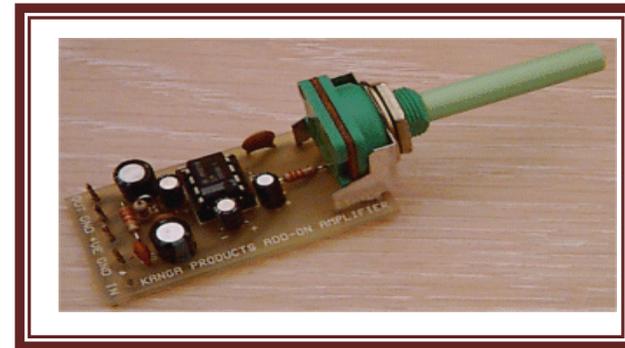




## The Add-On Amplifier

The Kanga Products Add-On Amplifier is an inexpensive audio amplifier designed to be used as a “building block” in radio receiver construction. It is based on the very popular LM386 integrated circuit and features high gain, wide supply voltage range, low current consumption and small size. The circuit board is mounted directly on the volume control, which fits a 10mm diameter panel hole.



### Uses for the Add-On Amplifier include:

- General test amplifier for the shack
- Crystal set booster
- Intercom Amplifier
- Morse practice oscillator amplifier

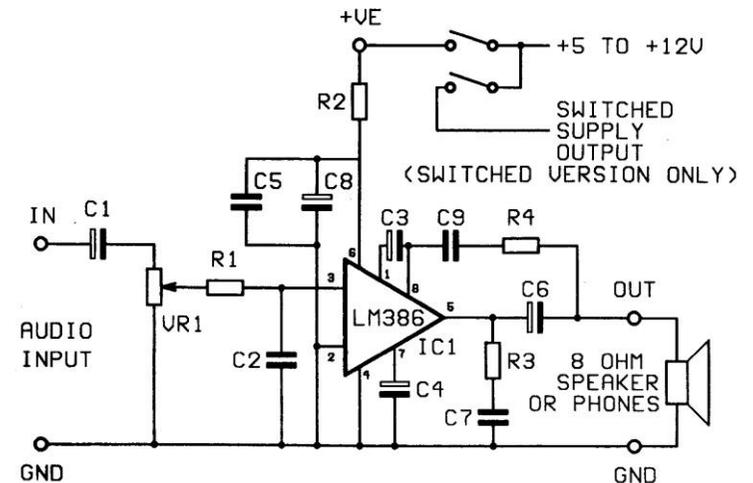
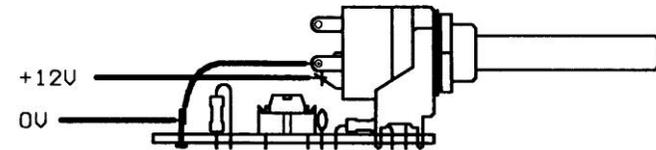
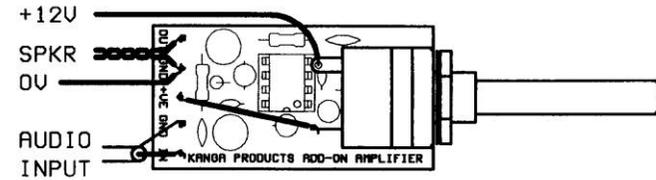
# The Add-On Amplifier

The add-on amplifier is designed to operate from a smooth DC supply of 4 to 12v. Batteries are ideal and the amplifier has a low quiescent (no signal) current consumption of about 4.4 mA at 9v. The amplifier has voltage gain of 200 and a nominal output power of 25mW.

The circuit includes power supply decoupling, input DC-Blocking capacitor, and a hiss-reducing circuit to make headphone listening more comfortable.

The diagrams opposite show the Add-On Amplifier's printed circuit board drawn twice full size. All the components, including the volume control, are mounted on the board. The component positions and external connections are marked with white printing to simplify construction and use.

The copper tracks are tinned for easy soldering. The input and output connections are located on the opposite edges of the board.



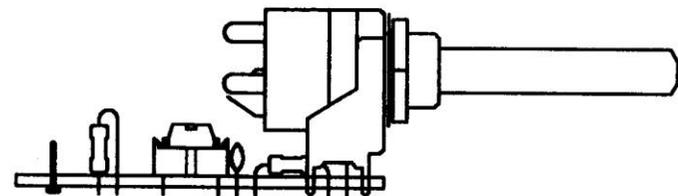
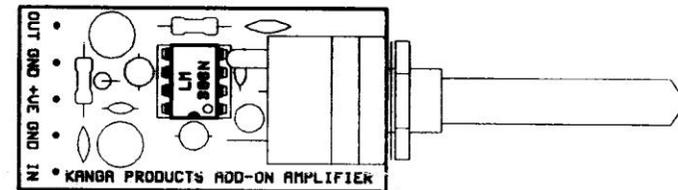
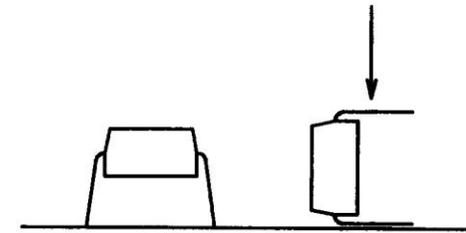
# The Add-On Amplifier

## Stage 1. Fitting the terminal pins

Input, output and power connections to the add-on amplifier are made via five terminal pins located in a line along the back edge of the board. The terminal pins have ridges to make them fit tightly in the holes in the printed circuit board.

Lay the board track side up on a firm support such as a book or a piece of wood. Insert terminal pins into the five holes marked **P** in the diagram. The end of the board carrying the pins should overhang the support.

Press the head of one of the pins with the tip of a hot soldering iron until the pin sinks into the hole and the head touches the track (A). Apply solder to join the head of the pin to the track (B). Repeat this for the other four pins. Leave the board to cool before handling it.



# The Add-On Amplifier

## Stage 6. Connecting the Amplifier

Give the board a final inspection to make sure all the components are in their correct positions. Examine the track side of the board for missed solder joints, dry joints and solder splashes which might bridge adjacent tracks.

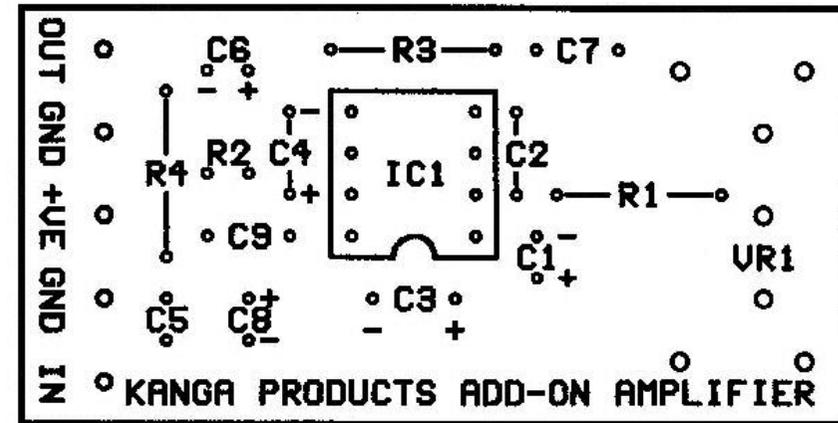
Your add-on amplifier has a switch which is located at the rear of the volume control. Solder a wire a wire between the terminal pin marked +VE and the lower right-hand tag on the back of the switch. The upper right-hand tag maybe used to connect a switched supply to other circuits. Solder the positive lead from the supply to the left-hand tags, which you link at stage 4.

Solder the negative lead from the supply to either terminal pin marked GND.

Solder a pair of wires from OUT and GND to your loudspeaker or headphones.

Solder a screened cable to IN and GND, the core of the cable going to IN and the screen (braid) to GND.

Connect a signal source such as a microphone or radio receiver to the screen input. Connect a supply of 4 – 12 volts DC to the supply leads. Turn the volume control clockwise until the signal can be heard in the loudspeaker o headphones (please remember if using headphones noise can be loud and damage your hearing). Adjust the volume control to give a comfortable level.



COMPONENT SIDE

## NOTES

# Add-On Amplifier

## Stage 2. Fitting the resistors and IC socket

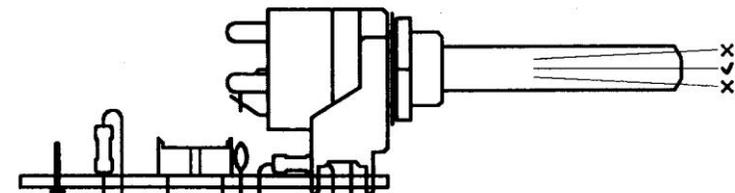
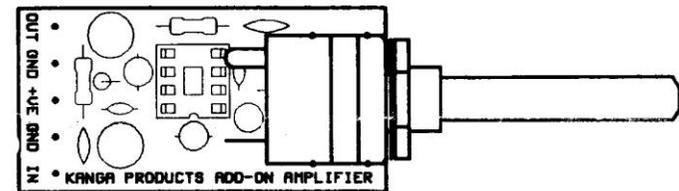
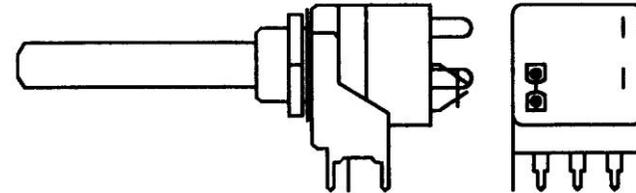
Carefully bend the leads of the four resistors and fit them into the holes in the board in positions shown. Solder them into place and trim off the excess wire. Resistors may be fitted either way round.

R1	10k $\Omega$	Brown, Black, Orange, Gold
R2	10 $\Omega$	Brown, Black, Black, Gold
R3	10 $\Omega$	Brown, Black, Black, Gold
R4	33k $\Omega$	Orange, Orange, Orange, Gold

The lower diagram shows R1 and R2 correctly fitted. The bodies of the resistors should lie close to the board.

Fit the IC socket in the position marked IC1, aligning the notch in the socket with the notch in the white outline, and solder two opposite corner pins to their tracks. Apply gentle pressure to the socket whilst re-melting the soldered joints in turn. This will ensure that the socket is in close contact with the board. Solder the remaining six pins to their tracks.

Examine your work to make sure there are no solder bridges between pins on the IC socket.



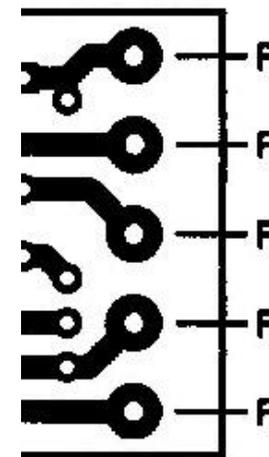
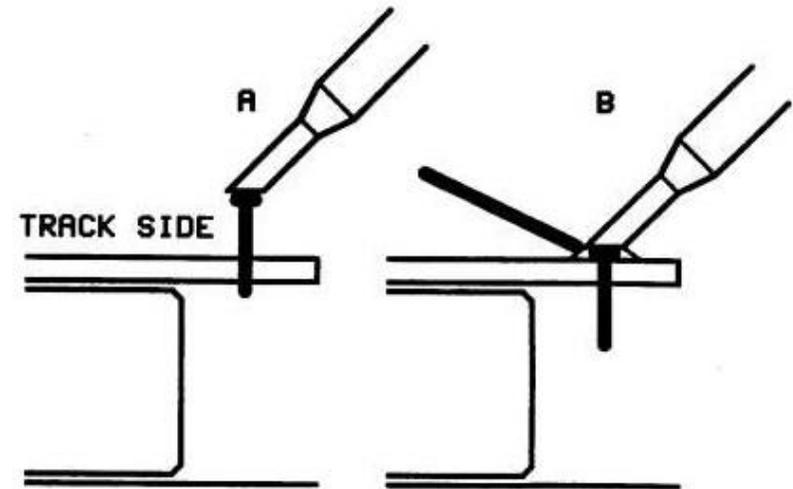
# The Add-On Amplifier

## Stage 5. Fitting the LM386 Integrated Circuit

The LM386 integrated circuit contains all the semiconductors in the amplifier. It is not particularly susceptible to damage by static electricity but it is good practice to touch an earthed metal object (such as a radiator) to discharge any static from your body before handling the device.

The leads of the LM386 are slightly splayed. Press them onto a hard surface until they are parallel. This makes them easier to insert into the socket.

Rest the Lm386 in position with its leads in eight contacts of the socket, then press it into position. Be sure that the notch in the body of the IC is aligned with the notch in the IC socket.



# The Add On-Amplifier

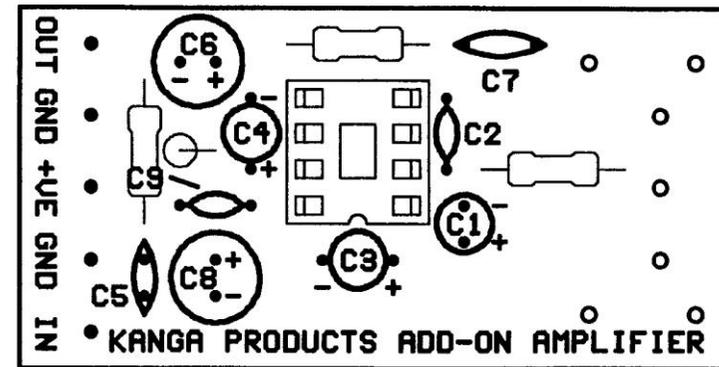
## Stage 3. Fitting the capacitors

Fit the nine capacitors in the positions shown (one by one), solder them in place and trim of the excess wire.

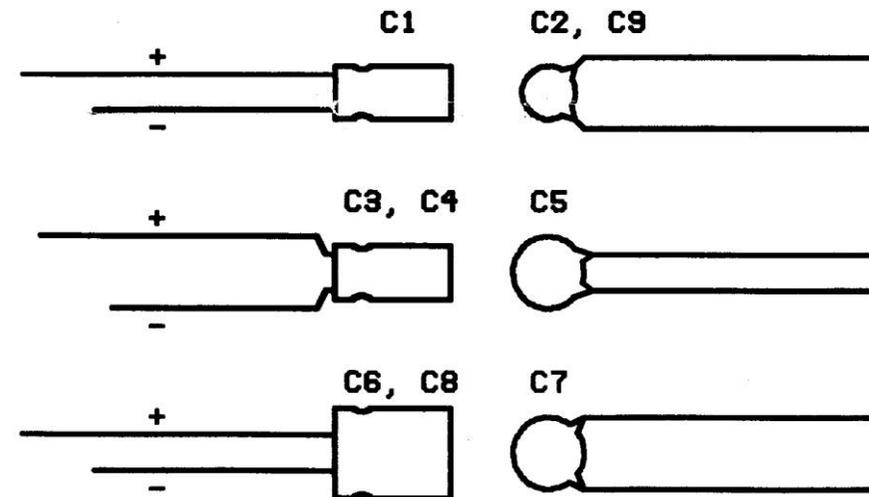
Capacitors C2, C5, C7 and C9 may be fitted either way round.

Capacitors C1, C3, C4, C6 and C8 are electrolytic and be damaged if connected the wrong way round. The holes for these capacitors are marked with a – (negative) and + (positive) symbols. The negative lead must go through the hole marked with a – symbol; it is a square pad on the track side of the PCB. The body of the capacitor is marked with a white band near to the negative lead, which is also the shorter lead.

The leads of C3 and C4 should be bent carefully to fit the wider spacing of their holes.



C1	10 $\mu$ F	10 $\mu$ F 16v
C2	2n2F	222
C3	10 $\mu$ F	10 $\mu$ F 16v
C4	10 $\mu$ F	10 $\mu$ F 16v
C5	10nF	<u>103</u>
C6	100 $\mu$ F	100 $\mu$ F 16v
C7	100nF	<u>104</u>
C8	100 $\mu$ F	100 $\mu$ F 16v
C9	10nF	<u>103</u>



# The Add on Amplifier

## Stage 4. Fitting the volume Control

Your kit comes with a volume control that contains a switch, carefully bend the two left hand tags on the back of the switch together, link them together with a piece of wire trimmed from a resistor, and solder them to the wire.

Fit the volume control to the board in the position marked VR1. There are seven pins to be soldered to the board, three on the volume control and four on its mounting bracket. Solder the outer two volume control pins to the board first. Rest the top of the volume control on a firm surface, press downward on the board and re-melt first one and then the other solder joint. This will ensure that the volume control pins are in firm contact with the board. Solder the middle pin to the board.

Looking at the side of the board, check that the spindle of the volume control is parallel with the board, not pointing upwards or downwards, then solder the four pins of the mounting bracket to the board. Leave the board to cool before handling it.

