DK7IH TwoTone Oscillator (Rev. 2.1)

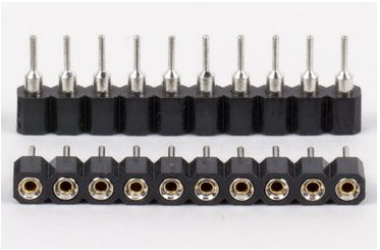
General



This audio oscillator can be used to supply an audio signal composed of two audio frequencies in the range between 400 to 2400 Hz for an SSB transmitter to check the linearity of the amplifier stages.

The generator‘s output will be connected to the microphone input of the SSB transceiver under test. Output impedance is in the range of some 10kΩ. Output voltage ranges up to 4Vpp. depending on the input impedance of the radio under test.

The two audio frequencies are f_1=700Hz and f_2 = 1600Hz (approx.). If they are too closely harmonically related, one set of the 3 identical capacitors in each branch of the generator should slightly be altered. An alternative is to change two resistors which often is easier. Detailed reference can be found later in this paper. A good idea is to use **socket pins** like the ones pointed out below for at least one branch in the generator. So different capacitors resp. resistors can be plugged in easily.

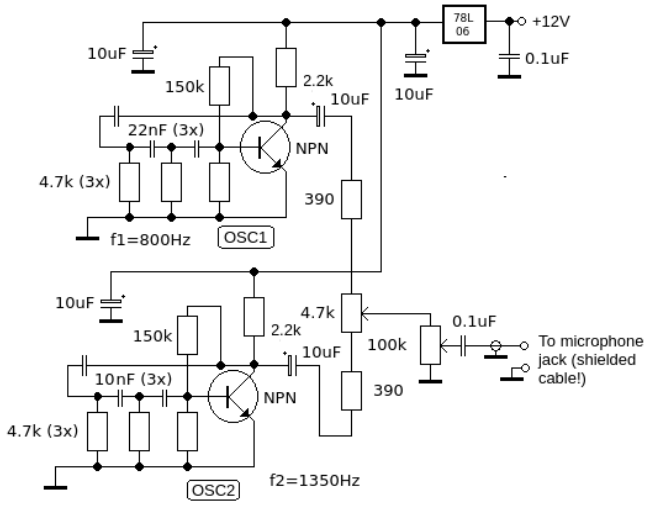


Output is about 4Vpp max. depending on the load.

DC supply can be in the range of 5 to 12V. A stabilized power supply or a 9V battery work best.

Circuit discussion

The schematic of the generator:



TwoTone audio generator for linearity test in SSB transmitters
DK7IH 2016-2022 https://dk7ih.de

Explanation: There are two identical phase shift audio oscillators using a simple BC547 (or another audio typ) transistor. Both are coupled to a “Balance” potentiometer using resistors in the range from 330 to 560Ω. The output voltage relation between the two oscillators is set here. The resistors (390Ω or 470Ω approx.) are for decoupling the output of each single oscillator from his opponent on the other side. The value can be increased up to some kΩ and is not critical.

The output voltage then is set by the “Volume” potentiometer.

PCB Layout

Hint #1: This and the subsequent paragraph only refer to the non-assembled version of this device!

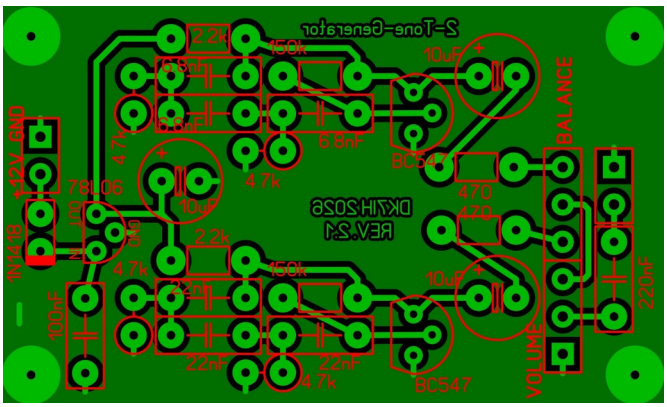
Hint #2: The layout is shown from the component side!

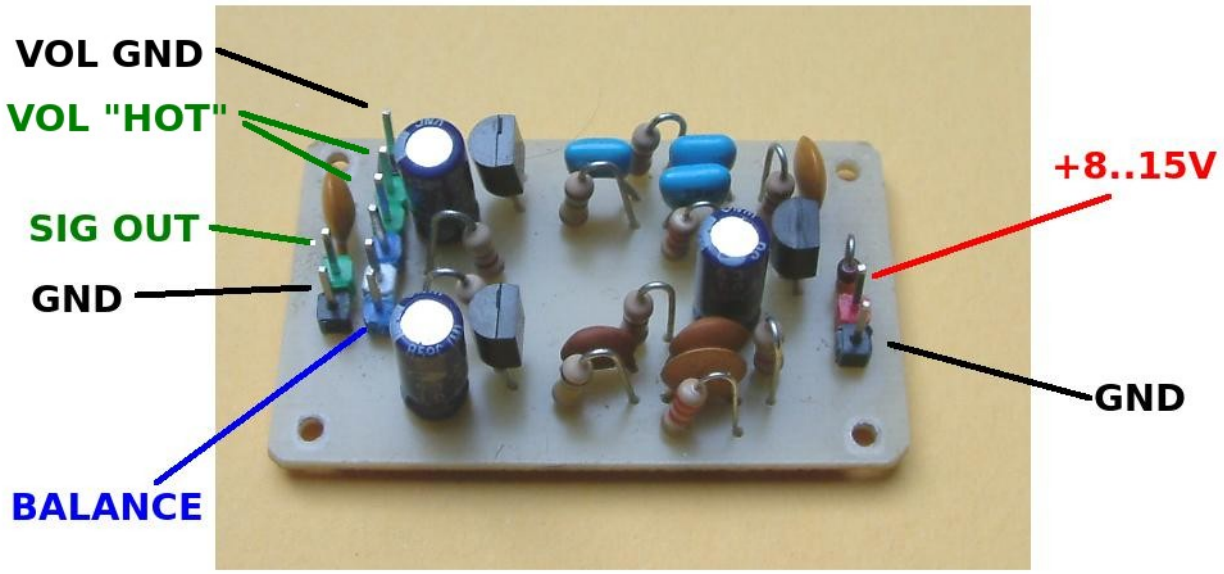
When not having ordered a preassembled version of this device, assembling the PCB it is recommended to use leaded soldering tin (if available) and a “pen style” small solder tip. Using the “SMD” size of 0.5mm diameter tip makes soldering easier and more precise.

The values of the components are not super-critical but should be kept within a reasonable range.

The connectors for the potentiometers (Balance and Volume) are sited on the right. DC input can be found on the left. Connectors are made using 2.54mm (0.1”) header connectors.

Wiring scheme: The lines to and from the generator are marked in the picture below:





Final Installation

To complete the device, some additional components must be connected. The respective values are not critical, the range is given for each component:

- Balance potentiometer (4.7k to 10k)
- Volume potentiometer (10k to 100k)

Also there are

- DC supply connector (for 8..12V),
- Signal output.

Audio jack connector

A standard 3.5 mm stereo jack can be used to connect the generator to the microphone cable. Using a shielded cable is mandatory to avoid stray radio frequency energy intruding the audio input of the transmitter.

The pins in the assembled version are connected as can be seen in the picture on the right. It is recommended to follow this layout when setting up the generator on you own.



When the switch “PTT” in generator’s front panel (to be installed!) is brought to e. g. upper position, PTT line is connected to GND thus enabling the transmitter.

Hint: Often there are stereo cables available used for feeding audio signals from MP3-Players or other audio sources into a computer’s soundcard or

another appropriate device. Provided they are made of shielded cable (what mostly is the case to my findings) they can be used. Just cut off one end’s 3.5mm stereo plug and mount a suiting microphone plug for the radio you wish to test!

Power supply

The generator can be supplied by any clean (i. e. hum-free) DC voltage between 8 and 15V.

There is a polarity protection serial diode integrated, but please mind the correct polarity of the power supply anyway!

DC supply lines should be short to avoid stray radio frequency energy when testing a stronger transmitter. The metal box is connected to the PCB's ground potential where the unit also draws VCC ("minus") from.

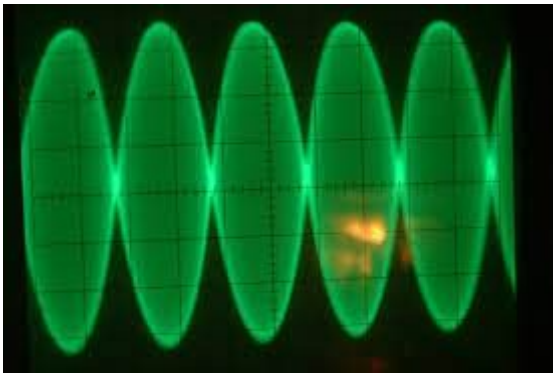
With version 2.1 and later there is no power supply switch. As soon as the generator is connected to DC voltage, it will operate.

Operation

Connect the transmitter to an appropriate dummy load and connect this to an oscilloscope suitable for the frequency of the transmitter. You might want to apply a voltage divider probe if available!

- Then set the “Volume” control to full left position first.
- Set “Balance” to the center.
- Power on the generator and activate the “PTT” to enable the transmitter if necessary. With the assembled version, PTT is active when the switch is in upper postion.
- Now turn the volume control clockwise until the modulated radio frequency appears on the the screen.

Change “Balance” control until the signal looks similar to this:



- Increase transmit power by turning “Volume” control more clockwise until the signal starts to get into saturation or other type of distortion occur.
- When testing a radio that has “ALC” adjust this to the optimum signal.

- Measure peak voltage with the oscilloscope reading of the clean signal and calculate real output power

$$P = \frac{Vpp}{\sqrt{2} * 2} \div 50\,\Omega$$

  provided that dummy load is designed for 50Ω impedance.

Vy 73!

November 2026 by DK7IH (Peter)

https://dk7ih.de