

ALIVO 2, Assembly Guide

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Diagrams:

ALIVO2 circuit diagram

ALIVO2 component layout

Front panel layout

Details of coil L1/L2

Circuit description.

The ALIVO2 is a low power 80m CW transceiver designed to operate from a 12-15v power supply. Output power is approx 2watts, and the tuning range is approx 3.53 to 3.58 MHz. Receiver output can be monitored on Walkman headphones or speaker.

Receiver:

The signal arrives at the aerial socket and is attenuated by the Gain control R1. After band filtering, the RF enters MIXER IC4 pins 1 and 2. This signal combines with the local oscillator signal via C3 from IC3 pin 8. This oscillator is controlled by resonator CR and tuned over a narrow section of the 80m band by TUNE C16 and RIT C15. When the local oscillator is tuned close to the aerial signal frequency, the mixer IC4 produces a beat note in the audio spectrum on pins 4 and 5. This Audio signal is filtered by IC4 and amplified by IC2 to a strength suitable for headphones or speaker. In the receive mode, the local oscillator frequency can be shifted slightly by the RIT (Receive Incremental Tuning) control. When the receiver needs to be netted to a received transmission, the RIT can be switched out by the NET switch. In this position zero beat should be obtained by the main TUNE control when receiving a station, ensuring your ALIVO will transmit on the same frequency. Releasing NET will allow the RIT control to set the pitch of the Morse for listening comfort.

Transmitter:

The same Local oscillator drives the gate of the final transistor Q1 at the transmit frequency through C18. The Key grounds the source of the output device Q1 to enable it to produce high-level RF on its drain. This output is filtered and matched to the 50-ohm aerial connection. The RIT control is disabled in transmit mode. The key also starts the audio oscillator IC3E&F, producing an audio sidetone in the phone amplifier IC2.

Power supply switching.

12v from the battery passes through the rear power jack, through the main ON/OFF switch to power the audio amplifier IC2 and local oscillator IC3. The power for the latter is regulated by R12 and Zener Z1 to a stable 6.8v. In receive mode switch S2b feeds power to the filter IC4 and mixer IC1. The power for these is regulated by R21 and Zener Z2 to a stable 6.8v. In transmit mode, switch S2b feeds power to the final transistor Q1.

History:

Fred Johnson ZL2AMJ originally developed the ALIVO transceiver in 1998.

This version was developed with the following changes:

1. Power supply requirement changed to a single 12-15v source.
2. More amplification and filtering in the receiver.
3. Small mods around the keying circuit.
4. Transmitter output matching revised
5. PCB construction.

Hints on buying components.

The parts can be purchased from the component suppliers listed below:

R1 (Variable Gain) should be PCB mounting with >50mm long plastic shaft.

Buy resistors large enough for your eyesight. The back pages of the Dick Smith catalogue will be invaluable help in reading capacitor and resistor values.

All electrolytic capacitors should be >25v

Build instructions:

Mechanical work.

Make two brackets to attach the PCB to the rear of the front panel, with the top surface of the board 40mm down from the top edge of the panel. This ensures the shaft of R1 is aligned with the front panel hole. Fix the brackets to the rear of the front panel with countersunk screw heads.

With the PCB temporary fitted to the panel, make sure the PCB fits the case, the PCB rear corners may need to be cropped.

Make a heatsink for Q1 out of brass or copper. 30x20mm bent into L shape.

The 3mm hole in the PCB can be used to fix the heatsink in place.

Attach sticker to front panel. Mark hole centres with spike, cut sticker material away from hole before drilling to avoid tears (sic). C15 and C16 variable capacitors need two 2mm screw fixing holes.

Switch, jacks and Gain control holes 6.5mm, LED hole 3 or 5mm to suit LED.

Fit S3 to NET position, biased UP, S2 to TX/RX position. S4 to ON/OFF, J1 Key and J2 Phones.

Fit power jack and Aerial socket to back panel.

Construction of Receiver input transformer L1/L2.

A short length of ferrite rod aerial is used to construct a paper coil former as described below. With this size of coil, I found the windings should be 30 turns and 6 turns, with the tuning cap C1=100pF.

1. Wrap some Sellotape around the ferrite rod aerial until a layer of 0.5mm is formed. This makes a spacer around the rod.
2. Around this, wrap several layers of paper or thin card, using glue to fix them into a stiff tube.
3. Wind the required 30 turns for L1, and add 6 turns for L2 at one end of it. Fix the ends of the coils with wax or adhesive tape.

4. Remove the ferrite rod and unwrap its Sellotape, cut off a 25mm length of the ferrite rod, and use this to tune the coil from the 6 turn end once it is mounted on the board and connected into the circuit.

PCB building.

Do not solder C15 and C16 until PCB is attached to front panel. Place all the small components onto the PCB first, working up to the taller ones last.

Having made the transformer L1/L2, thread the wires through the PCB and hold assembly down with wire through fixing holes.

Attach PCB and C15 and C16 to front panel, then solder.

Attach all jacks and switches to front panel and wire to PCB with hook up wire (I hate that description). Wiring is shown on PCB layout, and should be kept short.

Battery pack is constructed from two C Cell holders each holding 4 cells. The holders are fixed together then bolted to back panel. The wires are brought through to the power jack on the back panel, then onto the ON/OFF switch and LED. The LED DL and resistor RL can be fixed between the bottom of the PCB and LED.

An optional speaker can be fitted to the lid of the case, and wired to the switched contacts of the phones jack J2.

Testing.

On receive:

Connect aerial and battery. Switch on and tune around for signals,

Find the position of the ferrite rod for best signal, and seal in place with some hot wax. Signals should be present with the rod in any position. It may be found the receiver is sensitive to AM broadcast signals, caused by overload of the front-end mixer. To reduce this effect, try cutting the track between the Pot R1 and the transformer coil L1, then wiring across the cut a small capacitor say 22pF. A standard Aerial Tuning Unit helps to eliminate Broadcast breakthrough.

Check supply voltage 12v on IC2 pin 6.

Check 6.8v on oscillator IC3 pin 14 and filter amp IC4 pin 8.

Check supply on mixer 6.8v on IC1A pin 8.

IC2 pin 5=6v bias, IC4 pin 1, 2 and 3= 3v bias.

3.5MHz oscillation on IC3 pin 8.

On Transmit:

3.5MHz oscillation on IC3 pin 6, seen as 3vDC on a voltmeter. Supply voltage 12v on Q1 Drain.

With Key down: Zero volts on Q1 Source, and audio oscillation on IC3 pin 10.

Parts List

Used	PartType	Designators
Capacitors Disk Ceramic		
3	100pF	C1 C17 C23
1	15pF	C14
2	10nF (10000pF)	C19 C30
2	47nF (47000pF)	C2 C6
1	390pF	C24
2	10pF	C3 C13
6	100nF (0.1uF)	C4 C5 C7 C21 C22 C25
3	1nF (1000pF)	C8 C18 C29
2	22nF (22000pF)	C9 C28
Capacitors Electrolytic >25v		
5	100uF >20v	C10 C11 C12 C20 C27
1	1uF >25v	C26
Diodes		
2	1N4148 or 1N918	D1 D2
2	6V8 Zener diode	Z1 Z2
1	LED 3mm or 5mm	DL
Transistor		
1	VN10KM	Q1
Integrated Circuits		
1	NE612	IC1
1	LM386N	IC2
1	CD4069UB	IC3
1	LM358D	IC4
Other bits		
2	Tuning Capacitor	C15 C16
1	Ceramic Resonator	CR
1	1K Log Pot	R1
Notes:		
R1 should be PCB mounting		with long plastic Shaft.
Tuning capacitor is miniature		Polycon type.

Used	PartType	Designators
Resistors		
1	820R	R12
1	47K	R10
1	1M	R15
2	1M5	R16 R17
2	100K	R2 R11
1	100R	R20
4	1K	R3 R5 R21 RL
3	22K	R4 R13 R19
3	10K	R6 R14 R18
1	2R2	R7
1	2K2	R8
1	10M	R9
Coils and Chokes		
1	Piece of ferrite rod	For L1 L2
2	10uH	L3 L4
1	6u8H	L5
Switches		
1	1pole, 2way biased	S3 (Net switch)
1	1 pole, 1 or 2 way	S4 (ON/OFF switch)
3	3pole, 2way	S2 (a,b,c)
Hardware		
1	Heatsink	CH1
1	BNC Socket	S1
1	Knob for GAIN pot	KN1
1	3.5mm mono socket	J1
1	Front panel sticker	ST1
1	3.5mm mono socket	J2
1	2.1mm Power socket	J3
2	6V 4xC Cell case	B1
1	CASE H2508	BOX1

Component Suppliers:

South Island Component Centre. 03 379 8833

(Resistors, Diodes, Capacitors, Inductors, switches, 1K Log Pot R1, Integrated Circuits, Battery cases)

Dick Smith Electronics. Any High Street Store.

(Resistors, Diodes, Capacitors, Inductors, VN10K transistor, tuning capacitors, switches, Integrated Circuits, Battery cases, Equipment case H2508.)

Radcliffe Electrical. 03 379 3008

(Resistors, Diodes, Capacitors, Tuning capacitors, BNC aerial socket-bulkhead mount, Biased switches, Integrated Circuits, Battery cases)

Wellington VHF Group Branch 74 NZART Inc. Box 12-259

Thorndon, Wellington.

(Ceramic resonator CR).

They are available on both 3.58 MHz and 3.68 MHz, for \$3.00 each post paid, or \$5.00 for two (either two of the same frequency or one of each frequency) post paid.

Christchurch Branch 05, Projects group, PO Box 1733 Christchurch

(Printed Circuit Board \$15 incl pp).

Conclusion

This is not the final solution, just a snapshot in a story of continuing development. In the meantime the radio gets regularly used on the air, fulfilling its original role as a FUN radio. Once I finish the "go anywhere" aerial tuner I will look forward to using it on holiday locations.

If you have any success, or failure, in developing this design, let your fellow "Breakin" readers know.

References:

Ref1 ALIVO transceiver, Fred Johnson, Breakin April 1998

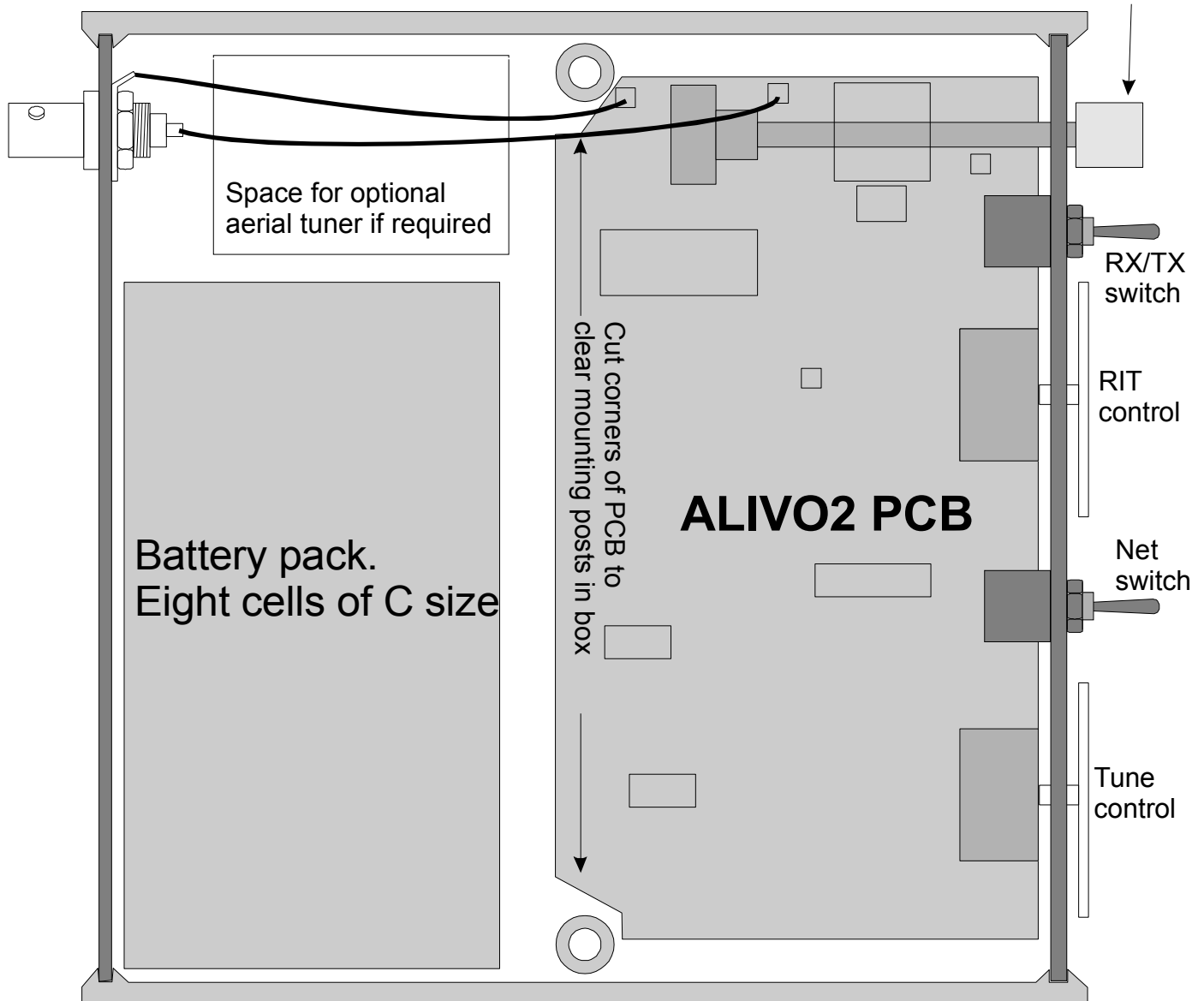
Ref2 Matching networks and computer solutions, Motorola

Ref3 Radio Data, Jessop, RSGB

Ref4 ALIVO2 transceiver, K.Barnsdale, Breakin November 1999.

Back panel
BNC aerial
connector

Gain
control
knob



View into top of unit.

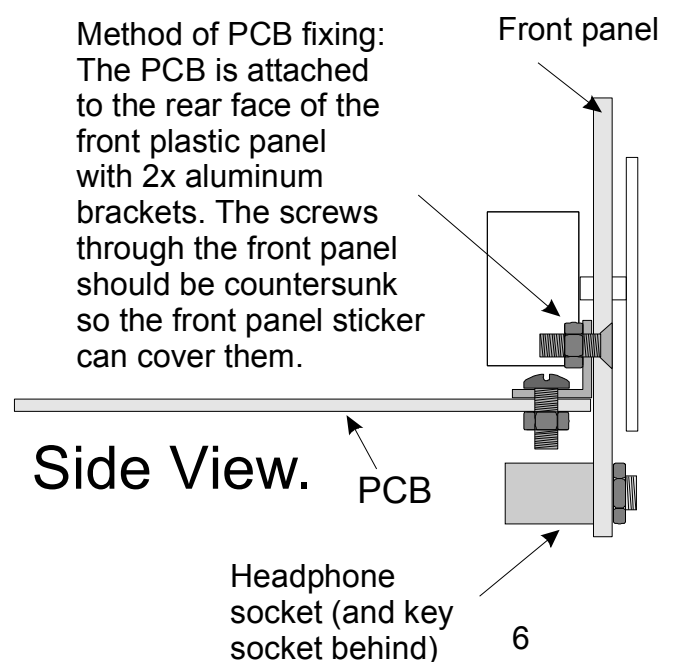
Small speaker
can be fitted
into lid of box

Mechanical layout
showing PCB fitted
into Dick Smith
enclosure H2508

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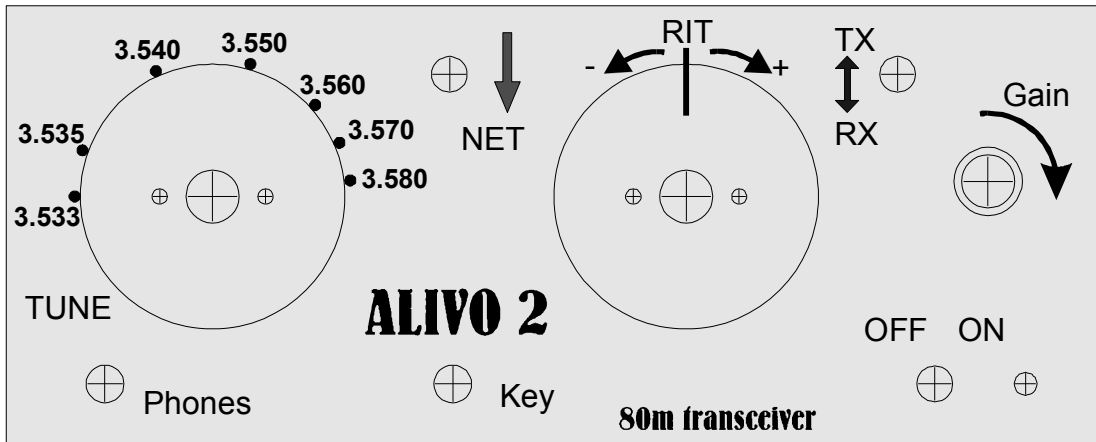
Method of PCB fixing:

The PCB is attached
to the rear face of the
front plastic panel
with 2x aluminum
brackets. The screws
through the front panel
should be countersunk
so the front panel sticker
can cover them.

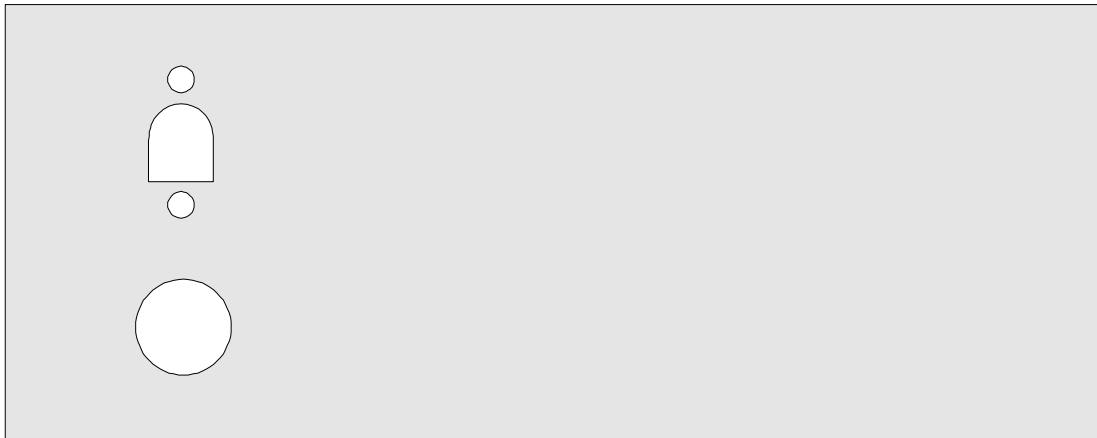


Side View.

Front panel layout.
Apply double sided tape to rear of this print,
and laminate front of print with clear book covering.

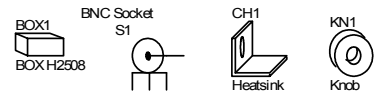
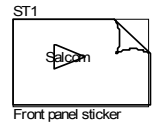
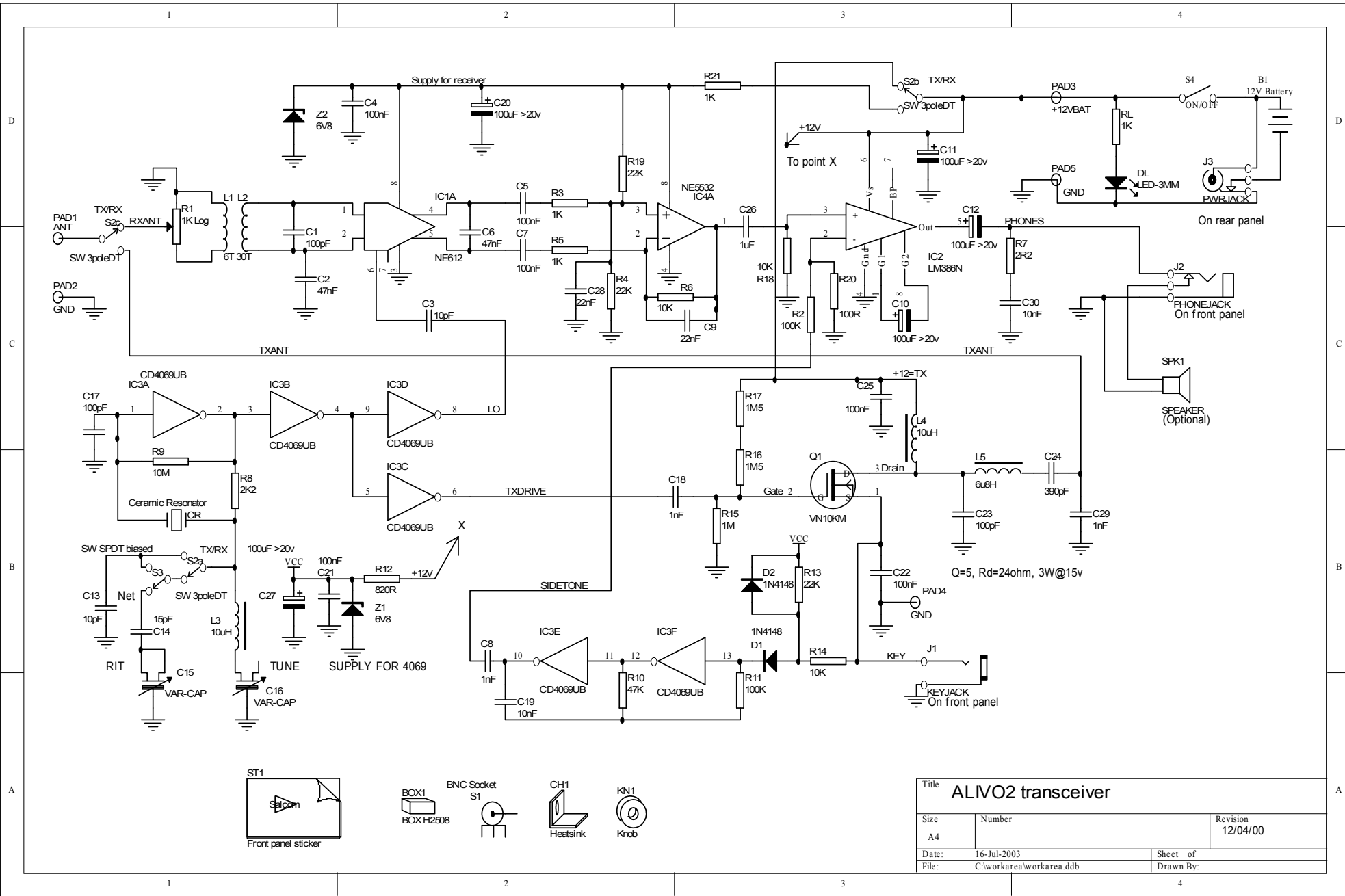


View of rear panel from outside.



Approx positions of Power Jack and Aerial socket

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Title		
ALVO2 transceiver		
Size	Number	Revision
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Date:	16-Jul-2003	Sheet of
File:	C:\workarea\workarea.ddb	Drawn By:

