supply being at the very bottom so as to get as far away as possible from the speech amplifier circuits; above it are the two low-power power supplies, all three of them being separated from the rest of the rig by a steel panel for maximum shielding.

The switching arrangement on the front panel is somewhat out of the ordinary in that it provides switches so that any one of the circuits or units may be tested alone. Thus, for example, one switch controls a.c. to all transformers. A second controls all filaments except those of the speech amplifier and modulator tubes, which are separately controlled, so that they can be left off when the transmitter is used for C.W. Similarly, individual switches control plate power to the

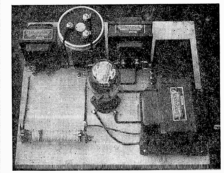


Rear view showing the three power supplies at the bottom and the modulator, exciter unit and final P A on the shelves above it.

modulator, exciter unit, and final amplifier, making it possible to put power on any one alone.

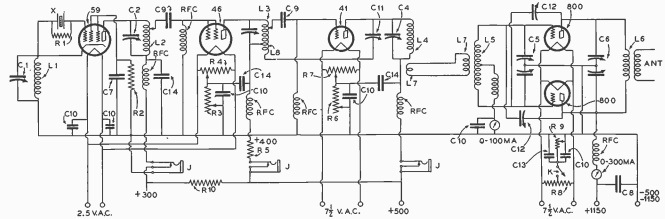
100 WATT R. F. UNIT

L1 to L8—see coil data.
C1—250 mmfd. National midget variable.
C2, C3, C4—100 mmfd. National midget variables.
C5—210 mmfd. Per section. National split stator midget variable.
C6—100 mmfd. Per section. National split stator double space transmitting condenser.
C7—0.05 mfd. Aerovox fixed mica condenser, Type 1450.
C8—0.002 mfd. Aerovox fixed mica condenser, Type 1457.
C9—0.05 mfd. Aerovox fixed mica condenser, Type 1450.
C10—0.01 mfd. Aerovox fixed mica condenser, Type 1450.



The speech amplifier power supply which delivers 350 volts at 200 mils.

C11—35 mmfd. National midget variable.
C12—Neutralizing condensers, home made.
C13—25 mfd. Aerovox electrolytic



Circuit wiring diagram of the entire r. f. unit from the crystal-controlled tri-tet '59 to the final 800's in push-pull.

Condenser (audio by-pass for modulated service only) Type E5-25.
C14—0.002 mfd. Aerovox fixed mica Type 1450.
R1—100,000-ohm Aerovox 20-watt resistor, Type 933.
R2—40,000-ohm Aerovox 20-watt resistor, Type 933.
R3—1,000-ohm Aerovox 25-watt adjustable resistor, Type 952.
R4—30-ohm Aerovox center-tapped resistor, Type 986.
R5—1,500-ohm Aerovox 10-watt resistor, Type
R6—1,000-ohm Aerovox 25-watt adjustable resistor, Type 952.
R7—50-ohm center-tapped resistor, Type 986.
R8—50-ohm 15-watt Aerovox center tapped resistor, Type 992-ct.
R9—2,000-ohm 75-watt Aerovox Adjustable resistor, Type 956.
R10—12,000-ohm Aerovox 10-watt resistor, Type 931.
RFC—National transmitting radio frequency chokes.
J—Closed circuit jacks.
X—Crystal.
K—Key for CW

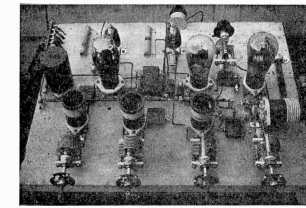
SPEECH AMPLIFIER AND MODULATOR

T1—Double button microphone transformer.
T2—Push-pull input transformer.
T3—Class B input Transformer.
T4—Class B output transformer.
RFC—Small National radio frequency chokes.
R2—500,000-ohm Potentiometer.

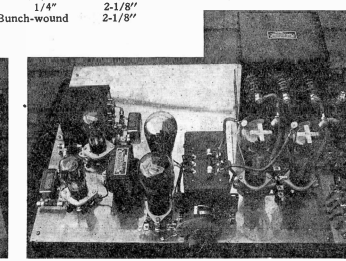
COIL DATA FOR 14-MC. OPERATION

Coil	Aprox. Freq. kc.	No. Turns	Wire Size	Spacing Between Turns*	Length of Winding	Inside Diam.
L1	3500	14	18 d.c.c.	None	1-1/4"	2-3/4"
L2	7000	10	18 d.c.c.	None	3/4"	2-3/4"
L3	14000	7	14 enam.	1/16"	1-1/2"	2-1/8"
L4	14000	8	14 enam.	1/4 "	3-3/4"	2-1/8"
L5	14000	8	3/16 c.t.	1/8 "	1-5/8"	2-1/8"
L6	14000	8	1/4" c.t.	1/4 "	4-1/2"	2-1/2"
L7	.....	7	18 d.c.c.	None	1/4"	2-1/8"
L8	.....	4	18 d.c.c.	None	Bunch-wound	2-1/8"

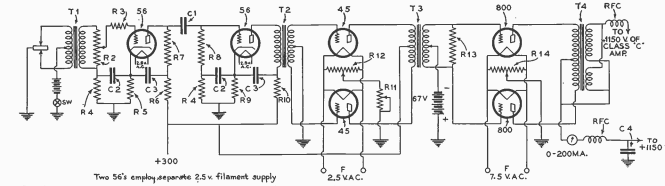
*Spacing turn-to-turn, not between centers.



The exciter unit showing how the crystal, '59 tri-tet oscillator, '46 buffer-doubler and '41 neutralized amplifier driver are mounted. All coils are plug-in type.



The speech amplifier and modulator unit, built on a copper sheet base, consists of two 56's resistance coupled feeding a pair of 45's push-pull to drive the pair of 800's in Class B.



Two 56's employ separate 2.5 v. filament supply

Circuit diagram of speech amplifier and modulator which starts with 56's resistance coupled and ends up with a pair of 800's in Class B.

R3— 75,000-ohm Aerovox 1-Watt resistor, Type 1094.
R4—200,000-ohm Aerovox 1-watt resistor, Type 1094.
R5— 2,800-ohm Aerovox 1-watt resistor, Type 1094.
R6— 25,000-ohm Aerovox 1-watt resistor, Type 1094.
R7— 50,000-ohm Aerovox 1-watt resistor, Type 1094.
R8—500,000-ohm Aerovox 1-watt resistor, Type 1094.
R9—2,700-ohm Aerovox 1-watt resistor, Type 1094.
R10— 7,500-ohm Aerovox 1-watt resistor, Type 1094.
R11— 1,500-ohm Aerovox 25-watt Adjustable resistor, Type 952.
R12—20-ohm Aerovox center tapped resistor, Type 986.
R13—40,000-ohm Aerovox 15-watt resistor, Type 932.
R14—50-ohm Aerovox center tapped resistor, Type 986.
C1—0.002 mfd Aerovox fixed mica condenser, Type 1450.
C2—0.1 mfd Aerovox fixed condensers, Type 260.
C3—2.0 mfd. Aerovox electrolytic condensers, Type E5-2.
C4—0.002 mfd. Aerovox fixed mica condenser (5000 volts), Type 1457.