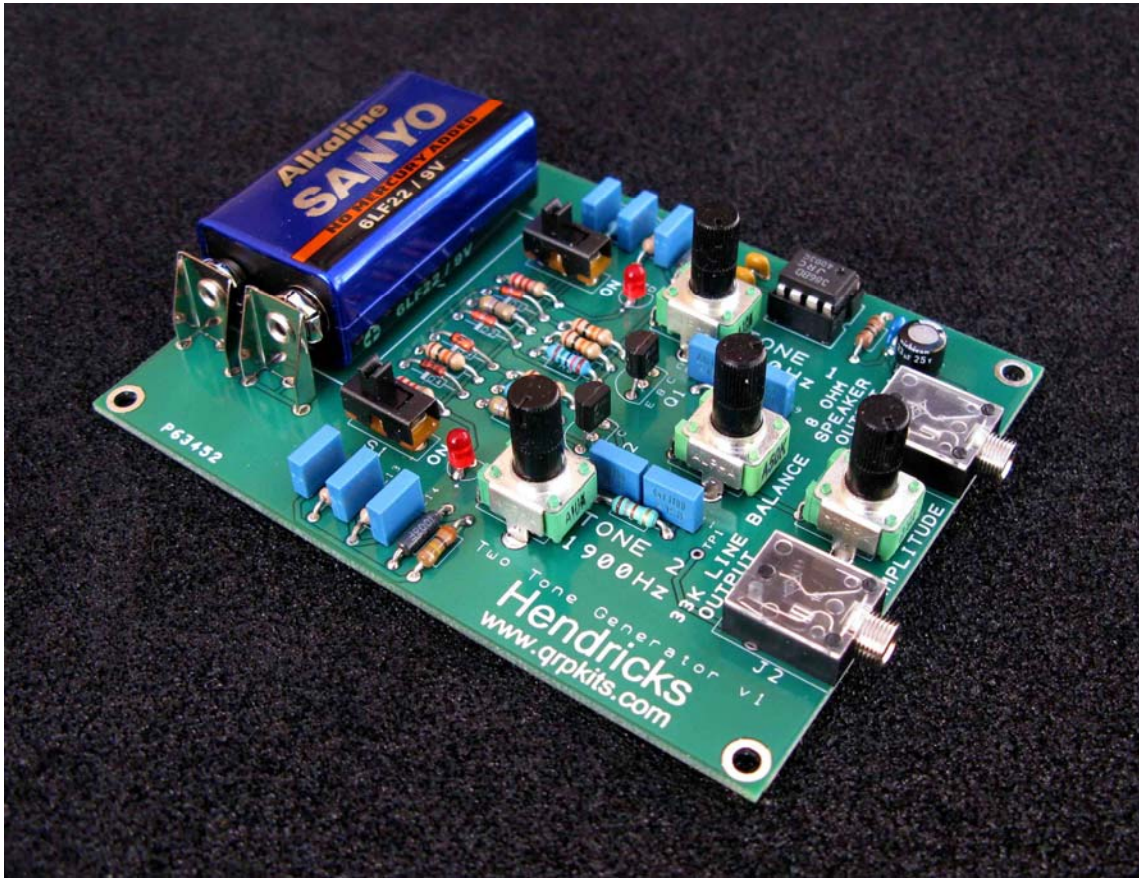


Hendricks Two Tone Generator Assembly Manual



This kit provides the builder with a universal two tone generator to test the quality of an ssb transmitter by injecting two non-harmonic tones (700 Hz and 1900 Hz) into the microphone input, and evaluating the displayed envelope output with an oscilloscope. The device has two outputs, one for a direct connection (33K ohm) to the transmitter microphone input, and another with an output to drive a speaker so that the microphone can also be included in the test. Line output amplitude is adjustable from approximately 250 uV to 2.50V p-p.

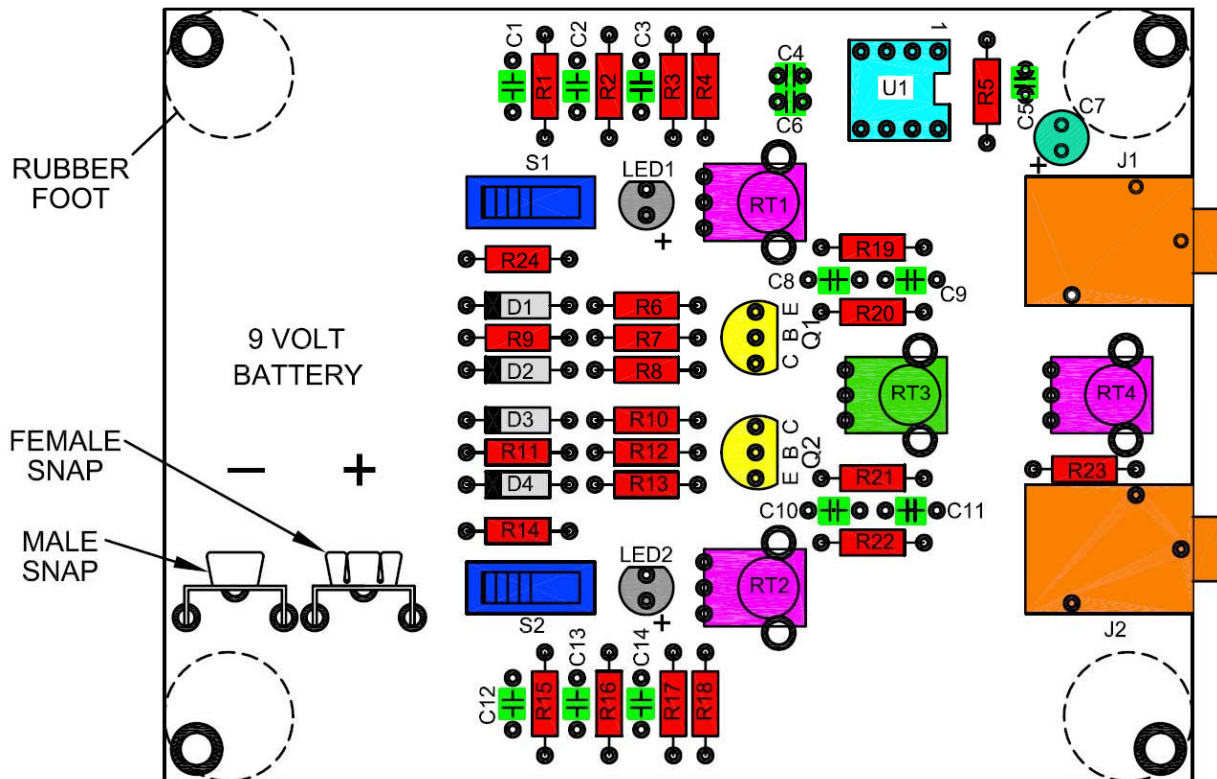
The kit comes complete with all the electrical/mechanical components. It is designed as a board/component only kit to be used as is, mounted with rubber feet, or the user could mount the board in a chassis, see page six. It uses all through hole components, and can be easily assembled with the normally available kit building tools. It is powered by a board mounted, 9 volt battery, (not included).

Please read all the instructions first.

Start the kit process by identifying and matching the parts with the list below.

Kit parts

Qty.	Part	Description
1	R1	3.3K 1/4 watt resistor (orn-orn-red-gld)
5	R2, R6, R7, R10, R11	10K 1/4 watt resistor (brn-blk-orn-gld)
2	R3, R17	100K 1/4 watt resistor (brn-blk-yel-gld)
2	R4, R18	300K 1/4 watt resistor (orn-blk-yel-gld)
1	R5	10 ohm 1/4 watt resistor (brn-blk-blk-gld)
2	R8, R12	15K 1/4 watt resistor (brn-grn-orn-gld)
2	R9, R13	51 ohm 1/4 watt resistor (grn-brn-blk-gld)
3	R14, R15, R24	2.2K 1/4 watt resistor (red-red-red-gld)
1	R16	8.2K 1/4 watt resistor (gry-red-red-gld)
4	R19, R20, R21, R22	18K 1/4 watt resistor (brn-gry-orn-gld)
1	R23	33K 1/4 watt resistor (orn-orn-orn-gld)
3	C1, C2, C3	0.01 uF cap. polyester film, marked (10n or 103)
2	C4, C6	0.1 uF cap. mono , marked (104)
1	C5	0.047 uF cap. mono , marked (473)
1	C7	33 uF cap. electrolytic
2	C8, C9	0.022 uF cap. polyester film ,marked (22n or 223)
5	C10, C11, C12, C13, C14	0.0047 uFcap. polyester film, marked (4n7 or 472)
1	U1	LM386, 8 pin dip amplifier IC
2	Q1, Q2	2N3904 transistor
4	D1, D2, D3, D4	1N4148 diode
3	RT1, RT2, RT4	10K vertical pot
1	RT3	50K vertical pot
2	LED1, LED2	LED, red
2	J1, J2	Stereo PCB jack
2	S1, S2	Slide switch, SPDT
1	8 pin ic socket	
1	"+" 9V battery clip	
1	"-" 9V battery clip	
4	Rubber foot	
1	Printed circuit board	



Using the graphic as a guide, you can check off each component as you install it. Start with the smallest, shortest components first.

- ☐ D1, ☐ D2, ☐ D3, ☐ D4

1N4148 diode (line up the cathodes correctly with the silk screen)

- ☐ R1
- ☐ R2, ☐ R6, ☐ R7, ☐ R10, ☐ R11
- ☐ R3, ☐ R17
- ☐ R4, ☐ R18
- ☐ R5
- ☐ R8, ☐ R12
- ☐ R9, ☐ R13
- ☐ R14, ☐ R15, ☐ R24
- ☐ R16
- ☐ R19, ☐ R20, ☐ R21, ☐ R22
- ☐ R23

3.3K 1/4 watt resistor (orn-orn-red-gld)
 10K 1/4 watt resistor (brn-blk-orn-gld)
 100K 1/4 watt resistor (brn-blk-yel-gld)
 300K 1/4 watt resistor (orn-blk-yel-gld)
 10 ohm 1/4 watt resistor (brn-blk-blk-gld)
 15K 1/4 watt resistor (brn-grn-orn-gld)
 51 ohm 1/4 watt resistor (grn-brn-blk-gld)
 2.2K 1/4 watt resistor (red-red-red-gld)
 8.2K 1/4 watt resistor (gry-red-red-gld)
 18K 1/4 watt resistor (brn-gry-orn-gld)
 33K 1/4 watt resistor (orn-orn-orn-gld)

- ☐ 8 pin dip socket

(match the notch in the silk screen)

- ☐ C1, ☐ C2, ☐ C3

0.01 uF cap. polyester film, marked (10n or 103)

- ☐ C4, ☐ C6

0.1 uF cap. mono , marked (104)

- ☐ C5

0.047 uF cap. mono , marked (473)

- ☐ C8, ☐ C9

0.022 uF cap. polyester film, marked (22n or 223)

- ☐ C10, ☐ C11, ☐ C12, ☐ C13, ☐ C14 0.0047 uF cap. polyester film, marked (4n7 or 472)

- o ☐ LED1, ☐ LED2 LED, red (**long lead is positive**)
- o ☐ Q1, ☐ Q2 2N3904 transistor (**match board outline**)
- o ☐ J1, ☐ J2 Stereo PCB jack
- o ☐ S1, ☐ S2 Slide switch, SPDT

- o ☐ C7 33 uF cap. Electrolytic, (**observe polarity, long lead is positive**)

- o ☐ RT1, ☐ RT2, ☐ RT4 10K vertical pot
- o ☐ RT3 50K vertical pot

- o ☐ Battery Clips **Male snap clip “-”, on the edge of the board,**
Female snap clip “+”, to the inside

Make sure this is correct, there is no reverse protection diode.

- o ☐ Rubber foot Stick the four feet on the far side corners

- o ☐ Install U1, LM386, **with the correct pin 1 orientation. Pin 1 has a dot or chip logo on the corner.**

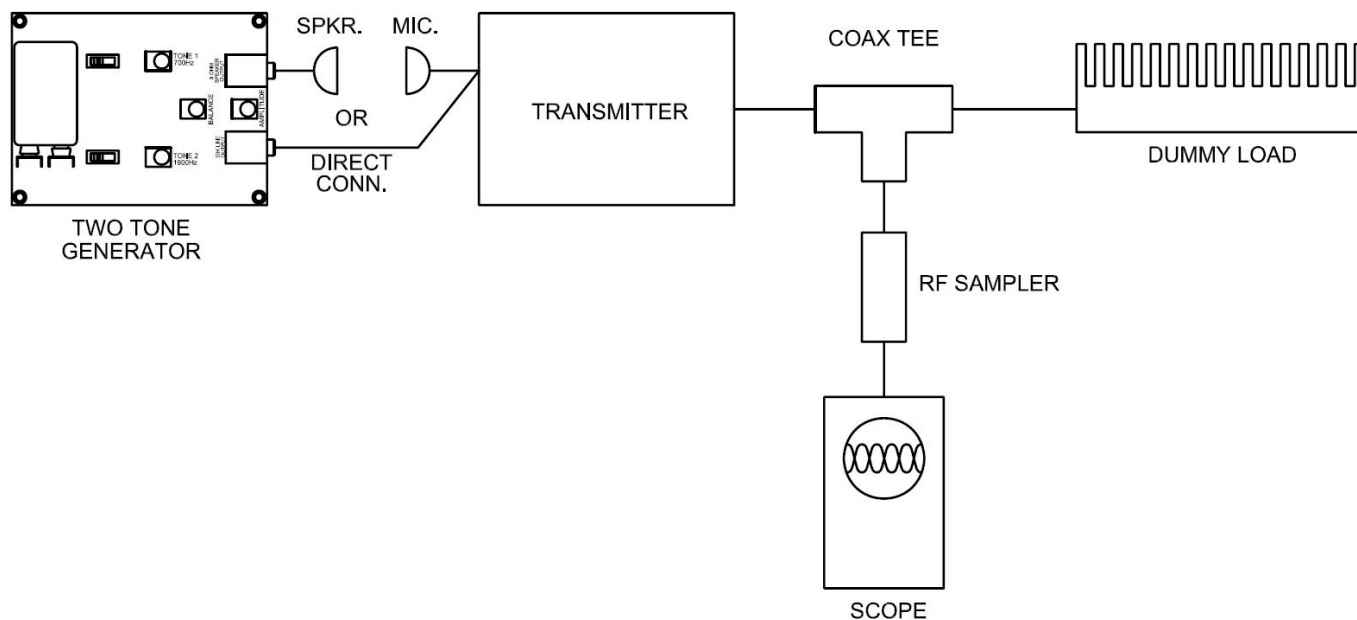
- o ☐ Install a 9 volt battery.

Testing the assembly

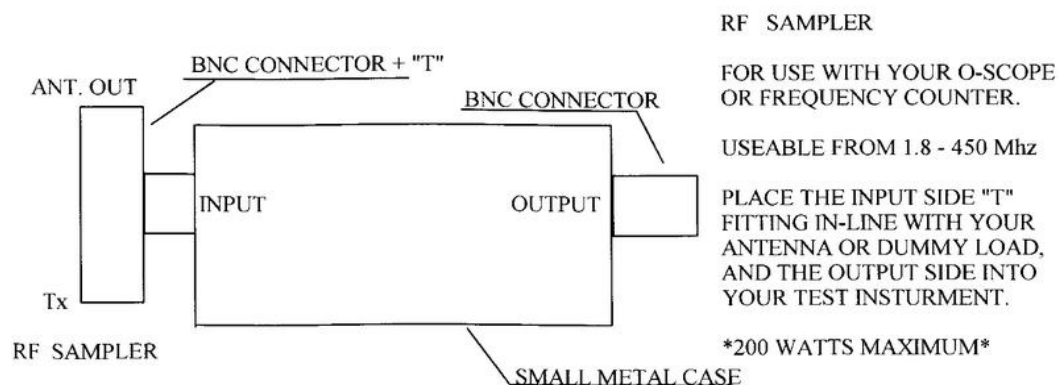
Set RT3 “Balance” for about mid position. Turn on Tone 1 and adjust RT1 with a frequency counter for a frequency of 700Hz at TP1. Turn off Tone 1 and turn on Tone 2, and adjust RT2 for a frequency of 1900Hz at TP1. Connect your oscilloscope to TP1, adjust RT4 “Amplitude” of either of the tones to about 1V p-p reading on the scope. Then, turning on each tone independently, adjust RT3 “Balance” potentiometer so that the amplitude of both tones are equal. RT4 “Amplitude” will provide adjustment of approximately 250uV to 2.50V P-P output.

Typical block diagram of transmitter testing

There are many references on the web for using two tone audio generators in ssb testing, coupling the transmitter to your oscilloscope, and interpreting the obtained waveforms.



Generic RF sampler:

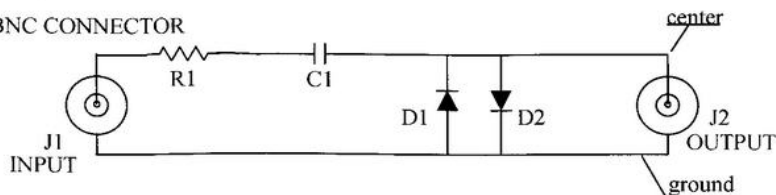


C1 = 5pF 1kv

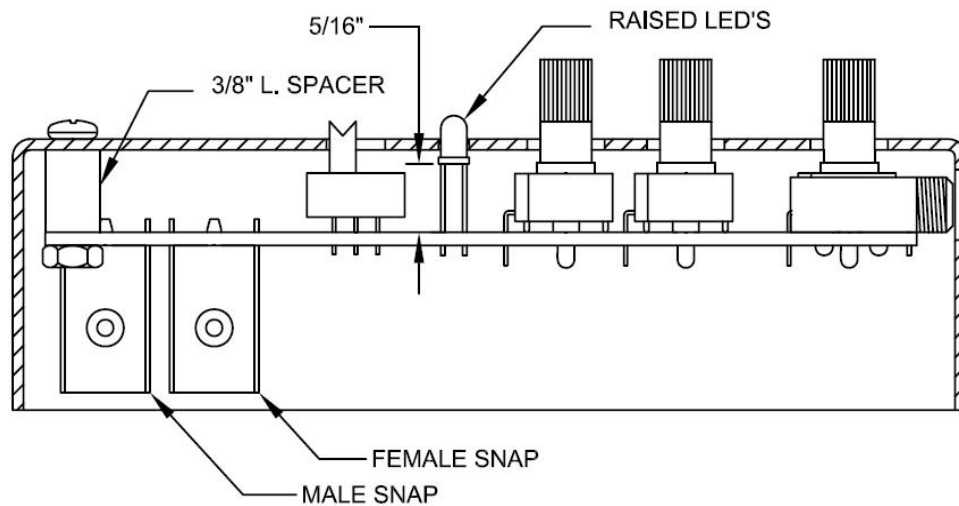
D1, D2 = 1N914

R1 = 50 Ohm, 1/4 watt

J1, J2 = BNC CONNECTOR



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For users that may want to enclose their board in a chassis, mount the battery clips on the far side of the pcb as shown. Also install the two led's 5/16" from the surface of the pcb to the bottom of the led's. Simple 3/8" long spacers on the four corners will give sufficient clearance and access for the other components.

