



PLATE TUNING

A large, circular, black knob with a brass-colored ring and a scale from 0 to 100. It has a small brass-colored logo on the right side of the ring.



PLATE CURRENT

A semi-circular meter with a white face and black markings. The scale ranges from 0 to 500. The needle is pointing to approximately 100. The text "MILLIAMPERES" is printed on the face.



GRID CURRENT

A semi-circular meter with a white face and black markings. The scale ranges from 0 to 20. The needle is pointing to approximately 10. The text "MILLIAMPERES D.C." and "GRID" are printed on the face.



FILAMENT

A small, round, brass-colored switch and a green indicator light.

R.F. POWER AMPLIFIER
TYPE NO. 90881

JAMES MILLEN MFG. CO., INC.
MALDEN MASS. U.S.A.



GRID TUNING

A large, circular, black knob with a brass-colored ring and a scale from 0 to 100. It has a small brass-colored logo on the bottom of the ring.

INSTRUCTIONS for The 90881 RF POWER AMPLIFIER

1. GENERAL

The No. 90881 Universal RF Power Amplifier unit is designed for use with a pair of tubes such as 812As, 35Ts, T40s, T55s, HK154s, RK35s, etc., with a plate circuit power input on the order of 500 watts. As shipped, the unit is wired for use with the popular "812A" tubes. This amplifier is designed to operate from an exciter such as the Millen No. 90801. It is equipped with Millen No. 43000 center link coils in the grid circuit and No. 42000 coils for use with swinging link in the plate tank circuit. As shipped, the unit includes a 10 meter 43011 and a 10 meter 42010. Additional coils are available for the 20, 40, 80, and 160 meter bands, as might be required. Special coils are available for special frequencies in connection with commercial applications.

The power amplifier is provided with terminals for filament input, 115 volt A.C., C-, ground and high voltage. The high voltage connection is provided by means of a 37001 safety terminal. The pilot light is connected directly across the filament circuit, so as to indicate when the filaments are on. The 115 volt input and control switch are added so as to provide for external control or for the inclusion of a filament transformer in the power amplifier itself. Ample room has been left in the chassis to provide for mounting this filament transformer, if it is so desired. The entire circuit is laid out for ease of operation, adjustment and maintenance.

The grid circuit, which has a split section, dual condenser is tuned by the dial on the right hand side of the panel. The RF input terminals are provided immediately back of the grid coil.

A meter is provided for indication of grid current. The meter is calibrated in grid current per tube. Total grid current is the meter reading multiplied by two. Grid bias is provided by a combination of fixed and self bias, sufficient external bias being required to prevent any "runaway" operation. At the same time, this is kept to a minimum so as to avoid the necessity of supplying over 45 volts external bias.

The plate tank is tuned by means of a dial on the left hand side of the panel. This dial controls a Millen No. 16060 split stator dual condenser. The plate tank coils are of the No. 42000 type and plug into a jack bar, mounted to the right of the condenser. While the combination of a No. 16060 and the No. 42000 coils cover all of the amateur bands, except 160 meters, provisions have been made for the addition of a G.E. vacuum condenser, if it is found desirable to operate the amplifier at a frequency lower than 3.5 megacycles. RF output terminals are back of the plate tank coil for easy connection to the antenna. Antenna coupling is controlled by means of screwdriver adjustment, just to the left of the center escutcheon. The No. 90881 is easily neutralized by means of two No. 15001 disc type neutralizing condensers, mounted to the right of the center of the chassis.

The equipment is designed so that all adjustments are simple and not unduly critical. Considerable information is available, in the ARRL Handbook, on the operations and use of Class C Amplifiers.

2. POWER REQUIREMENTS

The 90881 uses a pair of triodes such as 812-A in a push pull circuit. Maximum rated power input is 1500 volts at 346 milli-amperes,

or 520 watts. The r-f power output should be approximately 380 watts.

3. EXCITATION

The R. F. excitation required by a pair of 812-As in the 90881 is approximately $17\frac{1}{2}$ watts.

The R. F. excitation required for the 90881 may be supplied by the Millen No. 90881 Exciter.



4. CATHODE MODULATION

The Millen No. 90831 Modulator may be used to cathode modulate the No. 90881 RF Power Amplifier. Since the No. 90831 is capable of approximately fifty-five watts of undistorted output, the No. 90881 may be 43% plate modulated, and 57% grid modulated.

The No. 90881 plate voltage and total plate current must be adjusted to present approximately 4800 ohms load to the modulator. This condition is met when $M(E/I) = 4800$. M is the per cent plate modulation, which in this case is limited to 43% by the modulator output. E is the plate voltage applied to the R-F Power Amplifier, and I is the total R-F Power Amplifier plate current in amperes.

The maximum power input to the No. 90881, using 812-A tubes, for this type of operation at 43% plate modulation is 226 watts. With this input, the output is approximately 136 watts; equivalent to the output of a 100% plate modulated transmitter with 176 watts input.

For a power input of 226 watts and a modulator load impedance of 4800 ohms, the No. 90881 plate voltage should be 1040 volts, and the plate current should be 217 milliamperes.

The lower terminal strip on the No. 90831 Modulator should be connected exactly as described in section 3 of the Modulator instruction book, except that the TRANS + H.V. should now be grounded. Terminals 3, 4, and 5 on the upper terminal strip require no connection. The monitoring oscilloscope should be connected to the

upper terminal strip as described in section 3 of the Modulator instruction book. The output from the safety terminal, J2, on the modulator should be connected to the center tap of the amplifier filament transformer. This transformer should be used exclusively for the 812-As in the No. 90881.

The audio voltage for grid modulation may be obtained by connecting a 500K potentiometer from the SCOPE terminal on the modulator to ground. The arm of the potentiometer should be connected through a 2 mfd. condenser to the C- terminal on the No. 90881 R-F Power Amplifier. An audio choke should be connected between the amplifier C- terminal and the actual external bias. If more audio voltage is required for grid modulation, it can be obtained from the junction of C5 and R11.

When the No. 90881 is cathode modulated, it is advisable to change C2 and C3 from 6000 mmf to 1000 mmf and to add a 1000 mmf by-pass condenser between the grid coil center-tap and ground.

The audio grid modulating voltage, the bias voltage on the 812-As, and the amplifier plate current should be adjusted for maximum modulation linearity, using a trapezoidal pattern on the monitoring oscilloscope.

Terminals 3, 4, and 5 on the Modulator may be used to operate a relay to make the necessary phone-CW changes in the connections for the No. 90881 R-F Power Amplifier.

5. TECHNICAL SUMMARY

Power Supply

High Voltage

1000 volts d.c. at 230 ma.
to 1500 volts d.c. at 350 ma.

Heater Voltage

6.3 volts a.c. at 8 amperes for 812-A tubes.

Excitation

Approximately 17½ watts.

Power Input

C-W—520 watts maximum.
A-M—350 watts maximum.

Physical Dimensions

Height—10½ inches.
Width—19 inches.
Depth—13 inches behind panel.
Weight—32½ pounds.

The 90881 R. F. Power Amplifier is designed to mount in a standard rack.

Tube Complement

Two power triodes such as 812-As.

Frequency Range

1.8 mc. to 30 mc. with plug-in coils. Coils available for 1.8, 3.5-4, 7, 14, and 27-28 mc. amateur bands.

CATHODE MODULATION OF 90881

The 90831 Modulator may be used to cathode modulate the 90881 R-F Power Amplifier. Since the 90831 is capable of approximately fifty-five watts of undistorted output, the 90881 may be 43% plate modulated, and 57% grid modulated.

The 90881 plate voltage and total plate current must be adjusted to present approximately 4800 ohms load to the modulator. This condition is met when $M(E/I) = 4800$. M is the per cent plate modulation, which in this case is limited to 43% by the modulator output. E is the plate voltage applied to the R-F Power Amplifier, and I is the total R-F Power Amplifier plate current in amperes.

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For a power input of 226 watts and a modulator load impedance of 4800 ohms, the 90881 plate voltage should be 1040 volts, and the plate current should be 217 milliamperes.

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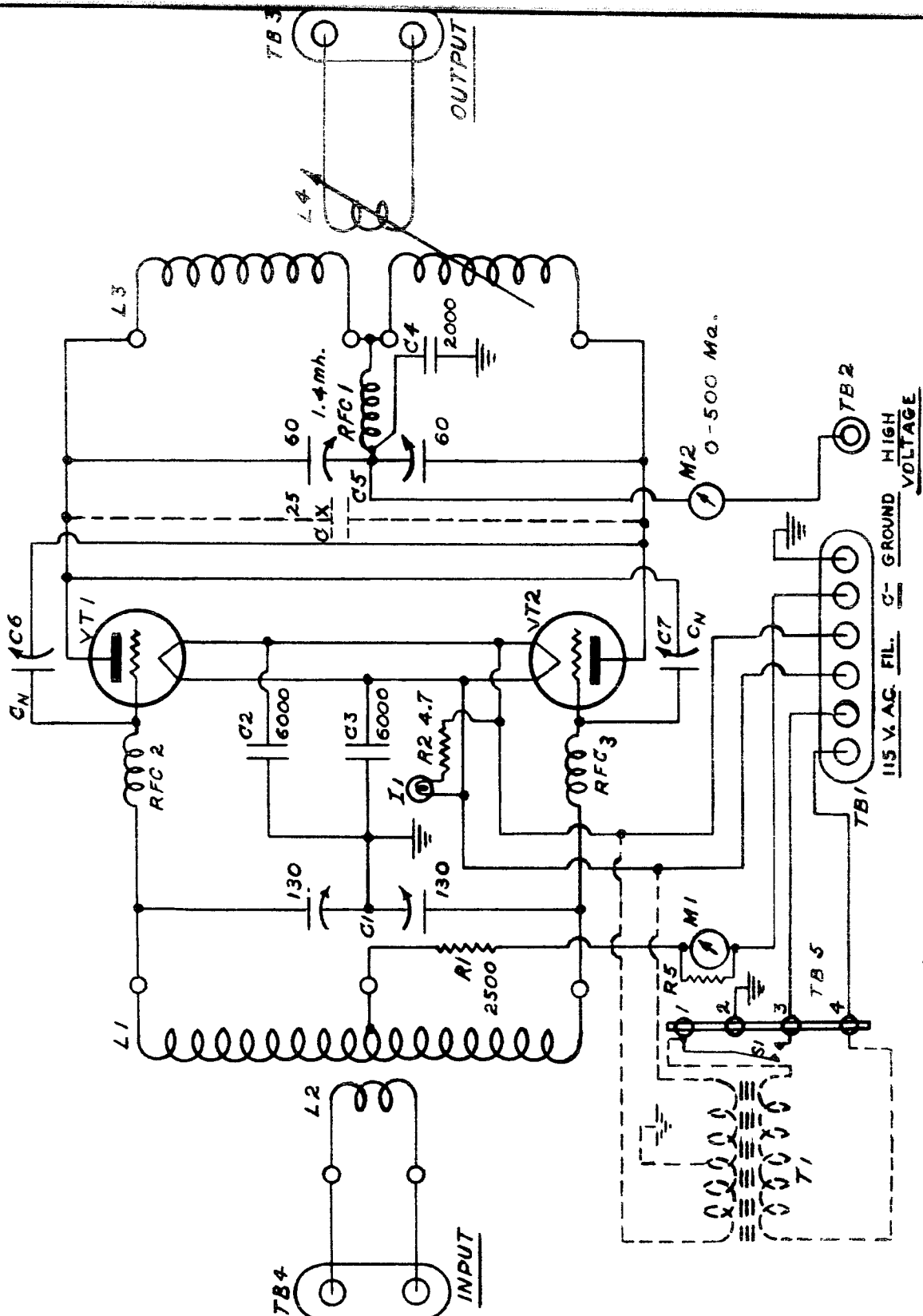
nection. The monitoring oscilloscope should be connected to the upper terminal strip as described in section 3. The output from the safety terminal, J2, on the modulator should be connected to the center tap of the amplifier filament transformer. This transformer should be used exclusively for the 812-As in the 90881.

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When the 90881 is cathode modulated, it is advisable to change C2 and C3 from 6000 mmf to 1000 mmf and to add a 1000 mmf bypass condenser between the grid coil center-tap and ground.

The audio grid modulating voltage, the bias voltage on the 812-As, and the amplifier plate current should be adjusted for maximum modulation linearity using the trapezoidal pattern on the monitoring oscilloscope.

Terminals 3, 4, and 5 on the Modulator may be used to operate a relay to make the necessary Phone-CW changes in the connections for the 90881 R-F Power Amplifier.



ALL CAPACITIES IN MMFD.
ALL RESISTORS IN OHMS

ALL DIMENSIONS UNLESS OTHERWISE NOTED MUST BE HELD TO A TOLERANCE OF

POWER AMPLIFIER

FIRST MADE FOR

DESIGNED BY R.W.C.
DRAWN BY A.B.M.

CHECKED BY P.A.B.
APPROVED _____

JAMES MILLEN MFG. CO., INC.
MALDEN, MASS., U.S.A.

K 90881

DATE
12/2/46

11-12-48	2	added values to components
11-12-48	1	Replaced R3 + R4 with R.F.C. and R.F.C3 R.W.C.