

Instructions for the 90811 High Frequency R-F Power Unit

1. General

The No. 90811 High Frequency R-F Power Unit is a physically small unit (8 3/4 inches long – 4 inches deep – 6 3/4 inches high) capable of a power output of 70 to 87 watts (higher output up to 144 watts may be obtained by the use of forced air cooling) on the 20, 15, 11, 10, 6 or 2 meter amateur bands. Provisions are made for quick band shift by means of the new 48000 series high frequency plug-in coils. The 90811 unit uses an 829-B or 3E29 tube in a push-pull circuit. Provisions are made on a rear terminal board for connection of external power supply, modulator, and grid and plate current meters. Output is taken from a low impedance variable link coil. Only approximately 0.8 watts is required to drive this unit to full power output. Low impedance input may be connected directly to the link terminals on the grid coil jack bar. The 90811 may be excited directly by a crystal oscillator or a low power VFO on 20,15,11,10 or 6 meters.

2. Coils

The new 48000 series high frequency coils are used in the 90811 RF Power Unit.

<i>Millen Amateur Band</i>			
Part No.	Meters	Circuit	Link
48021	20	Grid	Fixed
48015	15	Grid	Fixed
48011	10-11	Grid	Fixed
48006	6	Grid	Fixed
48002	2	Grid	Fixed
48121	20	Plate	Variable
48115	15	Plate	Variable
48111	10-11	Plate	Variable
48106	6	Plate	Variable
48102	2	Plate	Variable

All coils are equipped with link coils. The 90811 grid coil jack bar is supplied with 2 sets of link terminals. This enables the unit to be connected to both a 2 meter exciter and a lower frequency exciter. The 48000 series coils provide correct selection of excitation.

3. Power Supply

The power supply required for the 90811 may deliver any voltage from 400 volts to 750 volts and must be capable of supplying 180 mA to 275 mA.

For typical intermittent operation as a plate-modulated push-pull RF power amplifier - Class C telephony, the 90811 requires 600 volts at 180 milliamperes and will deliver an RF power output of approximately 70 watts.

For typical intermittent operation as a push-pull r-f power amplifier-Class C telegraphy - the 90811 requires 750 volts at 190 milliamperes and will deliver an RF power output of approximately 87 watts.

The heater requires 6.3 volts at 2.25 amperes.

The Millen No. 90281 High Voltage Power Supply is well adapted for supplying the high voltage power and heater power to the 90811. The power supply will deliver 700 volts at 235 milliamperes.

4. Mechanical Data

The 90811 High Frequency R-F Power Unit was designed so that it may be table mounted, rack mounted, or incorporated as a component unit in a transmitter. Its small physical size makes it ideal for incorporation as a component in a transmitter.

Length	8 3/4 inches (including mounting feet)
Depth	4 inches
Height	6 3/4 inches

The three shafts on the front of the 90811 unit are long enough to extend through a panel.

The bushing on the switch is long enough to extend through a panel.

Four 8-32 tapped holes are provided on the front of the chassis to enable bolting the unit to a panel. Also included on the unit are feet to provide means of mounting the unit on a chassis or base plate.

When the 90811 is mounted on a panel, 1/2 inch clearance holes should be provided for the shafts of the grid and plate tuning condensers.

5. Installation

Mount the 90811 unit as desired (see section 4). See that neither the grid tuning condenser shaft or the plate tuning condenser shaft is touching a panel if a panel is used.

Connect external grid and plate current meters, power supply, and modulator to the proper terminals on the terminal board. If

a key is used, place the key plug into key jack. Connect a load (dummy or radiating antenna) to the output terminals on the plate coil jack bar. The impedance of the load should be approximately 70 ohms.

Connect the ground terminal on the terminal board to the ground on the exciter.

6. Excitation

Less than 1 watt driving power is required at the grids of the 829-B. For 20, 15, 11, 10, or 6 meter operation, connect a low impedance twisted line to the two terminals nearest the left edge of the 90811 chassis. Use care in soldering to the lugs. Too much heat will melt or soften the Quartz-Q jack bar and loosen the terminal in the jack bar. The other end of the twisted line should be connected to a low impedance link coil on the exciter.

For 2 meter operation, connect the input line to the two closer spaced terminals on the jack bar.

Both input lines may be left connected. The grid coils provide correct selection of excitation.

Caution. The DC grid current should not exceed 20 milliamperes. Excessive grid current may damage the tube.

About 12 milliamperes DC grid current is required for proper operation of the 90811.

Under certain conditions, the tuning of the exciter will react on the tuning of the 90811 and vice versa. When this occurs there are usually two sets of tuning points. This results from the exciter being too tightly coupled to the 90811. Slight over-coupling does no real harm if the grid current is sufficient and if the grid circuit tunes. Where possible, however, it is advisable to reduce the coupling until there is very little reaction and to where there is only one set of tuning points.

Some owners of the Millen 90800 exciter may desire to excite the 90811 from the 90800 exciter even though less than one watt of drive is required. For 20 meter operation remove the 807 from the socket and connect the low impedance line from the 90811 input terminals to the link terminals on the 43022 6L6 plate coil. Plug in the 6L6 coil so that the link is near the top of the 90800 chassis. Ground the 90800 chassis. Reduce the 6L6

plate voltage until the grid current to the 90811 is less than 20 milliamperes,

For 15 meter operation, using the 90800 exciter to excite the 90811, connect the units the same as for 20 meter operation except replace the 43022 6L6 plate coil with a 43012 plate coil and tune the 6L6 plate tuning condenser to the third harmonic of the crystal frequency.

For 10 and 11 meter operation, using the 90800 exciter to excite the 90811, plug the 807 in the 90800 and operate the exciter as in normal 10 or 11 meter operation. Connect the low impedance line from the 90811 input terminals to the link terminals of the 807 plate coil. Reduce the high voltage input to the 90800 until the 829-B grid current does not exceed 20 milliamperes.

For 6 meter operation, using the 90800 exciter to excite the 90811, use a crystal at approximately 8.67 mc. Use a 43640 cathode coil, a 43012 6L6 plate coil tuned to about 26 mc. and a 43012 807 plate coil tuned to about 52 mc. The 90800 exciter cannot of course, be used on 2 meters.

7. Keying

The key jack on the rear of the 90811 opens the cathode return of the 829-B tube. When no plug is in the jack, the keying circuit is automatically closed. When it is desired to key the exciter, it will be necessary to use some external bias. (See section 8).

For CW operation the *Mod. Trans.* terminals on the terminal board should be connected together with a jumper. The high voltage supplied to the 90811 may be as high as 750 volts for C-W operation.

8. Bias

The 90811 is normally biased by the voltage across *R1* which results from rectified grid current. No fixed bias is used. If the exciter is keyed, or if it is felt desirable to have some protective fixed bias, a 22 1/2 volt battery or bias supply may be connected in series with the grid current meter. Connect the negative terminal of the battery to the minus Grid Meter terminal and connect the negative meter terminal to the positive battery terminal.

9. Neutralization

Because of the high gain of the 829-B beam tetrode, it is necessary to neutralize the slight feedback that often occurs.

The 90811 is neutralized by the very small capacity between the plates of the tube and the wires mounted on the stand-off insulators above the tube.

To neutralize the 90811:

1. Insert the proper grid and plate coils.
2. Apply heater voltage.
3. Connect a 0-30 mA milliammeter to the Grid Meter terminals on the terminal board.
4. Remove the key plug from the key jack.
5. Switch the Tune-Transmit switch to Tune.
6. Remove plate voltage from 829-B.
7. Apply excitation.
8. Tune grid circuit for maximum grid current.
9. Vary the position of the neutralizing wires with respect to the tube, until the grid current remains constant when the plate condenser is tuned through resonance.

The neutralization is not difficult or critical if the 90811 chassis or ground connection is grounded to the chassis of the exciter.

When the 90811 is neutralized on 20 or 15 meters, the unit is also neutralized for the other of these two bands. Most units will neutralize on these two bands with the neutralizing wires at about the midpoint of the possible positions.

When the 90811 is neutralized on 10 or 11 meters, it is also neutralized for the other of these two bands. Most units will neutralize on these two bands with the neutralizing wires slightly closer to the tube than for 20 or 15 meters.

Most units will neutralize on 6 meters with the neutralizing wires farther away from the tube than for 20 or 15 meters.

Most units will neutralize on 2 meters with the neutralizing wires in a position between the neutralized position for 20 meters and for 10 meters.

The above recommendations are for complete neutralization over the entire tuning range of both the grid and plate tuning condensers. Most units, when neutralized on 2 or 10 meters, will remain neutralized on all the other bands.

Another somewhat more sensitive means of neutralization available for those who can reduce the plate supply voltage is as follows:

- a. Insert the proper grid and plate coils.
- b. Apply heater voltage.
- c. Connect a 0-30 mA milliammeter to the Grid Meter terminals on the terminal board.
- d. Remove the key from the key jack.
- e. Switch the Tune-Transmit switch to Tune.
- f. Apply excitation and remove external bias.
- g. Tune grid circuit for maximum grid current.
- h. Remove excitation.
- i. Switch the Tune-Transmit switch to Transmit.
- j. Connect a 0-300 mA milliammeter to the Plate Meter terminals on the terminal board. Apply not over 400 volts to the H.V. terminal on the terminal board.
- k. Tune the plate tuning condenser. If the plate meter dips; remove the plate voltage and adjust the position of the neutralizing wires. Apply plate voltage, and tune the plate tuning condenser. Repeat the above procedure until no dip in the plate current occurs at any setting of the plate tuning condenser. Since the entire d-c power input to the tube must be dissipated in heat in the tube under these conditions, do not leave the plate voltage applied to the tube any longer than is necessary to tune the plate condenser.

Caution: Do not touch any part of the circuit when the plate voltage is applied.

10. Operation

1. Connect the external units to the terminal board as mentioned in section 5.
2. Supply excitation as described in section 6.
3. Neutralize the 90811 as described in section 9.
4. Switch the Tune-Transmit switch to the Tune position.
5. Connect the antenna load to the output terminals as described in section 5.
6. Apply plate voltage.
7. Tune plate condenser for minimum plate current.
8. Switch Transmit-Tune switch to the Transmit position.
9. Adjust antenna link coil for proper plate current at resonance.

The 90811 is now ready for operation.

The Transmit-Tune switch, when in the tune position reduces the screen voltage on the 829-B, thus preventing excessive screen and plate current when the unit is not yet tuned or properly loaded.

Caution: The 829-B should be loaded so the plate will draw between 140 milliamperes 240 milliamperes at resonance. To prevent damage to the tube, it should not be allowed to run lightly loaded for more than short periods when the Transmit-Tune switch is in the Transmit position.

Typical and Maximum Operating Data

Operation	Plate Current Milliamperes	Plate Voltage	Approx. Power Output Watts
Typical - C-W	160	750	87
Typical - Phone	150	600	70
Maximum - C-W	240	750	144
Maximum - Phone	240	600	115

Forced air cooling of the 829-B tube is required for plate power input greater than those listed as typical in the above table.

11. Modulation

The 90811 was designed with the voltage rating on all parts high enough to allow plate and screen modulation at maximum rated plate voltage (600 volts for plate and screen modulation). For plate and screen modulation, no changes need be made. Merely connect the secondary of the modulation transformer to the *Mod. Trans.* terminals on the terminal board.

For frequency or phase modulation, the 90811 may be operated as for CW Supply frequency or phase modulated excitation.

R.W.C.
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