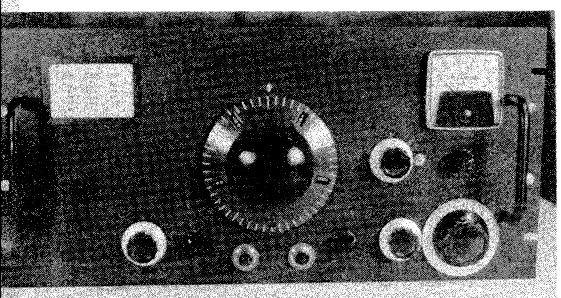
TABLE I — EXCITER COMPARISON CHART

FEATURE	HETRODYNE EXCITER	MULTIPLIER-TYPE EXCITER
OSCILLATOR TUNING RATE	Same Tuning rate on all bands (Kc. per revolution of Tuning Knob).	Tuning rate increases with order of frequency multiplication between oscillator and output frequencies.
TUNABLE OSCILLATOR FREQUENCY DRIFT	Same drift in Kc. on all bands.	Drift increases with order of frequency multiplication (often 8 times higher on 28 Mc. than on 3.5 Mc.).
DIAL CALIBRATION	Good reset accuracy on all bands because of constant tuning rate.	Reset accuracy in Kc. decreases with order of frequency multiplication on higher frequency bands.
ADAPTABILITY TO SSB OPERATION	Excellent—SSB generator can be placed on single fixed frequency for operation on all bands.	SSB generator must be bandswitched to the output frequency, requiring readjustment with each band change.
CHIRPLESS KEYING ON CW	Excellent—Both oscillators can run continuously, and mixer and following stages can be keyed.	Oscillator usually must be keyed for break-in operation, making chirps hard to eliminate. Or, oscillator must have complex shielding to reduce signal in station receiver during break-in keying.
SPURIOUS SIGNAL OUTPUT	Crystal and tunable oscillator frequencies must be chosen carefully to avoid "birdies" in output signal from exciter, resulting from harmonics of oscillators crossing output frequency of exciter.	Harmonics of oscillator can be radiated through mis-tuning of frequency multiplier stages. Harmonics of oscillator are at output frequency and cannot cause "Birdie" problem.



FRONT PANEL VIEW of the hetrodyne exciter. Pilot lamps have since been moved to left side of panel to make room for "zero-in" push-button switch and signal level control below tuning dial. Another good quality type of dial also can be used on the exciter, if available, such as the Eddystone type 898 dial.

(continued from page 1)

this third signal being the exciter output frequency. Simple amplifying stages then build up the level of this signal to the desired output power.

The principal precaution that must be taken in the design of a hetrodyne exciter is to select frequencies — or frequency ranges — for both oscillators so that low-order harmonics (2nd, 3rd, 4th, 5th, 6th and 7th) from either one do not cross output frequency. These considerations were explained in detail in a previous issue of *G-E HAM NEWS.*[1]

A comparison of the principal features, advantages, and disadvantages of both multiplier and hetrodyne-type exciters has been compiled in TABLE I, which gives information that could take several columns of text to cover.

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CIRCUITRY IN W2FBS's exciter is straightforward, with no trick circuits. Starting with the tunable oscillator, as shown in the schematic diagram, Fig. 3, the high-C Colpitts circuit was chosen. A detailed description of this oscillator was given in a previous issue of *G-E HAM NEWS.*[2] Component values were chosen to cover 6.0 to 6.25 megacycles in the grid circuit, and 12.0 to 12.5 in the plate circuit, tuned to the second harmonic. Parts are coded with the last digit the same as in the original article.

The crystal oscillator is a simple triode, with appropriate crystals switched into the grid circuit, and tuned circuits for each crystal in the plate circuit. An untuned type crystal oscillator also could be used, such as those recommended by several crystal manufacturers for their fundamental type crystals. This would eliminate four coils (L_1 to L_4) and one section of the bandswitch (S_{1B}).

Four positions of the main crystal selector section of the bandswitch (S_{1A}) select proper crystals for 3.5 to 21.45-megacycle coverage. The "28" megacycle position of S_{1A} connects a second crystal switch which selects any of the four crystals required for complete coverage of the 28 to 29.7-megacycle band.

Both oscillators are lightly coupled (through 10-mmf. capacitors) to the control grid of a 12BY7-A high-transconductance pentode which serves as the mixer stage. The small coupling capacitors prevent overdriving the mixer stage and reduce the generation of harmonics of either oscillator in the mixer output. Five separate bandpass type L/C tuned circuits (L_7 and C_3), one for each band from 3.5 to 28 megacycles, select the sum or difference frequencies in the mixer plate circuit. The tabulation in TABLE III — COIL TABLE AND ALIGNMENT CHART shows how the two oscillator frequencies become the output frequency for each band.

A second 12BY7-A pentode operates as an intermediate class A amplifier, building up the mixer output signal to sufficient power to drive the power amplifier stage. Bandpass tuned circuits (L_8 and C_4) similar to those in the mixer plate circuit are also in this stage. Specifications for these coils are in TABLE III — COIL TABLE. A detailed connection diagram of these coils is shown in Fig. 4.

The G. E. type 6146 beam pentode is recommended for the power amplifier stage. However, W2FBS has been operating experimentally a G. E. type 7581 beam power pentode in his model with excellent results; thus the text refers to the 7581. It is similar to the popular 6L6-GC audio power pentode and has a low-loss micanol base. While the 7581 is not specifically rated for RF service, it operates with voltages and currents normally applied to the similar 807, but with a maximum of 500 plate volts. No neutralization was necessary in this circuit for either the 6146 or 7581.

The amplifier plate tuned circuit is commercially made, a Harrington GP-50 multi-band circuit. It has two coils, one (L_{10}) covering 3.5 and 7 megacycles, and the other (L_9) for 14, 21 and 28 megacycles, selected by a section of the bandswitch (S_{1F}). Output link coils