Plug in the tubes as needed to activate each stage in turn for alignment.

Heater and plate power may be temporarily applied, as previously mentioned, to tune up the RF section before the power supply and keyer unit construction is finished. About 100 plate volts is required for the oscillators, 200 volts for the mixer and buffer plates, and amplifier screen grid, and about 300 to 400 volts for the 7581 plate. About 20 volts of negative bias is adequate for the 7581 control grid.

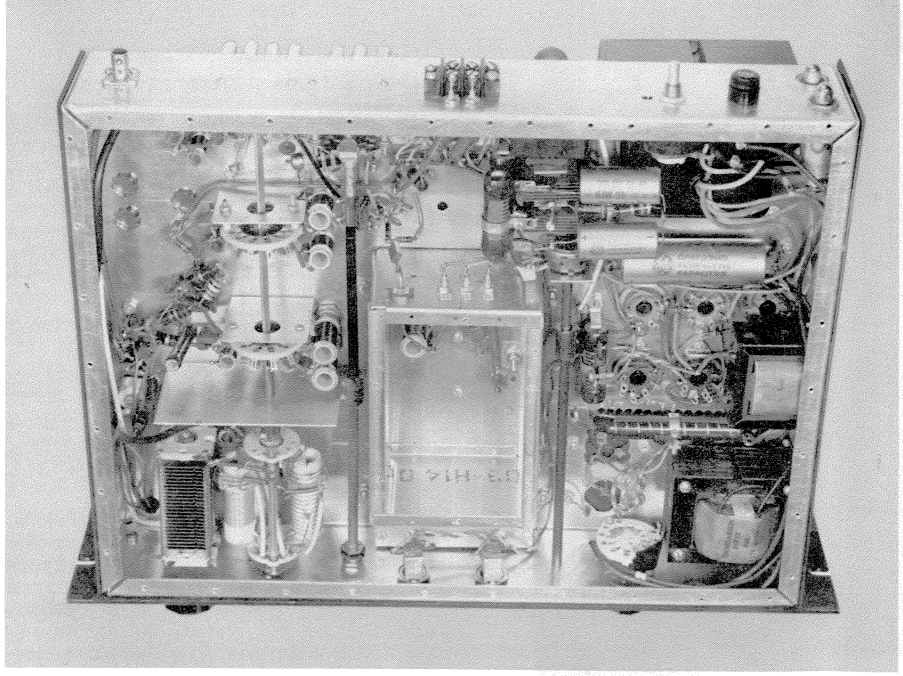
The tunable oscillator should be adjusted to cover 6.0 to 6.25 megacycles in the grid circuit before it is mounted in the exciter. With a straight-line capacitance unit for $C_{101}$, tuning was nearly linear, and an output frequency of exactly 12.0 to 12.5 megacycles was covered from maximum to minimum capacitance in W2FBS's model. Thus, the dial read one kilocycle per division, and frequency was direct reading to within a few divisions across the tuning range. Check the frequency coverage at 12 megacycles with a receiver. Adjust $L_{102}$ for maximum signal at 12.25 megacycles.

The crystal oscillator should be tuned up by listening for the oscillator signal with a receiver which tunes to each of the crystal frequencies. One tuned circuit ($L_1$) is adjusted so that both the 8.5 and 9.0-megacycle crystals oscillate at one setting. The four crystals from 16.0 to 17.5 megacycles should oscillate with a single setting of the slug in coil $L_4$. Rotate the bandswitch, $S_1$, to the proper positions for these adjustments.

To tune the mixer plate circuits, set the bandswitch to the 3.5 megacycle position, and the tunable oscillator to an output frequency of 12.15 megacycles. Tune a receiver to 3.65 megacycles and listen for a signal. Tune the slug in the proper $L_7$ coil for maximum signal. Repeat the adjustment of the slugs in the $L_7$ coils for the other bands, setting the tunable oscillator to deliver the proper mixer output signal frequencies for $L_7$ as listed in TABLE III. Use the "29.0" megacycle setting of $S_2$ to align the 28-megacycle $L_7$ coil.

Next, align the plate circuits ($L_8$ and $C_4$) of the 12BY7-A amplifier by plugging in the 7581 power amplifier tube with the heater energized, but without screen grid or plate voltage applied. Set $S_1$ at the 3.5-megacycle position and, with the tunable oscillator set for a 3.85-megacycle *exciter output* frequency, adjust the 3.5-megacycle $L_8$ coil for maximum grid current in the 7581 with $S_3$ in position "A." Repeat this adjustment at each position of $S_1$ using the *exciter* output frequencies for $L_8$ in TABLE IV. Use the "29.0" megacycle position of $S_2$, align the 28-megacycle $L_8$ coil.

**CAUTION:** When aligning the mixer plate ($C_3$—$L_7$) and buffer plate ($C_7$—$L_8$) tuned circuits in this exciter, check *carefully* — and then *recheck* each circuit with a well-calibrated grid-dip oscillator. This will insure that the circuits are aligned to the frequencies specified in TABLE III, and not to a spurious signal frequency, such as a harmonic of either oscillator.



**REAR VIEW** of underside of exciter, showing more constructional details. Long extension shafts each side of VFO unit run to crystal switch ($S_2$) and screen grid voltage control ($R_{303}$) for the 7581 amplifier. Components on rear wall of chassis are (left to right) RF output connector ($J_3$), terminal strip for key connections, negative bias adjustment potentiometer for the 7581, power fuse ($F_{201}$), and power line feedthrough bypass capacitors ($C_{204}$ and $C_{205}$).

Then, go back and realign the mixer plate circuit coils ($L_7$) for each band, setting the VFO to obtain the *exciter output* frequencies specified for $L_7$, and using maximum control grid current of the 7581 tube as an indication of resonance. The alignment frequencies given in TABLE III provide for stagger-tuning of the $L_7$ and $L_8$ circuits on each band to achieve relatively constant control grid current in the 7581 power amplifier as the VFO is tuned over its range.

Finally, connect a 50 or 70-ohm dummy antenna load — one capable of dissipating about 50 watts — to $J_2$ and apply screen and plate voltage to the 7581 stage. Test this stage on every band, tuning $C_5$ for minimum plate current, and loading to about 60 milliamperes plate current with $C_6$. Then check to see if maximum RF output, as indicated on position "E" of $S_3$, occurs at the same setting of $C_5$ as minimum plate current. Any tendency toward self-oscillation in the 7581 stage can usually be corrected by inserting an 18-ohm resistor in series with control grid socket connection, as is shown for the 12BY7-A buffer stage.

If you are satisfied with the performance of the RF section, remove power (and the tubes from their sockets, if you value them) and continue construction of the power supply and keyer unit. Once construction has been completed, test the power supply circuit first before plugging in the other tubes. Leave out the 12AU7-A and 6BL7-GT keyer tubes, but insert a 10,000-ohm, 2-watt resistor into pins 5 and 8 of the 6BL7-GT socket. Give the RF section a thorough recheck, following the whole alignment procedure again, as outlined above.

Adjust $R_{302}$ in the keyer so that minus 90 volts is measured at pin 7 of the 12AU7-A. Plug in the 6BL7-GT and 12AU7-A tubes and check the operation of the keyer unit. Adjust $R_{301}$ to obtain your preferred degree of sharpness in the keying "make" characteristic. The value of $C_{301}$, 0.02 mfd., gives a medium "break" characteristic. Reduce this value for a sharper "break," or increase it for a longer "break."

The length of time that the blocking bias holds the mixer cut off can be varied by changing the values of $C_{304}$ and $R_{304}$. Increase these values for a longer "hold" time. All this adjustment of keying characteristics is done with the dummy antenna load still connected.

Connect the exciter to your station's antenna changeover system and hammer out a good snappy "CQ." If the band you are on (and the other ham operators) is "alive," you should hear at least one answer. And — during the course of this first QSO, don't be too surprised to hear the other fellow say, "Say, OM, that's a mighty fine-sounding CW signal you have there — no chirps, thumps or key clicks — real smooth."

This one comment should make the 100 or more hours of construction time, that this exciter probably will require, well worth the effort. W2FBS felt this way on his first contact with his model exciter, and he's sure you will too.

**SIDE VIEW** of the packaged VFO unit which fits into the center of the main chassis. Complete constructional details were described in a previous issue.[2]