INC.
P.O. BOX 864
COUNCIL BLUFFS, IOWA 5150

PRELIMINARY INSTRUCTION FOR 90800 Transmitter-Exciter

1. General

The Millen 90800 transmitter-exciter is a commercial version of the "two-tube plug in coil exciter" as described on pages 149 and 152 of the eighteenth edition of the ARRL Radio Amateur's Handbook and in the later editions of the ARRL Handbook. The transmitter consists of a 6L6 or 6L6-G tri-set crystal oscillator-doubler or beam tetrode crystal oscillator, driving an 807 amplifier or frequency doubler. T 6L6 may also be used as a frequency doubler driven by a V.F.O., such as the Millen 90700-90701 Variam.

The 90800 transmitter is capable of a power output of fifty to sixty-five watts in any amateur frequency band up to and including the 14,000-14,400 kc band. The transmitter may be used in the 28,000-30,000 kc. V.H.F. band with an output of twenty to thirty watts.

The transmitter is supplied with one set of plug-in coils. Additional coils may be purchased in matched sets or singly from Millen distributors.

2. Description of Chassis

Looking at face of panel:

Five prong socket at left is for reception of crystal or V.F.O.
Switch above it shorts out cathode coil in "Out" position, and leaves cathode coils in circuit for tritet operation in "In" position.
Left dial tunes 6L6 plate tank condenser, C-4.
(Symbols refer to attached schematic circuit diagram X-9088)
Right dial tunes 908 plate tank condenser, C-10.
Both dials read zero when condenser plates are fully meshed.
Switch at right controls meter in center, reading 6L6 or 807 plate current as indicated on panel.
Cathode coil, L-1, plugs in 5 prong socket, X-4, next to 6L6 socket.
Oscillator and amplifier coils are interchangeable between 6L6 and 807 tanks (for any given frequency coil) and plug into the jack strips adjacant to the 6L6 and 807 sockets. The 807 tee plate coil, L-3, should be plugged in so that the link coil is near the bottom of the chassis. Power supply leads attach to terminal board, TB-1, at back left bottom of bhassis. Terminals are labeled:

"HV"	- Hight Voltage	"45"	- 45 volts C bias
"H"	- Heater (6.3)	"G"	- Ground, other heater, CH.V.
		"K"	- Key

3. Coils

Cathode coils available for the unit are: a coil for 160 meter crystals, a coil for 80 meter crystals, a coil for 40 meter crystals. The plate coils of the 6L6 and 807 are interchangeable. Coils are available for all amateur Bands from 80 meters through 10 meters.

Table 1 lists the recommended methods of operating the 90800 transmitter-exciter. Table 1 tabulates the coils required, against the output band and the exciter band. These sets af coils marked "std" are supplied as standard sets of coils with the 90800 transmitter-exciter.

TABLE 1

Output Band	Crystal Band	VFO Output Band	Cathode Coil	6L6 Plate Coil	807 Plate Coil
std. 80	160	43660	43660	43082	43082
80q	80		out	43082	43082
80			out	43062	43082
80		320	out	43082	43082
Std. 40	80	160	43680	43042	43042
40	40		out	43042	43042
40	160		43660	43082	43042
40		160	out	43082	43042
40		80	out	43042	43042
20	80		43680	43042	43022
std. 20	40		43840	43022	43022
20		80	out	43042	43022
20	0	40	out	43022	43022
std. 10	40		43640	43022	43012
10		40	out	43022	43012
10		20	out	43012	43012

4. Operation

a. High Voltage Supply

High voltage can be any value between 500 and 750 volts, since the 807 plate tuning condenser, C-10 is double spaced. An internal voltage divider furnishes proper plate and screen voltages for both the 807 and the 6L6; therefore, only on e high voltage power supply is necessary.

b. Caution

1. Cathode coil switch, S-1, at left MUST be thrown to the right or OUT position WHENEVER 6L6 PLATE CIRCUIT IS TUNED TO CRYSTAL FREQUENCY: otherwise crystal fracture may result. Switch is thrown to left, or IN position when using the 6L6 as a tri-tet oscillator doubler.

2. Never operate the 807 without a load (either real or dummy antenna) since its screen current becomes excessive with insufficient plate load.

c. Excitation

Under all circumstances, with the 6L6 operating as a beam tetrode oscillator, as a doubler from a variable frequency oscillator exciter, or as a tri-tet crystal oscillator, the power output is more than sufficient to drive the 807 as an amplifier or as a doubler on all frequencies up to 15mc. To get maximum output from the 807, it is often necessary to reduce the capacity of the variable coupling capacitor, C-6, to avoid over-driving the 807 grid. Maximum output is obtained when the 807 grid current is approximately 5 milli-amperes. A milliameter in series with the C bias on the 807 will aid in adjusting the 807 grid drive. In some cases, sufficient output from the 6L6 operating as a quadrupler may be obtained to excite the 807. The small coupling capacitor is installed to avoid damage to the 807 grid when operating straight through.

d. Input

The five prong socket on the panel, "CRYSTAL or VFO" is wired to receive the coupling coil of the Millen 90700 and 90701 Variam VFOs. The 6L6-807 transmitter operates very well when controlled by either of these Variam units. It is necessary that the 6L6 be operated as a doubler when the variarm is plugged into the grid circuit; otherwise, self-oscillation of the 6L6 will occur.

The input socket is wired so that a standard crystal holder with 3/4 inch spacing between pins may be plugged into pins 2 and 4, as indicated on the panel; or type CR-1 holders and type FT-243 holders may be plugged into pins 3 and 4.

5. Frequency Doubling in Output Stage

Any transmitter whose output is tube is operating as a frequency doubler may emit onhalf the desired frequency. So may the 90800 Transmitter-Exciter, if the 807 is heavily loaded. Such ommission is illegal; therefore, the 807 plate currenbeshould be limited to 90 milliamperes by adjusting the antenna loading when operating the 807 as a frequency doubler. If there is reason to believe half-frequency emission exists, couple a wave trap for that frequency to the 807 tank coil or put a wave trap in series with the transmission line.

6. Performance

The 90800 transmitter may be operated from a 750 volt power supply for output on all amateur frequency bands up to and including the 14,000-14,400 kc band. The output is upwards of 50 watts when the 807 is loaded to 90 to 100 milli-amperes. The transmitter may also be used in the 28,000 30,000 kc VHF band at reduced inputs. For this frequency band, the 807 is operated as a frequency doubler. The power supply voltage should be limited to 500 volts and 807 plate current to 90 milliamperes. The 6L6 plate coil, L-2, should be pperated on 20 meters. The grid circuit of the 6L6 should be excited by a 40 meter crystal or a VFO with 40 meter output. The output from the 807 on 10 meters will be 20 to 30 watts.

7. Revisions

For specific applications of the 90800, it may be desirable to make small revisions in the transmitter.

a. Modulation

For plate and screen grid modulation of the 807, the 807 plate voltage should be limited to 600 volts and must be supplied from a separate power supply.

b. Oscillator Keying

90 volts fixed bias should be used on the 807 if it is desired to key the oscillator on a variarm exciter and leave the 807 cathode connected to ground. With this type of keying, it is necessary that the power supply for the transmitter be well regulated to avoid "chirpy-keying."

c. Excitation

In operating the 6L6 as a frequency quadrupler, it may be necessary to get more excitation to the 807 grid. To increase excitation, shunt C-6, with 200 mmf. Don't operate the 6L6 as a frequency doubler or straight through with the 200 mmf. shunting C-6. This would overdrive the 807 grid, reduce the power output from the 807, and damage the 807 grid.

d. Increased Bias Resistor

If it becomes desirable to increase the value of the 807 grid leak resistor, R-6, insert the additional resistor in series with the external fixed bias supply connected to the "45" and "G" terminals on terminal board, TB-1.

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TVI ELIMINATION FOR 90800

In all cases of TV interference, the exciter should be shielded and a good band-pass or high-pass filter should be used between the transmitter out-put and the antenna feed line.

The 90800 Exciter-Transmitter causes very little TVI on 20, 40, 80, or 160 meters. For operation on any of these bands, the above treatment usually will elimimate all trace of TVI.

TVI Elimination for 10 and 11 meter operation requires the exciter to be operated with the 807 as a straight-through amplifier. The 616 plate coil should be a 43012 10 meter coil with one turn removed. Twenty meter excitation must be supplied to the 616.

If the 90800 Exciter is to be used on ten and eleven meters exclusively, the 616 circuit can be revised to permit frequency quadrupling in the 616. The variable coupling condenser between the 616 and the 807 should be replaced with a 250 mmf., fixed condenser and the 616 screen voltage should be raised to the full rated value. With these revisions, the Exciter can not be used on any amateur bands except the ten and eleven meter bands.

90800 on 50 MC.

1. New 807 Plate Coil - 4T #12 - 3/4" Dia. W. L. 1 ½".

2. Use 43012 Coil in 6L6 plate) same as for 29
3. Use 43640 - 7 Mc. Cathode coil) Mc. set up.

4. Crystal ranges -8,334 Kc x 3 x 2 = 50,004 Kc.
9,000 Kc x 3 x 2 = 54,000 Kc.

5. Crystal of 8528.57 used in test.

6. 8.5 Mc. Crystal, tripling to 25.5 Mc. in 6L6, doubling to 51.0 mc. in 807.

7. Additional Bias resistor of 24,000 ohms BT2 (between C-and 2nd post on chassis.) Improves output.

8. 6L6 plate current approx. 32ma.
807 plate current approx. 92ma.
807 plate dial approx. reading .88
6L6 plate dial approx. reading .88
807 grid current approx. - 3.6 ma.
807 grid current with added 24K for bias, 2.4ma.

"Use Crystals for SCR 522"

2/6/48
M.A.D.

MODIFICATION TO PROVIDE FOR MODULATING

The 90800 Exciter

The 90800 exciter was primarily designed as an exciter for a larger transmitter or as a CW unit. This unit can be adapted for modulation by means of very minor changes, which provide for the plate and screen modulation of the 807 in the exciter.

1. Disconnect pin 2 on V2 from R7 and R8

2. Replace C9 with a .002 mfd. mica capacitor, rated at 500 d.c. working volts.

3. Disconnect R11 and S2 from the terminal post connected to R10, leaving R11 and the lead to S2 connected together.

4. Connect a 55,000 ohm, 2 watt resistor between pin 2 on V2 and the junction of R11 and S2.

5. Connect modulated high voltage to this point.

These changes are shown on the attached blueprint.