BOXA-DUAL

The BOXA-DUAL is a high quality enclosure kit with built-in 1.5 Watt audio amplifier to be used with our LASERBEAM-DUAL filter modules.

The BOXA-DUAL is available as an easy-to-make kit or as a ready-made unit. The BOXA-DUAL PCB can either be fitted into our neat custom enclosure or mounted in your own enclosure.

Building the BOXA-DUAL is easy and fun. It will take less than an hour to build and is suitable for a beginner.

Revision History

Aug 2016	First issued
Feb 2022	Updated for PCB V1.1
Apr 2023	Fix typos

BOXA-DUAL Packing List

It's a good idea to check that you have all the parts before you get started:

Note: If you have PCB version v1.0b or earlier, some parts were different:

- Capacitors C7 & C8 not present
- Capacitors C3 & C4 were 220 µF
- LEDs D2 & D3 were Bicolour

Item	Qty	Comments
3.5mm AF sockets	2	J3 and J4
10 way header sockets	2	J2 and J2
10 way header pins	2	For LASERBEAM−DUAL module
2.1mm DC socket	1	J1. Centre positive
2.1mm DC plug	1	Centre positive
Audio amplifier IC	1	U1. LM386N-4 or NJM386BD.
Switch	1	S1. SPDT.
Potentiometer	1	R1. Volume control 10k.
Red LED	1	D2
Green LED	1	D3
Diode	1	D1. Reverse polarity protection.
Resistor 330R	2	R2 and R3. LED droppers.
Resistor 47k 1% Metal film	2	R4 and R5
Resistor 10R	1	R6
Capacitor 270 µF	2	C3 and C4. Electrolytic.
Capacitor 10 µF	1	C5. Electrolytic.
Capacitor 100nF	1	C2. Ceramic, marked "104".
Capacitor 47nF	1	C6. Ceramic, marked "473".
Capacitor 1 µF	2	C7 and C8. Ceramic, blue, marked "105".
Knob	1	
Printed circuit board	1	

ENCLOSURE KIT		
Laser cut front panel	1	
Laser cut rear panel	1	
Aluminium enclosure	1	
Panel fixing screws	8	
Self adhesive feet	4	

If anything is missing, just get in touch for help support@sotabeams.co.uk

BOXA-DUAL Instructions

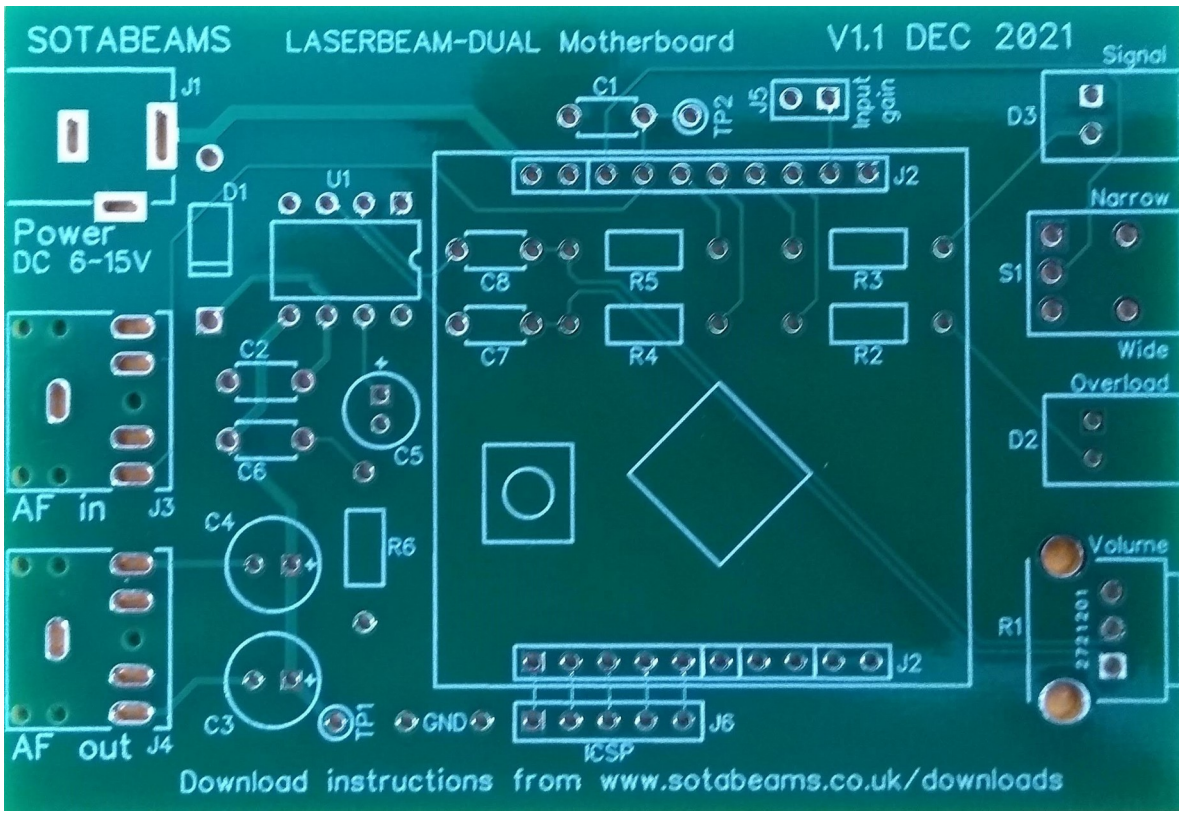
The BOXA–DUAL kit is easy to make and you will end up with a great way to use your LASERBEAM– DUAL filter module.

Step by step instructions make it easy to build your BOXA–DUAL. It will take around an hour to build.

Spotted a mistake or need help?

Please let us know! support@sotabeams.co.uk

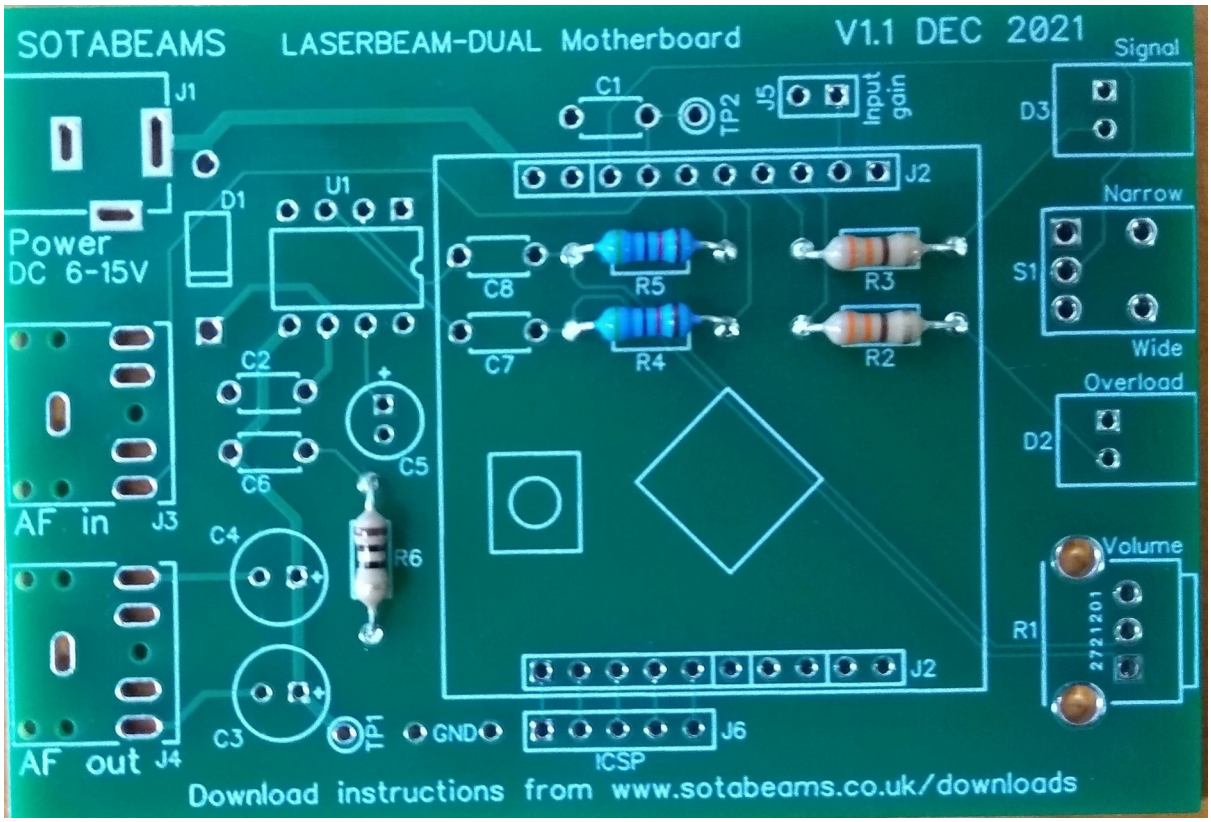
NOTE: all components are installed on the side of the board with the writing on.



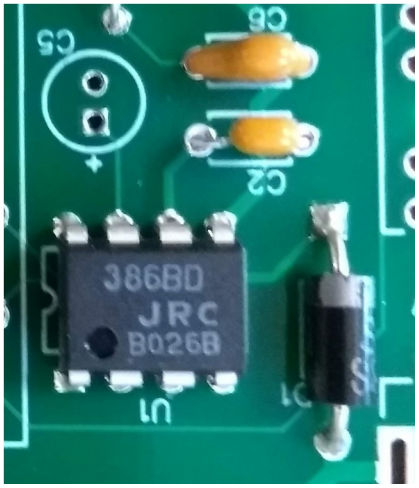
Install the resistors as shown below:

Designator	Value	Colours
R2	330Ω	Orange-Orange-Brown-Gold
R3	330Ω	Orange-Orange-Brown-Gold
R4	47KΩ *	Yellow-Violet-Black-Red-Brown
R5	47KΩ *	Yellow-Violet-Black-Red-Brown
R6	10Ω	Brown-Black-Black-Gold

**Note: the values of R4 and R5 have been selected as a compromise between power output and using headphones. With a value of 47kΩ you can use headphones or a small loudspeaker (max output 230mW into 8Ω , 79mW into 30Ω).*
If you only intend using headphones, you might try higher values (68kΩ-100kΩ).
If you are only using a loudspeaker, R4 and R5 can be replaced with 220Ω resistors. In this configuration the output is about 1.5 watts into 8Ω



Install the Integrated Circuit U1 – be sure to get it the right way round.
There are 2 different ICs that may be supplied:
Chips marked LM 386N-4, align the notch mark at the end of the chip with the markings on the PCB.
Chips marked JRC do not have a notch mark, fit with the dot adjacent to the pin with the square pad (pin 1).



Install the diode, ensuring that it is fitted the right way round.

Install the following ceramic capacitors :-

Designator	Value	Marking/Notes
C2	100nF	104
C6	47nF	473
C7	1 µF	Blue, 105
C8	1 µF	Blue, 105

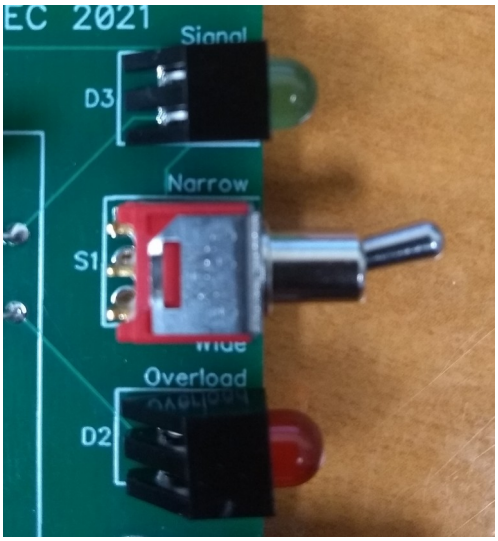
Note that C1 should normally be left empty. A capacitor (not supplied, but perhaps try 100nF) should only be fitted in C1 if after testing you find that you need extra decoupling on the audio input.

Install the audio sockets J3 and J4, ensure that they sit flush on the the PCB

Install the green LED J1. The LED should face away from the PCB, ensure that it sits flush on the PCB.
Install the red LED J2. The LED should face away from the PCB, ensure that it sits flush on the PCB.
If you have PCB v1.0: We are likely to have supplied two bi-colour LEDs instead of separate red and green LEDS, so note carefully their orientation — they should be fitted with opposite polarities. The LEDs should be installed pointing up with 1cm lead length above the board.

- ❒ D2 = Overload LED; install with short lead in square hole
- ❒ D3 = Signal LED; install with long lead in square hole

Install switch S1, ensure it sits flush on the PCB



Install the two 10 way header sockets (both labelled J2). Make sure that they are upright and at right-angles to the surface of the PCB.

Install volume control potentiometer R1, ensure that it sits flush on the PCB.

Install the DC power connector J1.

Install the following electrolytic capacitors :-

Designator	Value	Marking/Notes
C3	270µF	270µF. Long lead through square pad.
C4	270µF	270µF. Long lead through square pad.
C5	10µF	10µF. Long lead through square pad.

Testing the PCB

Connect a small loudspeaker or headphones to the AF output socket.

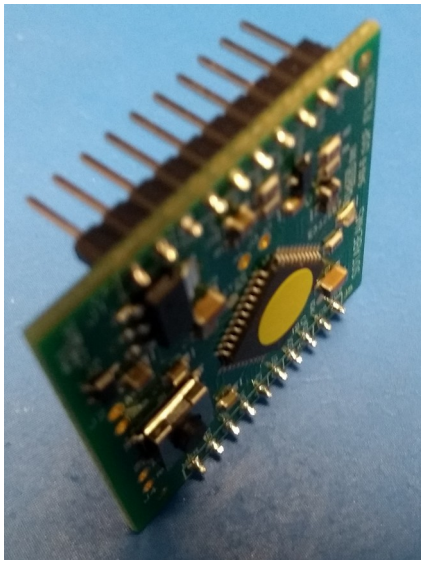
Important Note A 3.5mm mono to 3.5mm stereo adapter is required to connect speakers or headphones with a mono plug to this unit, which has a stereo output (plugging in a 3.5mm mono plug without an adapter will cause a short circuit and reduced audio output volume). See our adapter

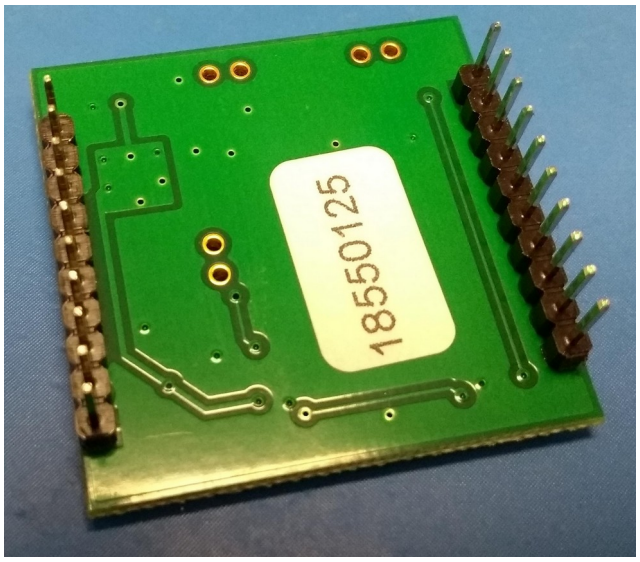
Connect a 6 Volt or 12 Volt supply (for testing, ideally current limited to 50mA).
Turn the Volume pot clockwise.

Tap one leg of R5 with a metal screw-driver, you should hear a click in the loudspeaker / headphones.

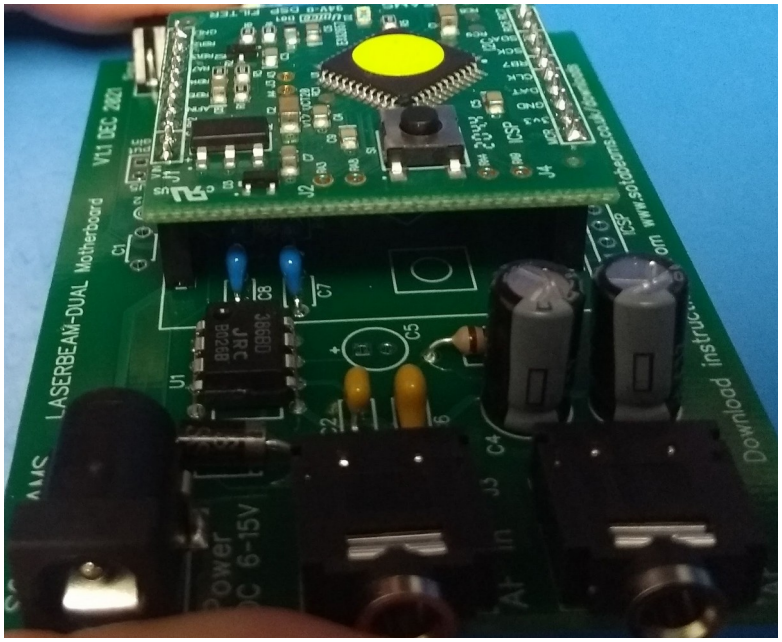
These tests confirm that the audio amplifier is working.

You can now solder the header pins to your LASERBEAM-DUAL module. These are installed on the underside of the module and the pins must be at right-angles to the PCB. You may find it easier to put the header pins into the assembled PCB, put the module onto the pins and then solder. This will ensure the headers are aligned.





Plug your LASERBEAM-DUAL module into the BOXA-DUAL PCB. Important: the module **must** be installed the right way round. The BOXA-DUAL PCB is marked showing the IC and switch on the module to ensure that you get this correct.



Final testing

Using a current-limited supply set between 6 and 12 Volts, 100mA, power up the board and test with an audio source – such as a radio. When you turn the audio level up on the audio source, the red overload LED should come on. The best setting is just below the point where the overload LED lights.
Your filter is now ready to use.

Notes:

- ❒ The signal LED works best when the input source does not have much filtering, such as with simple DC receivers.
- ❒ Only connect a stereo plug to the output.
- ❒ If your radio has a low audio output, the Voltage gain of the filter module can be increased x4 by inserting a link across J5. If this is not required, we do not recommend installing this link.

Final testing

The most likely problem on this board is a poor solder joint. Soldering joints can be checked with a magnifying glass and reheated where necessary. If you get stuck, send us an e-mail for help!
support@sotabeams.co.uk

Assembling the enclosure kit

1. Carefully remove the protective paper from the engraved panels. We use fine tweezers and a soft cloth wetted with water.
2. Stick the self adhesive rubber feet on the bottom of the enclosure (the plain face; not the face with the decorative milled grooves).
3. If you have PCB v1.0 :- Bend the LEDs so that they will align correctly with the holes in the front panel.
4. Loosely screw the front panel onto the box, making sure to get it the right way up (hint: the feet are on the bottom of the box).
5. Gently insert the PCB into the box (bottom grooves) so that the controls and LEDS fit through the front panel.
6. Tighten the screws on the front panel.
7. Screw on the rear panel. Your BOXA-DUAL is good to go!