

INSTRUCTIONS

For

HIGH FREQUENCY TRANSMITTER

Cat. No. 90810 - Serial No. 87

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

INSTRUCTIONS for the 90810

High Frequency Transmitter

1. General

The No. 90810 crystal control transmitter provides 70-87 watts output (higher output up to 144 watts may be obtained by the use of forced cooling) on the 10, 11, 6 and 2 meter amateur bands. Provisions are made for quick band shift by means of the new 48000 series high frequency plug-in coils.

Crystal and circuit development on "third overtone frequency output crystals" has made possible this highly efficient unit, providing high output and crystal control with a minimum of tubes.

The No. 90810 consists of a Bliley CCO-2A crystal oscillator unit,* using a 6AG7 crystal oscillator, a 2E26 tripler and an 829B power amplifier stage. For 10 or 11 meter operation, a conventional crystal is used, the crystal unit driving the 829B direct. For 6 meter operation, an overtone crystal is used in the crystal stage and drives the 829B directly as a power amplifier. For 2 meter operation, the overtone crystal is likewise used, but the output from the crystal unit is fed through the 2E26 tripler.

The new 48000 series coils are designed so as to provide correct link selection in the grid circuit for these various combinations. The power amplifier plate coils are of the variable link type.

Operational checks are possible by means of the multi-purpose meter connected into the grid and plate circuits of the tripler and power amplifier.

Provisions are made for the direct drive of the PA by means of a high frequency ECO. Power supply and modulator connections are made to a terminal board on the back of the chassis. The transmitter is supplied with one set of ten meter plug-in coils. Additional coils are available from Milen distributors, additional crystals from Bliley distributor.

2. Coils

The 90810 is normally supplied with grid and tank coils for 10 and 11 meter operation. Available coils are listed below:

No. 48011	10-11 meter grid coil and link
No. 48006	6 meter grid coil and link
No. 48002	2 meter grid coil and link

No. 48111	10-11 meter PA tank coil and link
No. 48106	6 meter PA tank coil and link
No. 48102	2 meter PA tank coil and link

*Any correspondence regarding the crystal oscillator unit should be addressed directly to Bliley Electric Co. Union Station Bldg., Erie, Pennsylvania

3. Operation

The adjustment and operation of the transmitter are straightforward. Those who have used 829a before do not need to be reminded of the necessity for neutralizing them or told how to do it, but those who have not will find the process very simple. The neutralizing preferably should be done with the amplifier operating on 2 meters, if multiband operation is used, and the transmitter should be tuned as described later but without plate voltage on the 829B (the plate voltage may be disconnected by leaving the modulation-transformer terminals open). The positions of the neutralizing "condensers" - the short lengths of wire mounted on the stand-off insulators - are then varied, keeping them symmetrical with respect to the tube, until the 829B grid current remains constant when the plate tank condenser, C16, is swung through resonance. The adjustment is not too critical.

For 10-11 meter operation the BAND SWITCH on the rear of the chassis is set to the 6-10-11 position, the crystal oscillator switched to the 27-30 Mc. position and the toggle switch, S3, to the TUNE position. The METER SWITCH should be set in Position 3, so as to read the 829B grid current. The meter scale should be read directly in milliamperes grid current (0-30 ma.).

A crystal for the correct frequency (between 13.58 and 13.71F) is then plugged into the CCO-2A crystal unit. Final-amplifier grid and plate coils for 10-11 meter operation should be plugged into their respective sockets.

After allowing the heaters to reach operating temperature, the plate voltage is applied and the XTAL OSC. tuned for maximum 829B grid current. After that, the P.A. GRID condenser is adjusted for maximum grid current. The meter switch is then set in Position 4 so as to read the 829B plate current. To read plate current, the milliammeter scale reading should be multiplied by ten (0-300 ma.). Tune the P.A. PLATE for minimum plate current. After this has been done, the TRANS-TUNE switch should be set in the TRANS. position. The antenna coupling link is then adjusted for maximum output. The P.A. GRID and P.A. PLATE adjustments are then corrected to give optimum performance.

The power amplifier can be operated from a VFO by connecting its output to the binding posts on the back of the chassis and following the procedure just outlined, except insofar as the crystal oscillator is concerned.

The procedure on 6 meters is very similar, except that a 25-27 Mc. crystal is used, S1 is set to 48-54 Mc. and the 50-54 Mc. grid and plate coils are plugged in the 829B circuit.

Adjustment on two meters is very much the same, and is tabulated below:

Turn BAND SWITCH to 2. Set S1 in the CCO-2A to 27-30 Mc.

Turn toggle switch, S3, to TUNE position.

Turn METER SWITCH to Position 1 (reads 2E26 grid current directly in milliamperes (0-30 ma.)). 2E26 grid current will be only 1-2 ma.

Plug in 24-24.67 Mc. crystal

Plug in 144-148 Mc. final-amplifier grid and plate coils

Turn on filament voltage.

Turn on plate voltage after heaters are up to temperature.

Tune C5, XTAL OSC. for maximum grid current.

Tune MULTIPLIER GRID condenser, C8, for maximum grid current.

Turn METER SWITCH to Position 2 (reads 2E26 plate current).

Tune MULTIPLIER PLATE condenser, C10, for minimum grid current.

Tune P.A. GRID condenser C12, for maximum current.

Turn METER SWITCH to Position 4 (reads 829B Plate current).

Tune P.A. PLATE, C16, for minimum plate current.

Turn S3 to TRANS. position.

Adjust antenna coupling to final amplifier for maximum output.

Recheck 9, 11, 13 and 15

4. Power Input and Power Supply Requirements

The transmitter can be operated from a single 600 volt supply that is capable of delivering 300 ma. or the 600 volt supply may be used for the 6AG7 and 2E26. When a single power supply is used, the $\frac{1}{2}$ -LV terminal should be connected to the $\frac{1}{2}$ -HV terminal. For C-W operation, a jumper should be connected across the MOD. TRANS. or JUMPER terminals. Under normal operating conditions, the 6AG7 plate current is 35 ma. and the 2E26 plate current 75 ma. The plate potential on the 829B can be increased to 750 volts for C-W operation, with a current of 160 ma. to 240 ma. On 'phone, the 829B plate current should run 150 ma. to 212 ma., at 600 volts. At the higher power inputs, it is advisable to use forced air cooling on the 829B.

The Millen No. 90281 High Voltage Power Supply is well adapted for supplying the high voltage power to the 90810 transmitter. If a separate power supply is used to supply the 6AG7 and 2E26, the 90281 power supply can supply up to 200 ma. for the 829B plate and 35 ma. for the 829B screen for a plate input of 120-150 watts (corresponding to an output of 95-120 watts). The 90281 power supply may be used to supply the entire transmitter if the total current drain is limited to 235 ma.

The ~~at~~ LV supply should supply 400-750 volts at 100-135 ma. The supply voltage may be adjusted to supply the proper 829B grid current for the desired type of operation.

R.W.C.
9/16/47

THE BLILEY CCO-2A. . . . CRYSTAL CONTROLLED OSCILLATOR

The Bliley CCO-2A is a single tube oscillator designed and engineered to utilize the many advantages of crystal control on 2-6-10-11 meters. It provides adequate output for direct drive of conventional tubes as amplifiers on the lower bands and v.h.f. beam tubes as triplers in the 2-meter band.

Since the CCO-2A is a "packaged oscillator" it may be easily adapted as a basic unit in new construction or for simple conversion of existing equipment. The design features include:

1. Reliable performance over wide voltage range.
2. Adequate output for v.h.f. medium power tubes.
3. Only desired frequencies tunable in output.
4. Single dial tuning for maximum output.
5. No self-oscillation under any operating condition.
6. Easy installation in new or existing equipment.
7. Compactness.

The circuit is the familiar tri-tet (revamped) and arranged so that the usual problems of self-oscillation and other difficulties are eliminated. The unit is semi-enclosed in a metal case constructed along the lines which permit the choice of several mounting positions. A single tuning control and crystal socket are located on the front panel. The oscillator tube, a 6AG7, plugs into a recessed socket below the chassis surface. Band switching is facilitated by a D.P.S.T. switch located on top of the case. Power and output terminals are placed at the back for short direct leads to external connections.

The CCO-2A is designed for four band operation at 11, 10 and 6 meters directly, and for 2 meter tripler excitation. Band selection is made by (1) turning the D.P.S.T. slide switch to the desired range position, (2) plugging in the proper AX type crystal, and (3) tuning the single control for maximum output, which will be twice the indicated crystal frequency.

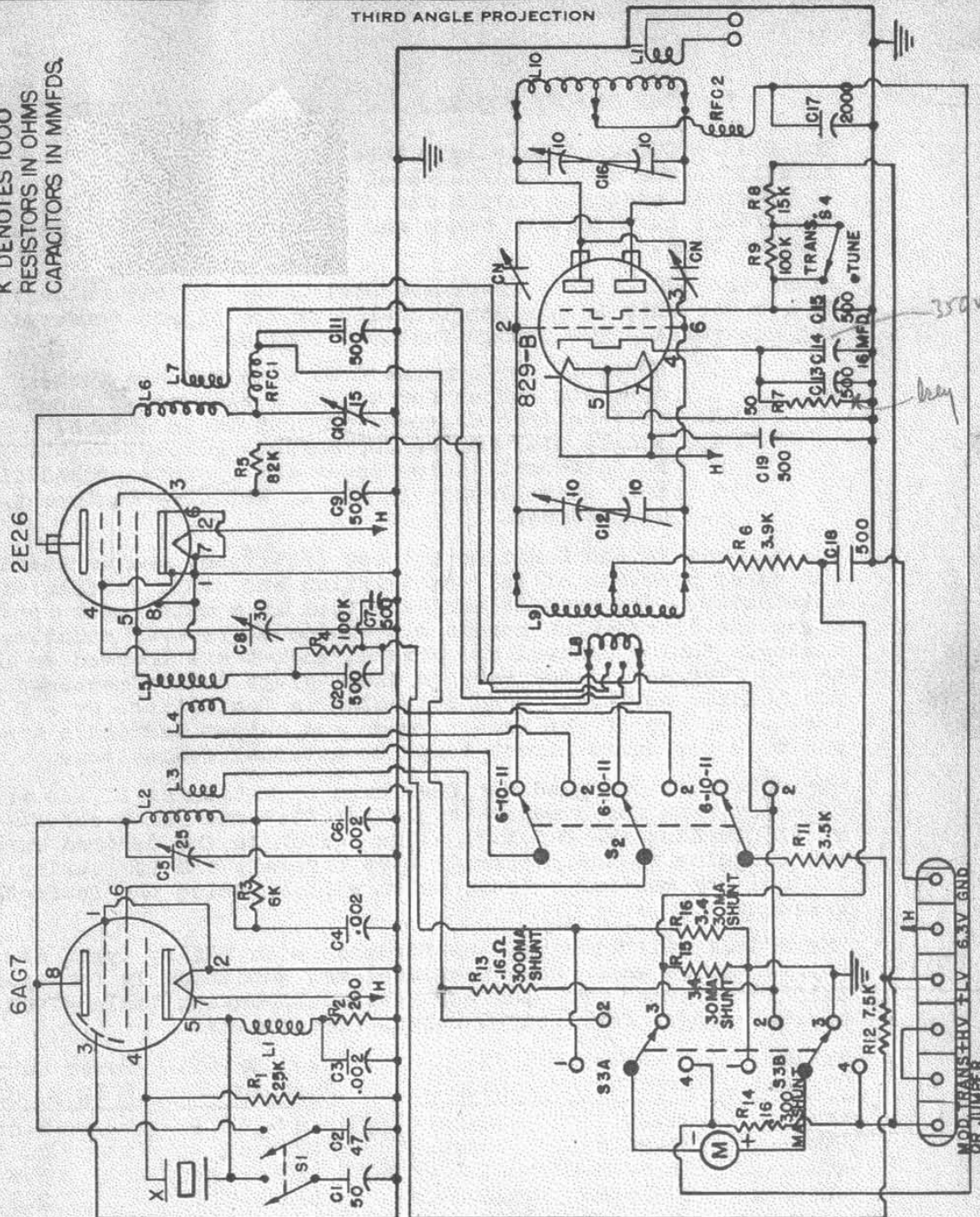
The CCO-2A will give peak performance with Bliley types AX2 and AX3 crystal units which have been designed specifically for operation on third "overtone" frequencies. The accompanying table gives proper crystal ranges for desired output frequencies.

Bliley Crystal	Frequency (Mc)		Band Switch Position	Power Output (Watts) $E_p = 300$
	Crystal	Output		
AX3	25-27	50-54	(2 - 6)	2.5
AX3	24-24.6	48-49.3	(2 - 6)	3.
AX2	13.6-13.8	27.1-27.6	(10 - 11)	3.5
AX2	14-14.85	28-29.7	(10 - 11)	3.5

Output is taken through link coupling to the succeeding stage which may be either an amplifier or a tripler. Depending on the type of tube used, the power output from this stage ranges from a few watts to 100 for amplifiers, and from 1 to 40 watts for triplers. Thus a CCO-2A installation results in higher operating efficiency and less construction expense than any method involving a low initial crystal frequency.

K DENOTES 1000
RESISTORS IN OHMS
CAPACITORS IN MMFDS.

THIRD ANGLE PROJECTION



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

TRANSMITTER

FIRST MADE FOR

DESIGNED BY

DRAWN BY *A.D.M.*

CHECKED BY *W.C.*

APPROVED

JAMES MILLEN MFG. CO., INC.

MALDEN, MASS., U.S.A.

K90810

DATE

7-9-47

11-14-47	4	R7 was marked 50K.
10-8-47	3	Added C19-C20 - C17 was connected to L5
9-22-47	2	C17 was 500 Redrawn with change
9-22-47	1	Revised S2, S3 Added R13-14-15-K C18 - Removed R10 A.D.M.

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MOD TRANS HV FLV 5-V GND OR JUMPER