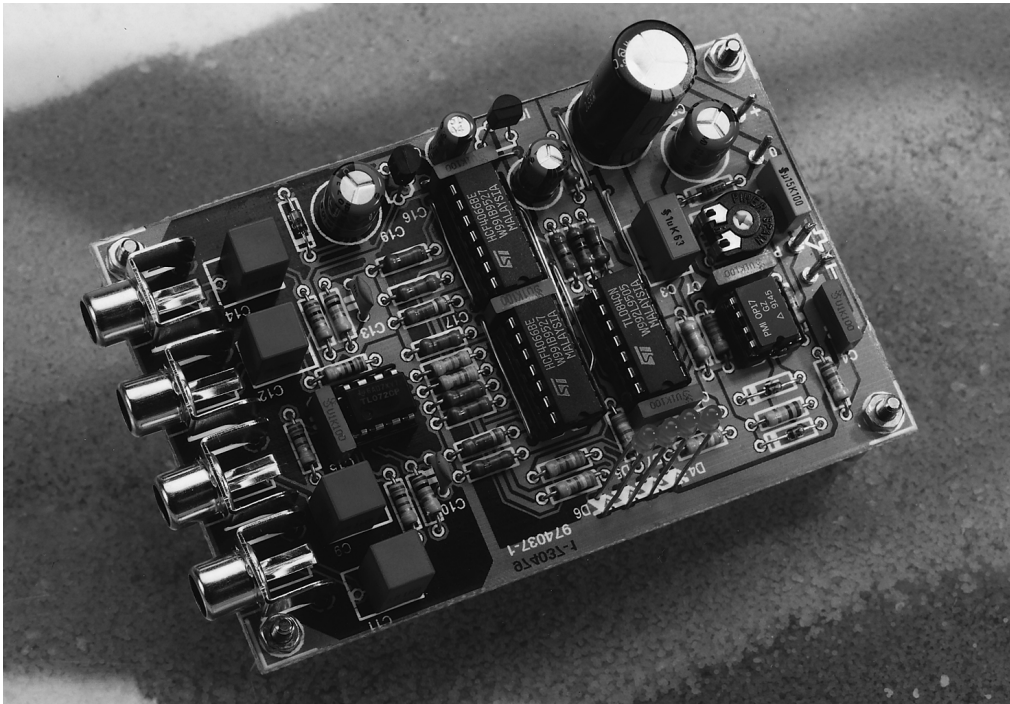


auto volume control



the case may be.

The comparators control electronic switches IC_{5a}-IC_{5d} and IC_{6a}-IC_{6d}, which modify the degree of feedback of IC_{4a} and IC_{4b} on the basis of the control input. For instance, if none of the comparators in IC₃ has changed state, IC_{4a} operates as a voltage follower with unity gain. When U_{AA} exceeds the level at junction R₆-R₇, the gain of IC_{4a} is raised by 5 dB. When with increasing road and engine noise it exceeds the level at junction R₉-R₁₀, the switches are all closed so that R₁₃-R₁₆ are in parallel, whereupon the gain of IC_{4a} is raised by 20 dB. The position of the automatic volume control is indicated by light-emitting diodes D₄-D₇.

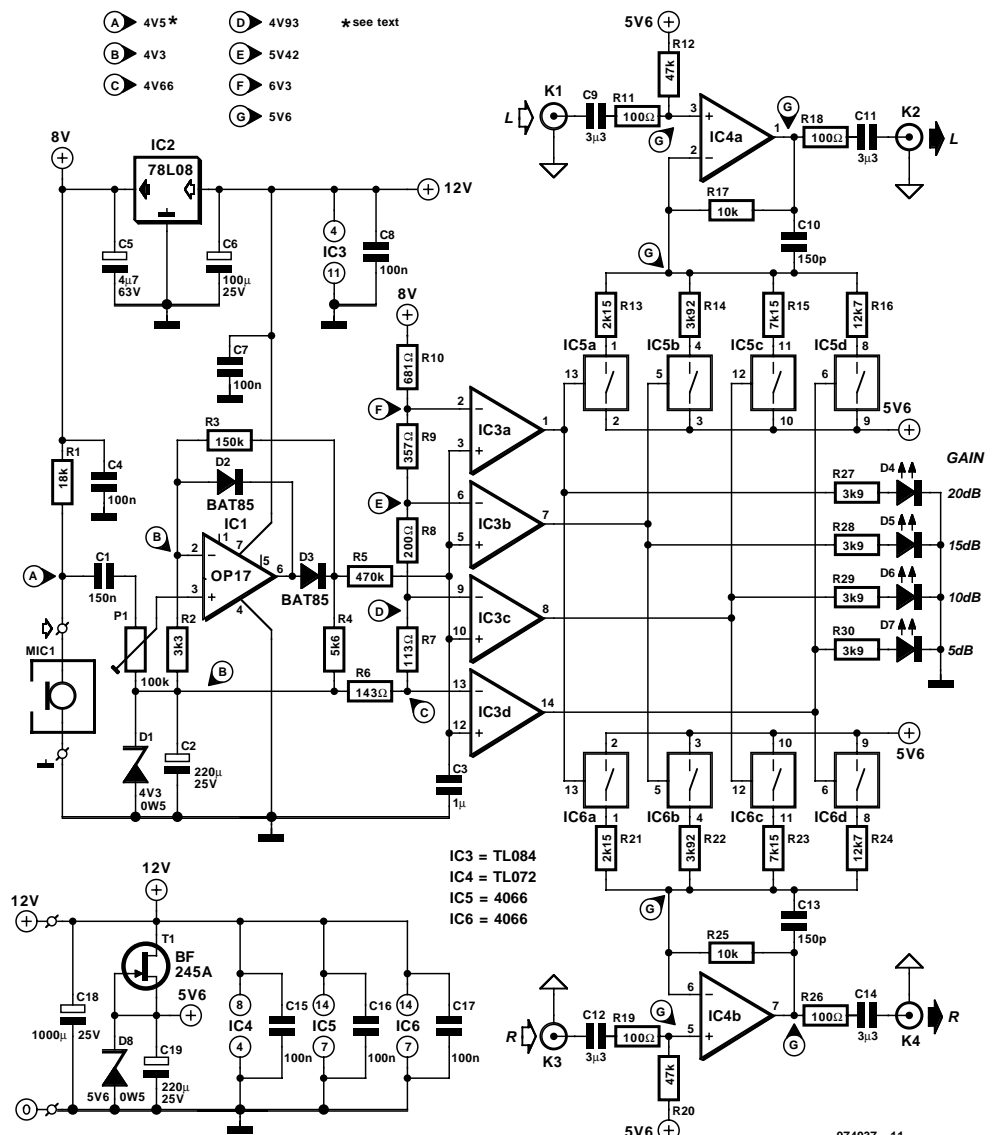
The circuit is powered by the car battery. It is recommended that the battery voltage is well filtered.

The volume control is intended primarily for insertion between a car radio and its booster. It automatically adapts the volume to the amount of road and engine noise. This is done in four 5 dB steps based on the measured sound pressure in the interior of the car. This means that the volume can be increased by up to 20 dB with respect to the set volume level. This implies that care should be taken that the booster and loudspeakers do not become overloaded.

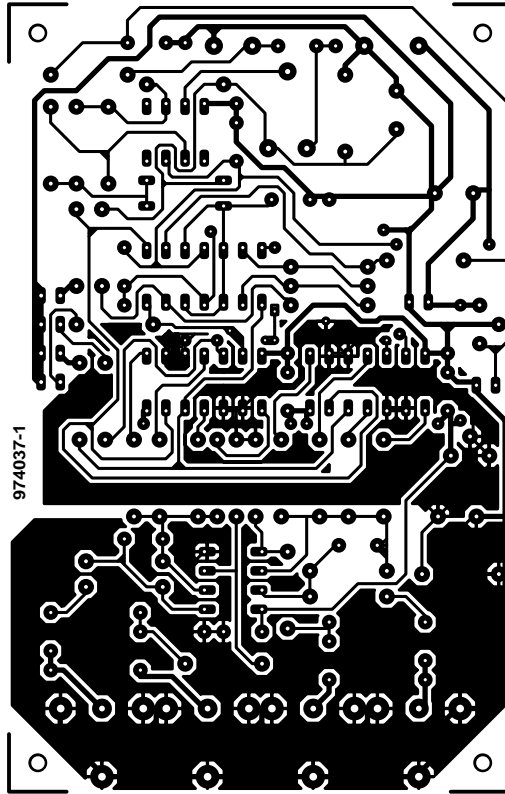
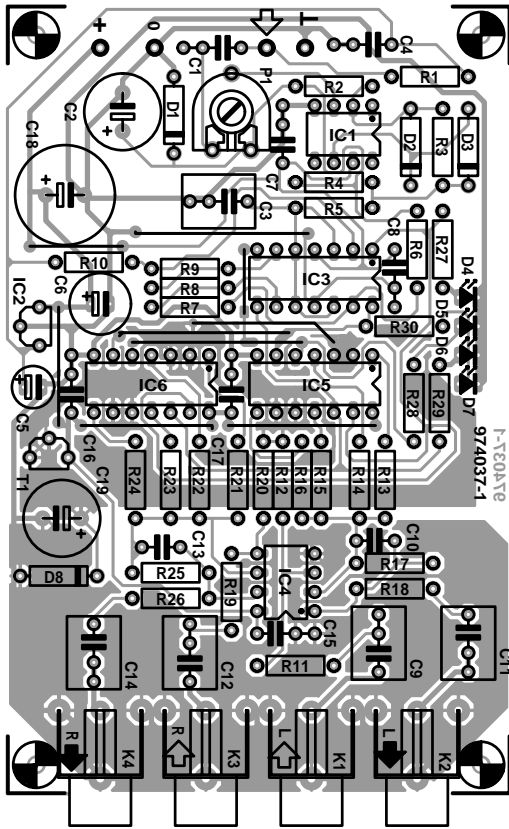
In the diagram in Figure 1, IC_{4a} and IC_{4b} operate as control amplifiers. The audio signal is input via K₁ and K₃ and applied to the booster via K₂ and K₄. The basis level is that registered with the electret microphone MIC₁.

The microphone should not be too sensitive to avoid drive and acoustic coupling between it and the loudspeakers. Its d.c. setting is arranged with resistor R₁ while its sensitivity is set with P₁.

The output of the microphone is applied to fast op amp IC₁ via the wiper of P₁. The op amp, arranged as a rectifier/amplifier, provides an amplification of $\times 45$. Its output is averaged by R₅-C₃ and then applied to comparators IC_{3a}-IC_{3d}. These like the amplified signal and averaged signal, U_{AA} , with the potentials at the junctions of divider R₆-R₁₀. Each of these potentials differs by 5 dB from the preceding or next one as



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- R₈ = 200 Ω
 - R₉ = 357 Ω
 - R₁₀ = 681 Ω
 - R₁₁, R₁₈, R₁₉, R₂₆ = 100 Ω
 - R₁₂, R₂₀ = 47 kΩ
 - R₁₃, R₂₁ = 2.15 kΩ, 1%
 - R₁₄, R₂₂ = 3.92 kΩ, 1%
 - R₁₅, R₂₃ = 7.15 kΩ, 1%
 - R₁₆, R₂₄ = 12.7 kΩ, 1%
 - R₁₇, R₂₅ = 10 kΩ
 - R₂₇-R₃₀ = 3.9 kΩ
 - P₁ = 100 kΩ preset
- Capacitors:**
- C₁ = 150 nF
 - C₂, C₁₉ = 220 μF, 25 V, radial
 - C₃ = 1 μF, MKT (metallized polyester), pitch 5 or 7.5 mm
 - C₄, C₇, C₈, C₁₅-C₁₇ = 100 nF
 - C₅ = 4.7 μF, 63 V, radial
 - C₆ = 100 μF, 25 V, radial
 - C₉, C₁₁, C₁₂, C₁₄ = 3.3 μF, MKT (metallized polyester), pitch 5 or 7.5 mm
 - C₁₀, C₁₃ = 150 pF
 - C₁₈ = 1000 μF, 25 V, radial
- Semiconductors:**
- D₁ = zener, 4.3 V, 500 mW
 - D₂, D₃ = BAT85
 - D₄-D₇ = LED, high-efficiency
 - D₈ = zener, 5.6 V, 500 mW
 - T₁ = BF245A

Integrated circuits:

- IC₁ = OP17
- IC₂ = 78L08
- IC₃ = TL084
- IC₄ = TL072
- IC₅, IC₆ = 4066

Miscellaneous:

- K₁-K₄ = audio socket for board mounting
- MIC₁ = electret microphone

The supply lines for the microphone and the voltage divider are held at 8 V by regulator IC₂. That for IC₄ is held at 5.6 V by T₁-D₈, irrespective of the battery voltage. The circuit draws a current of 40 mA when the LEDs light. The distortion of 0.0025% is well within the requirements for

car hi-fi equipment. The volume control is best built on the printed-circuit board in Figure 2, which is, however, not available ready made.

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Parts list

- Resistors:**
- R₁ = 18 kΩ
 - R₂ = 3.3 kΩ
 - R₃ = 150 kΩ
 - R₄ = 5.6 kΩ
 - R₅ = 470 kΩ
 - R₆ = 143 Ω
 - R₇ = 113 Ω