Audio Headset Tester

For aircraft or PC headsets

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The headsets used in light aircraft are subjected to some pretty rough treatment, particularly in flying training: repeated connections and disconnections, involuntary pulling of the wires on the connectors, repeated twisting of the microphone, drops and bumps….. the life of an aircraft headset is pretty difficult!

On top of this, the use of the headset gives a degree of comfort and security to the user, so its reliability must be the very best possible. For this reason, it is useful to test the headset from time to time to guarantee that it's working. I came up with this little circuit to verify that the microphone and earpieces are in good working order. I've made two of these: one for the club and one for myself.

Description

An aircraft headset is usually comprised of an electret microphone and two earpieces; these last two are connected to the same signal in series or in parallel, because stereo sound is not much use in a light aircraft. The total impedance may vary from a few ohms to several hundred ohms.
The circuit accomplishes three functions: vari-

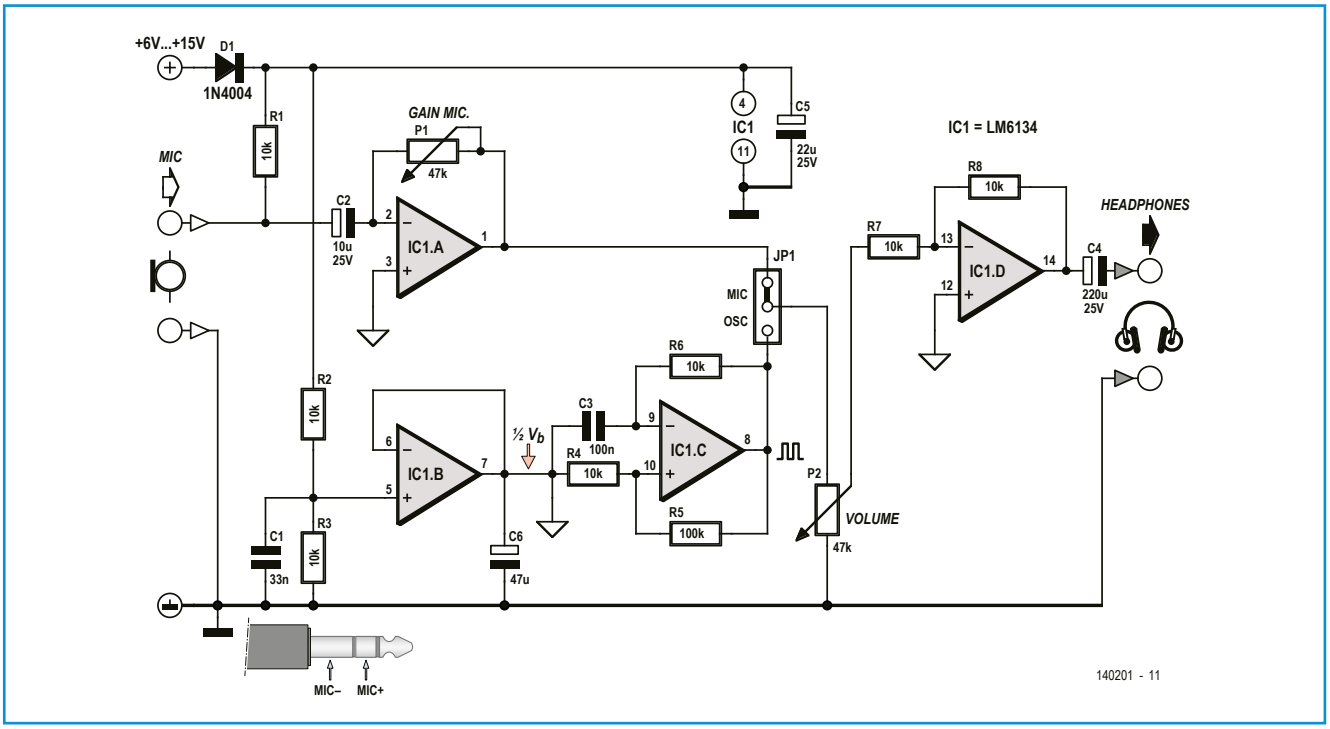


Figure 1.
Schematic of the tester for aero and PC headsets.

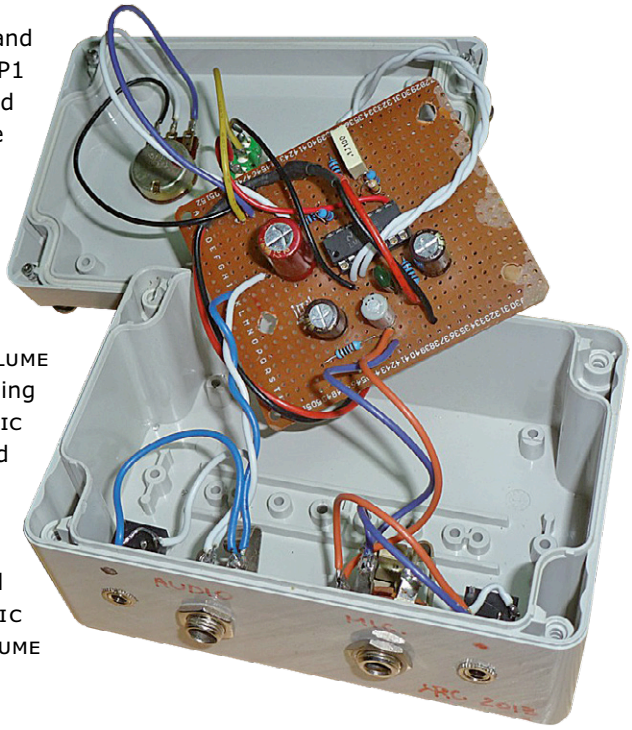
able-gain microphone amplifier; generation of a test signal; and output amplifier with variable gain for the earpieces. With these facilities, it is possible to test the earpieces with a signal generator, and to test microphone and earpieces together by using the microphone signal.

I have looked to make the circuit as simple as possible, by getting rid of any resistor or capacitor which is not strictly necessary, the object being to simplify the wiring while keeping reasonable performance.

The circuit uses a quadruple rail to rail opamp; I had available an LM6134, but you can use any amplifier of this type, even the slowest ones. Opamp IC1B is used to recreate and buffer the midpoint of the power rail; there is nothing particularly significant about this apart from the fact that the output must be well filtered. IC1A is used as a simple inverting amplifier, with the input impedance being that offered by the 10-µF capacitor at audio frequencies; the gain is set by the feedback resistor, P1. IC1C is an oscillator producing a large amplitude square wave signal; it is a very simple circuit using minimum components to create an audio signal: three resistors and a capacitor. This signal, being a square wave, is a little harsh on the ears, but the objective is not quality audio! The last amplifier IC1D is fed by a choice of either the signal from the IC1C oscillator, or the microphone signal amplified by IC1A. Its gain is fixed at 1, because its output level is set by varying the input signal with the volume control potentiometer. A large output capacitor, C4, is necessary to avoid putting any DC on the earpieces.

It only remains to put it all together. I used a piece of prototyping PCB and a simple plastic case. In less than half an hour you should be finished.

Before mounting the LM6134 in its socket, connect the power and check for the power supply voltage on pin 4, and half this voltage on pin 5. Disconnect the power and insert the LM6134 in its socket. With the power back on, you should be able to see a square wave signal on pin 8 with your oscilloscope. You should also find the same half power rail voltage on pins 5, 6 and 7. With jumper JP1 (or a switch wired accordingly) in the osc position, you should hear the 3-kHz test signal in the earpieces, and be able to change its level with the VOLUME control. On changing the switch to the MIC position, you should hear your own voice in the earpieces, and you can set the level with both the MIC GAIN and the VOLUME controls.



Using the tester

Connect the headset to be tested using the correct jacks:

- Airplane Headset: microphone plug 5.2 mm diameter (0.0205”); earphone plug 6.35 mm diameter (0.25”);
- PC headset: microphone plug 3.5 mm (pink plug); earpiece jack 3.5 mm (green plug)

Set the volume control to minimum and the switch to the osc position. Power up the circuit; turn up the volume, and you should hear the test tone in the earpieces if the headset is working properly. Change the switch to the MIC position, and any sound captured by the microphone should then be heard in the earpieces. The microphone gain and the volume are both adjustable.

This circuit can also be used with a PC headset. It may be powered by practically any DC power source giving 6 to 15 V DC. I have put a protection diode in the power line in case of reverse polarity connection. All my portable testers are powered by the same type of two-pole connector; in that way I only need one cable type connected to my lab power supply to use any of these pieces of test gear.

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