

K155. Stereo Tone Control Unit



This is a stereo tone control unit which will make a useful addition to many of our power amplifier kits. It provides +/-12 dB of bass and treble boost/cut, and channel balance control.

Specification

D.C. Input :	6V – 15V DC
Current Drain :	10 mA
Maximum output :	> 3 V RMS (12V DC supply)
Maximum input :	> 3 V RMS
Gain (loss) :	-2 dB.
Input Z :	~50 k ohm
Frequency resp. :	< 20 Hz to > 50 kHz -3 dB
THD at 1kHz :	< 0.1 % at 1V output
S/N ratio :	> 85 dB re. 1V RMS
Bass boost/cut :	~ 12 dB at 50 Hz
Treble boost/cut :	~ 12 dB at 15 kHz

How it works

C1 couples the AC signal set by the volume and balance potentiometers to the base of Q1 via R2. Q1 acts as a class A, emitter follower, buffer stage. R1 and R3 set the DC voltage at base to allow maximum signal swing. R2 determines the DC bias current and R4 provides the load impedance.

The AC output is coupled by C2 to the input of IC1 via a variable filter network which is also part of the feedback loop. With the bass and treble pots at their centre position, the impedance of the feedback circuit is balanced and will give a fixed gain at all frequencies within the pass band. When the pots are moved, the feedback ratio will increase or decrease at a frequency dependent rate governed by the capacitors C3 to C6 thereby providing the desired response curves.

R8 and R9 provide a DC bias on the op-amp input to allow it to operate from a single DC supply. C7 prevents the AC signal from varying this DC voltage level. C8 and R10 couple the AC signal to the power amplifier whilst blocking the DC voltage present at the op-amp output. C9 and R11 provide power supply decoupling or filtering. If you are using a battery supply, you can replace R11 with a wire

link to reduce battery consumption, although the difference is negligible.

Construction

NOTE:

Some components are marked incorrectly on the PCB overlay:

- *Capacitor C11 (10u) is shown the wrong way around. The + lead should be to the left.*
- *Resistors R1 and R13 are incorrectly labelled. They are 56K as per the schematic and parts list.*
- *Resistors R3 and R15 are incorrectly labelled. They are 47K as per the schematic and parts list.*

Install the smaller components, starting with the resistors and the IC socket, with the notch as shown on the overlay. The IC will also have a notch or a dot at one end. Do not fit the IC until after you have soldered the socket into place though. Install the transistors, capacitors and PCB pins, leaving the pots until last. The volume pot is the log pot (A taper). Be careful when installing the transistors, they must go in the correct way as shown on the PCB overlay. The electrolytic capacitors are also polarised and the leads marked. The longer lead is positive, and should be inserted in the hole marked with the + sign.

Use only shielded cable for the input and output connections, and make sure the power supply leads are as short as possible.

Testing

The power supply is critical to the noise performance of the pre-amp. A well regulated supply or plug pack should be used to reduce mains hum. However a regulator will not be necessary with a car or other battery supply. Make sure you test the voltage and polarity first in all cases before connecting to the board.

Make sure the volume control is turned down, and that the other pots are centred. Then connect a music source and power amp, and increase the volume slowly. You should hear the music. Check the operation of the Bass, Treble and Balance controls, being careful not to use full boost at high volume.

If there is no output, recheck all wiring, all

K155. Stereo Tone Control Unit

component positions and polarity of transistors, caps, and orientation of the IC. Check for bad solder joints, and solder bridges between tracks, especially the IC pins.

The complete data sheet for the MC4558 IC can be obtained from our web site at :

<http://www.kitsrus.com>

PARTS LIST

Resistors

R1,R9,R13	56K (green,blue,orange).....	3
R2,R10,R14,R20	1K (brown,black,red)	4
R3,R8,R15	47K (yellow,violet,orange) .	3
R4,R16.....	2K2 (red,red,red).....	2
R5,R6,R7,R17	10K (brown,black,orange) ..	6
R18,R19		
R11	120R (brown,red,brown)....	1
R12,R21.....	3K3 (orange,orange,red).....	2

Capacitors

C1,C2,C8,C10	10uF/25Vcap.....	6
C11,C16		
C3,C4,C12,C13	33nF mono (333)	4

C5,C6,C14,C15.....	3n3F mono (332)	4
C7	33uF/25V ecap.....	1
C9	100uF/25V ecap.....	1

Misc

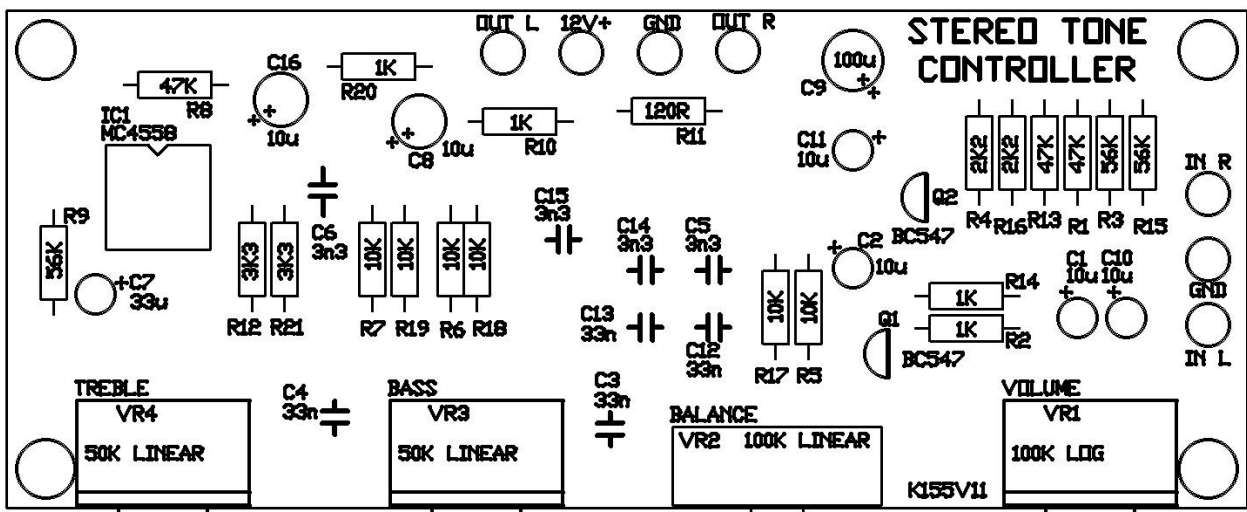
IC1	MC 4558	1
Q1, Q2	BC547	2
VR1	100k dual gang log pot. (A)	1
VR2	100k single gang linear pot. (B).....	1
VR3, VR4	50k dual gang linear pot. (B).....	2
Kit 155	Printed Circuit Board.....	1
	8 pin DIL IC socket	1
	PCB pins	7

Component Overlay

NOTE:

Some components are marked incorrectly on the PCB overlay:

- *Capacitor C11 (10u) is shown the wrong way around. The + lead should be to the left.*
- *Resistors R1 and R13 are incorrectly labelled. They are 56K as per the schematic and parts list.*
- *Resistors R3 and R15 are incorrectly labelled. They are 47K as per the schematic and parts list.*



K155. Stereo Tone Control Unit

Circuit Diagram

Left channel only (right channel components in brackets)

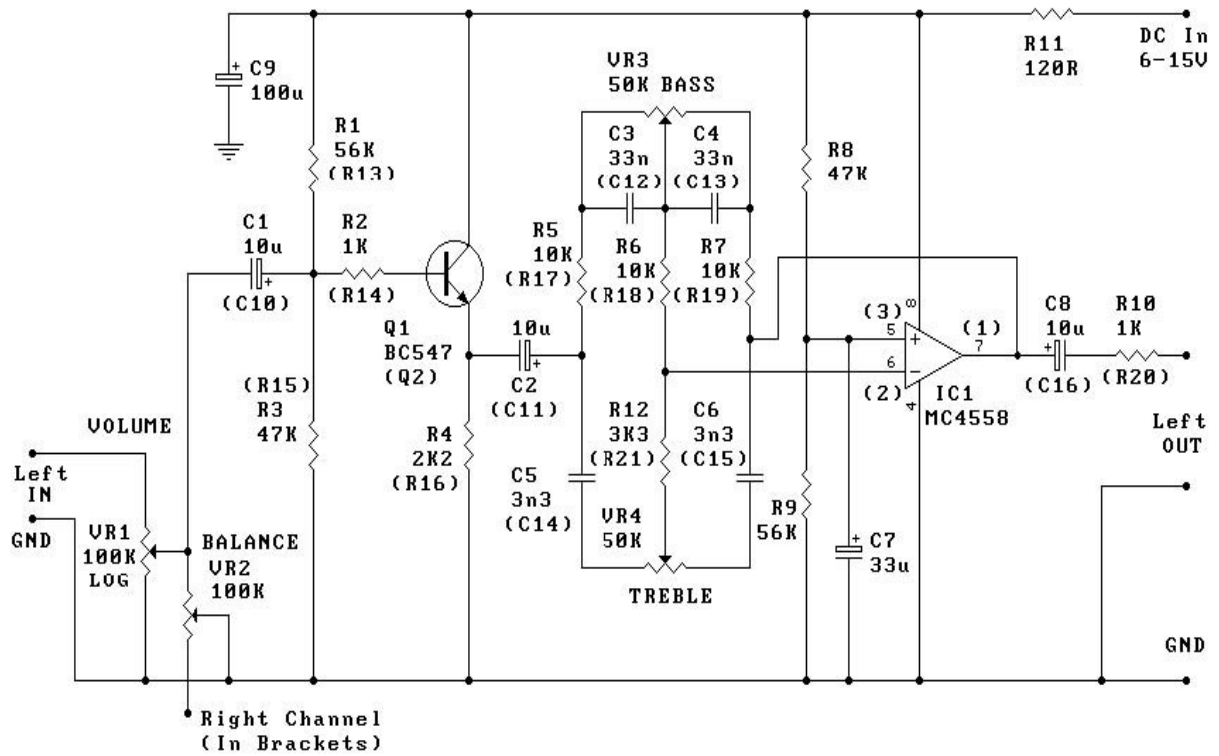
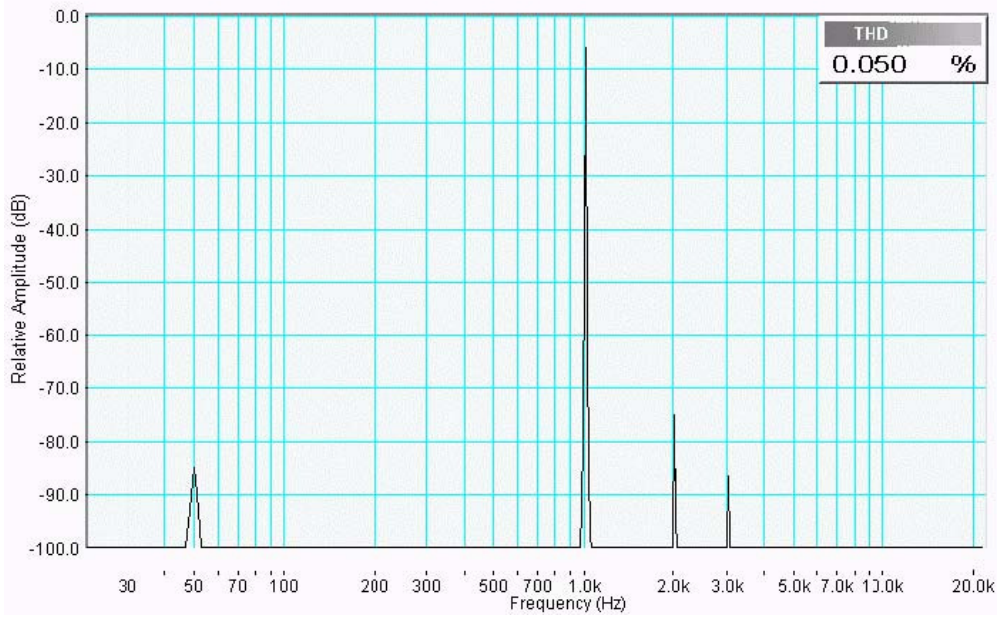


Photo of completed circuit board.

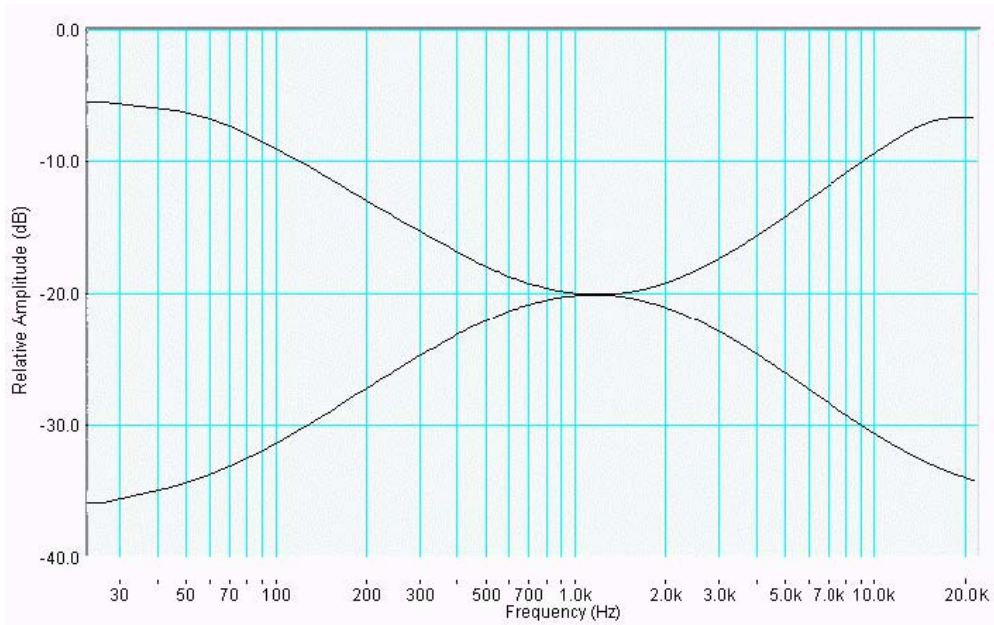


K155. Stereo Tone Control Unit

THD at 1 kHz, 1V RMS output



Effect of Tone Controls Maximum Boost / Cut



Documentation Date: March 7, 2010