Quartzmite construction notes

These are the construction notes for building a Quartzmite on the V1.0 prototype boards.

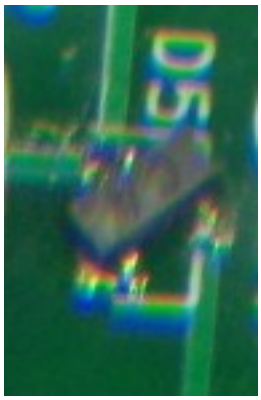
Board Errata

There are a few minor errors and changes on the V1.0 PCB:

The middle connection for the two crystals is supposed to be a ground, but the pad is actually isolated, a ground pad has been created next to them on the back of the PCB and the ground lead from the crystal case should be soldered to this.

The clearance between the extended heat-sink tab for Q6 was **very** close to the ground connection for the secondary of T1, the clearance has been extended by cutting away a small portion of the tab.

The footprint for D5, the varicap diode is incorrect, it should be fitted rotated as shown in the image to the right.



The sense of the sidetone level pot RV1 is reversed, max volume is fully anti-clockwise.

C15 & C29 have been changed to physically larger parts to get a higher voltage rating, they will still fit but care should be taken.

The second Zener diode D7 was added to the design after the boards were made. To enable D7 to be fitted the track between the drain of Q2 and the junction of R10, R11 and D4 has been cut. D7 can be fitted over the cut track between the drain of Q2 and R10.

Parts Identification

Many of the smaller parts have code numbers instead of their part number, the following table cross references part number to code number

1N4148	5HS, T4 or A2J3
BB510	CA
2N7002	K7B
MMBT4401	2X
78L05	8Cxxx
10k pot	14

Suggested construction and testing sequence

Fit the voltage regulator, U4 and it's associated capacitors C5 & C6. Temporarily fit a power connector. Connect a supply of between 9v and 12v and check that there is 5v where expected (e.g. U3 pin 1).

Fit the PIC U3 and C1, C2, C3 & C4. Temporarily fit a push button and a paddle connector. With a DMM or 'scope check that the 'shift' signal on U3 pin 3 toggles between 0v and 5v alternately each time the button is briefly pressed. Check that the sidetone squarewave can be seen on U3 pin 5 when either the dot or dash paddle is closed.
Fit the op-amp U2 and R3, R6, R7, R8, R9, C18, C19, C20 & RV1. Now fit C15, this part is much bigger than the footprint on the board due to a part change to get a higher voltage rating so care is needed. These parts form the sidetone low pass filter. Temporarily connect a pair of headphones, when keying with the paddles the sidetone should now be heard.

Fit Q4, D4, R11, R12, R13, R14, R15, C21, C22 & C23. Fit Y2 either directly to the board or in a socket. Add a ground wire from the metal can to the middle pin (see image right). These form the basic local oscillator. Fit the varicap diode D5 making sure to use the corrected orientation, see the image above. Fit R10 getting it as far from the Q2 footprint as possible to leave as much room as possible for the extra Zener diode D7 which will be fitted later. It should now be possible to see the output from the local oscillator at the emitter of Q4.

Fit Q2, then fit D7 in the space between it and R10. Listening for the local oscillator on a receiver tuned close to the crystal frequency it should be possible to detect the frequency shift up or down each time the button is pressed briefly.

Fit U1, Q1, D1, D2, Y1, C7, C8, C9, C10, C11, C12, C13, C14, C16, C17, R1, R2, R3, R5, R20. Either fit R4 or replace it with a 1M pot to act as a volume control. These parts comprise the receiver, if an antenna is connected to point 'A' on the schematic then signals should be heard.

Fit Q6 since it is easier to fit before L1 is fitted in the next step.

Fit the capacitors in the low pass filter, C30/C301, C31/C311, C32/C321, C33/C331, C34/C341 these are in parallel pairs so that exact values can be obtained. Not all positions have both fitted, it is band dependent. Then wind and fit L1 and L2. Connecting an antenna to the antenna connection should now enable signals to be heard in the receiver.

Fit Q3 and D3. The receiver audio should now mute when keying with the paddles.

Fit C24, Q5, R16, R17 & R18. When keying with the paddles a ‘scope should show driver output at the collector of Q5.

Fit C25, C26, C27, C28, D6 & R19. Carefully fit the oversize C29. Wind transformer T1, note that the PCB pads for the primary winding are diagonally opposite each other as are the pads for the secondary winding. Choose the winding direction so that the ends come out in the correct places. With an antenna or dummy load connected there should now be RF output when keying.