What to do first

READ THIS ENTIRE MANUAL BEFORE UNPACKING ANYTHING!

Then, go through the checklist enclosed in the kit and make sure that everything is present. Arrange a good place to build the kit, with adequate ventilation, in an area where you won't be disturbed. It should take no more than three hours to assemble the kit, assuming a reasonable level of experience.

Disclaimer

As the construction and use of this kit is beyond my control, I take no responsibility for any damage, incidental or direct, caused by use or misuse of this product.

What you will need to complete this kit

In addition to the contents of the kit, you will require the following items:

- A low wattage soldering iron with a point of about 2mm, well tinned
- A damp sponge to clean the soldering iron tip
- A meter or so of rosin cored electronics solder
- A posidrive screwdriver of a size suitable for the M3 screws
- A small pair of sharp side cutters
- Wire strippers
- A multimeter capable of measuring at a minimum resistance, voltage, and continuity
- A 12-14V power supply capable of 200mA or so. This can be a mains adaptor or a battery
- Isopropyl alcohol
- A static-free location to build the kit
- The ability to solder reasonably well!

The following items are optional but will help:

- Solder braid (highly recommended), or
- A desoldering pump
- A 5mm nut driver

Explanatory notes on the manual and construction of the kit

The manual is laid out in three columns. The first column indicates the part number(s) used in a particular step. The next column has the instructions for that step, and the last column shows an image dealing with that step. Most of these images are views of the PCB silk screen, with the appropriate component(s) highlighted in red to aid identification and positioning.

At the end of the manual is a complete parts list, the overlay for each PCB in a full-page format and a wiring diagram of connections to the PCBs. It is recommended that the parts list be printed out and as each part is fitted it is ticked off on the list.

All components in the kit are identified with adhesive labels. It is highly recommended that these labels not be removed until just before the component is fitted to the board. Identification of the resistors in the absence of a label can either be done from the colour band code, explanations of which can easily be found on the web, or more easily by using a multimeter. The labels on the low value resistors may use R as a symbol meaning ohm, so for example 220R is 220 ohms. The capacitors are labelled with their value. In the case of the ceramic capacitors, the value is shown as a three digit number. The first two digits give the base number, the last digit is the number of zeros that follow this base number. The value is given in picofarads (pF), so a 100 nanofarad capacitor (100nF) would be labelled 104, ie 100000 picofarads.

Transistors have the part number etched on one side. ICs have the part number and generally a date code etched on the top. One end of the package will have either a small notch or an off-center dot, or occasionally both. These indicate pin one. If the chip is oriented so that the mark is at the top, the pins are labelled from pin 1 in the top left, down the left side, across the bottom and up the other side to the top right.

Reference will be made several times in the test to a header. This refers to the strip of pins that can either have jumpers, such as those used on hard drives, placed on it, or have a matching socket strip connected as in the case of the connector that links the processor and RF boards. The headers are either 0.1inch or 2mm spacing, depending on purpose.
The GDT, or gas discharge tube, use on the board is a device designed to absorb any high-voltage spikes that might be directed into the antenna socket. This protects the tuner module from damage.

The polyfuse used is a square yellow device with two leads coming out of one side. It is a type of fuse that will automatically reset after the overload which causes it to trip is removed.

The top side of the board, which has the printed legend, is called the component side and is the side from which all but one of the parts are inserted. The bottom side is the solder side, and all the components but one are soldered on this side. The exception is the 10-way header PL4, which is used to connect the top and bottom boards together.

Ceramic capacitors, resistors, inductors, the polyfuse, the 3.6864MHz crystal and the gas discharge tube are non-polarised. They can be fitted either way around. Everything else must be fitted correctly oriented, as described in the text for that part.

The PCBs should be wiped down with the alcohol before construction starts, and the builder should try not to touch the solder side of the PCB more than necessary. Skin oils can impede the ability of the solder to form a good joint.

It will been noted that there are two obvious types of hole on the PCB. One goes through a tinned or ‘shiny’ pad, one goes through a smaller non-tinned pad. The tinned pads contain the actual component mounting holes. The non-tinned ones aren’t a mistake in manufacture, as some beginners occasionally believe, but are called vias and are used to connect tracks on one side of the board to tracks on the other side. Don’t get them mixed up with component pads and attempt to solder a lead into them. Not only is this wrong for the circuit, but it won’t work anyway as the vias are coated with solder resist, which as it’s name suggests is there precisely for the reason that solder does not stick to it.

When the PCB is finished, excess solder flux can be cleaned off with isopropyl alcohol. This should be applied liberally with a cotton swab or something similar, with the PCB held over a sink at an angle so the alcohol can drain off. When the board is clean, place it somewhere warm and dry for an hour or so to make sure that all the alcohol has evaporated, before continuing the kit assembly.

It is recommended that when components leads are cropped to length after soldering, the offcuts are immediately placed in some sort of container and not allowed to fly around the room. Aside from the hazard of one landing on the PCB and shorting something out, if the wire offcuts, which ***always*** have at least one very sharp point, end up on the carpet, sooner or later someone ***will*** step on one with bare feet. This inevitably results in the wire being driven some distance into the foot, with all the associated yelling, swearing, and hopping around in severe pain this entails. I am speaking from bitter experience here, so please listen.

Notes on soldering procedure

If you have never soldered before, or are inexperienced, hopefully this short guide will help your technique. If you are an expert, feel free to skip this section.

Before soldering anything, the tip of the soldering iron should be properly tinned. This is essential, as it is virtually impossible to produce a good solder joint otherwise. Tinning is the process of coating the soldering iron tip with fresh solder. The tip is made of copper, plated with iron to stop it dissolving in the molten solder which would otherwise eat it away in a matter of minutes. It is imperative that the iron plating remain intact, which means that the tip should be treated gently. **DO NOT** scrape it with anything metallic or abrasive, as this will puncture the plating and ruin the tip.

If the tip is new, the correct procedure is to turn the iron on, then hold the end of the solder against it until it begins to melt. If the iron is a temperature-controlled one, it should be set to around 350 degrees centigrade, or 550 degrees fahrenheit. As the solder melts, move it around the tip until at least 3-4mm of the end is completely covered in molten solder. It is often helpful to hold the iron vertical with the tip downwards during this procedure, so the solder forms a ball on the end. Let it sit for 30 seconds or so, then wipe the tip thoroughly on a damp sponge to remove the excess solder. Be careful not to splatter solder on anything not heat resistant, such as the carpet, the cat, or yourself.

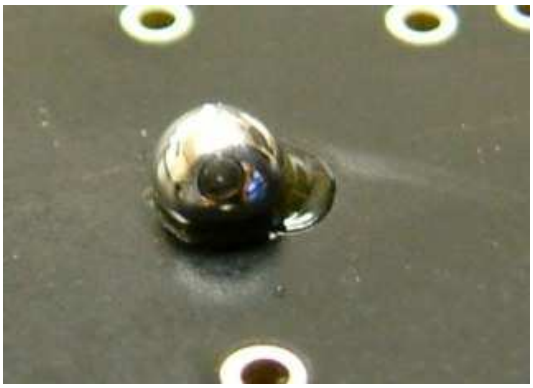
If the tip is old, heat the iron up, wipe it thoroughly and re-tin it. If it proves to be impossible to get the solder to adhere properly, replace the tip.

At all times during use the tip should be tinned properly. As the solder and flux oxidises in the heat, it will go crusty and hard, which will make achieving a good joint difficult. Every minute or so, wipe the tip, reapply a little solder, and wipe it again.

To make a joint, the soldering iron tip should be placed against both the PCB and the component lead, and the solder fed in from the side. The solder should be melted against the heated component lead and PCB pad, not against the iron itself. It only takes a small amount of solder, so be economical in its application.

A good joint should present a shiny, conical appearance, as shown below. If it has a dull, frosted appearance either the iron isn't hot enough, or the joint was moved before the solder cooled sufficiently to harden. In either case, reheat the joint for a second, which should fix it.

There are many causes of bad joints, the more common ones being too much solder, insufficient heat on one part of the joint, or contamination of the joint with a foreign substance. All three of these tend to produce a ball of solder sitting above the PCB, as shown below.



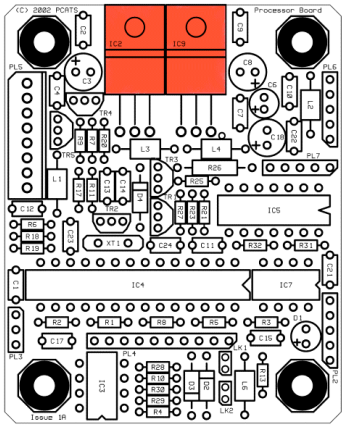
A small amount of excess solder can generally be lifted off by wiping the soldering iron tip on the sponge and immediately remelting the joint. If the joint is contaminated or heavily over-soldered, the excess should be removed with solder braid or a desoldering pump, The joint can then be remade correctly.

IC2, IC9

Insert the leads of IC2, the MC7805CT 5V voltage regulator, through the holes in the PCB, then bend the component over until it lies flat against the board. The hole in the tab of the regulator should align with the 3mm hole in the PCB. If it doesn't, move the regulator slightly until the holes match. Push one of the plastic rivets through the regulator and PCB from the top, then snap it into place while holding the regulator firmly against the PCB. It will take appreciable force to make the rivet snap closed, but be careful not to slip. A good method is to place the rivet head against the top of a table or similar solid object with the regulator body past the edge, then push down quite hard.

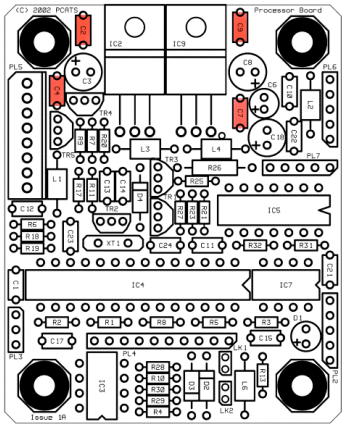
Repeat this procedure with IC9, the MC7809CT 9V regulator.

Once satisfied both regulators are correctly mechanically mounted, solder the leads and clip off the excess wire. As noted in the introduction, it is only necessary to solder leads to the bottom side of the board.



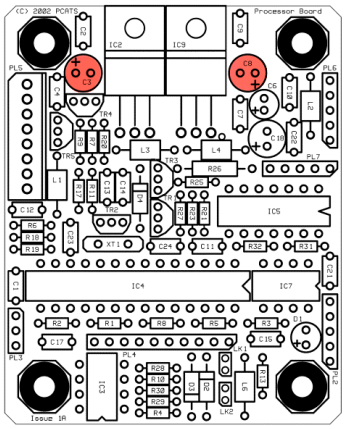
C2, C4, C7, C9

Take four of the 100nF ceramic capacitors and form the leads by bending them down 90 degrees next to the body of the capacitor. Both leads should obviously be bent in the same direction, the end result being a U shape with the body of the capacitor forming the bottom of the U. Insert the leads through the holes in the PCB for each capacitor, then bend the leads sideways a little under the board to hold the component in place. Try to keep the body of the capacitor flush against the PCB while bending the leads. Solder the leads and remove the excess.



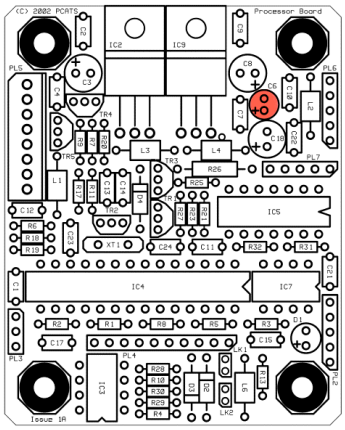
C3, C8

Take two of the 47uF/16V electrolytic capacitors and insert them in the correct locations. These capacitors are polarised, the negative lead being indicated by a white stripe down the body of the device. This stripe should be positioned AWAY from the + sign shown on the PCB legend. Double check the capacitors are inserted correctly, bend the leads, solder, and remove the excess.



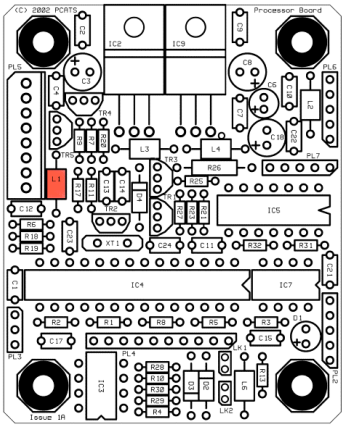
C6

Insert the 22uF/25V electrolytic capacitor in the correct location, once again obeying the polarisation as above. Double check the capacitor is inserted correctly, bend the leads, solder, and remove the excess.



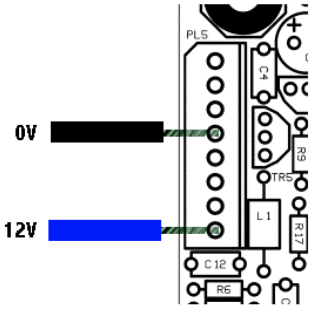
L1

Form the leads of one of the ferrite beads as noted above for the capacitors. Take care when inserting the leads of this component through the board, as there is a via immediately below the top pad which is easily mistaken for the correct pad. Double check this before attempting to solder the lead in place. Insert the leads through the PCB, bend them, and solder. Remove any excess.



At this point the PSU section should be tested. Visually inspect the PCB, top and bottom under a bright light. Look for any components that are crooked, bent, or otherwise suspect, and correct. Check the solder side for any bridges, shorts, or loose fragments of offcut wire. Also check there is no short between the middle pin and either end pin on both regulators, or between the right-hand pins of the regulators, or between the end pins of each regulator.

Take one of the two blue lengths of wire, and the black one. Strip approximately 5mm of insulation from each end of both lengths of wire, tightly twist the conductors together, and lightly tin the ends. Insert one end of the blue wire into hole 8 of PL5 until the insulation touches the PCB and solder it in place. Hole 1 of PL5 is at the top of the row, when the PCB is held so that the regulators are at the top. Repeat the procedure with the black wire in hole 4. Remove and excess wire from the underside of the board. Check continuity between the black wire and the middle pin of each regulator, and between the blue wire and the pin nearest PL5 on each regulator.



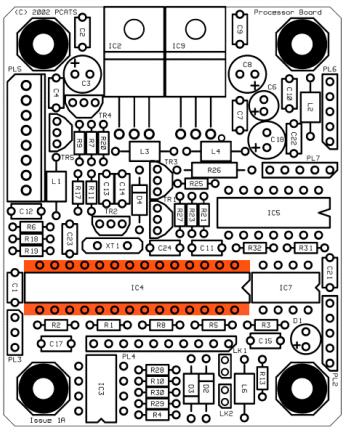
Also check there is no short between the middle pin and either end pin on both regulators, or between the right-hand pins of the regulators, or between the end pins of each regulator.

When satisfied, connect the black wire to 0V and the blue wire to +12V. Measure the voltage on each regulator on the pins furthest from PL5. IC2 should measure 5V within 5%, and IC9 should measure 9V within 5%.

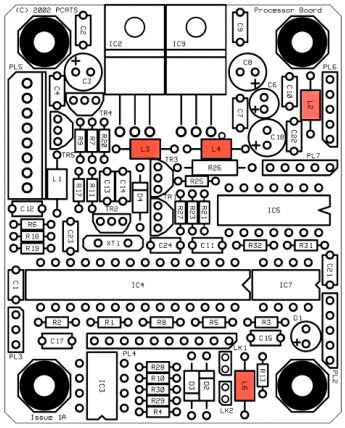
If any of the above tests are not successful, go back and check for solder bridges or shorts. Make sure that the electrolytic capacitors are in the correct way around, and that the power and ground wires are connected to the correct holes.

Socket for IC4

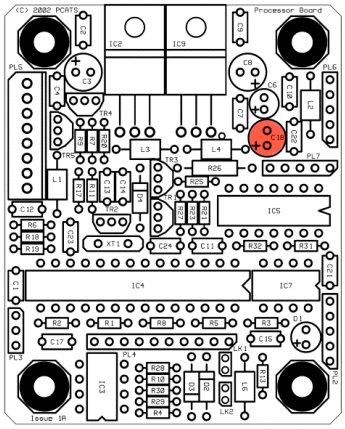
Next, insert the 28-pin IC socket into the location for IC4. Make sure the half-moon cutout at one end of the socket (the pin one indicator) is at the end of the outline on the legend with a similar marking. Holding the socket in place with one hand, turn the PCB upside down and solder a pin at either end. This will hold it in place while you solder the remaining pins. A word of advice: DON'T hold the socket to the board with a finger over the pins you're soldering to! Copper is an excellent heat conductor.



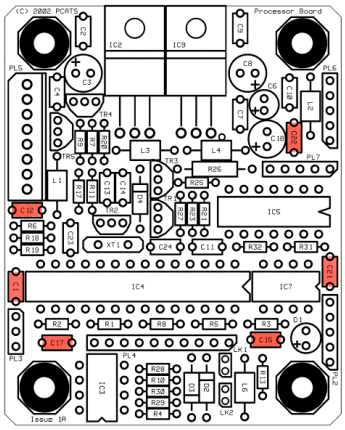
L2, L3, L4, L6 — Form the leads of the remaining ferrite beads and solder them in place. Remove excess wire. Check for shorts as described above.



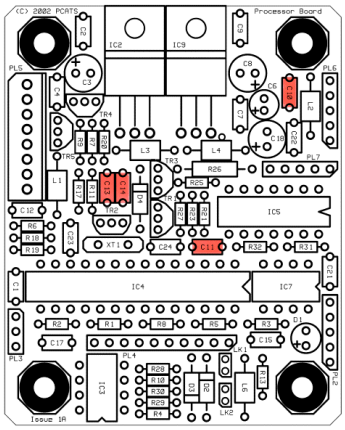
C18 — Insert the remaining 47uF/16V electrolytic capacitor into the correct location, again checking the polarity as described above. Bend the leads, solder, and remove the excess. Check for shorts.



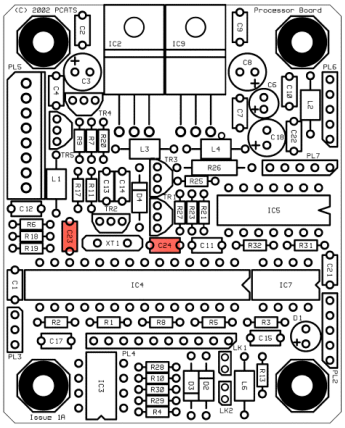
C1, C12, C15, C17, C21, C22 — Form the leads of six more of the 100nF ceramic capacitors and insert them in the correct locations, bend the leads, solder, and remove the excess. Check for shorts.



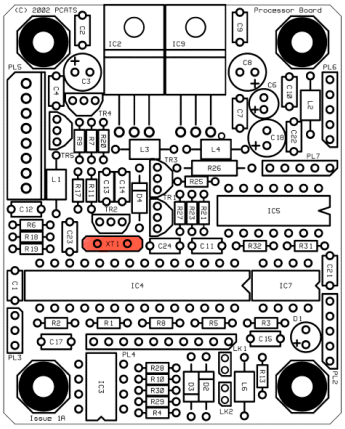
C10, C11, C13, C14 — Form the leads of and insert all four 10pF ceramic capacitors in their respective positions. Bend the leads, solder, and remove the excess. Check for shorts.



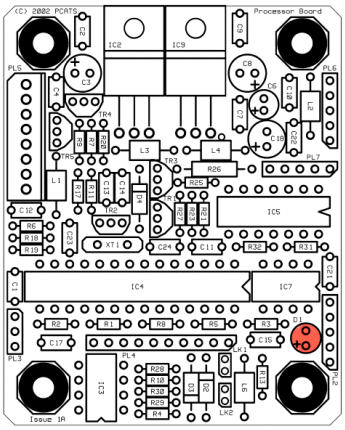
C23, C24 — Form the leads of and insert both 22pF ceramic capacitors in their respective positions. Bend the leads, solder, and remove the excess. Check for shorts.



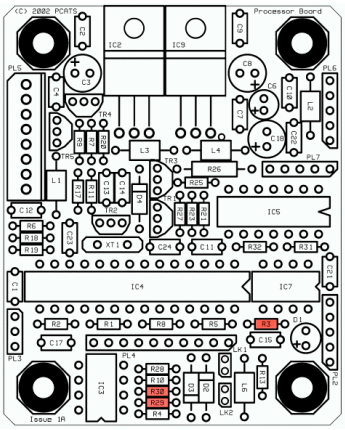
XT1 — Insert the 3.6864MHz crystal into the PCB, bend, solder, and crop the leads. Check for shorts. Checking in this case should be very thorough, to make sure that the edge of the crystal can does not touch the pins of the socket for IC4. It is recommended that the crystal is mounted with a small amount of clearance, no more than a millimeter or so, between the bottom of the case and the PCB. It can then be pushed very slightly sideways, away from the IC socket, to maintain the required clearance. Be gentle with it, don't push hard enough to break the leads.



D1 — Inspect the green LED. You will find that one of the leads is longer than the other. This is the anode, and goes into the hole labelled with a + sign. Insert it, bend the leads, solder, and crop. Check for shorts.

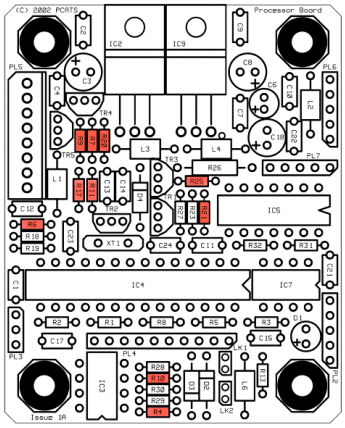


R3, R29, R30 — Form the leads of three of the 10K resistors. Insert them, bend the leads, solder, and crop. Check for shorts.



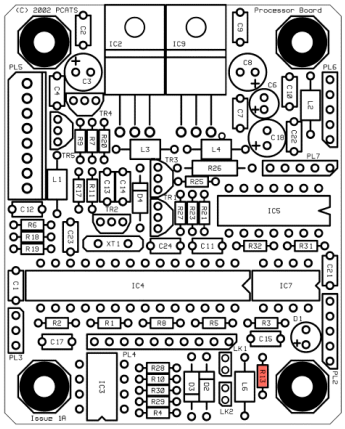
R4, R6, R7, R9, R10, R11, R17, R20, R21, R25

Form the leads of ten of the 1K resistors. Insert them, bend the leads, solder, and crop. Check for shorts.



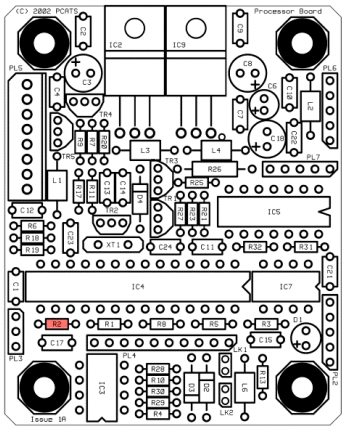
R13

Form the leads of the 220 ohm resistor. Insert it, bend the leads, solder, and crop. Check for shorts.



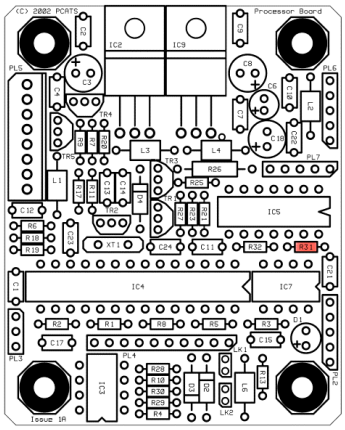
R2

Form the leads of the 22K resistor. Insert it, bend the leads, solder, and crop. Check for shorts.

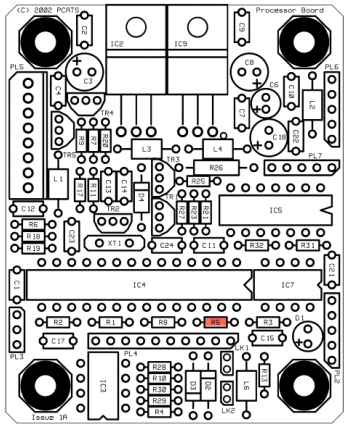


R31

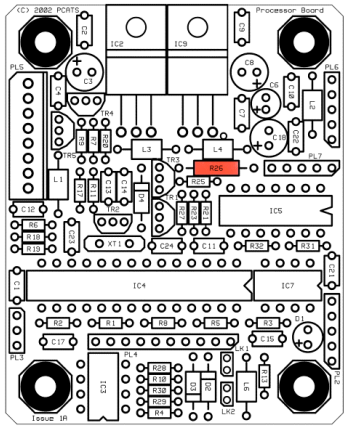
Form the leads of the 2.2K resistor. Insert it, bend the leads, solder, and crop. Check for shorts.



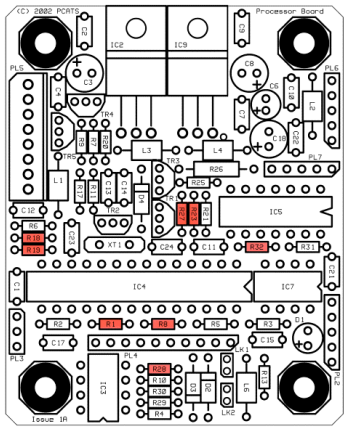
R5 Form the leads of the 330 ohm resistor. Insert it, bend the leads, solder, and crop. Check for shorts.



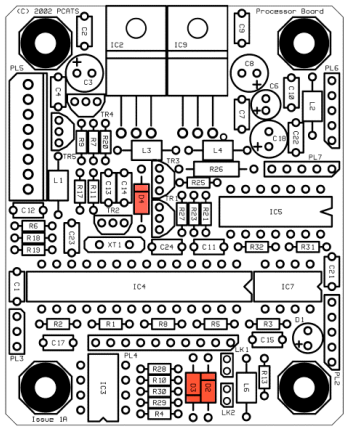
R26 Form the leads of the 1 ohm resistor. Insert it, bend the leads, solder, and crop. Check for shorts.



R1, R8, R18, R19, R23, R27, R28, R32 Form the leads of the eight 4.7K resistors. Insert them, bend the leads, solder, and crop. Check for shorts.

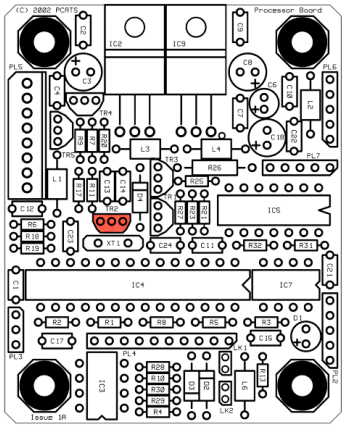


D2, D3, D4 Form the leads of the three 1N4148 diodes. They must be inserted with the lead indicated by the black band on the body of the diode (the cathode) towards the line on the diode symbol shown on the legend. This is important, so double-check it before soldering. Bend the leads, solder, and crop. Check for shorts.



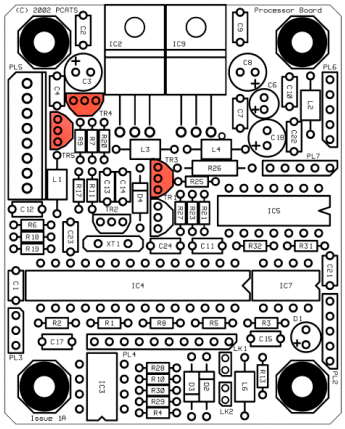
TR2

Insert the ZTX789A transistor into its location on the PCB, oriented so that it matches the outline on the legend. Push it is so that the body of the devices sits approximately 3-4mm above the surface of the PCB, and bend the two outer leads slightly to hold it in position. Double check its orientation, then bend the leads, solder, and crop. Check for shorts.



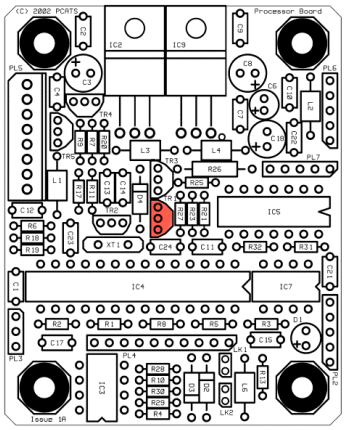
TR3, TR4, TR5

Insert the three 2N3904 transistors into their locations in the same way you did TR2.



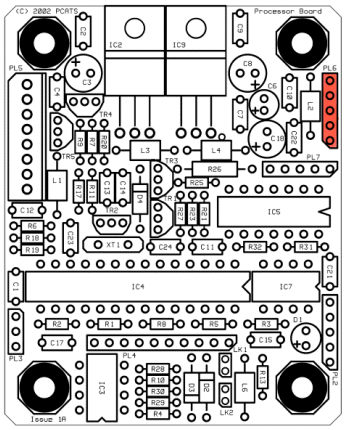
TR1

Insert the BC558 transistor as per TR2, bend the leads, solder, and crop. Check for shorts.



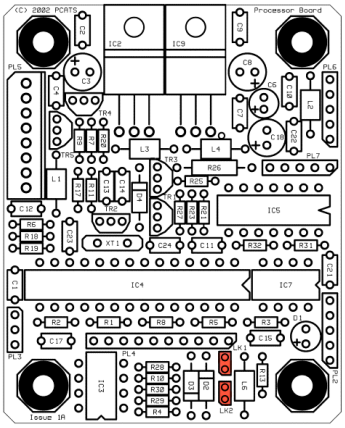
PL6

Fit the 5-pin header into its location, and make sure the pins are at right-angles to the PCB. The short pins go through the holes. It's normally best to solder one end of the connector, then if necessary reheat the joint and reposition the header until it is correctly vertical. When satisfied, solder the remaining pins.



LK1, LK2

As with PL6, fit and solder the pair of two pin 2mm headers. Crop the excess pin length under the PCB.

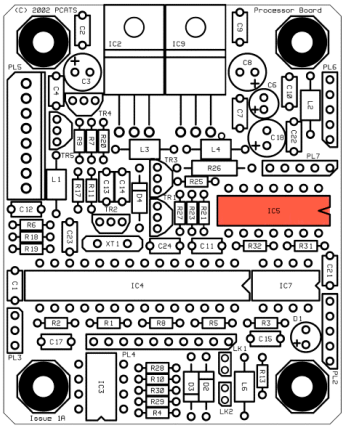


At this stage, once more visually inspect the PCB as you did when testing the power supply.

Apply power to the PCB as in the PSU section above, and make sure that there is still 5V on the correct pin of IC2 and 9V on the correct pin of IC9. Disconnect the power supply.

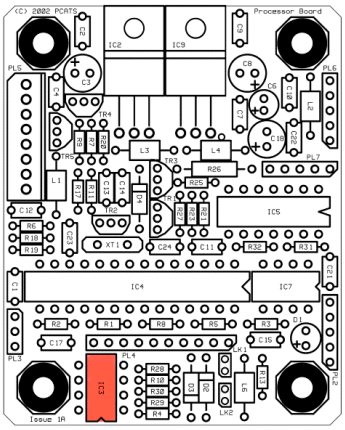
IC5

Insert the DS1489 into its location, ensuring that the cutout or dot at one end of the chip is aligned with the PCB legend. Solder it in place, and crop off excess lead length.



IC3

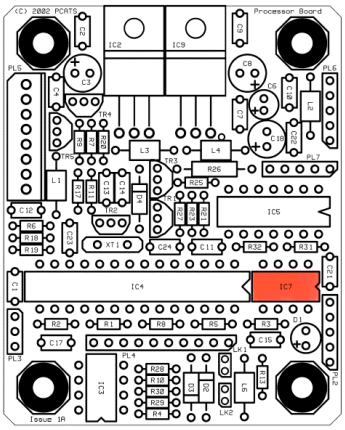
Insert the LM258 into its location, ensuring that the cutout or dot at one end of the chip is aligned with the PCB legend. Solder it in place, and crop off excess lead length.



IC7

Insert the CA3140 into its location, ensuring that the cutout or dot at one end of the chip is aligned with the PCB legend. Solder it in place, and crop off excess lead length.

Once more, check for shorts and perform the continuity tests listed above

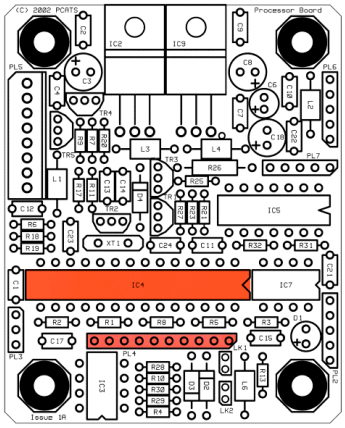


PL4

Insert the 10-way female header socket into the solder side of the PCB, ensure it is vertical, and solder it in place. Be very careful to note that this is the only component that is inserted into the ***bottom*** of the PCB, and is soldered from the ***top***. It is important that this connector is exactly vertical, so take your time and get it correct.

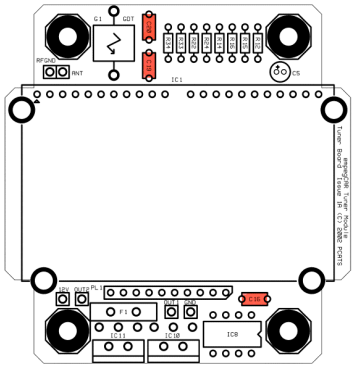
Plug the PIC16F73, IC4, into the socket, ensuring the cutout or dot at one end of the chip matches the cutout on the socket and the outline on the PCB.

Put the finished processor board to one side at this point. The next part is to build the RF PCB.



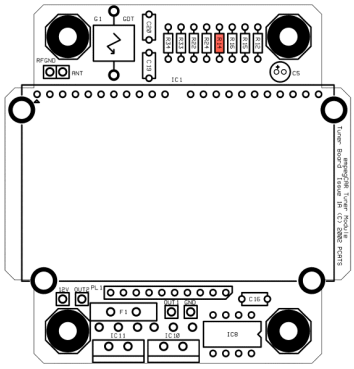
C16, C19, C20

Form the leads of the three remaining 100nF ceramic capacitors and insert them in the correct locations, bend the leads, solder, and crop. Check for shorts.



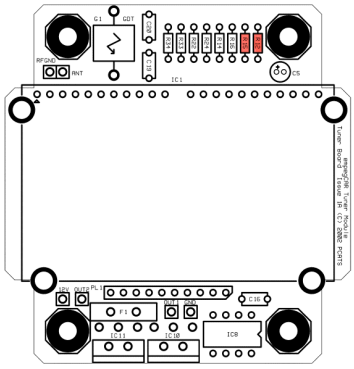
R14

Form the leads of the 200K resistor. Insert it, bend the leads, solder, and crop. Check for shorts.



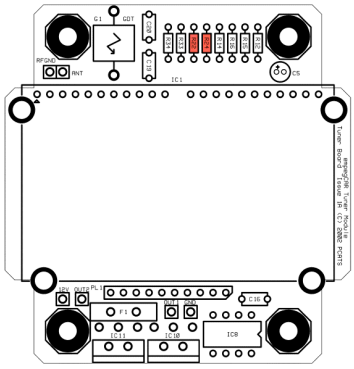
R12, R15

Form the leads of the 100K resistors. Insert them, bend the leads, solder, and crop. Check for shorts.

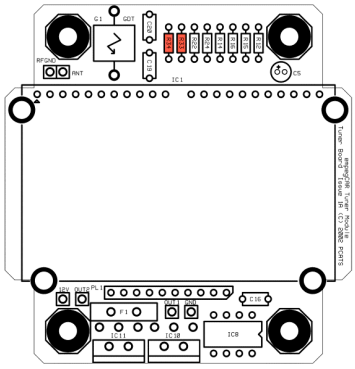


R22, R24

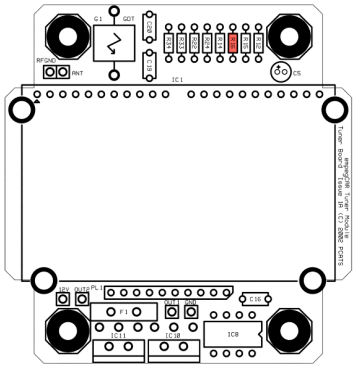
Form the leads of the remaining two 10K resistors. Insert them, bend the leads, solder, and crop. Check for shorts.



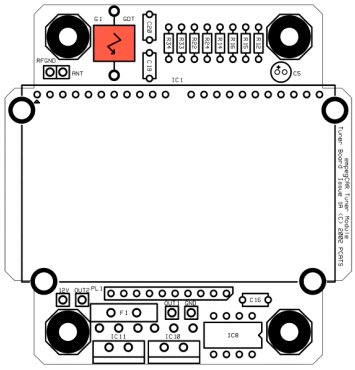
R33, R34 — Form the leads of the remaining two 1K resistors. Insert them, bend the leads, solder, and crop. Check for shorts.



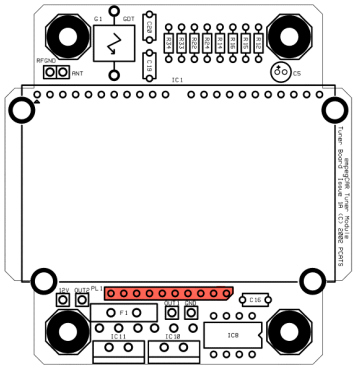
R16 — Using one of the lengths of excess wire removed previously, jumper the holes of R16, and solder the wire in place. Crop the excess. Check for shorts.



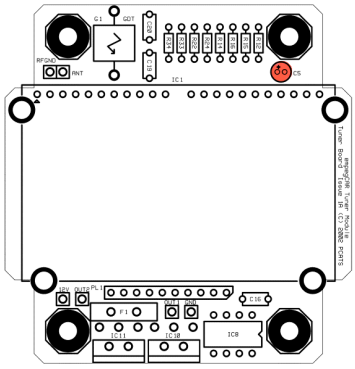
G1 — Carefully form the leads of the GDT. Insert it so the body of the device clears the PCB by about 3mm. Bend the leads, solder, and crop. Check for shorts.



PL1 — Insert the 10-way male header into the PCB, ensuring it is vertical. Solder it in place. Check for shorts.

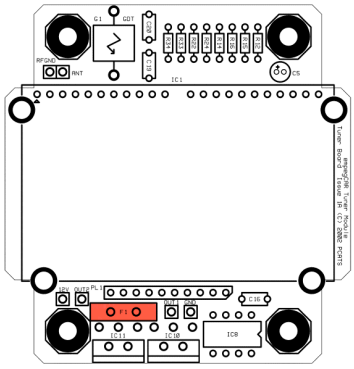


C5 — Insert the 10uF/16V electrolytic capacitor into the correct location, again checking the polarity as described above. Bend the leads, solder, and crop. Check for shorts.



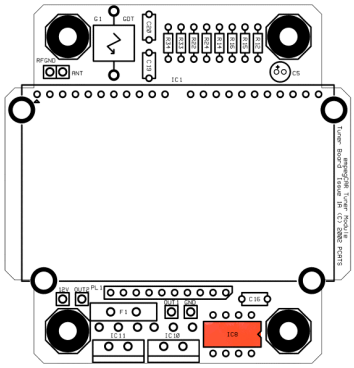
F1

Insert the polyfuse into the PCB, bend the leads, solder, and crop. Check for shorts.



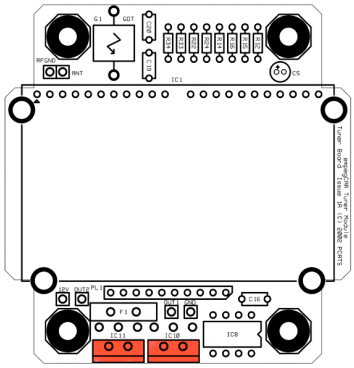
IC8

Insert the MAX4544 into its location, ensuring that the cutout at one end of the chip is aligned with the PCB legend. Solder it in place, and crop off excess lead length. Check for shorts.



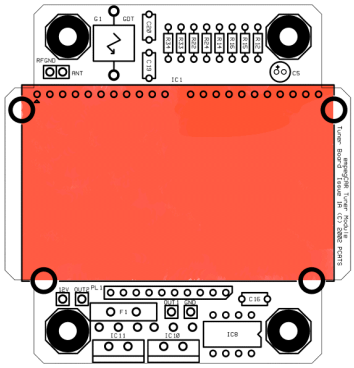
IC10, IC11

Insert the two VN02 devices into the correct locations, until the three bent leads touch the top side of the PCB. Solder the devices in place, ensuring that they are vertical. Make sure that they do not touch each other. This is important, so double-check it. Crop the excess lead length, and check for shorts.



IC1

Insert the tuner module. It is a tight fit, so be careful. The pins must be accurately lined up with the holes, and the module then gently pushed down from both ends at once. It should snap into position with a little resistance. If it won't go in, check all the pins are lined up with their holes, and that there isn't one or more bent pins fouling the edge of a hole. When satisfied, solder it in place. Solder all the corner tabs except for the one nearest the GDT and antenna cable pads. The tabs should be bent in slightly then soldered. Check for shorts.



At this point, it is a good idea to test-assemble the two PCBs. Screw one of the 20mm spacers to each corner of the top PCB with the M3 screws, then plug the top board into the bottom board. The 10-way connectors should alight easily, with the thread on the end of the spacers going through the corner holes of the bottom board. Look through the gaps between the two boards, and ensure that there aren't any leads long enough to foul the top of the tuner module. If there are, cut them down. The tabs of the VN02 devices should clear the edge of the top PCB. If they do not, gently bend them outwards until they do.

Separate the boards and remove the spacers and screws.

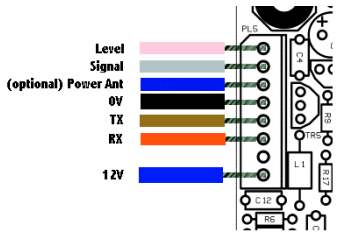
Blue, grey, red, pink, and brown wire

Strip approximately 5mm of insulation from one end of each length of wire, twist the conductors together, and lightly tin the ends.

Connect one end of each wire to PL5 in the following order:

Pink to hole 1
Grey to hole 2
Blue to hole 3 (this is the power antenna output, which can be omitted if not required)
Brown to hole 5
Red to hole 6

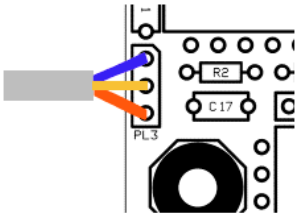
Hole 7 is not used and should not have anything connected to it. Crop the excess wire if any, and check for shorts.



Shielded wire

Carefully strip approximately 12mm of the outer insulation from one end of the two-core screen wire. Peel back the screen and twist it together. Strip about 5mm of insulation from each of the inner wires, twist, and tin. Tin the end of the screen, but be careful not to heat it to the point that it melts the inner wire insulation.

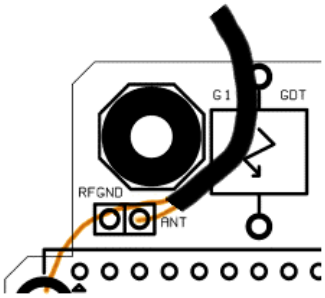
Solder the screen to the center hole of PL3, the blue wire to the hole nearest the PIC (hole 1), and the red wire to the remaining hole. Crop the excess wire if any, and check for shorts.



Coaxial cable

Carefully strip 15mm of the outer sheath of the coaxial cable at one end. Peel back the screen, cut approximately half of it away around the diameter of the cable, then twist together and tin the remainder. Remove about 5mm of the inner insulation, twist and tin the center conductor.

Solder the center conductor to the hole on the RF board labelled ‘ANT’. Push the outer conductor through the hole for the tuner module corner tab nearest it, then solder both the conductor and tab in place. Try to make the outer conductor length slightly less than that of the inner conductor, so that if the cable is gently pulled the outer conductor takes the strain. Route the cable over the GDT so that it clears the fixing hole.



20mm M3 pillars, crinkle washers, cable tie, ABS box

Place the RF pcb in the ABS box with the antenna cable end nearest the two holes. Push the free end of the coaxial cable through the lower hole in the box and feed it through until there is only a little slack left inside the box.

Screw the PCB into place using one mounting pillar and crinkle washer at each corner. If a 5mm nut driver is available use it, otherwise the pillars can be fitted by screwing one of the M3 machine screws into the top hole in the pillar and then using it to tighten the pillar in place. Once it is sufficiently tight to compress the washer, the screw can be removed leaving the pillar in place. Don’t overtighten the pillars, they only need to be a little more than finger-tight.

Use one of the cable ties to attach the coaxial cable firmly to the nearest mounting pillar. Cut off the excess tie.

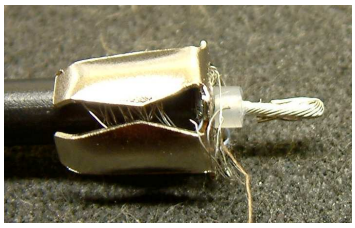
Antenna socket

Unscrew the end of the antenna socket and disassemble it, being careful not to lose any of the parts. Carefully bend out the tabs on the cable clamp until the coaxial cable easily fits through it. Slide the top of the socket onto the cable, threaded end away from the box.

Very carefully remove about 15mm of the outer insulation of the cable, trying not to damage or nick the screen inside. Fold the screen back along the cable, twisting it around the insulation so that it is about 5mm long.

Place the cable clamp over the screen, the tabs towards the box, and squeeze it slightly so it stays in place.

Remove about 12mm of the inner insulation from the exposed end of the cable, twist the inner conductor together, and fold it double so the end of the conductor just clears the insulation.



Slacken off the screw in the white plastic insulator, push the inner conductor all the way into the hole, and tighten the screw again. Check with the multimeter that there is no short between the inner and outer conductors on the cable.

The metal socket sleeve has an indentation all the way around it just over halfway along it's length, dividing it into two parts. Slide the longer of the two parts over the white insulator.

Then put the outer black plastic sleeve over the whole assembly and gently screw it back together. Don't be overenthusiastic when reassembling the connector or you may break an internal connection. When the connector has been reassembled, check once more that there is no continuity between the inner and outer connectors. Also check continuity between the outer conductor and the RF GND pin on the bottom PCB, and between the inner conductor and the ANT pin.

M3 screws, crinkle washers, cable tie

Carefully fit the processor PCB on top of the mounting pillars, ensuring that the 10-way connectors line up correctly and that the tops of the VN02 tabs clear the edge of the PCB. The VN02 tabs should end up sandwiched between the PCB and the wall of the box. When satisfied that everything is aligned properly, fasten the board in place using the screws and remaining washers. Once again the screws should be tightened sufficiently to compress the washers. Don't overdo it.

Feed the wires connected to PL3 and PL5 through the top hole in the box, pulling them through until there is only a little slack left inside the box. Loop the remaining cable tie around the wire bundle just inside the hole, pull it tight, and cut off the excess. Perform the tests previously noted for shorts and continuity. Arrange the wires inside the box so they loop around any tall devices, then trim them all to the same length at the end outside the box. Strip, twist, and tin the free ends of all the wires in the same way that the other ends were prepared.

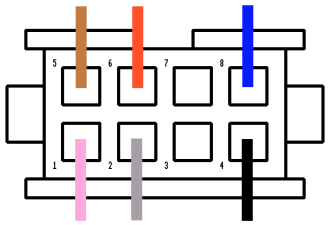
Molex pins, 8 way molex socket

Place the free end of one of the wires coming from PL5 into the slot in one of the molex pin inserts, and carefully fold the first set of tabs over the wire. This can be done with the side cutters, or a pair of needlenose pliers, but it's a somewhat fiddly job so take your time.

Solder the wire in place.

Then fold the remaining tabs down and squeeze them into shape. If using side cutters, make sure not to slip or you are liable to cut the wire you've just soldered. Repeat the process for all the wires except the blue one connected to hole 3 of PL5.

The 8-way molex connector when viewed from the rear with the cutout at the top has pin one at the bottom left, and is numbered from left to right. Pin four is at the bottom right, pin five is at the top left, and pin eight at the top right. The connector is wired as follows:



Pink wire to pin 1
Grey wire to pin 2
No connect to pin 3
Black wire to pin 4
Brown wire to pin 5
Red wire to pin 6
No connect to pin 7
Blue wire to pin 8

It is wired in one-to-one correspondence with the numbering for PL5. Each pin insert should be pushed into the connector from the rear, orientated so that the slot where the wire was soldered into the contact is upwards. The contact will snap easily into position when orientated correctly. Double check that you have each wire in the right hole before you push them home, as the contacts are very difficult to remove intact once locked in.

3.5mm stereo socket

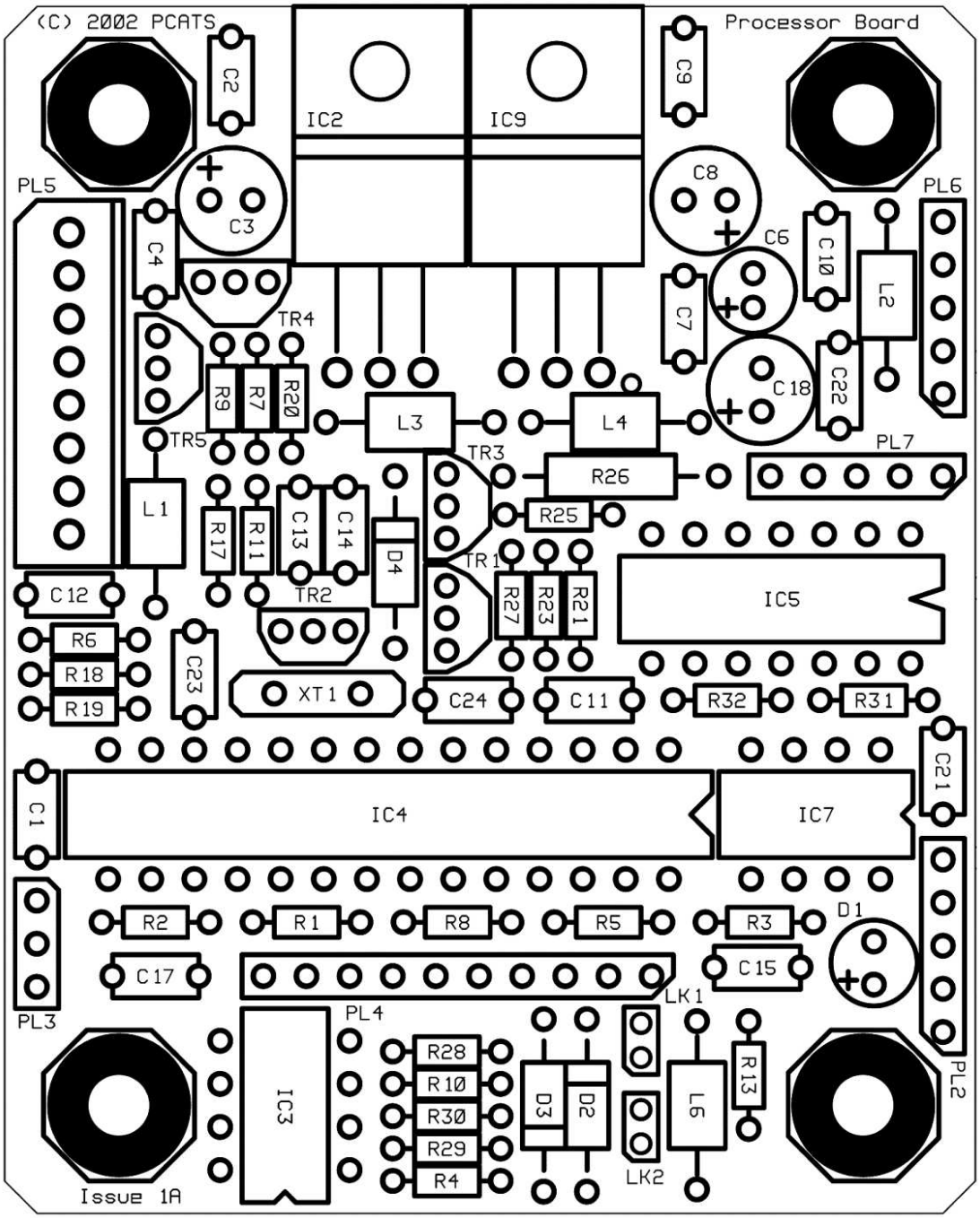
Unscrew the outer sleeve from the 3.5mm stereo socket and slide it over the twin-core screened wire, open end away form the box. With the connector orientated as shown in the picture to the right, solder the screen to the center terminal, being careful not to melt the insulation of the inner wires. When it has cooled down, solder the red wire to the right hand terminal, and the blue wire to the left hand terminal. Check no wires or wire fragments are shorting, and bend the tabs on the center terminal firmly over the wires. Check once more for shorts, and screw the outer cover back on.

Perform a final complete test for shorted power rails and double check all the wiring to the connectors against the diagrams. Assuming everything checks out, connect the tuner socket to the plug coming from the empeg wiring harness, plug the antenna in and turn on the power. The empeg should detect the presence of the tuner. If all is well, tune to a good station. The green LED should come on.

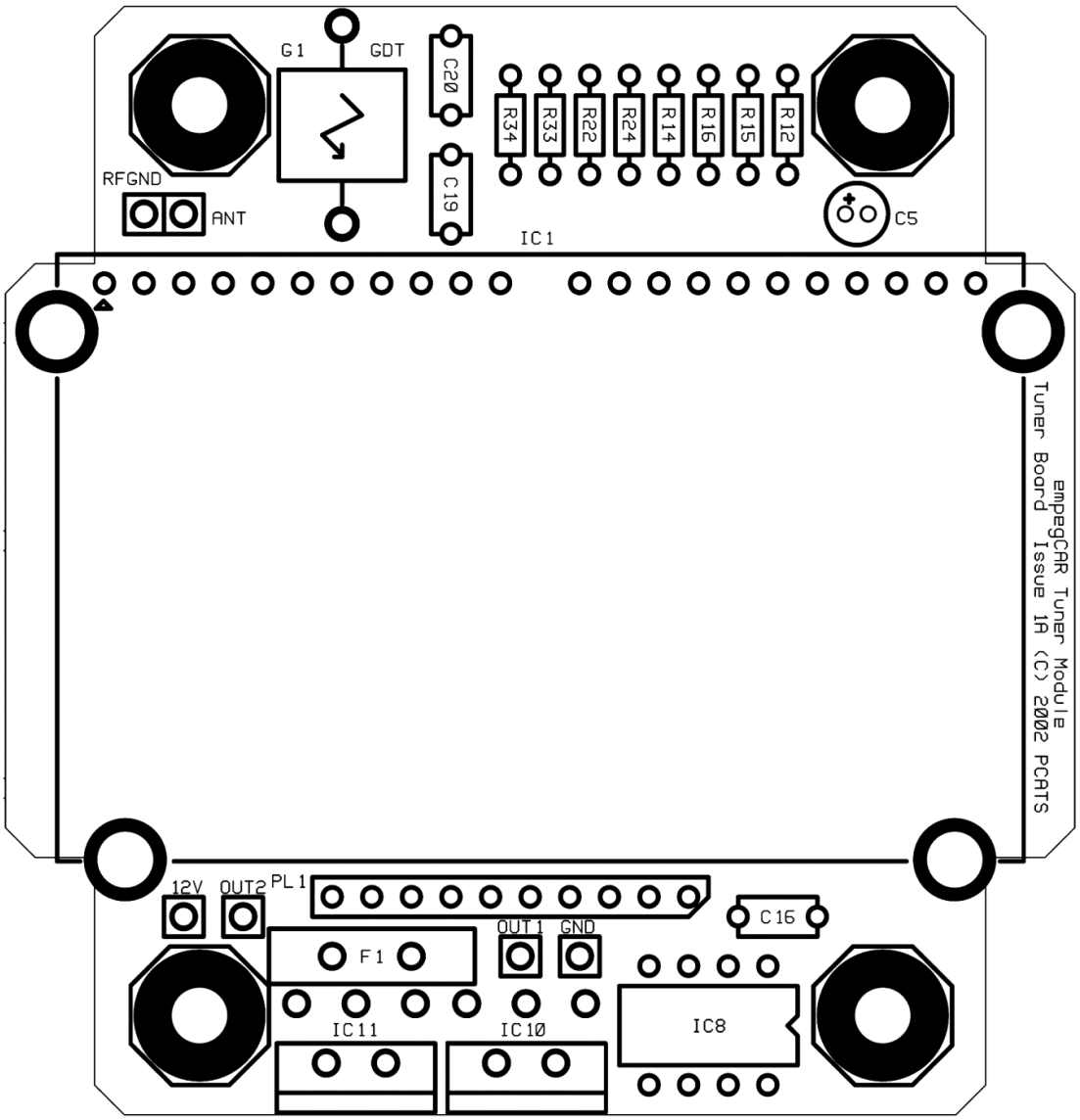
If everything works properly, screw the lid of the tuner box on using the four screws that came with it.

IC1	1385UFC 3X0197 Tuner module	❑
IC2	MC7805CT 5V Regulator	❑
IC3	LM258N Dual op amp	❑
IC4	PIC16F73 Processor	❑
IC5	MAX1489E Level converter	❑
IC7	CA3140 CMOS Op amp	❑
IC8	MAX4544 SPDT Switch	❑
IC9	MC7809CT 9V Regulator	❑
IC10	VN02N Mosfet high-side switch	❑
IC11	VN02N Mosfet high-side switch	❑
TR1	BC558B Transistor	❑
TR2	ZTX789A Transistor	❑
TR3	2N3904 Transistor	❑
TR4	2N3904 Transistor	❑
TR5	2N3904 Transistor	❑
D1	Green 3mm LED	❑
D2	1N4148 Diode	❑
D3	1N4148 Diode	❑
D4	1N4148 Diode	❑
XT1	3.6864 MHz Crystal	❑
R1	4.7K 0.125W Resistor	❑
R2	22K 0.125W Resistor	❑
R3	10K 0.125W Resistor	❑
R4	1K 0.125W Resistor	❑
R5	330 Ohm 0.125W Ohm Resistor	❑
R6	1K 0.125W Resistor	❑
R7	1K 0.125W Resistor	❑
R8	4.7K 0.125W Resistor	❑
R9	1K 0.125W Resistor	❑
R10	1K 0.125W Resistor	❑
R11	1K 0.125W Resistor	❑
R12	100K 0.125W Resistor	❑
R13	220 Ohm 0.125W Resistor	❑
R14	200K 0.125W Resistor	❑
R15	100K 0.125W Resistor	❑
R16	Wire link	❑
R17	1K 0.125W Resistor	❑
R18	4.7K 0.125W Resistor	❑
R19	4.7K 0.125W Resistor	❑
R20	1K 0.125W Resistor	❑
R21	1K 0.125W Resistor	❑
R22	10K 0.125W Resistor	❑
R23	4.7K 0.125W Resistor	❑
R24	10K 0.125W Resistor	❑
R25	1K 0.125W Resistor	❑
R26	1 Ohm 0.6W Resistor	❑
R27	4.7K 0.125W Resistor	❑
R28	4.7K 0.125W Resistor	❑
R29	10K 0.125W Resistor	❑
R30	10K 0.125W Resistor	❑
R31	2.2K 0.125W Resistor	❑
R32	4.7K 0.125W Resistor	❑
R33	1K 0.125W Resistor	❑
R34	1K 0.125W Resistor	❑
C1	100nF Ceramic capacitor	❑
C2	100nF Ceramic capacitor	❑
C3	47uF/16V Electrolytic capacitor	❑
C4	100nF Ceramic capacitor	❑
C5	10uF/16V Electrolytic capacitor	❑
C6	22uF/25V Electrolytic capacitor	❑
C7	100nF Ceramic capacitor	❑
C8	47uF/16V Electrolytic capacitor	❑
C9	100nF Ceramic capacitor	❑
C10	10pF Ceramic capacitor	❑
C11	10pF Ceramic capacitor	❑
C12	100nF Ceramic capacitor	❑
C13	10pF Ceramic capacitor	❑
C14	10pF Ceramic capacitor	❑
C15	100nF Ceramic capacitor	❑
C16	100nF Ceramic capacitor	❑
C17	100nF Ceramic capacitor	❑
C18	47uF/16V Electrolytic capacitor	❑
C19	100nF Ceramic capacitor	❑
C20	100nF Ceramic capacitor	❑
C21	100nF Ceramic capacitor	❑

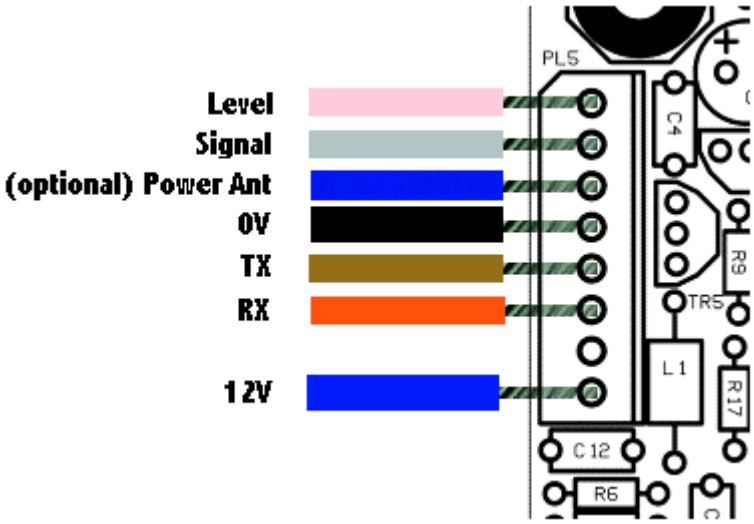
C22	100nF Ceramic capacitor	❑
C23	22pF Ceramic capacitor	❑
C24	22pF Ceramic capacitor	❑
L1	Axial ferrite bead	❑
L2	Axial ferrite bead	❑
L3	Axial ferrite bead	❑
L4	Axial ferrite bead	❑
L6	Axial ferrite bead	❑
PL1	10-way 2.54mm SIL header	❑
PL4	10-way 2.54mm SIL socket	❑
PL6	5-way 2.54mm SIL header	❑
G1	A81-C90X Gas discharge tube	❑
F1	4 Amp polyfuse	❑
LK1	2-way 2mm SIL header	❑
LK2	2-way 2mm SIL header	❑
	50cm Blue wire	❑
	50cm Blue wire	❑
	50cm Black wire	❑
	50cm Brown wire	❑
	50cm Pink wire	❑
	50cm Grey wire	❑
	50cm Red wire	❑
	50cm Shielded twin core wire	❑
	50cm 50 ohm Coax	❑
	Antenna connector	❑
	3.5mm Stereo line socket	❑
	8-way Molex socket	❑
	Molex pin connector	❑
	Molex pin connector	❑
	Molex pin connector	❑
	Molex pin connector	❑
	Molex pin connector	❑
	Molex pin connector	❑
	Molex pin connector	❑
	Molex pin connector	❑
	3mm Plastic rivet	❑
	3mm Plastic rivet	❑
	20mm M3 mounting pillar	❑
	20mm M3 mounting pillar	❑
	20mm M3 mounting pillar	❑
	20mm M3 mounting pillar	❑
	M3 x 6mm pozidrive machine screw	❑
	M3 x 6mm pozidrive machine screw	❑
	M3 x 6mm pozidrive machine screw	❑
	M3 x 6mm pozidrive machine screw	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	M3 Stainless crinkle washer	❑
	Cable tie	❑
	Cable tie	❑
	ABS box	❑
	Processor PCB	❑
	Tuner PCB	❑



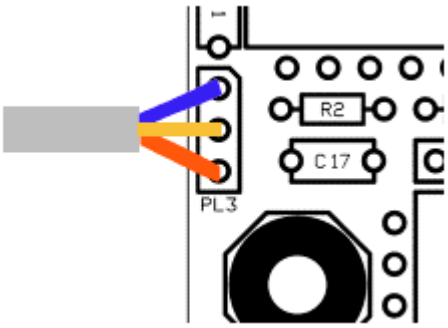
Processor board component overlay



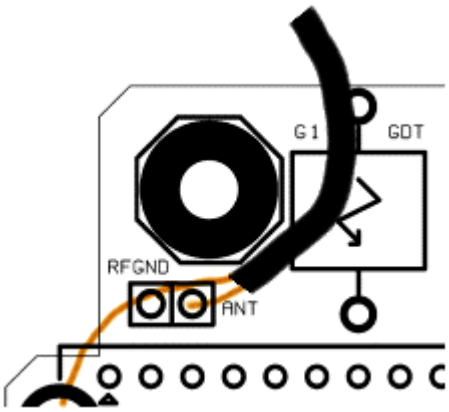
RF board component overlay



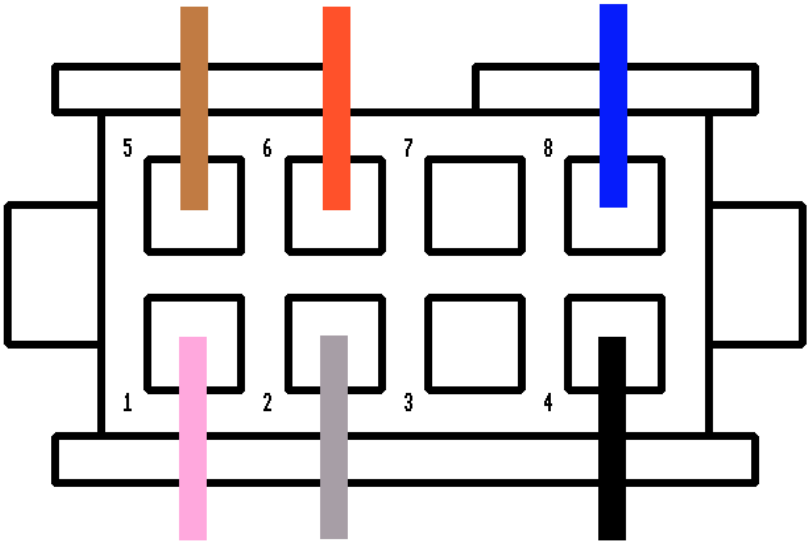
Signal cable wiring



Stalk wiring



Antenna wiring



Tuner connector wiring

Stalk connector wiring