

QUASAR ELECTRONICS KIT No. 1043

LOUDNESS CONTROL - STEREO

General Description

Scientific research and observations have shown that the human ear does not respond in the same way across the whole spectrum of audio frequencies. In fact a normal ear is much more sensitive to sounds having a frequency of about 1 KHz and its sensitivity falls progressively towards the two ends of the audible spectrum. This characteristic of the human ear is not apparent in average conditions because most of the sounds are above the hearing threshold, and there is no problem in perceiving them. The problem arises when we are listening to music and it is necessary to do so at very low volume levels. The music then sounds empty as a great deal of the information is lost below the acoustic threshold of the listener. To the rescue comes this circuit which, when it is turned on, boosts those frequencies thus overcoming the natural deficiencies of the human ear.

Technical Specifications - Characteristics

Working voltage: 9-28V DC

Current: 50 mA

How it Works

The circuit is based on an operational amplifier, the LF353 (TL082) which uses BIFET technology, and has very low noise and good frequency response. By adjusting the feedback loop of the amplifier it is possible to create an active filter with given parameters in order to boost certain frequencies over others. The network consisting of R2, R10, C1, C2 and C3 controls the frequency response of the circuit so that the low end of the spectrum is amplified by 14 dB while the high end receives a similar boost of about 16 dB while the frequencies around 1000 Hz are not affected at all. The response of the circuit over the audible frequency spectrum can be seen in the diagram below. Depending on the position of the switch S1 the characteristics of the filter can be changed from «FLAT» (no effect) to the shape shown in the diagram, thus making it possible to switch the effect on and off without interrupting the music. The loudness control unit is normally connected between the output of the preamplifier and the input of the final amplifier. It will work well with all the audio projects from Quasar Electronics Kit and it should work also well with audio amplifiers from other manufacturers. It is very easy to adapt to an existing circuit, as it can work well with any supply voltage between 9 and 28 VDC and it also has standard input and output impedance characteristics.

Construction

First of all let us consider a few basics in building electronic circuits on a printed circuit board. The board is made of a thin insulating material clad with a thin layer of conductive

copper that is shaped in such a way as to form the necessary conductors between the various components of the circuit. The use of a properly designed printed circuit board is very desirable as it speeds construction up considerably and reduces the possibility of making errors. Quasar Electronics Kit boards also come pre-drilled and with the outline of the components and their identification printed on the component side to make construction easier. To protect the board during storage from oxidation and assure it gets to you in perfect condition the copper is tinned during manufacturing and covered with a special varnish that protects it from getting oxidised and also makes soldering easier. Soldering the components to the board is the only way to build your circuit and from the way you do it depends greatly your success or failure. This work is not very difficult and if you stick to a few rules you should have no problems. The soldering iron that you use must be light and its power should not exceed the 25 Watts. The tip should be fine and must be kept clean at all times. For this purpose come very handy specially made sponges that are kept wet and from time to time you can wipe the hot tip on them to remove all the residues that tend to accumulate on it.

DO NOT file or sand paper a dirty or worn out tip. If the tip cannot be cleaned, replace it. There are many different types of solder in the market and you should choose a good quality one that contains the necessary flux in its core, to assure a perfect joint every time. DO NOT use soldering flux apart from that which is already included in your solder. Too much flux can cause many problems and is one of the main causes of circuit malfunction. If nevertheless you have to use extra flux, as it is the case when you have to tin copper wires, clean it very thoroughly after you finish your work. In order to solder a component correctly you should do the following:

- Clean the component leads with a small piece of emery paper.
- Bend them at the correct distance from the component's body and insert the component in its place on the board.
- You may find sometimes a component with heavier gauge leads than usual, that are too thick to enter in the holes of the p.c. board. In this case use a mini drill to enlarge the holes slightly. Do not make the holes too large as this is going to make soldering difficult afterwards.
- Take the hot iron and place its tip on the component lead while holding the end of the solder wire at the point where the lead emerges from the board. The iron tip must touch the lead slightly above the p.c. board.
- When the solder starts to melt and flow wait till it covers evenly the area around the hole and the flux boils and gets out from underneath the solder. The whole operation should not take more than 5 seconds. Remove the iron and allow the solder to cool naturally without blowing on it or moving the component. If everything was done properly the surface of the joint must have a bright metallic finish and its edges should be smoothly ended on the component lead and the board track. If the solder looks dull, cracked, or has the shape of a blob then you have made a dry joint and you should remove the solder (with a pump, or a solder wick) and redo it.
- Take care not to overheat the tracks as it is very easy to lift them from the board and break them.
- When you are soldering a sensitive component it is good practice to hold the lead from the component side of the board with a pair of long-nose pliers to divert any heat that could possibly damage the component.
- Make sure that you do not use more solder than it is necessary as you are running the risk of short-circuiting adjacent tracks on the board, especially if they are very close together.
- When you finish your work, cut off the excess of the component leads and clean the board thoroughly with a suitable solvent to remove all flux residues that may still remain on it.

There is nothing particularly difficult with this circuit, and as the outlines of all components

have been neatly stencilled on the board, it is a simple matter to identify the components and to place them in their assigned places. Start building the circuit by soldering the pins first, continue with the IC socket taking care to align it correctly, and then solder in place the resistors and the capacitors making sure that the electrolytic are correctly inserted with respect to their polarity. When all the components have been soldered in their places clean the board thoroughly and inspect it carefully. If everything looks satisfactory place the integrated circuit in its socket and make the following connections:

1 (+) and 2 (-) the power supply 9-28 VDC. - 12 (signal) and 11 (earth) R - IN. - 9 (signal) and 10 (earth) R - OUT. - 3 and 4 to one half of S1. - 13 (signal) and 14 (earth) L - IN. - 7 (signal) and 8 (earth) L - OUT. - 5 and 6 to the second half of S1.

As it has already been explained the loudness unit must be connected between the preamplifier and the final amplifier of your STEREO system. So the two inputs of the circuit should be connected to the corresponding outputs of the preamplifier and at the outputs of the circuit should be connected the inputs of the power amplifiers. If you turn everything on and depending on the position of the switch S1 you should be able to notice the difference in the reproduction of the same piece with the filter activated and with the filter off. Bear in mind though that as the loudness unit is there to counteract artificially the natural response of the human ear, it may, and will, introduce distortion if it is used at high volume levels. This is just normal and should not be mistaken for some sort of malfunction of the circuit.

Adjustments

This kit does not need any adjustments, if you follow the building instructions.

Warning

Quasar Electronics kits are sold as stand alone training kits.

If they are used as part of a larger assembly and any damage is caused, our company bears no responsibility.

While using electrical parts, handle power supply and equipment with great care, following safety standards as described by international specs and regulations.

If it does not work

Check your work for possible dry joints, bridges across adjacent tracks or soldering flux residues that usually cause problems.

Check again all the external connections to and from the circuit to see if there is a mistake there.

- See that there are no components missing or inserted in the wrong places.

- Make sure that all the polarised components have been soldered the right way round. -

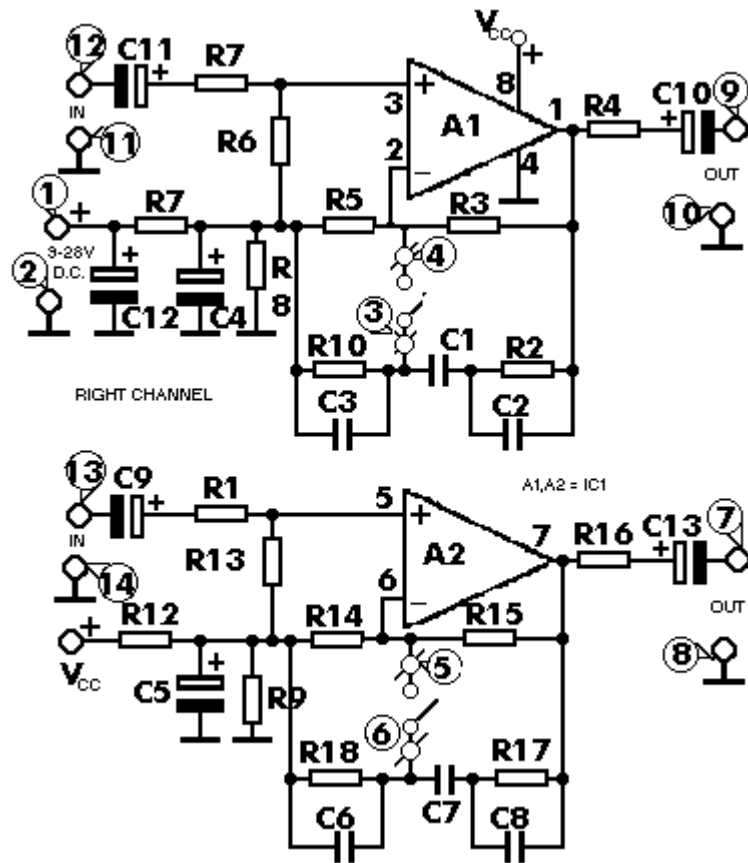
Make sure the supply has the correct voltage and is connected the right way round to your circuit.

- Check your project for faulty or damaged components.

If your project still fails to work, please contact us for information about our Get-You-Going

service.

Schematic Diagram



Parts List

All components including printed circuit board, assembly instructions including schematics and detailed parts list are supplied when you purchase the kit.

Ordering

For pricing info and online ordering please visit:

<http://www.quasarelectronics.com/1043.htm>

For further info please contact us by e-mail:

[mailto: sales@QuasarElectronics.com](mailto:sales@QuasarElectronics.com)

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