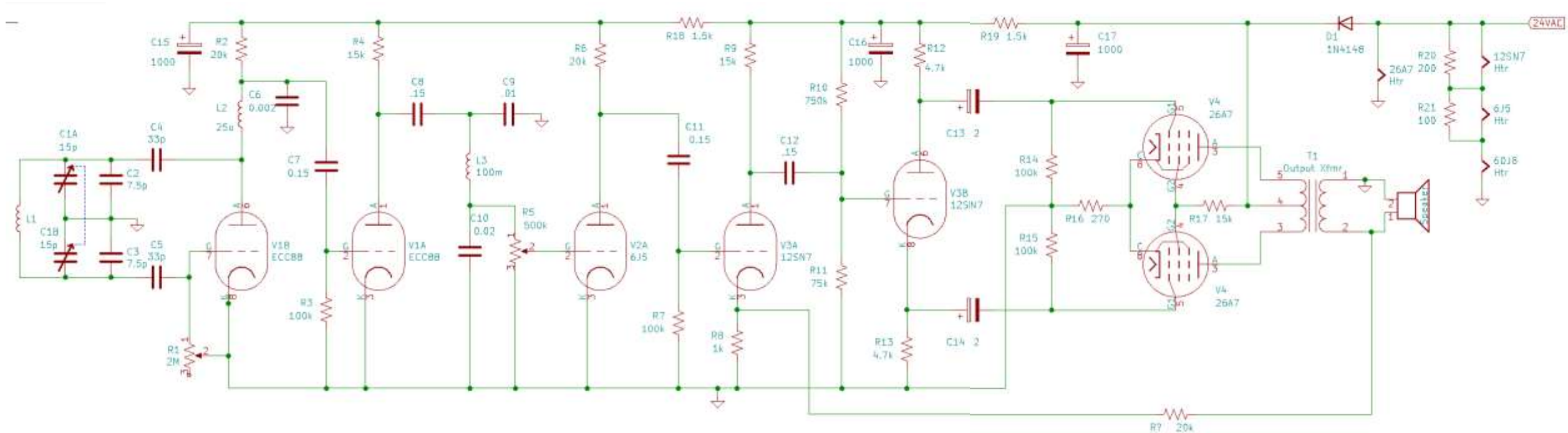
Gord's Superregen FM receiver runs from 24V

- I've never made a superregenerative receiver. The OVRC meeting about 1-tube radios inspired me to try.
- I decided to see if I could do it with low plate voltage. Just for fun.
- Superregen part is based on several Popular Electronics articles from the 60's.
- The results are surprisingly good, though since it uses "slope detection" distortion is a bit high and tuning is fussy. However, in my kitchen, it picks up all local stations without an antenna.
- Surprisingly, drift does not seem to be an issue.
- It is fairly loud, the 26A7GT can deliver about a half watt of audio.


HOT
6J5
6V6GT
6A7GT

Superregen 1st Audio 2nd Audio 3rd Audio Phase Splitter P-P Output



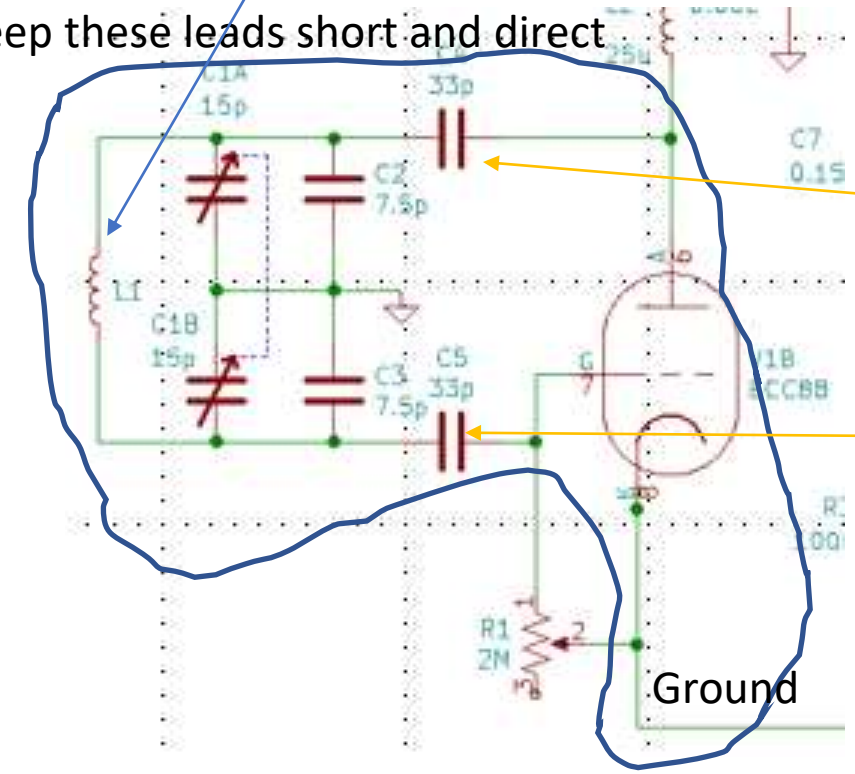
Superregenerative FM Receiver, Operates from 24VAC

Design Notes

- The magic all happens in and around the first triode.
- Keep leads short and direct. Use a ground plane.
- R1 sets the quenching frequency. Adjust for best performance.
- Adjust L1 until you get coverage of the FM band.
- I wanted a 6GM8 tube that is designed to work with 12V on the plate, but couldn’t find one. A 6DJ8 is pretty close.

2.75 turns of #14 house wire
about 1 inch internal diameter

Keep these leads short and direct



Note brass ground plane

I used a ceramic socket, but that's probably not necessary

Design Notes

- Yes, that is a 100mH choke! I found too much of the quench signal getting all the way to the output and this choke killed it completely.
- I probably have one audio stage too many. There is plenty of gain.
- I used a 26A7GT for the output, a tube designed to produce acceptable audio power from a 26V supply. I used a random universal output transformer, played with the output taps for best performance.
- Feedback cleaned up some distortion, but lowered gain. You'll need to experiment with the phase of the output transformer to ensure negative feedback. Positive feedback=oscillation!

Design Notes

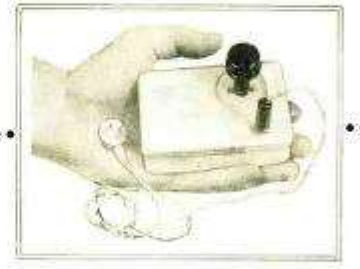
- Note that the 6DJ8 takes an odd filament current: 360mA, so the 100 ohm and 200 ohm resistors around the other filaments ensure the voltage is shared properly.
- You will want to shield the filament wire around V1 to prevent it from inducing hum.
- Please do not analyze this circuit or assume it has been optimized. It was thrown together on the bench with available parts!

For Reference

Triode currents at low plate voltage

			Current at	plate volta
E80CC	6085		3.5	50
ECC80	none!			
ECC81	12AT7		2	50
ECC82	12AU7		5	50
ECC83	12AX7			
ECC84	6CW7			
ECC85	6AQ8			
ECC86	6GM8		4	10
ECC87	ECC40	"Military"		
ECC88	6DJ8		15	50
ECC89	6FC7			
ECC91	6J6		5	50
ECC180	6BQ7		7.5	50
ECC186	12AU7			
ECC189	6ES8			
DCC90	3A5		2.5	50
	6AF4		22	50
	9002		4	50
	8056	nuvistor	6	10
8393	7586		18	50
	957	filament a	1.5	50

Pocket FM Receiver



By HERB COHEN*

Sensitive superregen circuit pulls in FM band—without an antenna

HERE'S a miniature FM receiver that requires no external antenna, uses only one miniature tube and has good fidelity. The entire FM broadcast band is covered with enough selectivity to separate weak from strong signals even in metropolitan areas.

And it's possible to complete this "under $10.00" project in just one evening. Component placement is not critical even though the radio is constructed within a plastic case that is no larger than a cigarette pack.

Construction. The subminiature 1AG4 tube socket should be pre-wired before installation. Follow detail view, soldering plate and screen lugs together and then connecting 2½" lengths of hookup wire as shown. Connect *C2*, *C3* and *R1* directly to the grid lug. The tube socket can be glued directly to the case with a drop of Duco cement.

Antenna coil *L1* is made by winding four turns of #14 gauge solid wire around a form ⅜" in diameter. The turns should be spaced as close together as possible without actually touching each other. Remove *L1* from the form and solder its two ends directly across tuning capacitor *C1*. All leads should be as short as possible.

Quench coil *L2* is a four-section 2.5-mh. choke. Tap into *L2* between the first and second section as shown. Then carefully scrape the connecting wire clean and solder a thin flexible 3" lead to the tap.

All components can now be screwed or glued into place. In order to eliminate hand capacitance effect, an insulated shaft extension is used with *C1*. A dynamic earphone of 2000-3000 ohms impedance should be plugged into *J1*.

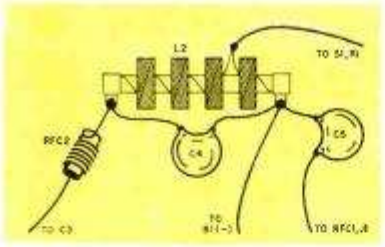
Trouble-Shooting. Before turning the unit on, check for shorts in the wiring. Turn *C1* to full mesh and *S1* to the "on" position. If the unit is functioning, a loud hiss will be heard. Tune *C1* across the band until the hiss subsides and a station appears. A large dead area may appear at the high end of the FM band. If this happens, shorten the leads in the tuning circuit.

If a hiss is not heard, touch *C1* with an insulated screwdriver. A click should be heard indicating that the ultra-audion section is oscillating but the quench circuitry is not functioning. Check all components, particularly the tap on *L2*, for a short, break or wiring error. Check battery voltage—if *B2* drops below 1.3 volts, oscillation will be difficult to obtain.

One method of calibrating your set to cover the entire FM band is to place the pocket receiver near a commercial FM set. Tune the commercial FM receiver to 88 mc. Then tune *C1* until a rushing noise is heard. Mark this spot on the pocket receiver's case. Repeat this procedure for the upper end of the FM band at 108 mc. If the high

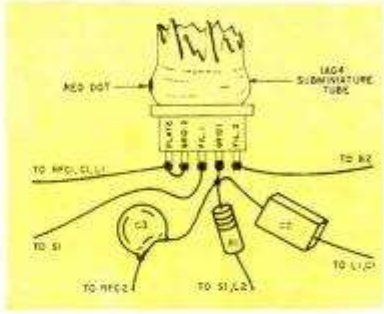
(*Continued on page 112*)

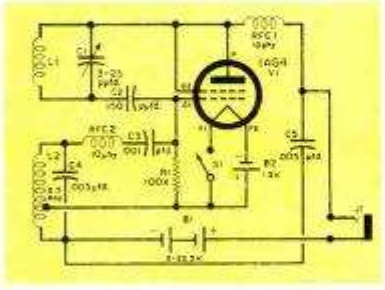
* General Transistor Corp., Applications Engineering Dept.



Wiring details of quench oscillator coil L2. Note added coil tap.

Detail view of wiring of sub-miniature tube socket. Red dot on tube is guide for proper installation.

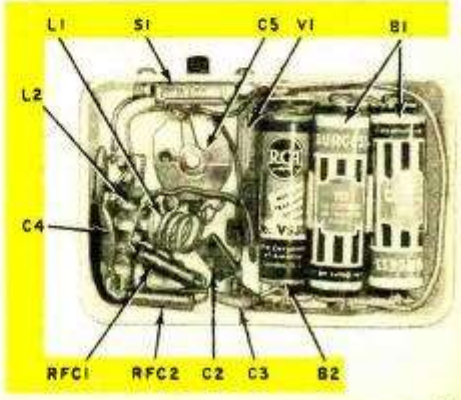




PARTS LIST

B1—22.5 volt battery (Burgess Y15)
B2—1.5-volt penlight cell
C1—3-25-μμfd. variable capacitor (Hammarlund APC-25)
C2—150-μμfd. mica capacitor
C3—0.001-μfd. disc ceramic capacitor
C4, C5—0.005-μfd. disc ceramic capacitor
J1—Miniature open-circuit phone jack
L1—Four turns of #14 solid wire (see text)
L2—2.5-mh. choke (Miller 4537)
R1—100,000-ohms, ½-watt resistor
RFC1, RFC2—10-μh. choke (Miller 4612)
S1—S.p.s.t. slide switch
V1—1AG4 electron tube
1—Plastic shaft extension
1—Plastic cabinet (Lafayette MS-302)
2—Battery holders (Acme 5 and Acme 45)
1—Subminiature tube socket

Antenna coil L1 is the only one requiring special winding. All others are commercially available. For longer battery life, a mercury cell can be used as B2 instead of standard penlight cell.



Parts placement shown should be followed carefully for best results. Consult the two detail views above for exact positions. All leads should be as short as possible.

FM in Your Pocket

(*Continued from page 36*)

end of the band does not come through, spread the turns of the tuning coil *L1* slightly. Compress to obtain the low end of the band.

In order to increase sensitivity in very weak signal areas, place the receiver near any metal surface. This method of loose coupling utilizes the metal object as an antenna.

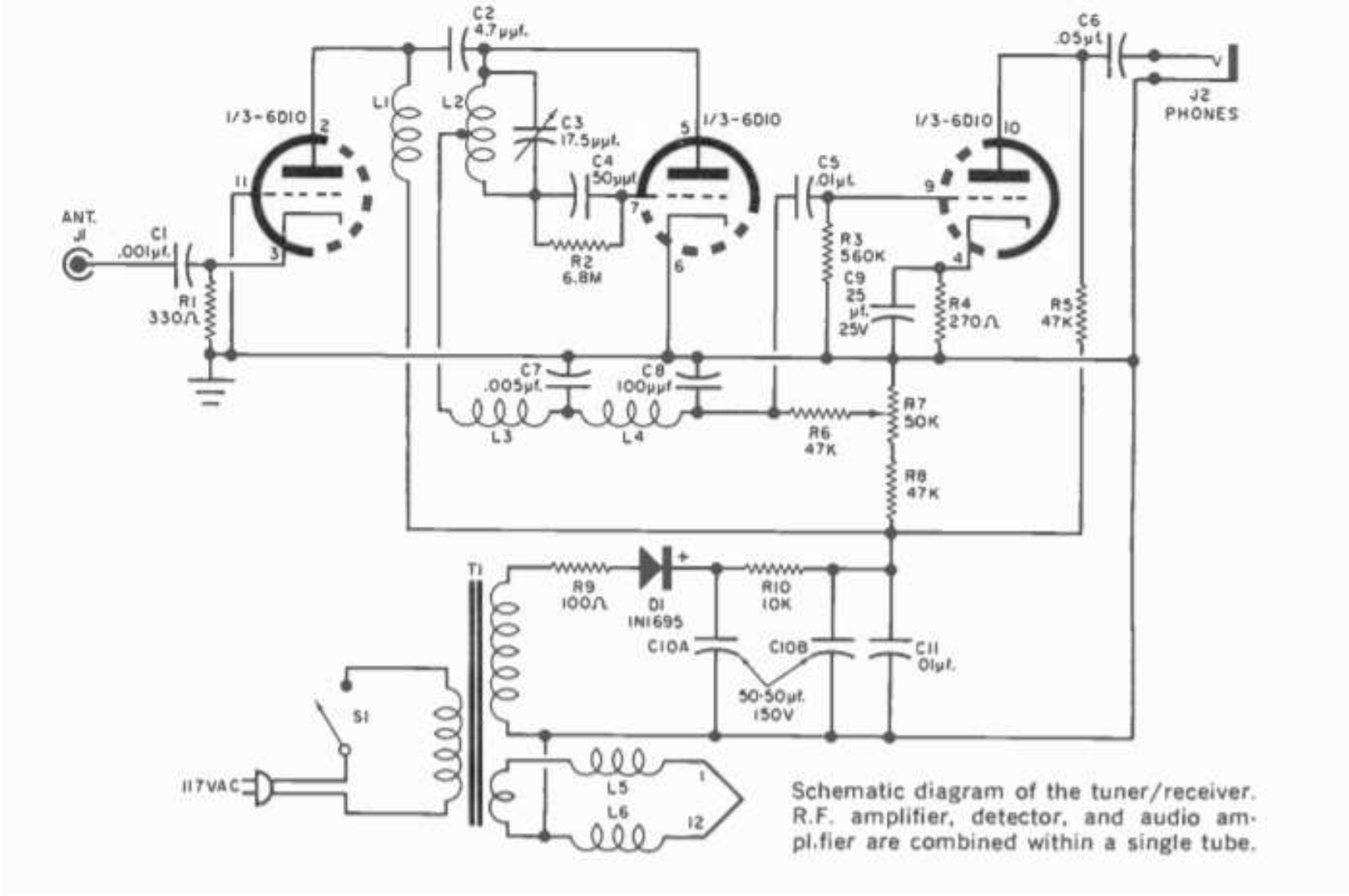
—30—

HOW IT WORKS

Though the use of a super-regenerative type detector, gain comparable to a full superheterodyne receiver has been obtained. The circuit utilizes two separate oscillators. The first, an r.f. ultra-audion type, is tuned by *L1* and *C1* in the incoming r.f. signal. The interelectrode capacitance of *V1* is used to provide the feedback to sustain the oscillation. A quench oscillator of the Hartley type, whose tank circuit is *L2* and *C4*, couples the grid circuit of *V1* on and off at a 30-kc. rate. Its only purpose is to interrupt the high-frequency oscillation.

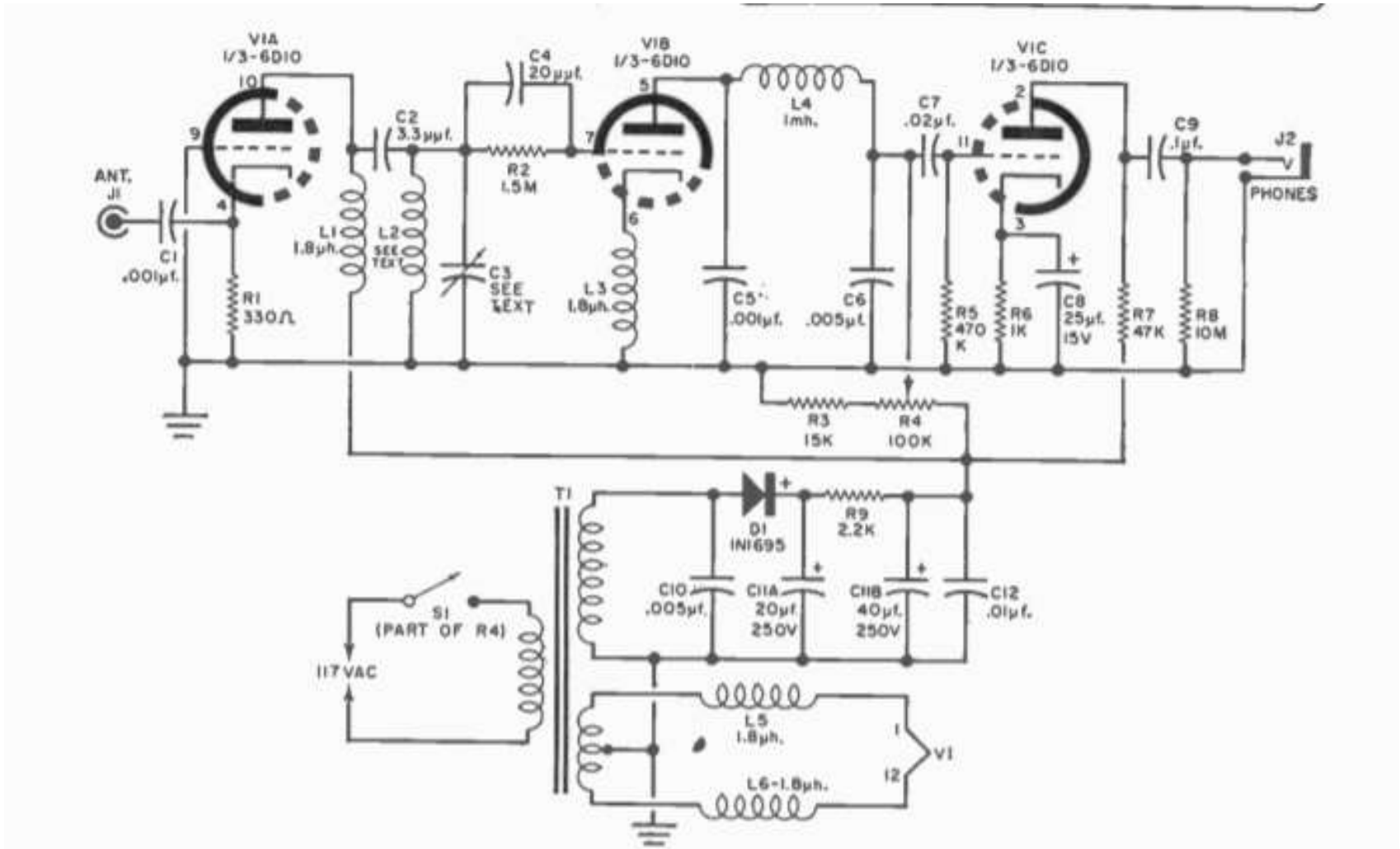
An r.f. signal appearing in the tank circuit triggers the ultra-audion oscillator on before its normal period and keeps it on slightly after the quench frequency would normally kill it. The "extra" period of oscillation by the ultra-audion section results in a large plate current change. This change appears as the audio signal in the earphone. Since the incoming r.f. signal is used only as a trigger to fire the high-frequency oscillator, the overall gain of the circuit is not dependent either on the strength of the incoming signal or the gain of the tube.

Superregenerative FM Receiver



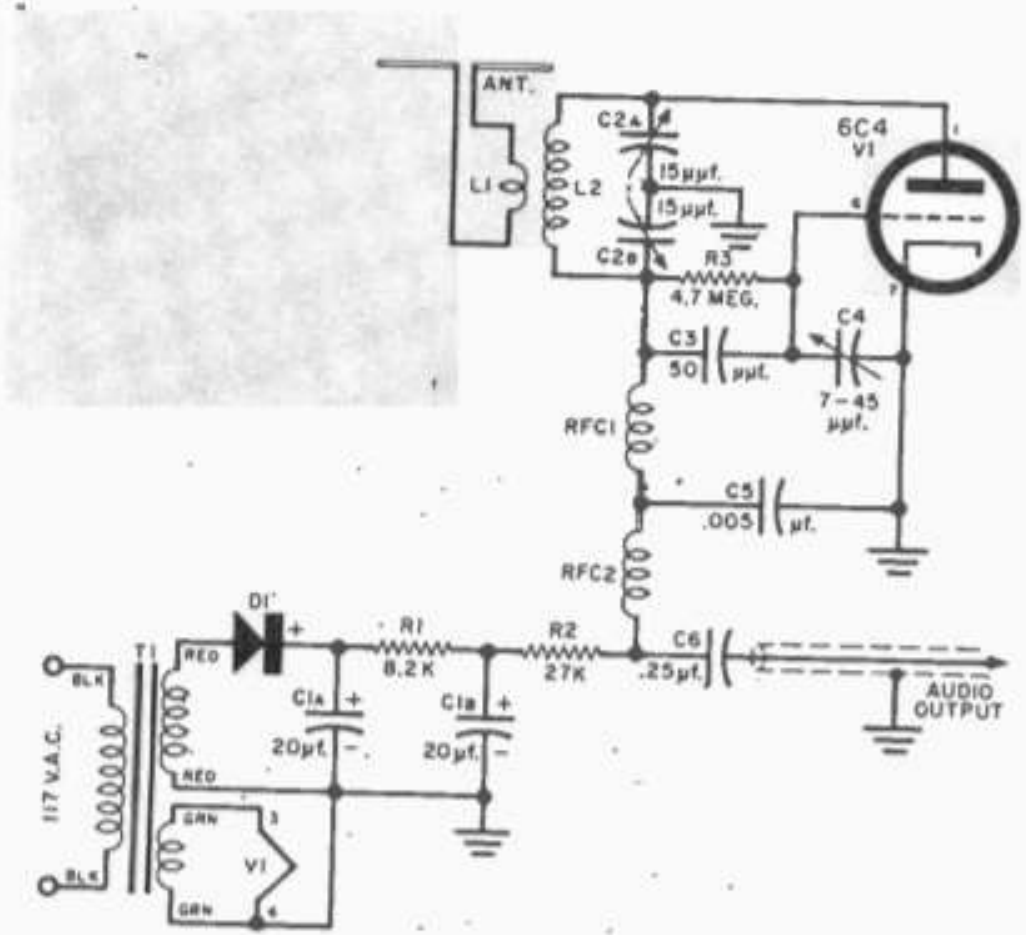
Schematic diagram of the tuner/receiver. R.F. amplifier, detector, and audio amplifier are combined within a single tube.

August 1961
Popular Electronics


V1A
1/3-6D10
V1B
1/3-6D10
V1C
1/3-6D10
ANT.
J1
C1
.001μf.
R1
330Ω
L1
1.8μh.
L2
SEE
TEXT
C2
3.3μμf.
C3
SEE
TEXT
C4
20μμf.
R2
1.5M
L3
1.8μh.
L4
1mh.
C5
.001μf.
C6
.005μf.
C7
.02μf.
R5
470
K
R6
1K
C8
25μf.
15V
C9
.1μf.
R7
47K
R8
10M
J2
PHONES
R3
15K
R4
100K
T1
D1
IN1695
R9
2.2K
C10
.005μf.
C11A
20μf.
250V
C11B
40μf.
250V
C12
.01μf.
S1
(PART OF R4)
117VAC
L5
1.8μh.
L6-1.8μh.
V1

Sept 1961 PE

Circuitry of the FM tuner is extremely simple, as the schematic diagram shows. A single triode (V1) is connected in a superregenerative hookup; power for the tube is furnished by rectifier D1.



Aug 1960
Popular
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