The HOWES AA2 is an RF preamplifier designed to enable the user to construct a compact, active, receiving antenna.

BRIEF SPECIFICATION

Input Impedance:	High Z FET input stage, with VHF choke
Output Impedance:	Nominal 50 Ohm, unbalanced.
Power Requirements:	12 to 14V DC at around 25mA.
Frequency range:	150kHz to 30MHz.

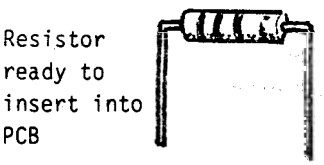
TOOLS REQUIRED:

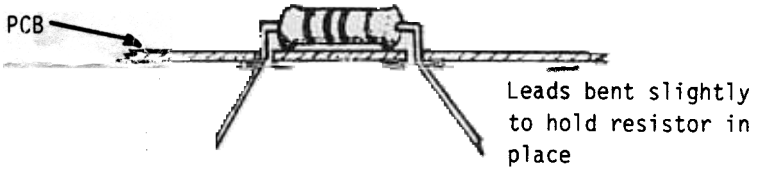
Fine tipped soldering iron of about 30W (or if thermostatically controlled, 50 or 60W). Long nosed pliers, small side cutters, and a sharp knife for scraping off coil insulation ready for soldering.

PLEASE READ ALL THE PAPERWORK THROUGH AT LEAST ONCE BEFORE STARTING WORK

BUILDING THE KIT

It is best to wind and varnish the VHF choke, L2 first. This can then be drying while you get on with building the rest of the kit. Refer to the Parts List for winding details. Assembly of the board (PCB) itself starts with the fitting of the terminal pins. These are fitted to the holes with circles round them. Refer to the Parts List page for details of where they go. The pins are inserted from the wiring (foil) side of the board and stick out of the component (with printed parts locations) side of the board. Insert the pins by hand, then resting the board over the edge of the bench, use a hot soldering iron and just a touch of solder to press them firmly home, flush into the board. BE CAREFUL not to slip with the hot iron as you do this.





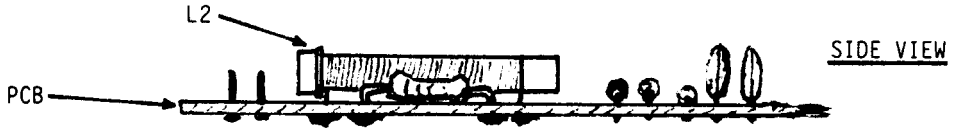
Next fit the resistors. Refer to the parts list, select the first resistor, bend its leads as shown in the diagram, and insert it into the PCB in the location marked for it on the board. Now bend the leads out just enough to prevent it falling out of the board, making sure the body of the component is resting on the board as shown. You can now solder the resistor's leads to the tracks on the board. Refer to the notes on soldering, if you are new to this.

With a few of the joints being quite close together in this compact module, it is best to visually check the component's track and where it leads to, before soldering the joint. Then check it again after soldering, to make sure you haven't "bridged" any solder across to a nearby track or joint. The most expert constructor can experience this problem, so it is worth taking the trouble to check for this as you make each joint. It is much nicer when something works first time!

When you have fitted the first resistor, cut the excess length of lead off as close to the joint as you can (without removing the joint itself!). Do not cut leads to length, until they have been soldered. When this is done, select the next resistor from the Parts List, and solder this in its rightful place on the board. Continue with fitting the resistors until they are all soldered in place. Next fit the inductor L3. This looks like a fat resistor, but has an overall blue or green background colour. Fit the capacitors next, starting with C8 which has to go the right way round.

CONTINUED

When the capacitors are in place, fit the two transistors. These must go in the board the correct way round as the printed outlines indicate. TR2 has a plastic spacer to hold it off the board just the correct distance. Slide this onto the leads before inserting them into the board.
The next job is to wind L1 and fit it to the board, the coloured wires going to the appropriate holes (r for red, y for yellow). Be careful as you remove the insulation from the ends of the wire for soldering, that you don't "nick" the conductor, or it might fracture later.
L2 is the last item to solder in place. When the varnish is dry, insert the leads into the PCB and lay the choke along the board as shown:-



Using a sharp knife, scrape the insulation off the leads where they emerge from the holes ready for soldering. Tin the coil leads first (apply some solder to the leads), and then solder them to the PCB tracks. Check you get a good joint here with well tinned leads. These L2 connections are probably the most likely to suffer a "dry joint" (bad connection).

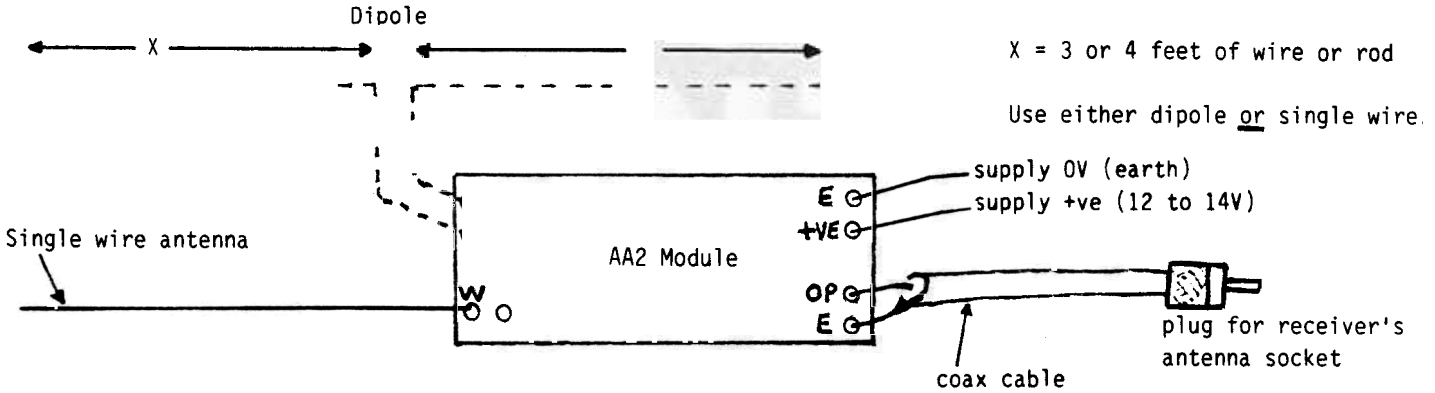
Your AA2 module is now complete, and you can wire it up as shown in the diagram for testing. BUT, before you do this, please check over the parts placement and the solder joints first. This isn't a complex kit, and with a bit of care, it should work first time.

MODULE WIRING INFORMATION

When the module has been assembled, it can be wired up as shown in the diagram. Decide if the unit is going to be powered via a separte set of DC power leads, or powered by means of the output coax. Solder a linking wire (an offcut resistor lead) between the terminal pins marked "LK3" if you are going to use coaxial powering. DO NOT DO THIS if you are going to use direct powering of the module.

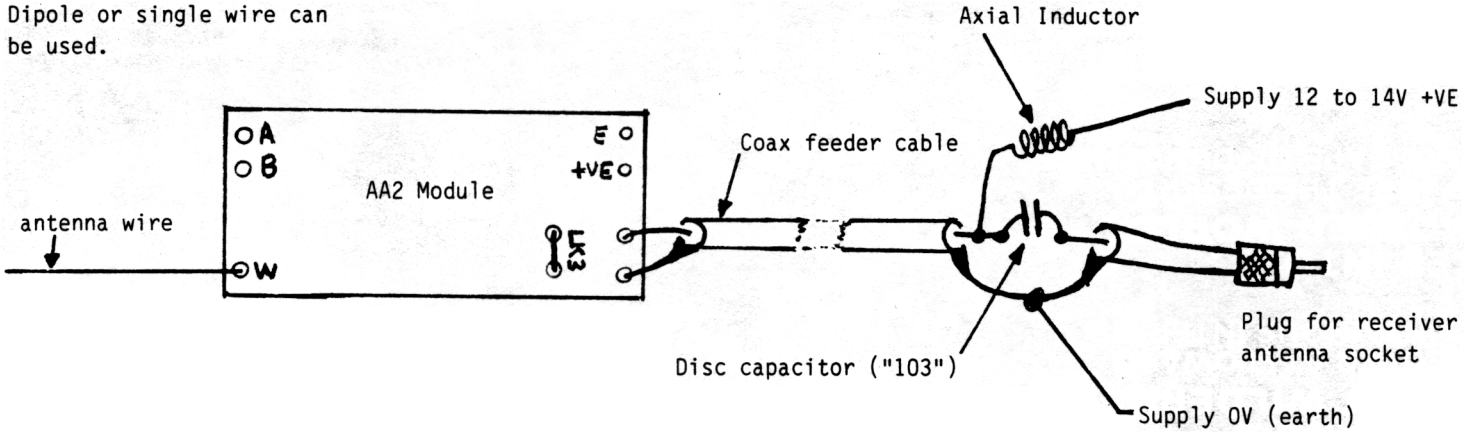
DIRECT POWERING.

(see next sheet for coax powering diagram)



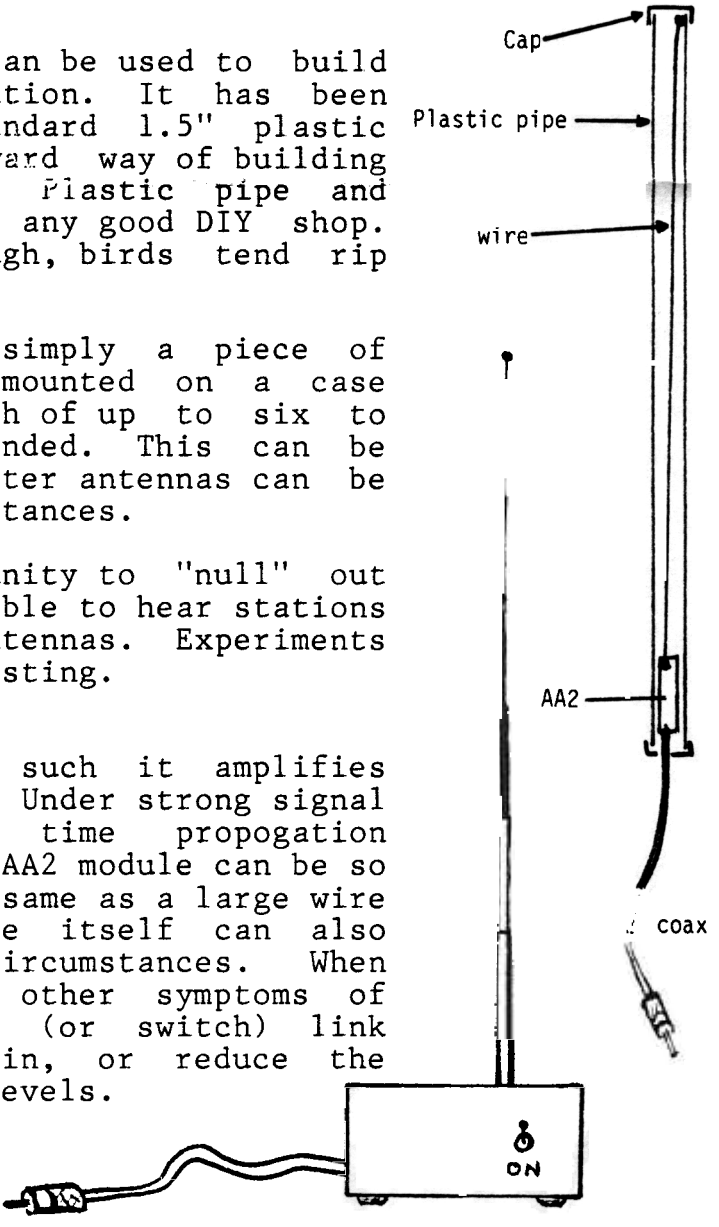
Making link "LK2" increases the gain of the module, and will be useful under many circumstances. However the extra gain may cause overloading of the receiver, or indeed the AA2 module under some strong signal conditions. You can fit a switch to alter the gain setting, provided you keep the leads very short (not more than an inch, 25mm or so). Link LK1 is wired up if a dipole antenna is going to be used, rather than a single wire.

COAX POWERING



Coax powering the AA2 module is a convienent way of doing things when the antenna is mounted remotely, in the loft, on a mast etc. It saves having a separate set of power leads going to the module. The power is fed up the same coax as is used for the signals coming from the unit. This requires a small additional circuit at the receiver end to separate the DC voltage from the signals. The parts for this are provided with the kit.

SUGGESTED CONSTRUCTION



The AA2 is a very versatile unit, and can be used to build many types of active antenna installation. It has been designed so that it can fit within standard 1.5" plastic water pipe, this enables a straightforward way of building a waterproof antenna for outside use. Plastic pipe and fittings are available quite cheaply at any good DIY shop. Don't tape up the ends of the pipe though, birds tend rip insulating tape to bits.

Indoors the antenna wire itself can be simply a piece of thin cable, or a telescopic whip type mounted on a case containing the AA2 module. A wire length of up to six to eight feet (2 meters approx) is recommended. This can be experimented with, and indeed even shorter antennas can be used quite successfully in many circumstances.

A short rotary dipole offers the oportunity to "null" out interfering signals, and therefore be able to hear stations that can not be resolved on fixed antennas. Experiments along these lines may well prove interesting.

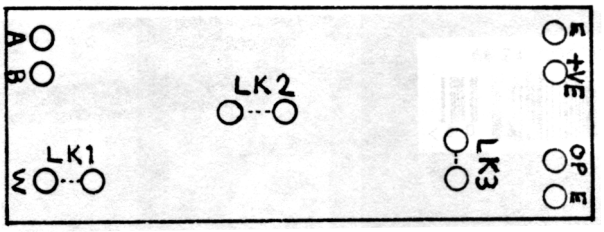
USER INFORMATION.

The AA2 is a broad-band preamp unit. As such it amplifies all signals within its frequency range. Under strong signal conditions (local transmitter, night time propogation around 7MHz etc), the output from the AA2 module can be so great as to overload the receiver (the same as a large wire antenna would do), and indeed the module itself can also become overloaded under these circumstances. When intermodulation, frequency doubling and other symptoms of overload occur, you can usefully remove (or switch) link LK2 on the PCB to reduce the module gain, or reduce the antenna length to decrease the signal levels.

C.M.HOWES COMMUNICATIONS Parts List AA2 Board issue 1

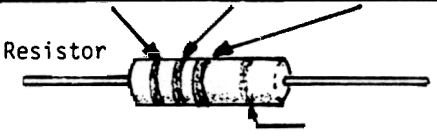
TERMINAL PINS.

These are fitted to the holes shown in the diagram.
(12 pins in all)



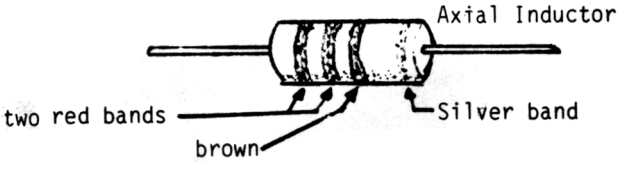
RESISTORS

Part No.	Value	Colour Code			Fitted	Checked
R1	1M5	Brown	Green	Green		
R2	82k	Grey	Red	Orange		
R3	330R	Orange	Orange	Brown		
R4	1k2	Brown	Red	Red		
R5	270R	Red	Violet	Brown		
R	270R	Red	Violet	Brown		
R	2k2	Red	Red	Red		
R	10R	Brown	Black	Black		
R	47R	Yellow	Violet	Black		



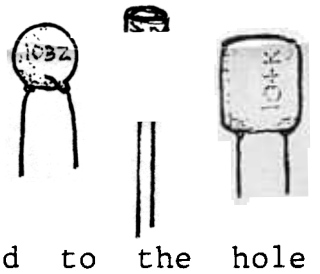
AXIAL INDUCTOR L3

This looks rather like a resistor.



CAPACITORS

Value	Marking Information	Part Numbers
1nF	marked 102	C1
.01uF	marked 103	C2 C3 C4 C5 C6 C7
.1uF	marked 104	C9
100uF	marked 100uF	C8*



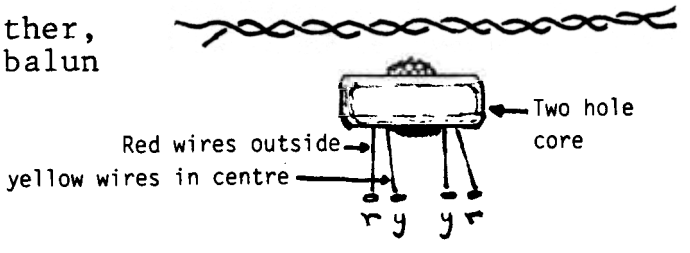
* Make sure you fit C8 the right way round. The long lead to the hole marked "+". The minus signs on the side of the device indicate the lead going to the hole marked minus on the PCB.

TRANSISTORS

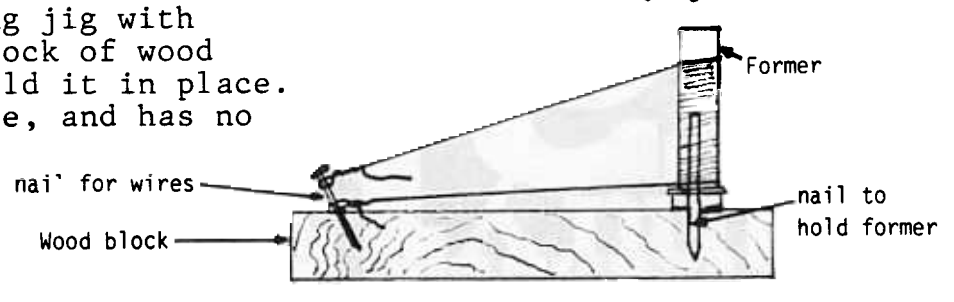
TR1 is a BF245 (FET) fit this as the outline on the board indicates. Keep the leads short. The type number is marked on the device.
TR2 is a special RF power transistor type 2N4427. Fit the plastic spacer bush to its leads, so that it is exactly the right height above the PCB.

INDUCTORS

L1 twist the red and yellow wires together, and wind three turns on the two hole balun core. Fit to the PCB as shown.

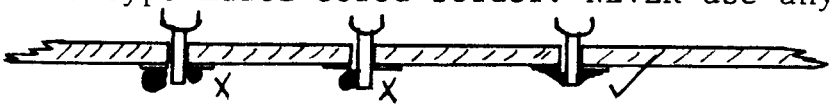


L2 This has 40 turns of enammelled wire. Make a simple winding jig with a couple of nails and a block of wood and varnish the wire to hold it in place. The former is quite fragile, and has no core in this application.

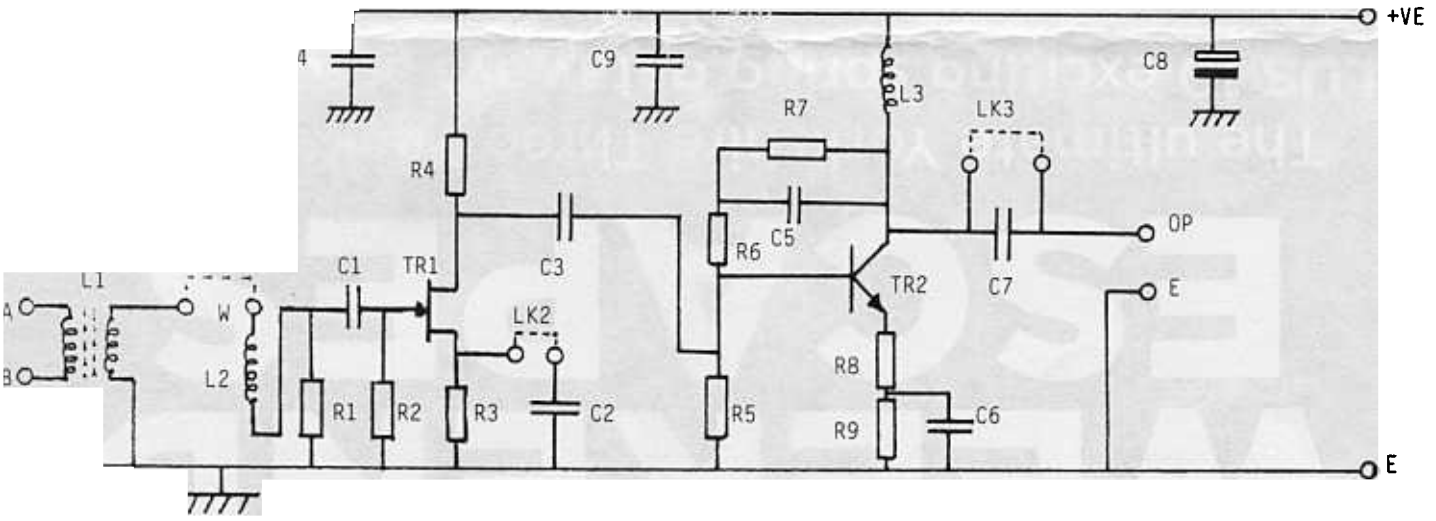


SOLDERING INFORMATION.

To solder properly, you must use the correct type of iron, and the right quality of solder. Use a small tipped soldering iron of about 30 Watts (unless it is a thermostatically controlled device, when a 50 or 60W item is recommended). Do not use an underpowered iron on this kit, as it will not enable the solder to flow freely on the larger areas of copper on the PCB. Only use electronic type multi-cored solder. NEVER use any extra flux.



You should hold the hot iron in contact with both the lead and track for about a second or so, to heat them up. Then, keeping the iron in place, touch the solder onto the junction of lead, track and iron, and wait for a further second or so for the solder to flow along the lead and track to form a good joint. Don't use too much solder, just enough to flow right round the lead covering the PCB hole completely. Now remove the iron from the joint. The iron should have been in contact with the work piece for a total time of about four seconds in all.



LK1 - fit link for dipole antenna
LK2 - Gain select link
LK3 - Fit for coax powered module only