Revision History

Always make sure that you are using the most recent version of this document. It will be updated periodically.

27-4-16 First issued
28-4-16 Removed references to Kapton tape as the module is now supplied with tape.
4-5-16 Revised power take-off point (thanks Roger G7RUH). This fixes two problems: the power to the module is now a switched supply and it now works on battery power as well as when the radio is powered from a DC source via the rear panel connector.
10-5-16 Small changes suggested by M0HEH
11-5-16 Added better photographs showing power take-off.
15-9-16 Added warning about red wire
31-3-2021 Correct pin number in step 26
26-07-2022 Add note to step 6 about bottom cover.
07-04-2023 Add background information about how the module works (last page of document) and clarify that menu option 38 should always be set to CW after installation.
12-03-2024 Correct typo in step 21, expected narrow voltage is around 0.04V not 0.4V.

Installing the LASERBEAM-817 Filter

The LASERBEAM-817 Filter Module has been designed specifically for the FT-817. It provides two high quality audio filters (SSB and CW). These audio filters can be used with the optional filters in the FT-817 to greatly improve their performance or as a cost-effective alternative to installing a plug-in CW filter. Prior to installing your filter, ***please read the FAQ on the product page*** at our website as the module has several effects.

The installation requires modifications to the FT-817. These should be within the capability of any technically competent radio amateur. However, before attempting the modifications I advise that you read through these instructions. If you do not feel capable of carrying them out, you can return the filter to me (in new condition). I will refund the filter cost – you will only pay shipping and handling charges. You must contact me to arrange to return the filter within 10 working days of receiving it.

Installing a LASERBEAM-817 Filter may invalidate any warranty that you have on your FT-817.

We have worked hard to make these instructions accurate but errors can creep in. There are at least two versions of the Main PCB in FT-817s and there are numerous after-market modifications that can change how things work. Exercise caution.

Installation

You will need screwdrivers, wire cutters, a soldering iron with a fine tip and fine solder (0.6mm or less). You will need a well-lit work area.

Pre-installation check

First, evaluate the stock filters. A simple way to do this, is to set your radio to LSB and tune into a strong carrier on the Medium-wave band; ideally one that is zero-beat on a frequency where kilohertz part is zero e.g. 1089.0 kHz. Tune HF gradually until you start to hear the carrier (low tone). Note the frequency that you start to hear it (e.g. 1089.16). Continue tuning HF (note increases in frequency) until you reach the point where you cannot hear it. Note this frequency (e.g. 1092.7kHz). If you have a CW filter installed, do the test again with it selected (use mode CWR). Keep these readings.

If you have a signal generator or a noise source, these can be used to do the tests rather more effectively.

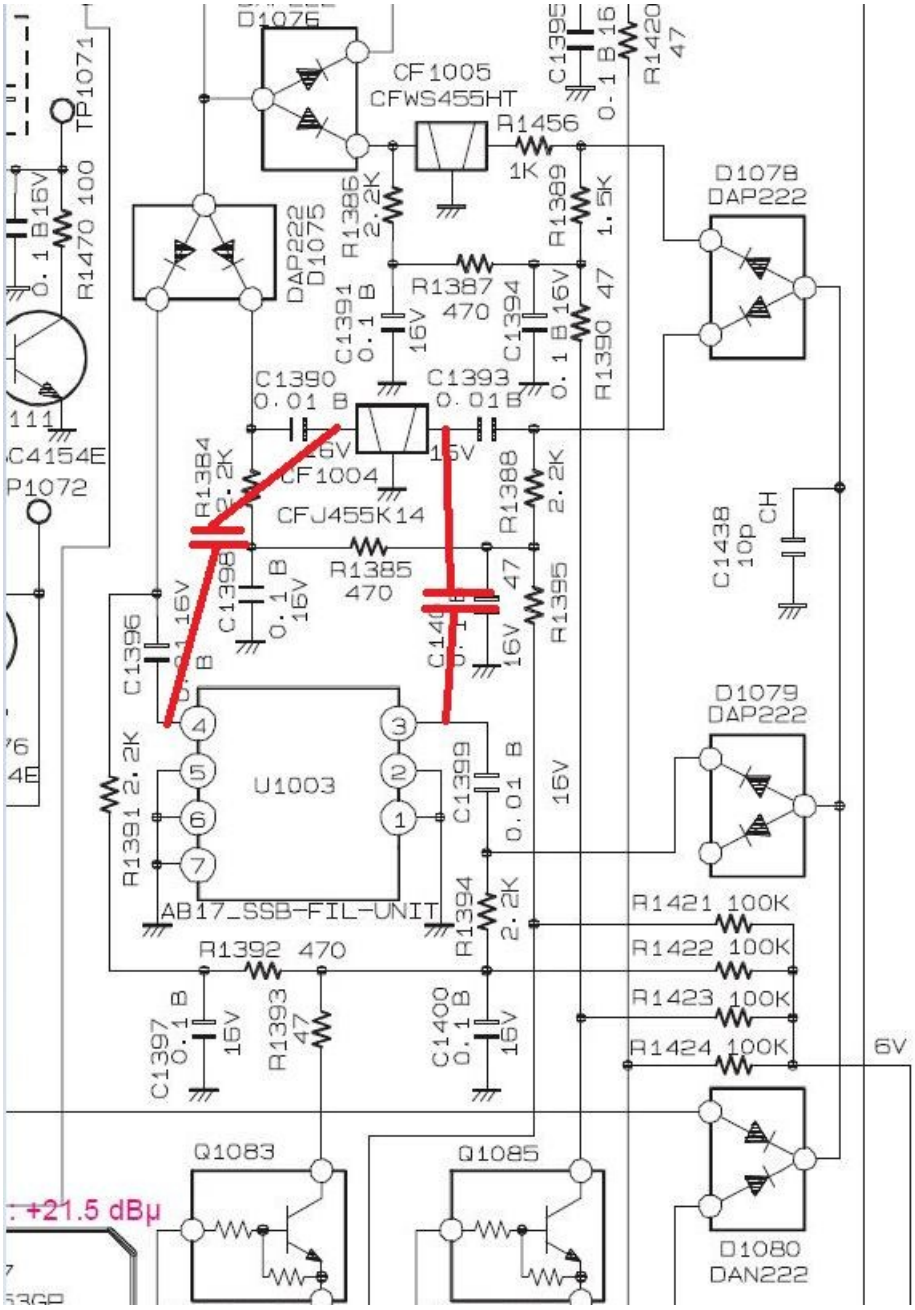
	Standard SSB	Standard CW	LASERBEAM SSB	LASERBEAM CW
LOWEST TONE				
HIGHEST TONE				
BANDWIDTH* = highest-lowest				

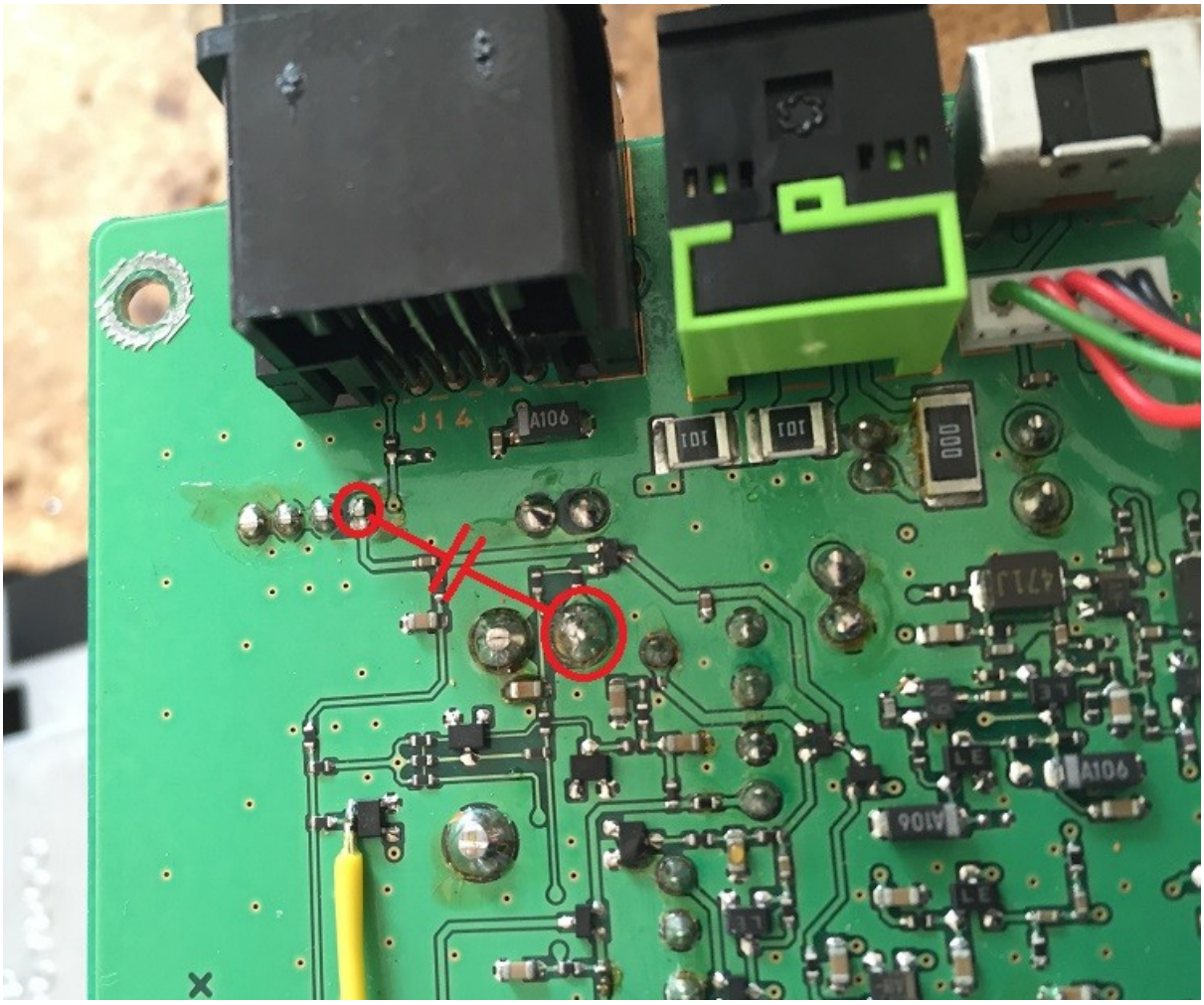
*perceived bandwidth

Installation Details

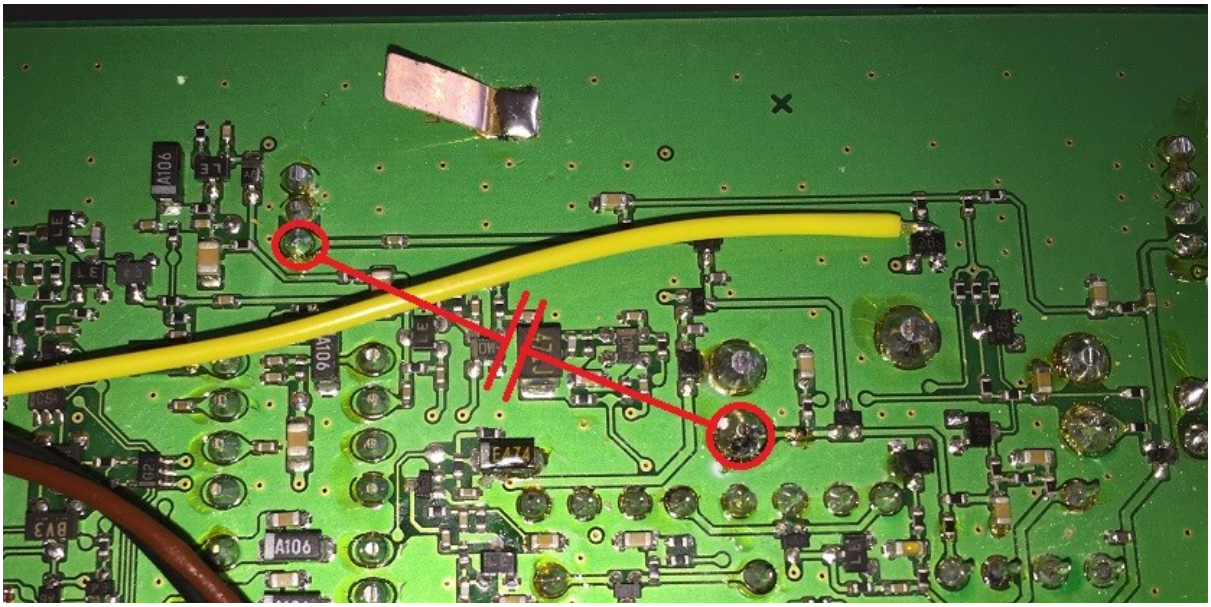
NOTE: as part of the installation kit we supply clear sleeving and grey heatshrink sleeving. For clarity these are not shown in the instructions however we do advise using it to insulate and protect connections where necessary.

1. Remove the battery pack from the bottom hatch.
2. Unscrew the top cover from your FT-817 (two screws top-front, two screws each side, one screw back).
3. Carefully remove the cover, unplugging the speaker.
4. Remove the 5 screws holding the Main PCB in place.
5. Unplug the two co-ax connectors.
6. Remove the plastic surround for the sockets on the right-hand side.
   In some cases, it might be easier to do this if you first also remove the bottom cover of the radio.
7. Unplug the small ribbon connector towards the rear of the board in the middle.
8. Lift the board out and lay forward to reveal the reverse side of the board – be careful of the connector on the underside of the board and make sure that the battery connector does not catch.
9. ***If you have the optional mechanical filter installed, skip this stage.*** **If you do not have an optional mechanical filter installed:** solder one of the supplied capacitors from the input of the ceramic filter to the input of the optional filter. Solder the other capacitor from the output of the ceramic filter to the output of the optional filter. Use the thin sleeving provided to insulate the capacitors. Stick Kapton tape under them if you wish, to provide insulation.


D1076
CF1005
CFWS455HT
R1456
1K
C1395
0.1 B 16
R1420
47
TP1071
R1470 100
0.1 B 16V
DAP222
D1075
R1386
2.2K
R1389
1.5K
D107B
DAP222
R1387
470
C1391
0.1 B
16V
C1394
0.1 B 16V
R1390
47
C1390
0.01 B
C1393
0.01 B
16V
16V
C4154E
P1072
R1384
0.2K
CF1004
CFJ455K14
R1388
2.2K
C1438
10p
CH
R1385
470
C1398
0.1 B
16V
C1396
0.1 B
16V
R1395
47
16V
D1079
DAP222
U1003
AB17_SSB-FIL-UNIT
R1391
2.2K
C1399
0.01 B
16V
R1394
2.2K
R1421 100K
R1422 100K
R1423 100K
R1424 100K
6V
R1392 470
C1397
0.1 B
16V
R1393
47
C1400
0.1 B
16V
Q1083
Q1085
+21.5 dBµ
D1080
DAN222



Your radio will not have the yellow wire installed at this stage.



Your radio will not have the yellow wire installed at this stage.

10 Power is taken from the emitter of transistor Q1082 (TP1084) on the top side of the board as shown. The red wire can be routed under the PCB.

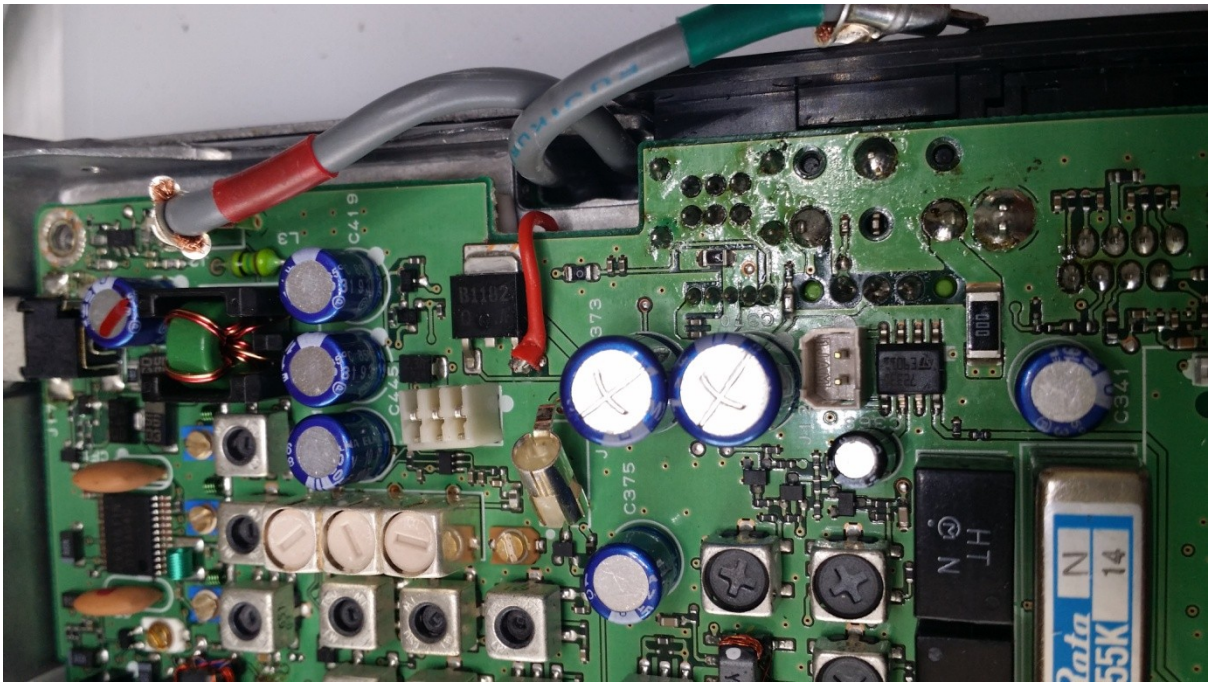
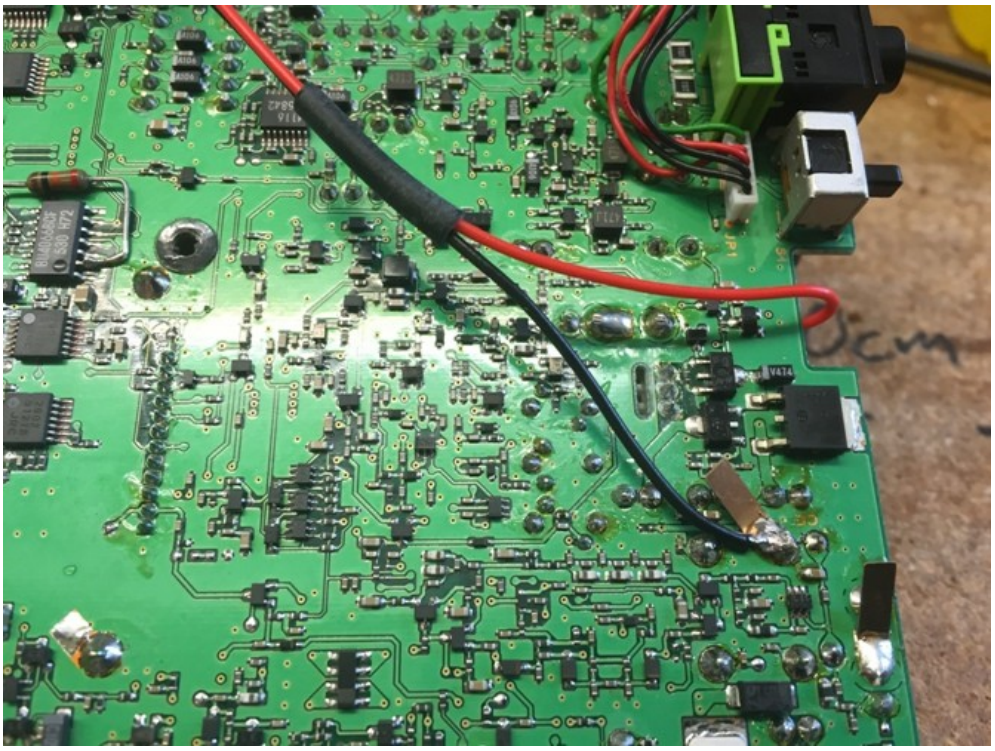
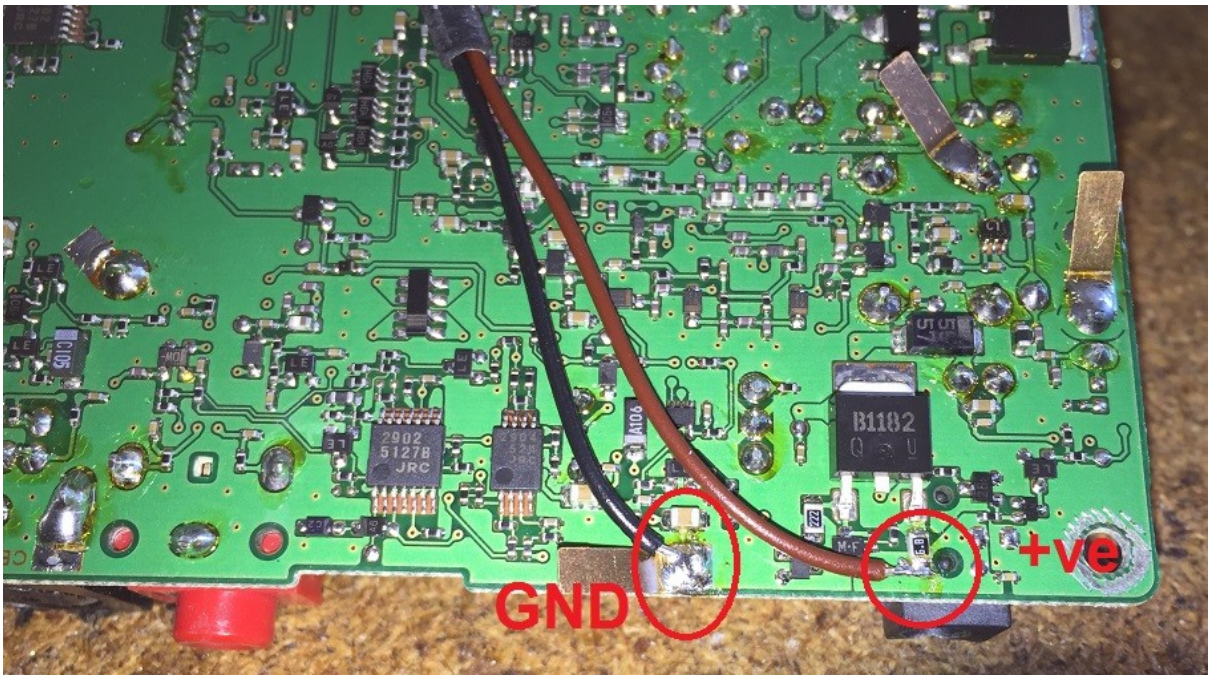


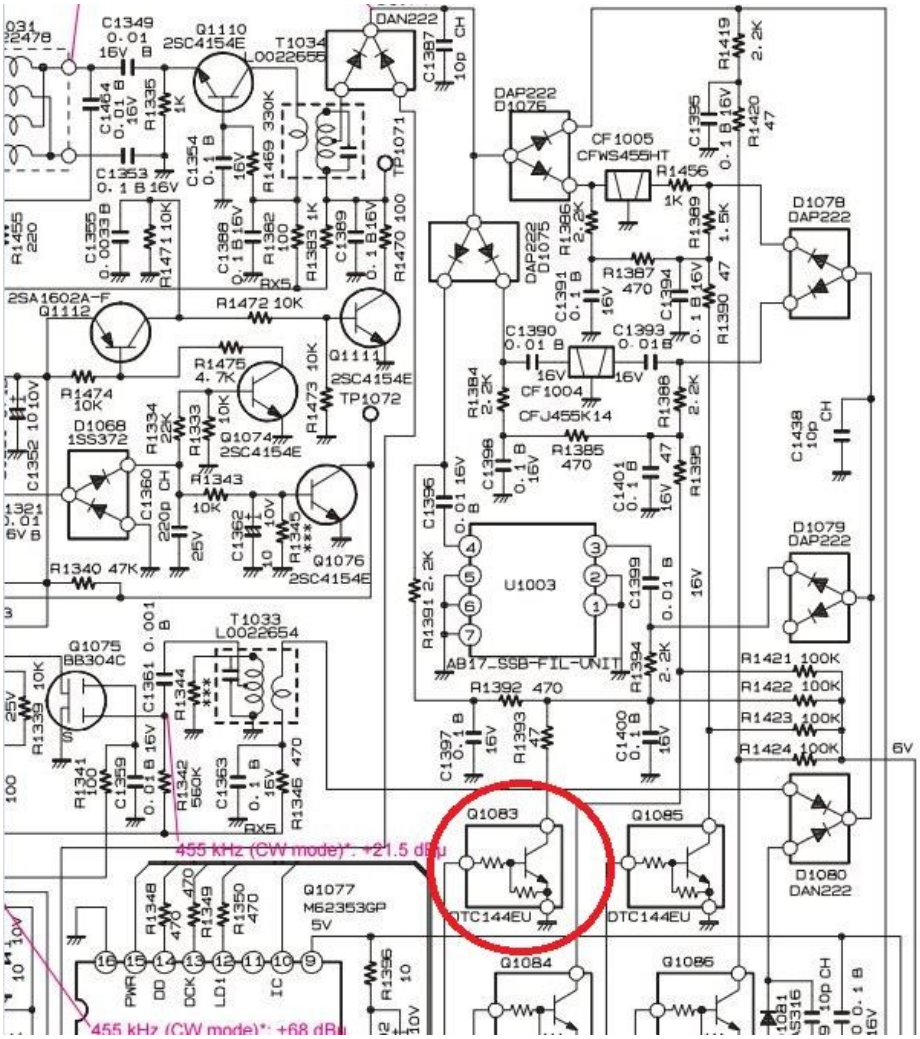
Photo © Roger G7RUH, used with permission

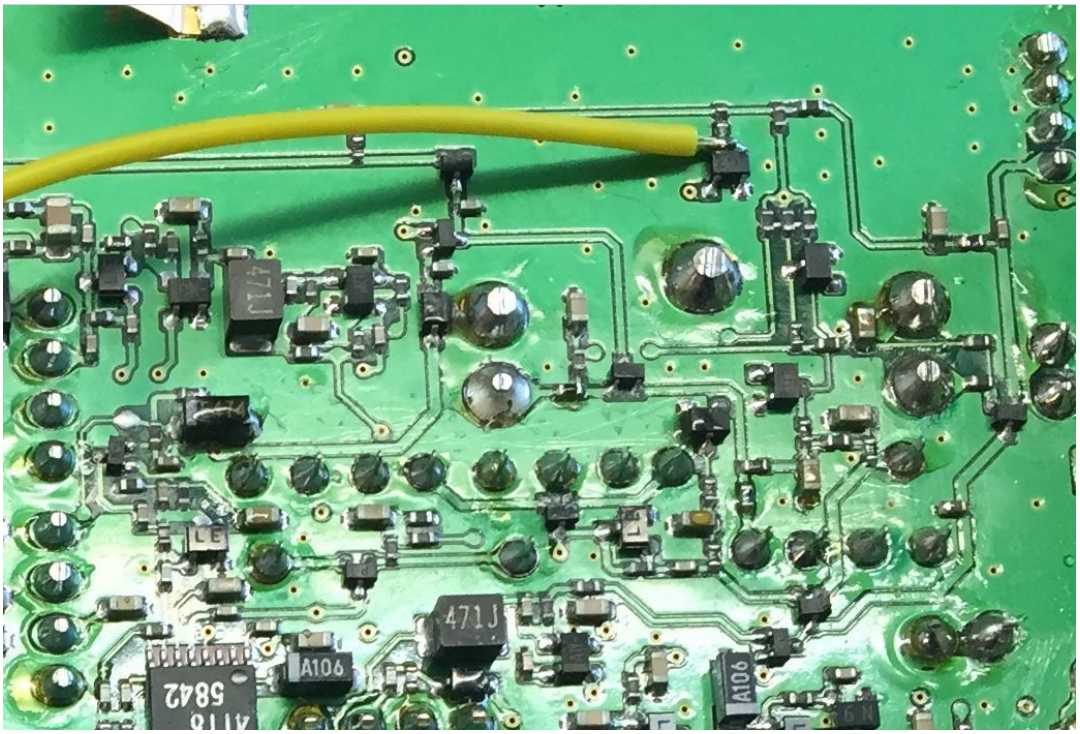
11 Solder the black wire (ground) on the underside of the board as shown. Dress this (along with the red wire) to the left of the FT-817 [OPTIONAL some builders prefer to route the red wire over the top of the board to reduce the risk of it being trapped when reassembling the radio].



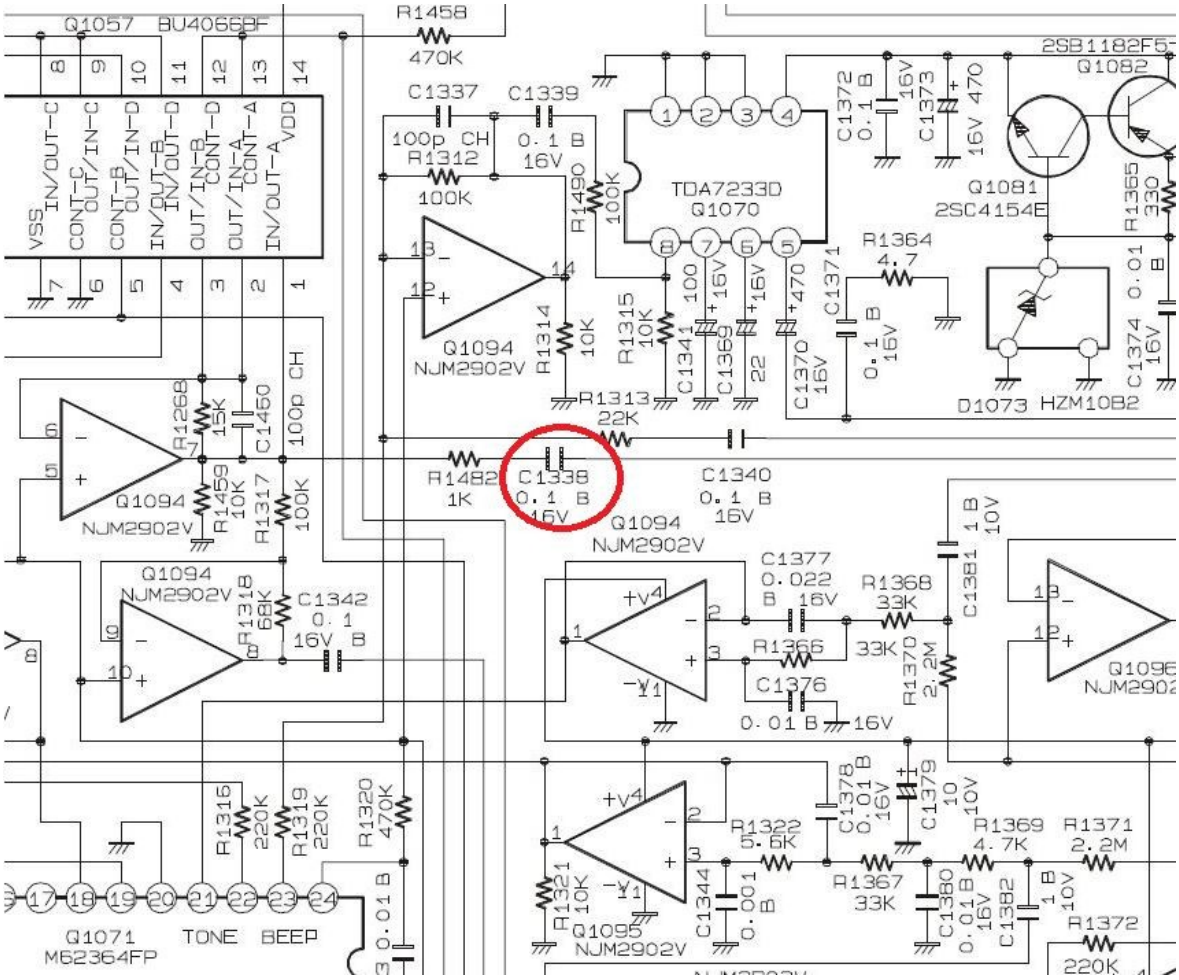


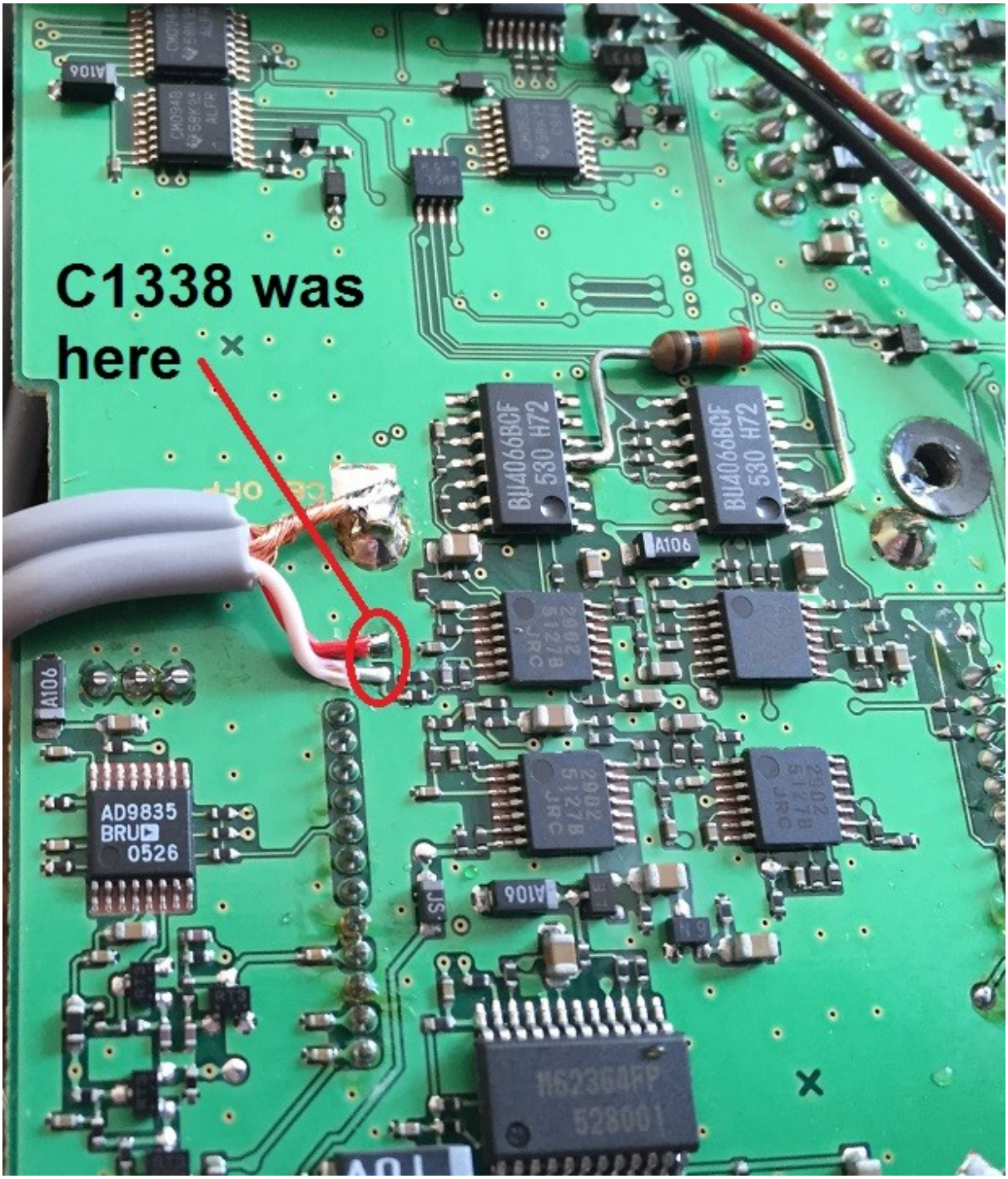
12 Solder the yellow switching wire to the collector of Q1083 (care required). Dress to the left of the FT-817.



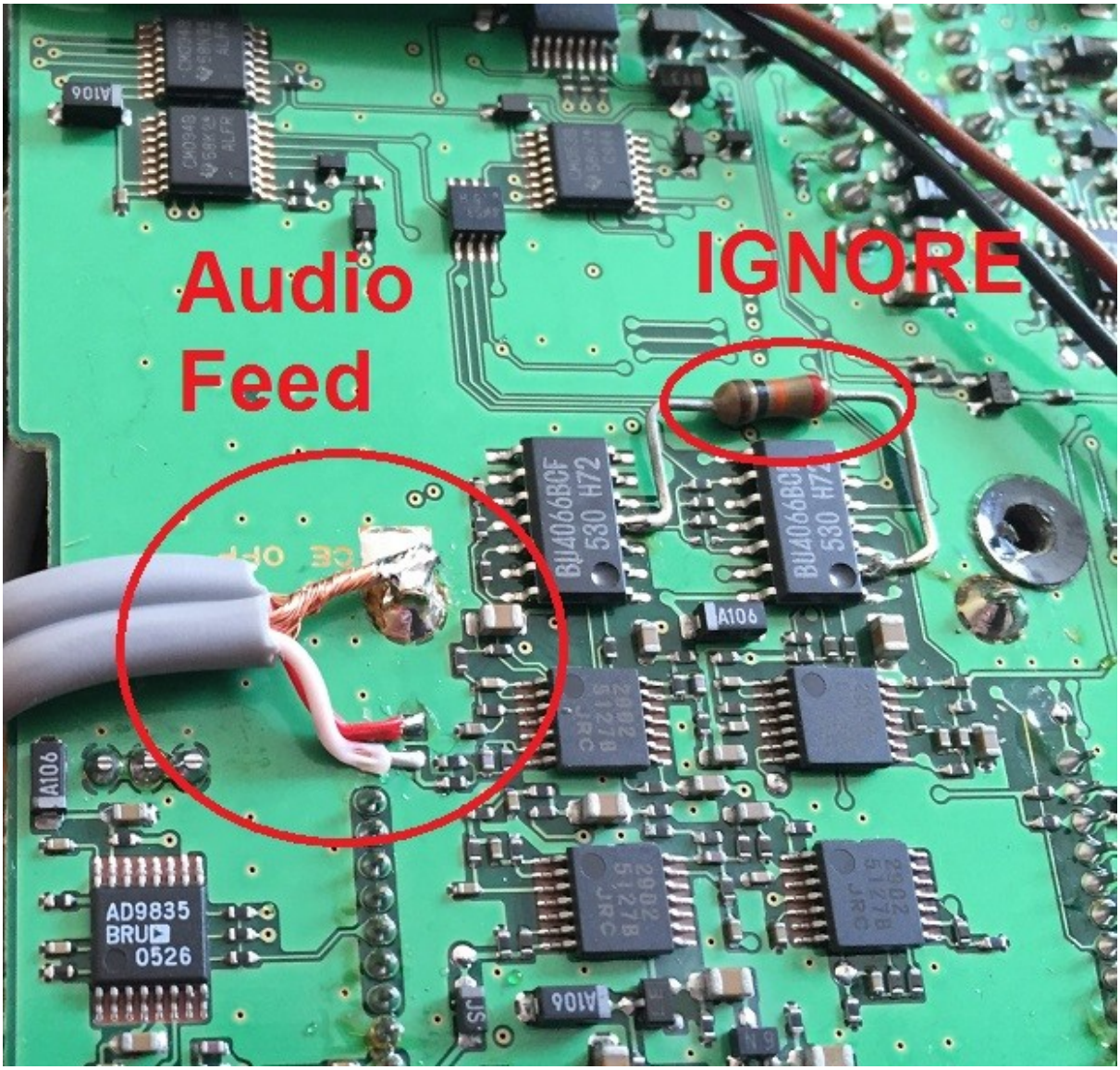


13 Remove C1338 by adding a little solder to each end of the capacitor and moving your iron from one end to the other. No force should be needed, the capacitor should easily lift or slide off when the solder is hot enough at both ends.

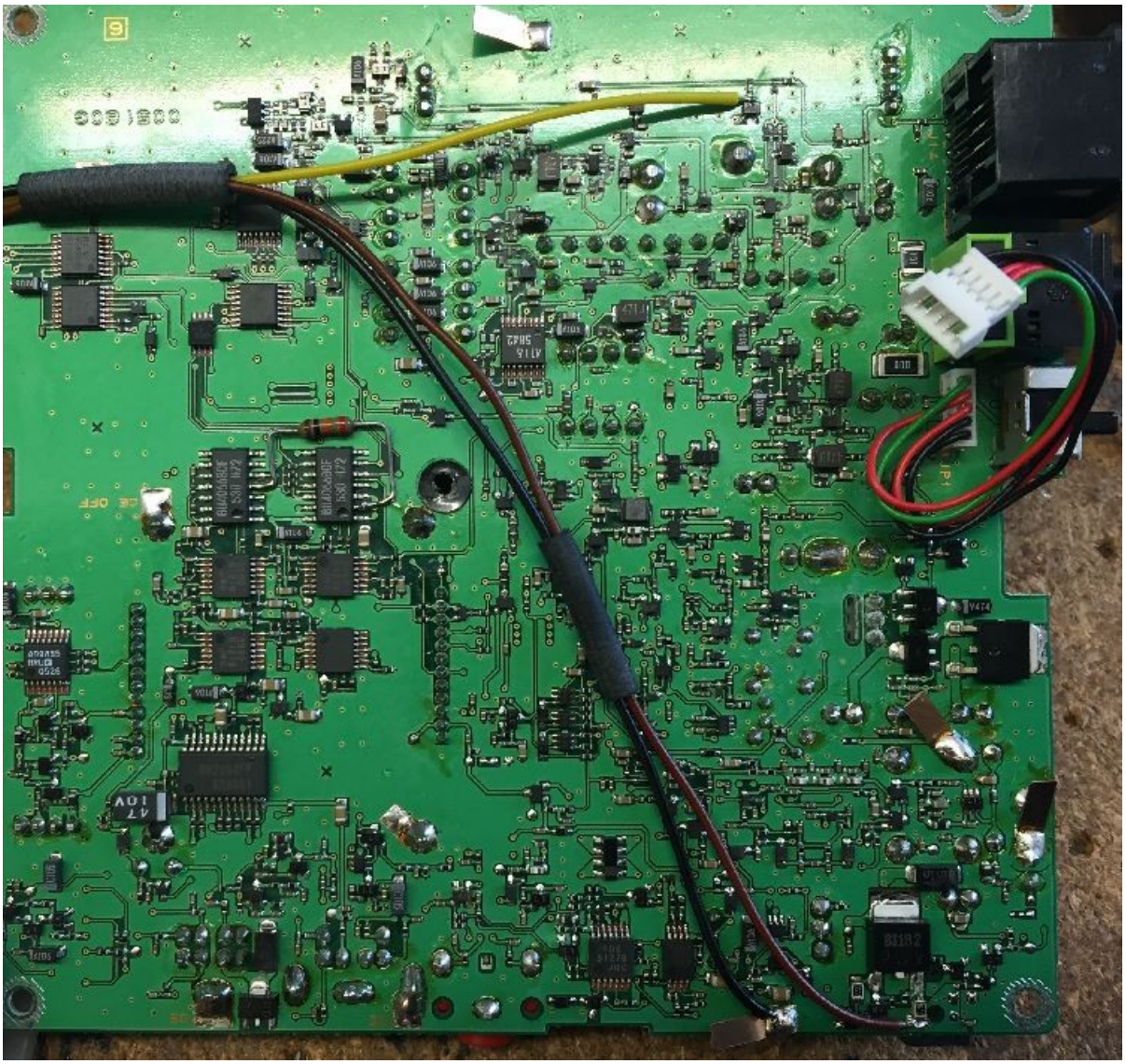




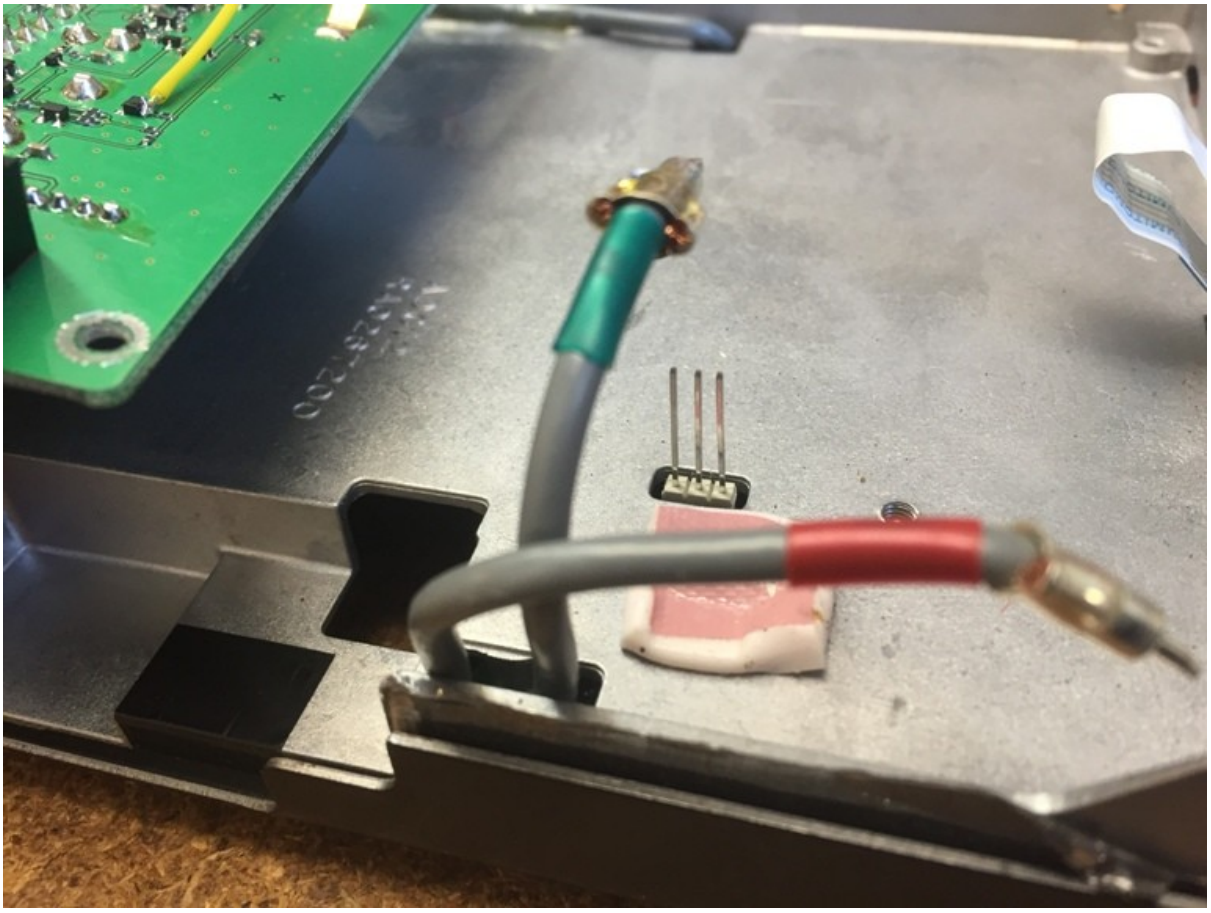
14 Keep C1338 by taping it to the underside of the Main PCB (this will allow you to reverse the modifications if required).
15 Clean the capacitor pads with solder-wick if needed.
16 Dress the end of the screened cable as shown. Solder the red core to upper capacitor pad and the white core to the lower capacitor pad.



17 Solder the screen of the screened cable to an earth point. Dress the screened cable to the left of the FT-817.



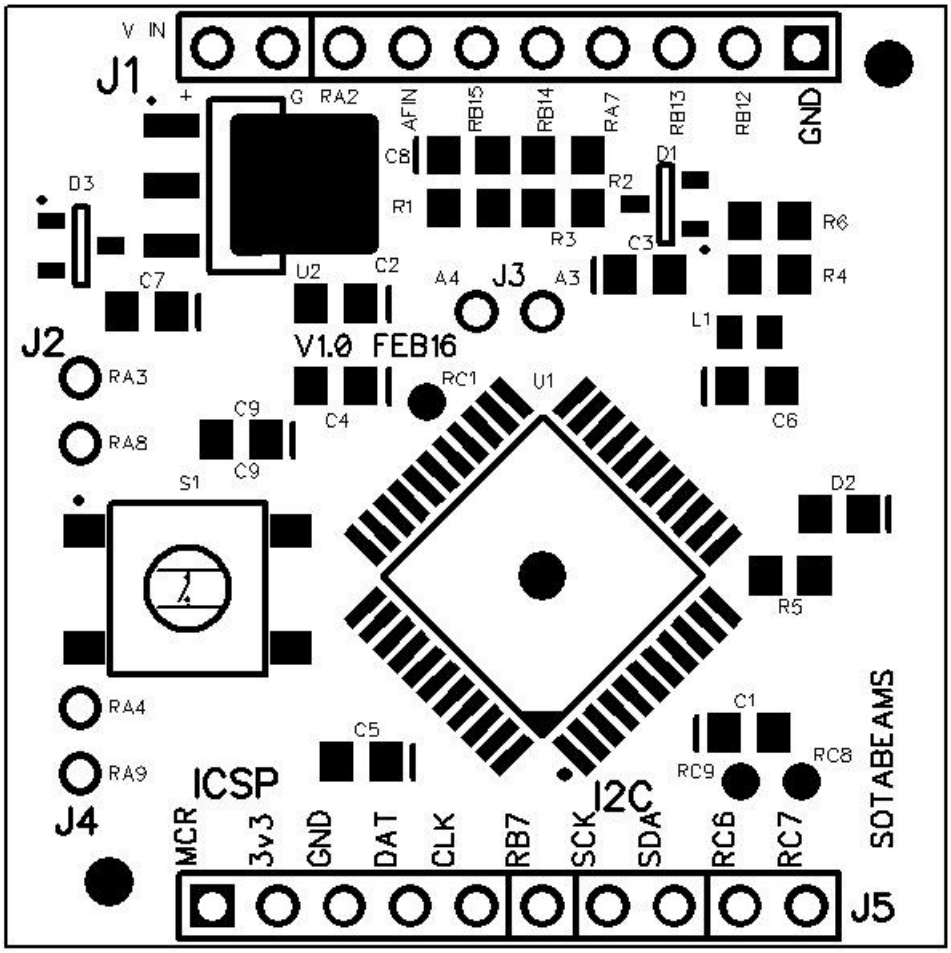
18 Carefully flip the Main Board back over and re-fasten it. Note that this is easier said than done. **Be careful not to trap the battery connector or the red power feed to the filter**. Make sure that the ribbon cable is not left under the board (I tend to tape it out of the way). Make sure that the three pins line up with the white socket on the underside of the board (tricky).



The tricky three pin connector

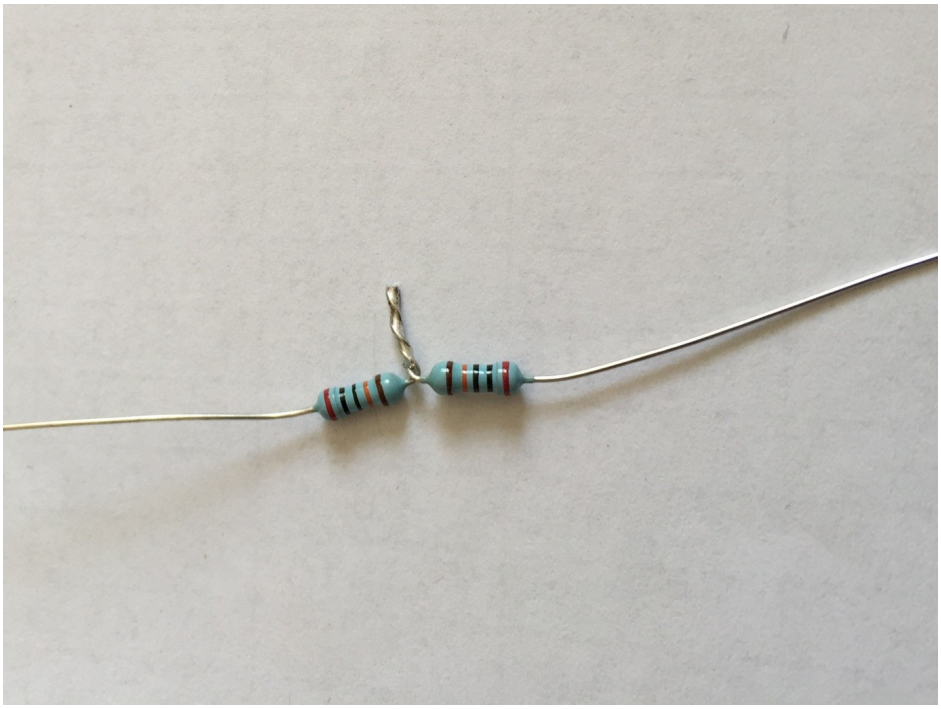
19 You should now have three single wires and a screened cable on the left hand side of the FT-817. These need to be near the blank board area (front left) by the multi-way ribbon connector to front panel.
20 Carefully connect power to your FT-817. Check that you can measure the supply voltage between the red and black cables.
21 Making sure that the optional filter is enabled (MENU item 38 = CW), set the radio mode to CW and switch between wide and narrow (toggle NAR, use F button to select the correct menu). Check that the voltage on the yellow wire toggles between about 0.04 Volts (narrow) and 6.5 Volts (wide).
22 Disconnect power from the radio.

23 Trim and solder the red wire (supply) to J1 pin 10 on the module (Vin). Solder on the upper side of the module – do not poke the wire through the hole as the underside of the module **must be perfectly flat**. [Note photograph shows a brown wire where the red wire is soldered – this was a pre-production prototype.]



24 Trim and solder the black wire to J1 pin 9 (G). Solder on the upper side of the module – do not poke the wire through the hole as the underside of the module must be perfectly flat.

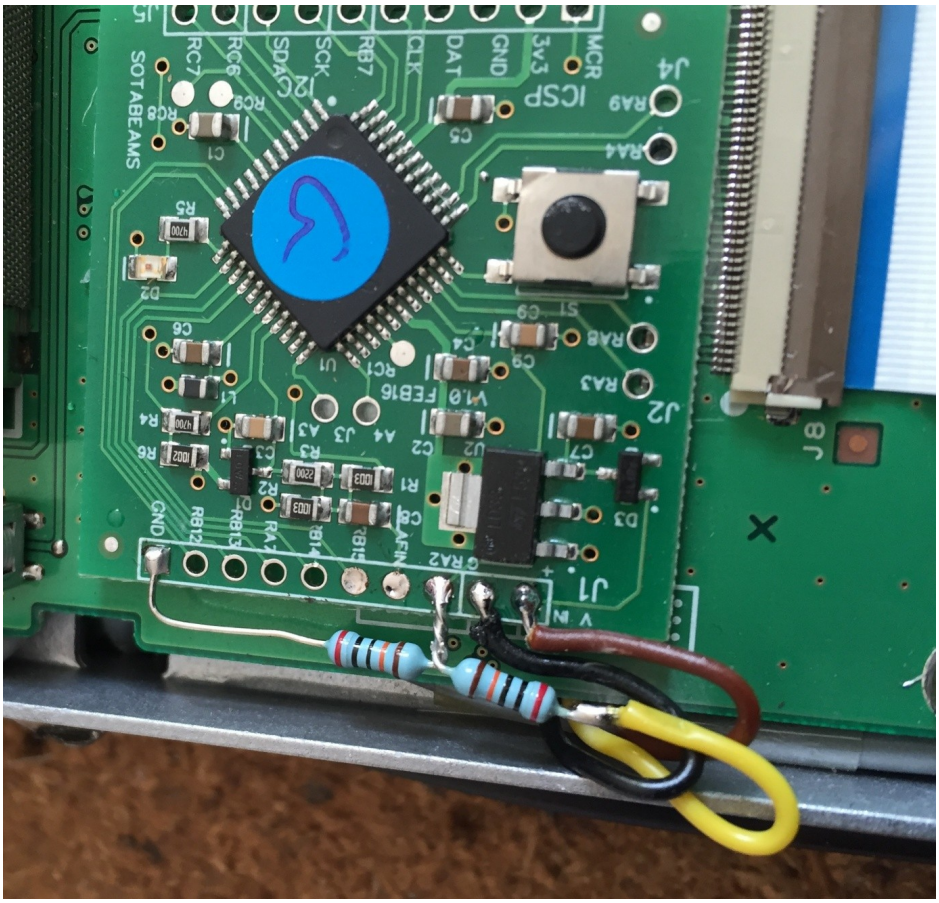
25 Solder the two 200K Ohm resistors together as shown.



26 Solder the junction of the resistors to the switch pad (J1 Pin 8 – marked RA2).

27 Solder one end of the resistors to ground on the filter PCB (J1 Pin 1 – square pad).

28 Trim and solder the yellow wire to the other end of the resistors.

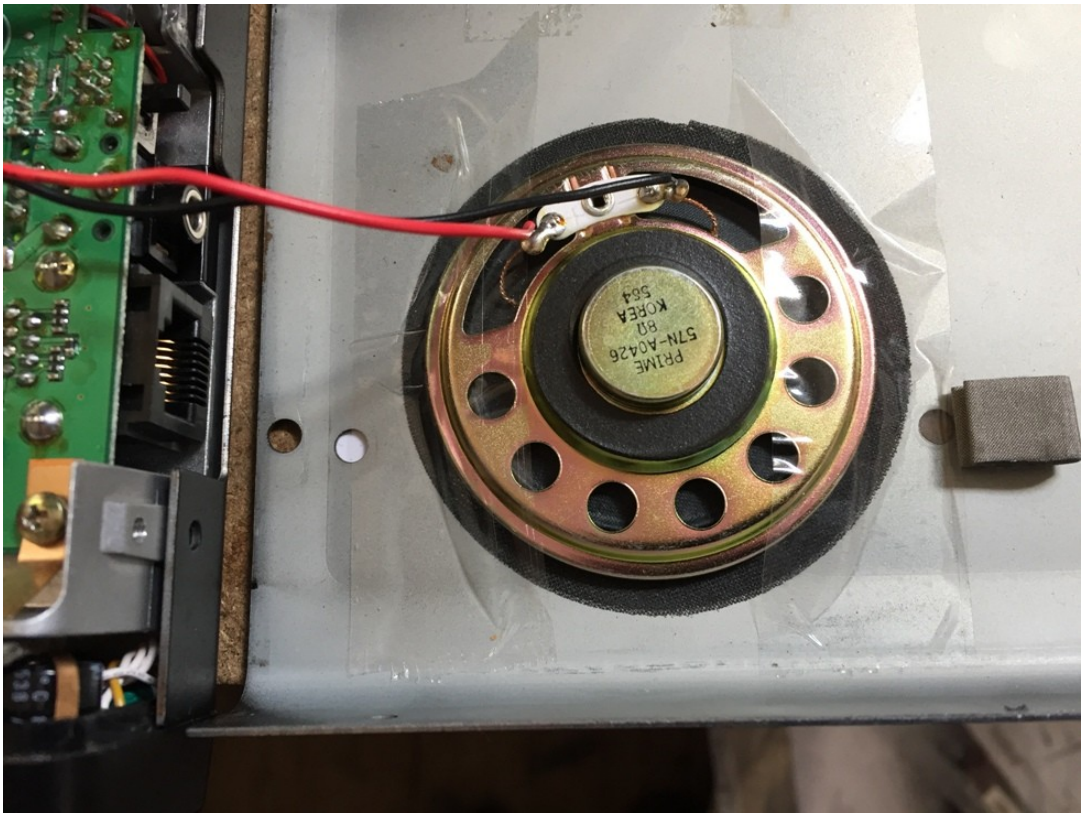


29 Dress the end of the screened cable. Solder the screens together – but not to anything else.
30 Solder the white core to J1 Pin 7 (AF IN).
31 Solder the red core to J1 Pin 6 (RB15).

32 Peel off pink tape layer, and attach the PCB to the upper side of the Main PCB as shown. NOTE: ***it is often easier to stick the board down before making the connections.***
33 Apply power to the FT-817 and toggle between wide and narrow. The LED on the PCB should be off when “NAR” is selected.
34 Make sure that your radio works with both its internal battery pack and with an external power source.
35 Remove the power.
36 Remove the bracket that fastens the speaker to the lid of the FT-817. Remove the speaker and remove the foam padding that sits between the speaker and the case.
37 Attach the speaker to the centre of the speaker grille using tape. We used ordinary Sellotape. One customer has suggested using hot-melt glue – use your ingenuity!
38 Removing the bracket leave two screw holes in the top cover of the FT-817. The original screws can be fitted with nuts (M2.5 – not supplied) to fill the holes or black tape can be used to cover them.

Customer Tip:

I made just one change, if you remember I was concerned about the placement and fixing of the internal loudspeaker, after a little research purchased a slightly smaller and thinner (50mm x 7mm) unit from RS Part Number 719-1964. This fitted perfectly in the original position so all looks pretty original. Sound just the same as the original and costs around €7.00 probably around a fiver in the UK. Tony EI6DT May 2016



39 Reassemble the FT-187 making sure that the speaker magnet sits over the processor on the LASERBEAM-817 module – and does not press the button on the module. [customer tip M0HEH: if you put a thin layer of BluTack on the speaker coil, you can press the lid of your radio gently closed to get a physical impression of where the coil touches the LASERBEAM-817 pcb].

40 Repeat the tests that you did at the start ***"pre-installation check"*** and note the figures. The improvement in performance should be immediately obvious!

Note: after the Laserbeam-817 module has been installed according to these instructions, menu option 38 should be set to CW at all times in order to make the filter switching work correctly. This is the same regardless of the radio mode, or of which optional mechanical filter (if any) is installed. The module will then use the SSB filter at all times, unless the radio is in a CW mode with NAR turned on, in which case it will use the CW filter.

Typical Voltages on Module PCB with DC input to FT-817 via rear connector = 12.5 Volts

FT-817 switched on.

Red wire (Vin) = 12.1 Volts

Switching wire

NAR (on) = 0 Volts

NAR (OFF) = 2.6 Volts

Details about how the module works

The Laserbeam-817 module connects into the audio frequency stage of the radio - the audio input/output connections to the module replace a DC blocking capacitor in the FT- 817/818's audio signal output path. The filter is always in circuit and active once installed.

The module contains two digital filters, a single narrow one for CW and a single wide one for SSB. It switches between them based on the voltage at the RA2 terminal, which is connected via the resistors and yellow wire to the FT- 817/818's signal for enabling or disabling the optional mechanical filter module (YF-122S/C/CN) in one of the IF stages. If the FT- 817/818 signal indicates that the optional filter should be switched in, then our module uses the CW filter. If the signal indicates that the optional filter should not be used, our module uses the SSB filter.

The optional mechanical filter comes in SSB, CW, or CW narrow variants, and menu option 38 is used to tell the radio which type of optional filter is installed. The filter enable/disable signal generated by the radio is based on the radio's current mode and on the settings of NAR and menu 38.

To make the Laserbeam module's filter switching work correctly, menu 38 should be set to CW. The module will then use the SSB filter at all times, unless the radio is in a CW mode with NAR turned on, in which case it will use the CW filter. Menu 38 does not need to be changed when changing modes, it should always be set to CW.

For advice and to give suggestions on how we can improve these instructions, please contact support@sotabeams.co.uk