Nokia Wrist Attached Sensor Platform

Development Platform Construction

Tom Ahola 2008-04-30

Contents

Tom Ahola 2008-04-30

Introduction

This document describes the construction of the development version of the Nokia Wrist Attached Sensor Platform (NWSP). Figure 1 shows the complete assembled unit. It consists of the electronics assembly clamped in between the bottom plate and window of the mechanics assembly.

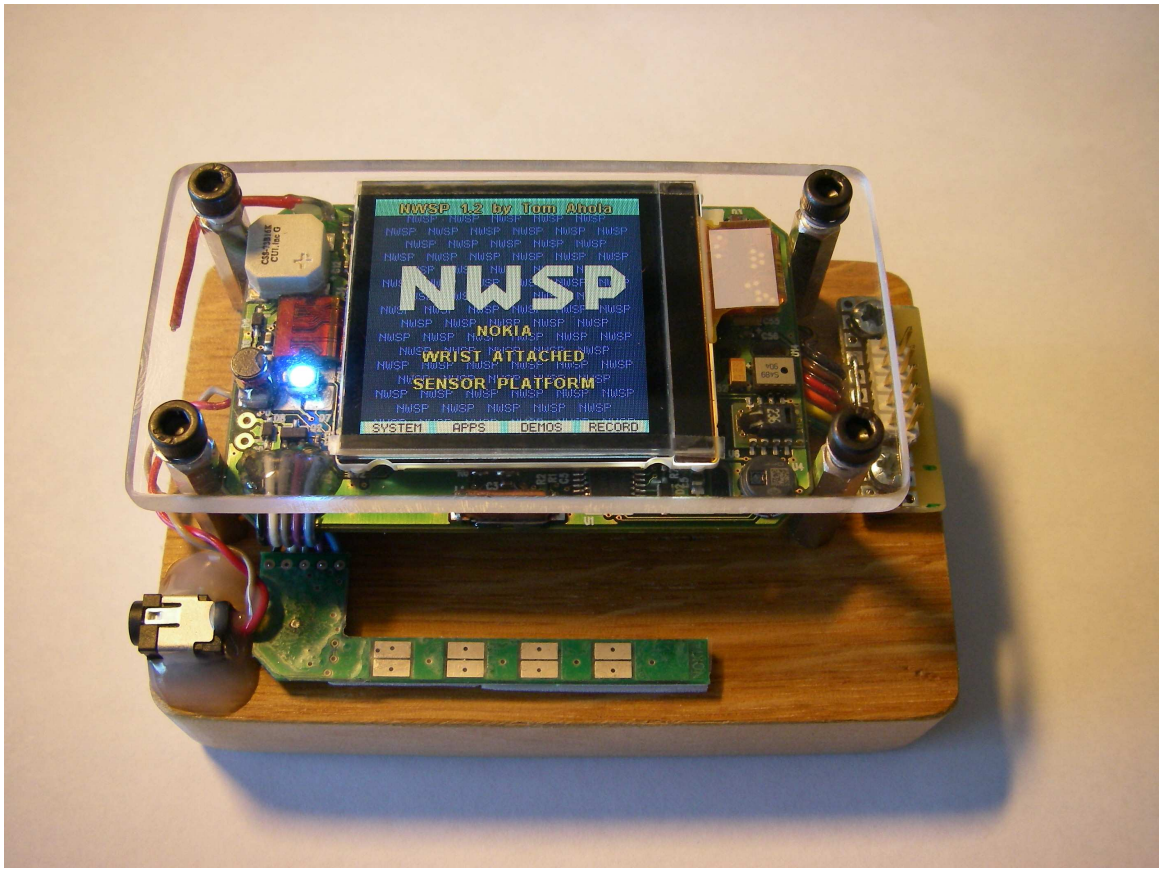

Figure 1 NWSP Development Platform Assembled and Operating

Tom Ahola 2008-04-30

1. MECHANICS ASSEMBLY

Figure 2 shows the parts of the mechanics. There is a base plate and a transparent window that is screwed to the base plate with spacers in between.

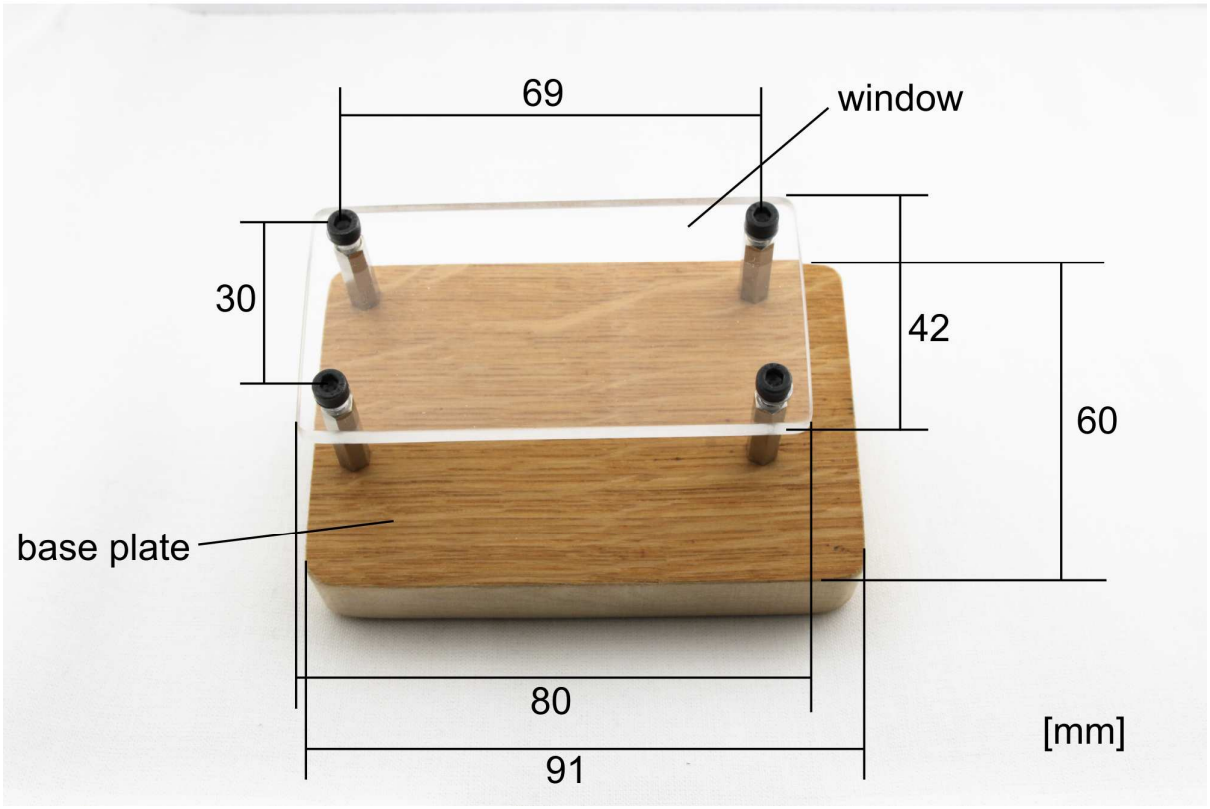

Figure 2 Parts of the mechanics

1.1 The base plate

The base plate dimensions is shown in Figure 3. The material can be any non-conductive material, such as wood or plastic. Metal can also be used if the components (charger jack, capacitive touchpad and JTAG connector) are properly insulated. The edges can be rounded. Base plate thickness can be anything between 6 and 18 mm. Four 3mm holes will hold the screws for the spacers. There should be a countersink on the bottom side of the plate for the screws. The length of the screws must be appropriate for the chosen thickness of the base plate.

base plate

material: plastic or wood
thickness: 6-18mm

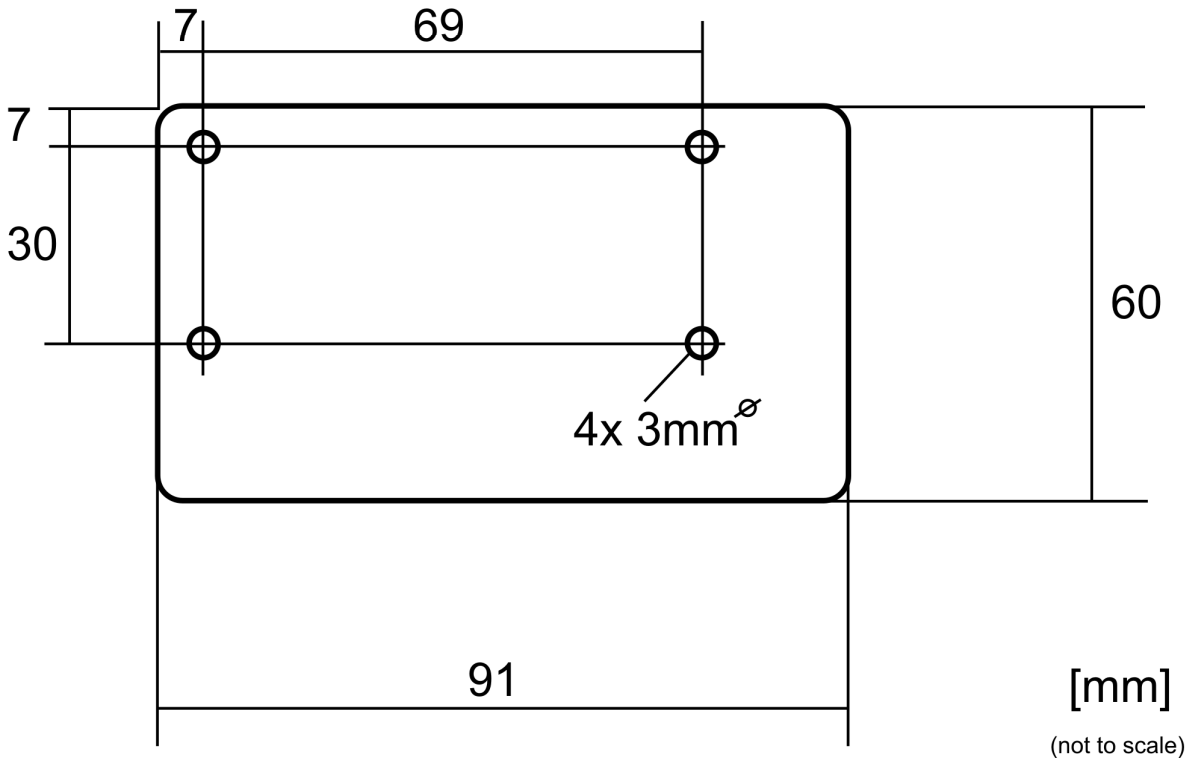

Figure 3 Base plate dimensions

1.2 The Window

The window dimensions are shown in Figure 4. The window can be any transparent plastic, acryl for example. Suitable thickness is 4mm. Corners can be rounded to taste (something between R2 and R4, for example). Care must be taken when drilling the 3mm holes for the spacer screws, as acryl is very brittle.

window

material: transparent plastic (eg. acryl)
thickness: 4mm

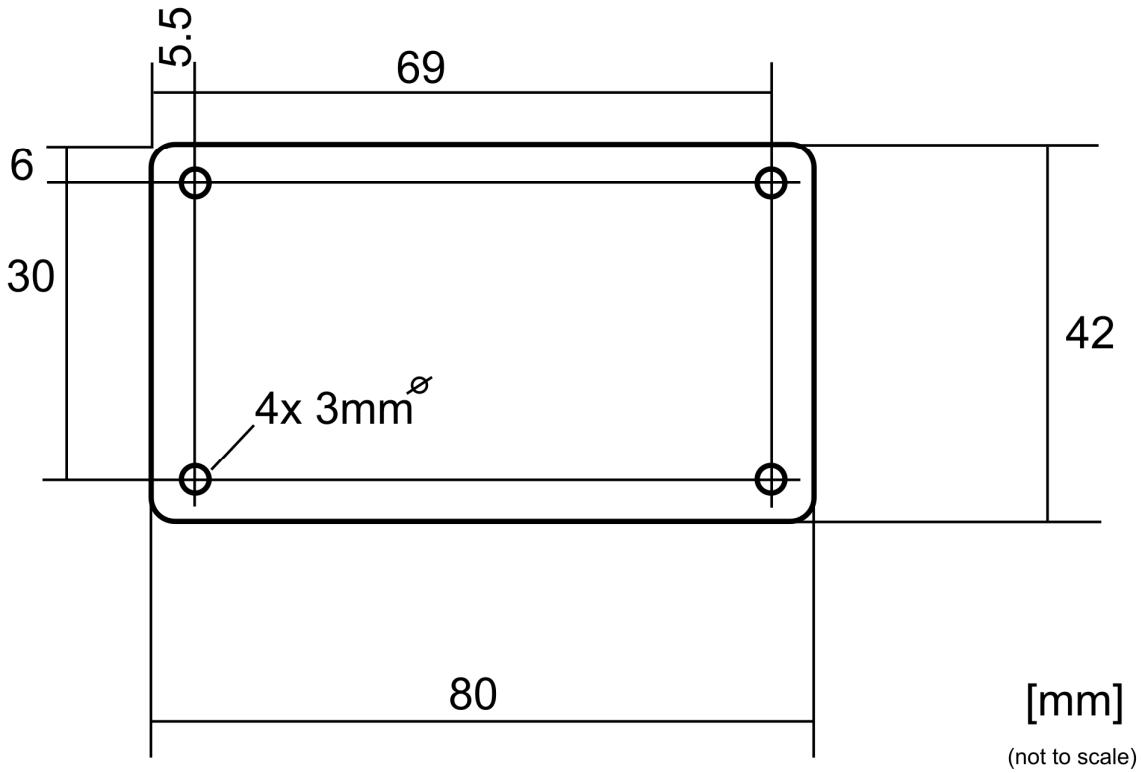

Figure 4 Window dimensions

1.3 The Spacers

Figure 5 shows the M3 spacers that hold the window above the base plate. The length of the spacers should be 18mm. The width of the spacers must not exceed 5mm, or the electronics assembly will not fit in between them. Any M3 screws can be used to tighten the window to the spacers, but for style the black hex bolts were chosen for the construction in the figure. Locking washers were also used but they are not necessary.

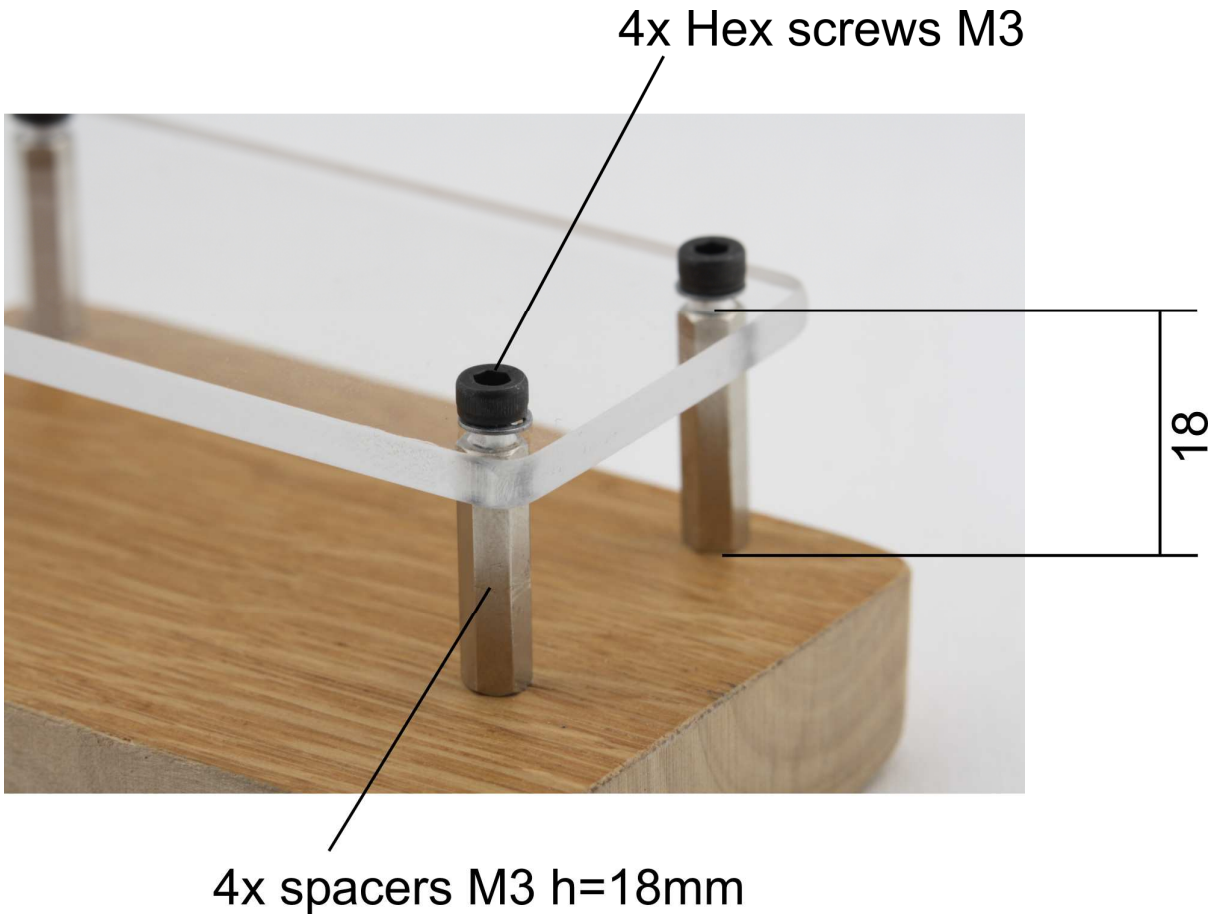

Figure 5 Spacers and screws

Figure 6 shows the details from the bottom side. There should be a countersink on the bottom side of the plate for the screws. The length of the screws must be appropriate for the chosen thickness of the base plate. Four rubber feet are attached to the bottom in each corner. There are available rubber feet with adhesive to just stick them to the bottom. Any small sized rubber feet will do.

Figure 6 Bottom details

2. FINAL ASSEMBLY

2.1 Bluetooth antenna and keypad

Start by attaching the Bluetooth antenna and touch keypad to the add-on board as shown in Figure 7. The wires for the keypad can be a piece of ribbon cable or separate wires. The keypad circuit board will be glued to the cover so there must not be anything (glue, solder, wires) shooting out to the flat side of the board. The wires don't have to be inserted into the holes but can be soldered to the surface only. The wires should be connected so that each one of the five pads on the keypad board are connected to each one of the pads on the add-on board in order with the orientation of boards shown in the figure.

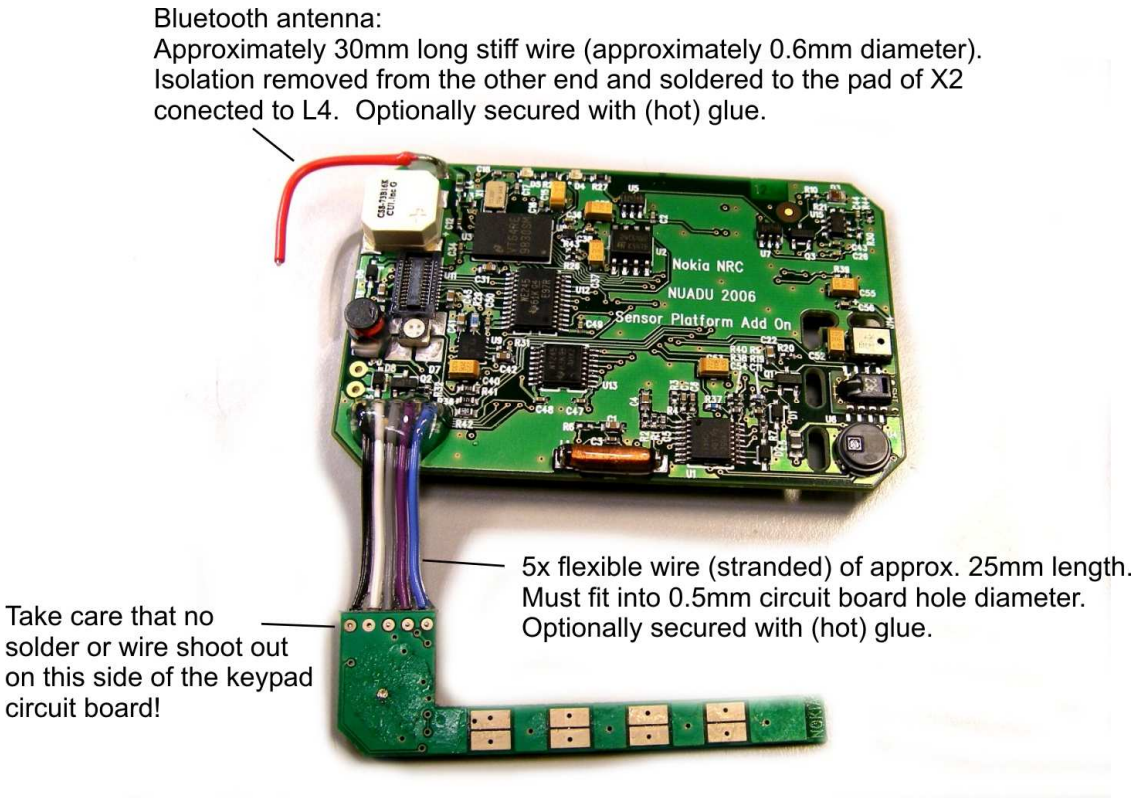

Figure 7 Attaching the Bluetooth antenna and touch keypad to the add-on board.

2.2 Charger connector and battery

Attaching the charger connector to the sensor platform circuit board is shown in Figure 8. Carefully observe polarity. The insulation of the negative wire should be stripped so that it can be soldered to the two terminals of the connector as shown in the figure. Be careful when soldering to the circuit board that there is insulation around the wire close to the board. When the wire is bent there is risk of short circuit to the neighbouring soldering pads on the circuit board. Use insulating (hot) glue if necessary, but make sure the wires plus glue will not be higher than 1.5mm above the board surface because the second board will be attached on top of this board.

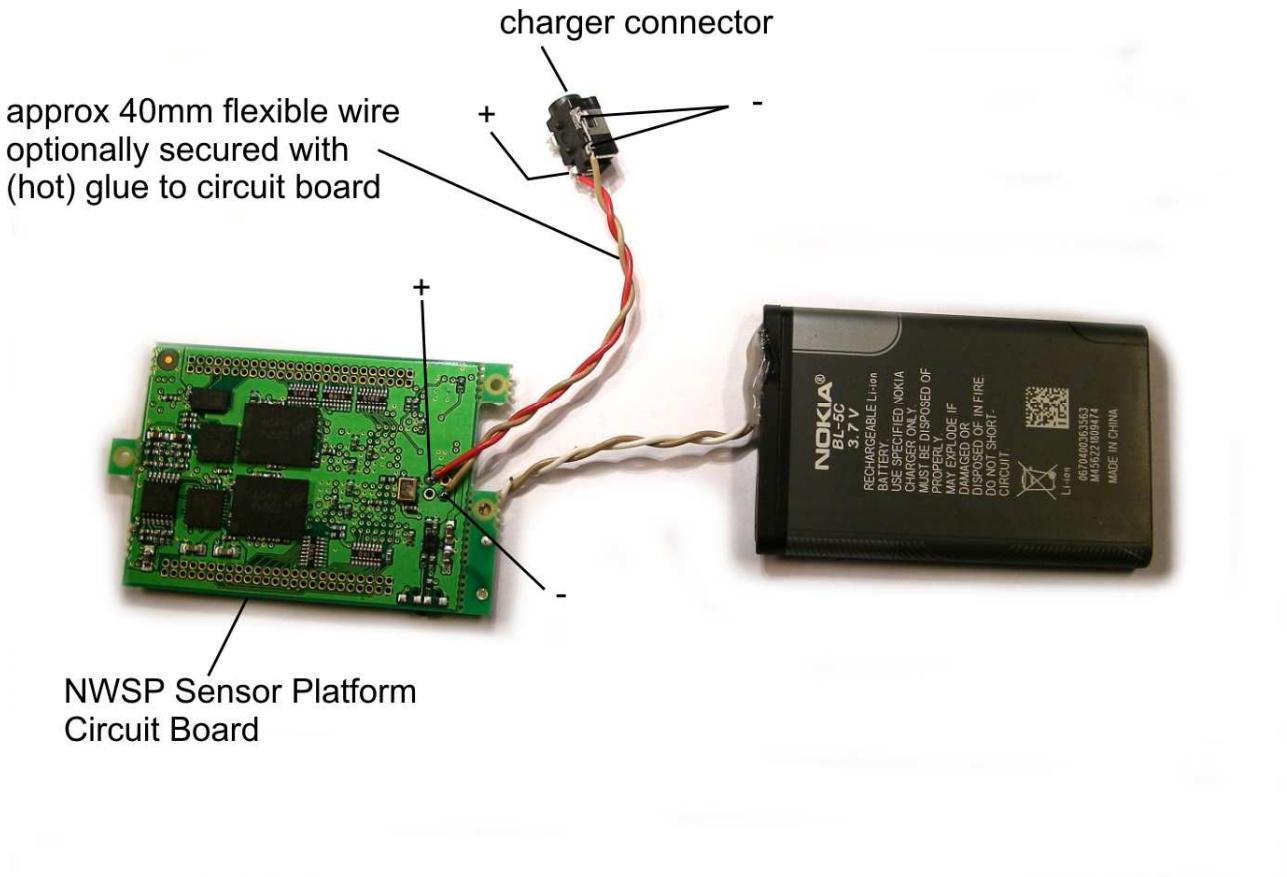

Figure 8 Attaching the charger connector to the sensor platform board.

Attaching the battery is shown in Figure 9. **IMPORTANT!** First make sure that the power switch is in OFF position. It must not be turned on before the device has been flashed with firmware. Otherwise the I/O terminals of the FPGA are in an undefined state and this can cause permanent damage to the device and it can become very hot. Carefully observe battery polarity. Wires can be soldered directly to the battery terminals, taking care not to overheat the battery. The middle contact of the battery should be left unconnected.

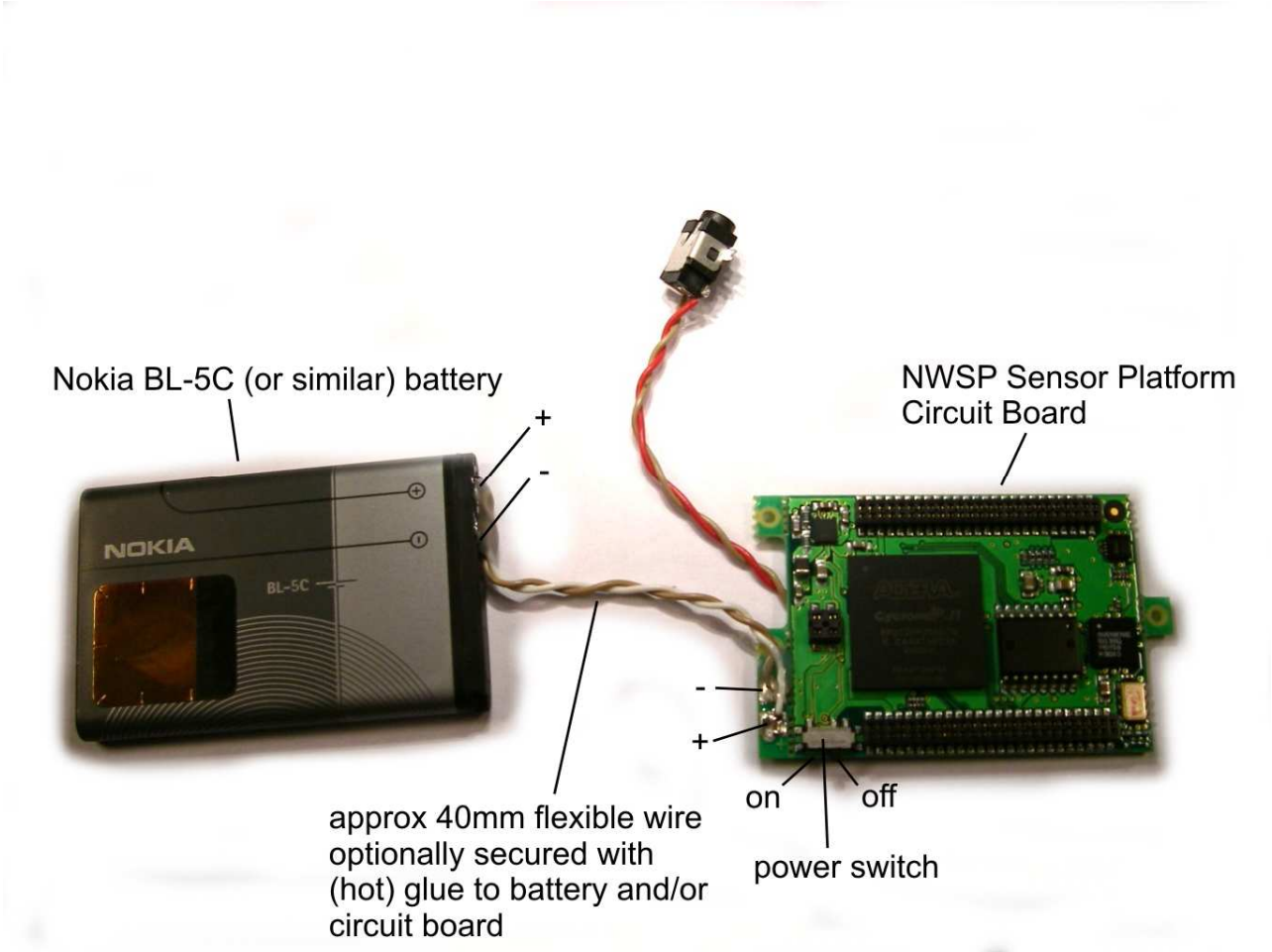

Figure 9 Attaching the battery to the sensor platform circuit board.

2.3 Putting together the electronics assembly

To attach the add-on board and sensor platform board together align the connectors as shown in Figure 10 and press evenly close to the connectors (not at the center of the boards). Use both hands to simultaneously press both connectors together. Look from the side to make sure the board are completely pressed together. The connector pins should completely go inside the platform board and not be visible looking from the side. There should be a small snap when the connectors mate. Check that the wires to the charger connector are neatly between the boards and are not blocking the attachment. Fix two small pieces of double sided foam tape (thickness approximately 1mm) on the bottom of the connectors as shown in Figure 10 for attachment of the battery.

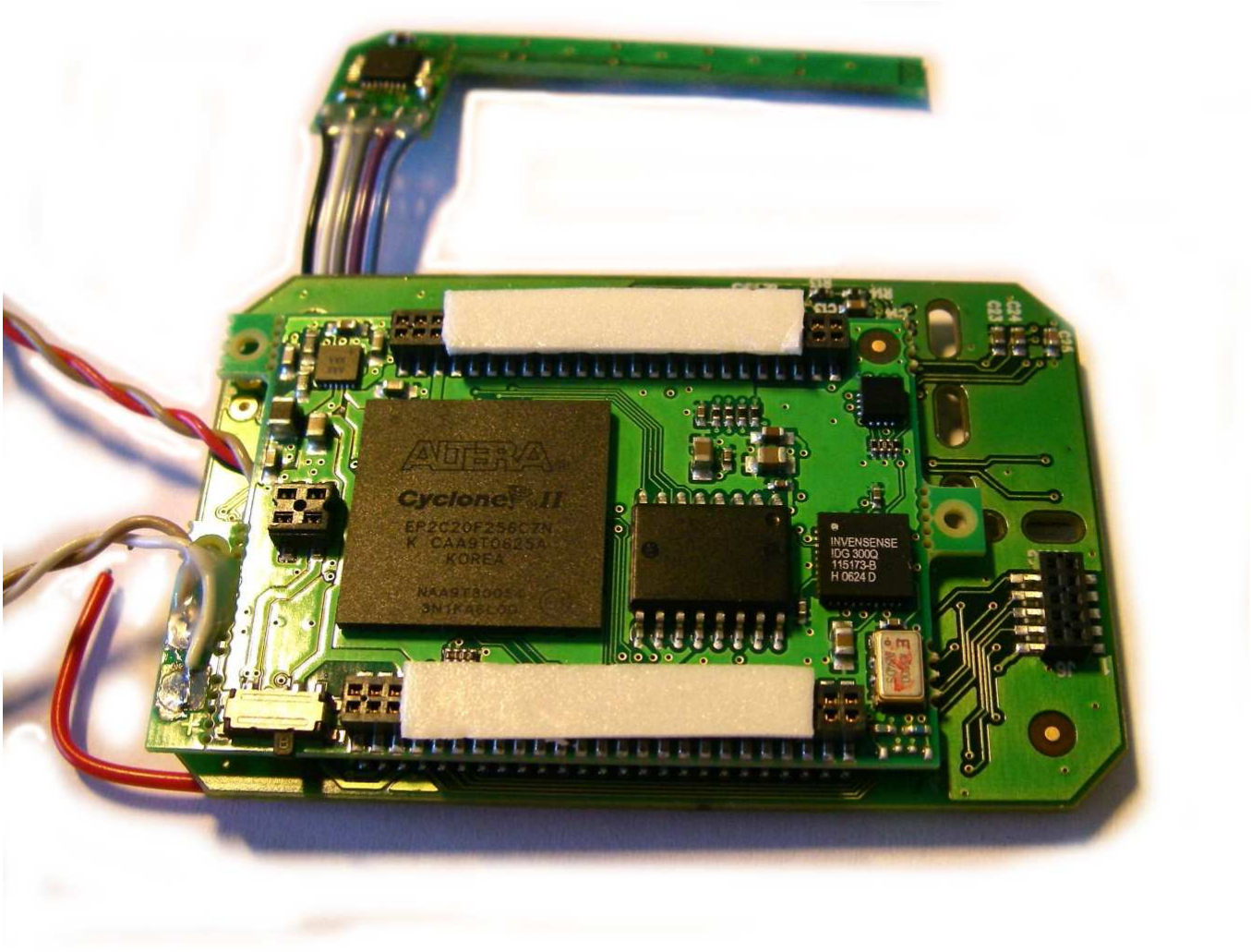

Figure 10 Attaching the add-on board to the sensor platform board.

Figure 11 shows the battery taped to the bottom of the circuit board assembly. It is important that the end of the battery with the wires is not protruding (including wires and glue) outside the edge of the circuit boards. In the figure the battery is slightly too much to the left leaving the glued wires outside the board making the assembly too wide to fit into the mechanics. The JTAG connector (J6) on the right should not be blocked by the battery either.

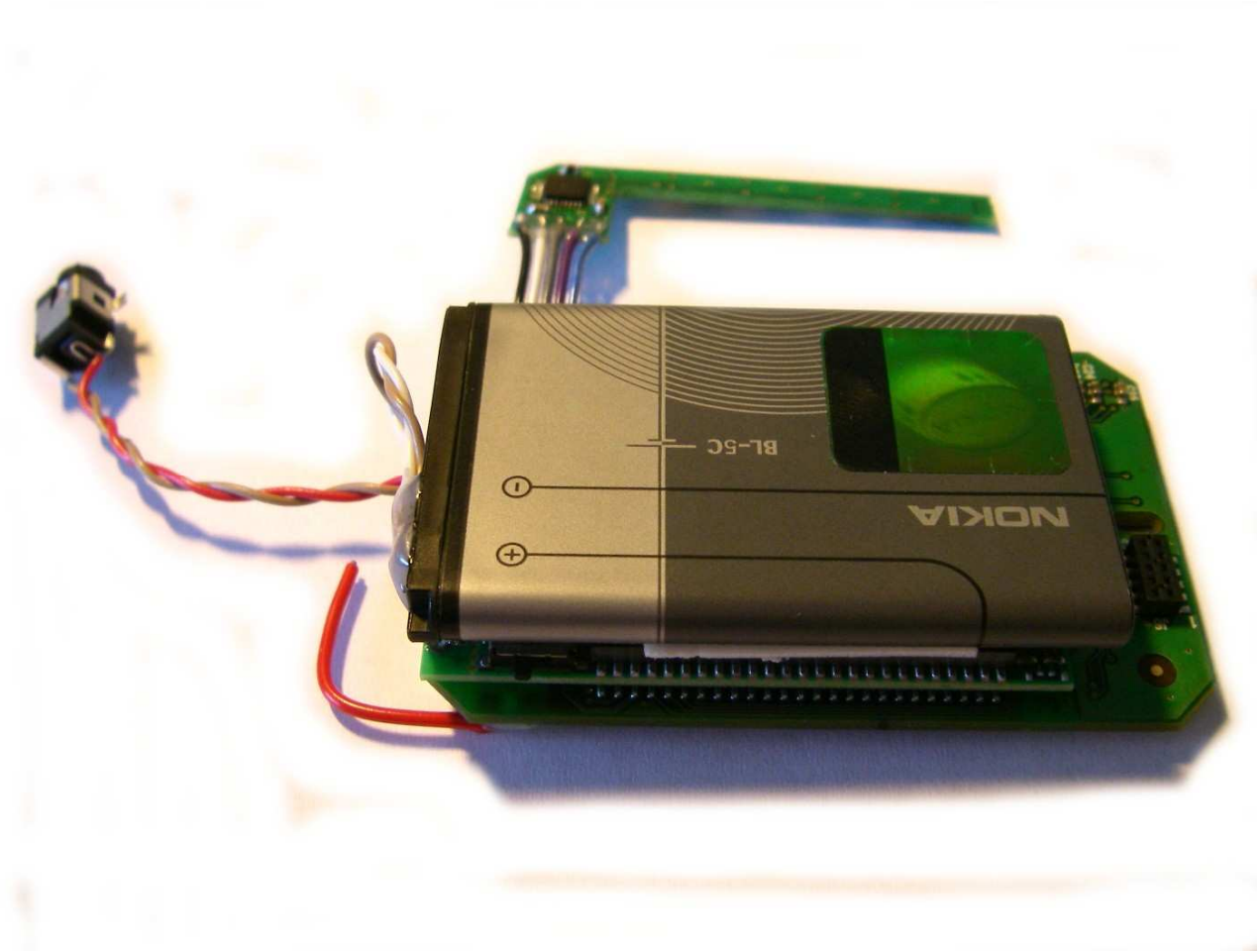

Figure 11 Attaching the battery to the circuit board assembly with double sided tape.

2.4 The JTAG connector assembly

Next prepare the JTAG connector assembly as shown in Figure 12. The length of the wire should be approximately 35mm and it can be a ribbon cable or separate flexible wires. At one end of the wires there is a piece of prototyping circuit board with a standard 2x5 way 0.1" pitch pine header. At the other end there is a 0.05" pitch 2x5 way pin header (Samtec FTS-105-02-F-D). The shorter golden ends of the pins of the smaller pinheader should be left unsoldered. Hot glue or similar is needed to fix the assembly. The detailed wiring of the assembly is shown in Figure 13. When it is ready, plug it in to the NWSP add-on board as shown in Figure 14. Pin number 1 (GND) is marked "1" on the circuit board.

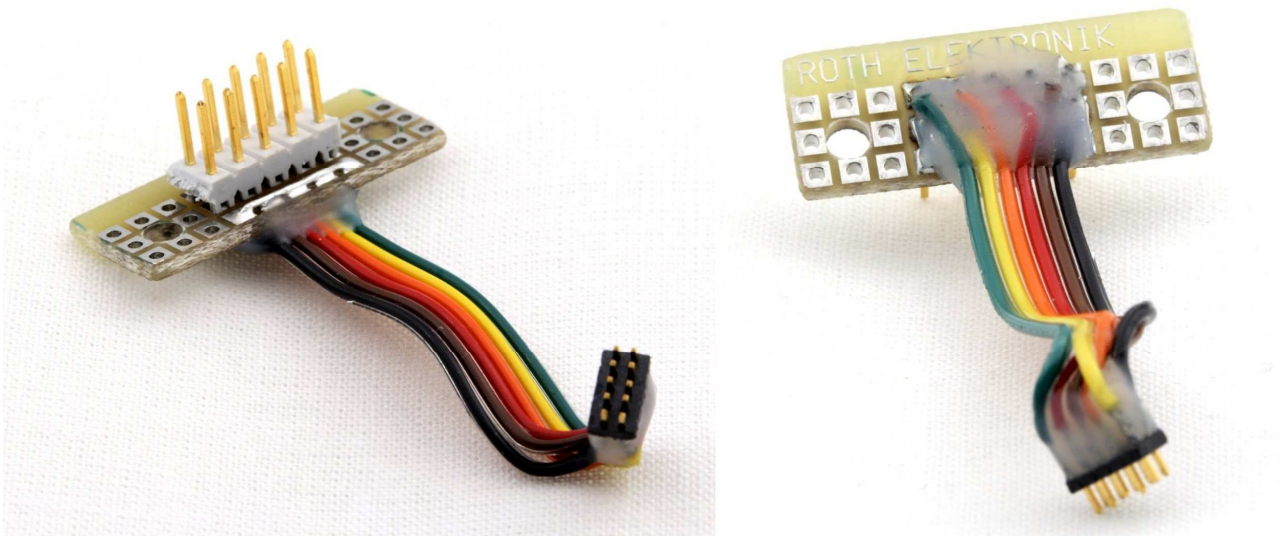

Figure 12 JTAG connector assembly

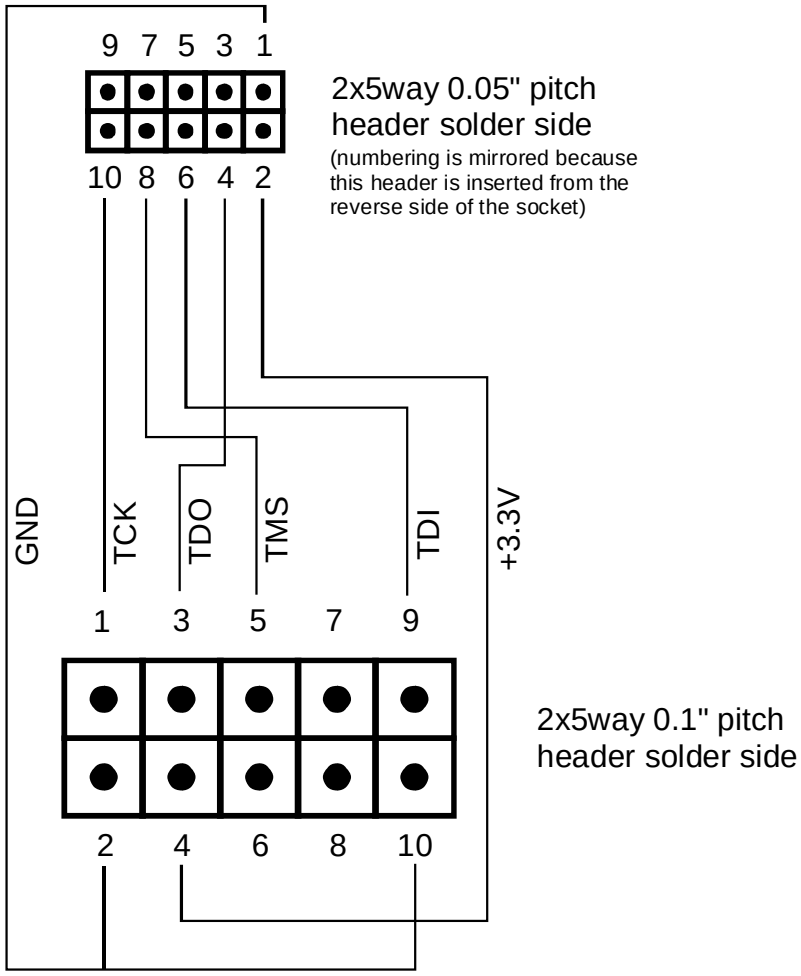

Figure 13 Wiring diagram of the JTAG connector assembly

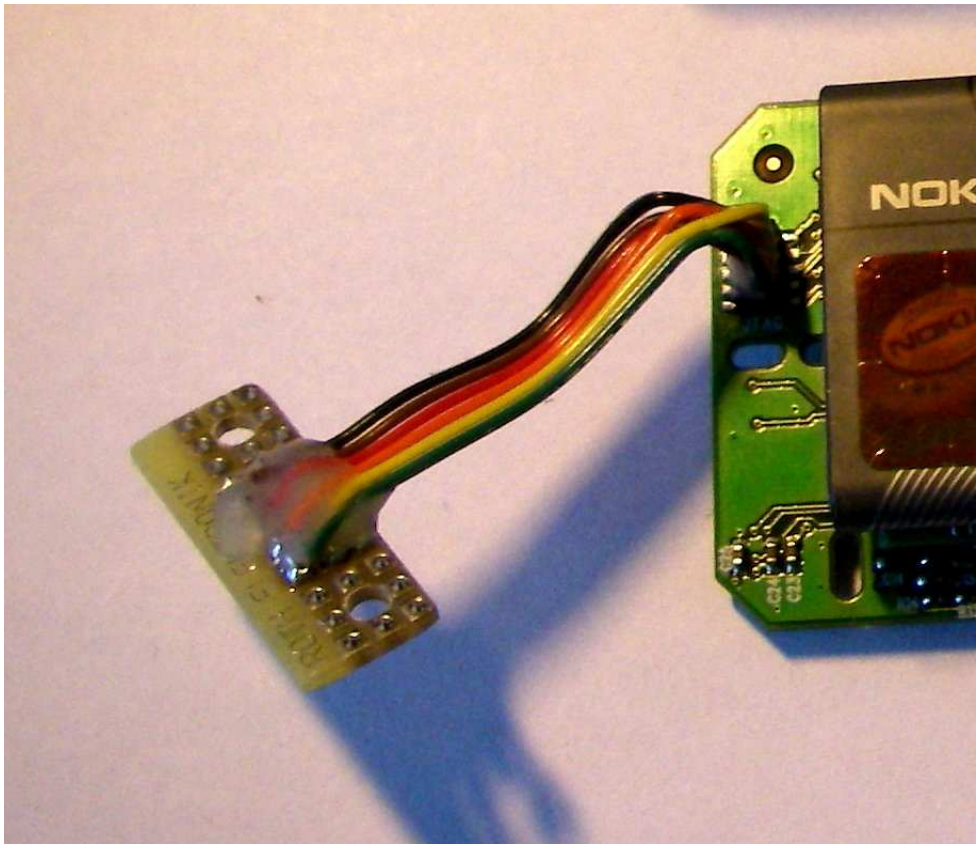

Figure 14 Connecting the JTAG connector assembly to the NWSP add-on board

2.5 Final assembly

In Figure 15 the electronics assembly has been inserted on top of the base plate. Note the holes drilled for the JTAG connector screws. Not visible in the figure is two pieces of 0.8mm thick rubber tape glued to the base plate under the battery. Anything that is approximately 0.8mm thick and flat can be put underneath the battery, but preferably not something too slippery. Even 1mm thick double sided foam tape can be used but then only moderate slices so that the electronics assembly can be detached from the base plate if needed The spacers for the window might need to be rotated so that the electronics assembly can fit in between them. On top of the electronics assembly in locations shown in the figure where there are no components on the circuit board supports for the LCD display should be placed. These supports should be approximately 3mm high and flexible. In this prototype three layers of 1mm thick double sided foam tape has been used.

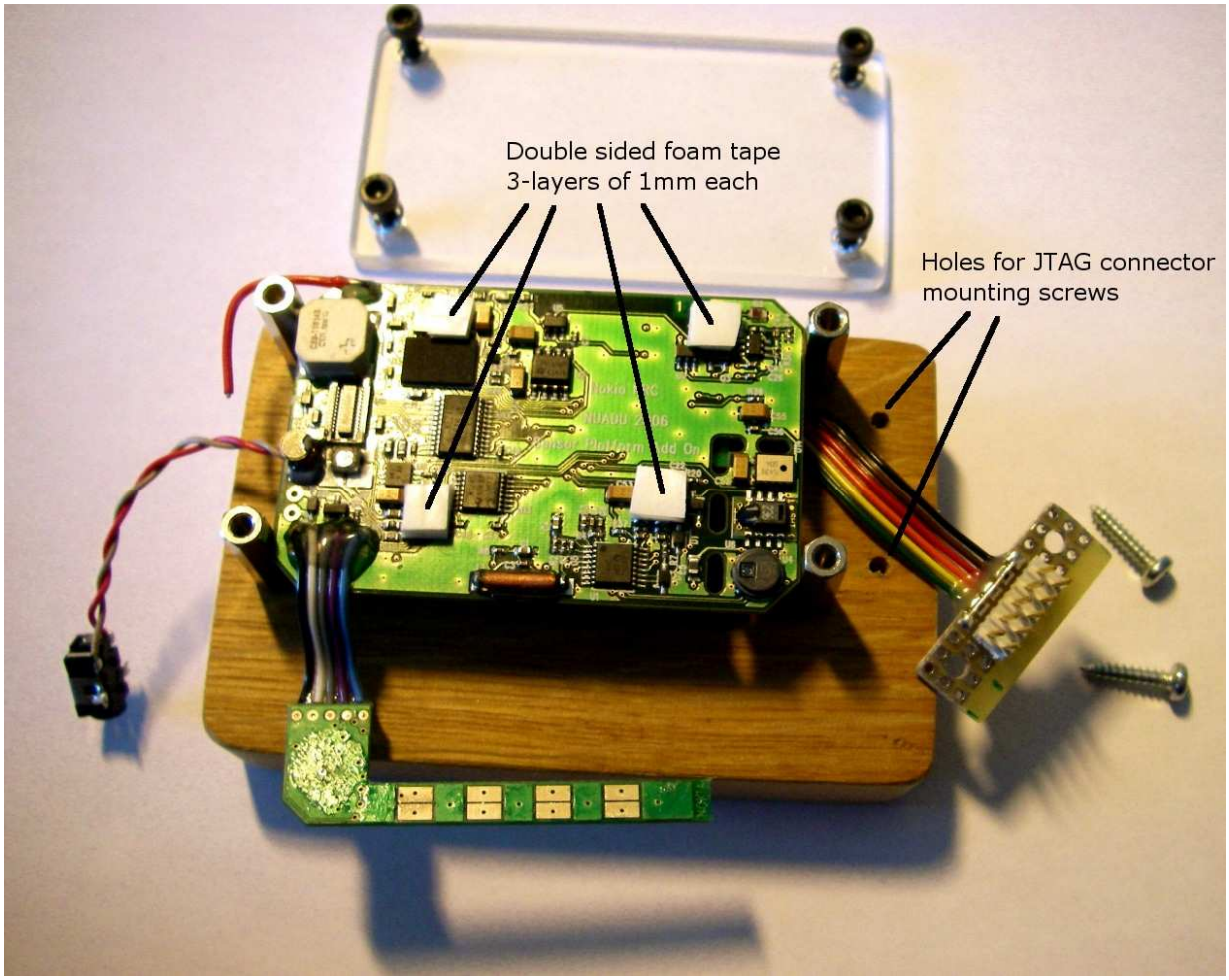

Figure 15 Electronics assembly inserted on top of base plate and double sided foam tape supports for LCD display added

The LCD has been attched to the platform in Figure 16. First snap the LCD connector in place and then lower the LCD to the double sided tape supports. Because it is not possible to adjust the position of the display after it has been taped the connector must be connected before the display touches the tape. It is also possible to leave the non-adhesive paper on top of the double sided tape to make mounting easier. The display usually stays in place from the pressure of the window and the connector. Thin stripes of tape (office tape or similar) should be placed at the top and bottom edges of the display outside the actual viewing area to make a small air gap between the LCD display and the window to be screwed on top. Also screw the JTAG connector in place using enough washers or spacers underneath to prevent wires below the circuit board to get squashed. The touch keypad should be taped to the base plate with two layers of 1mm double sided foam tape as shown in the figure. On top of the keypad a thin sheet of transparent tape should be put for protection. This can be ordinary office for example.

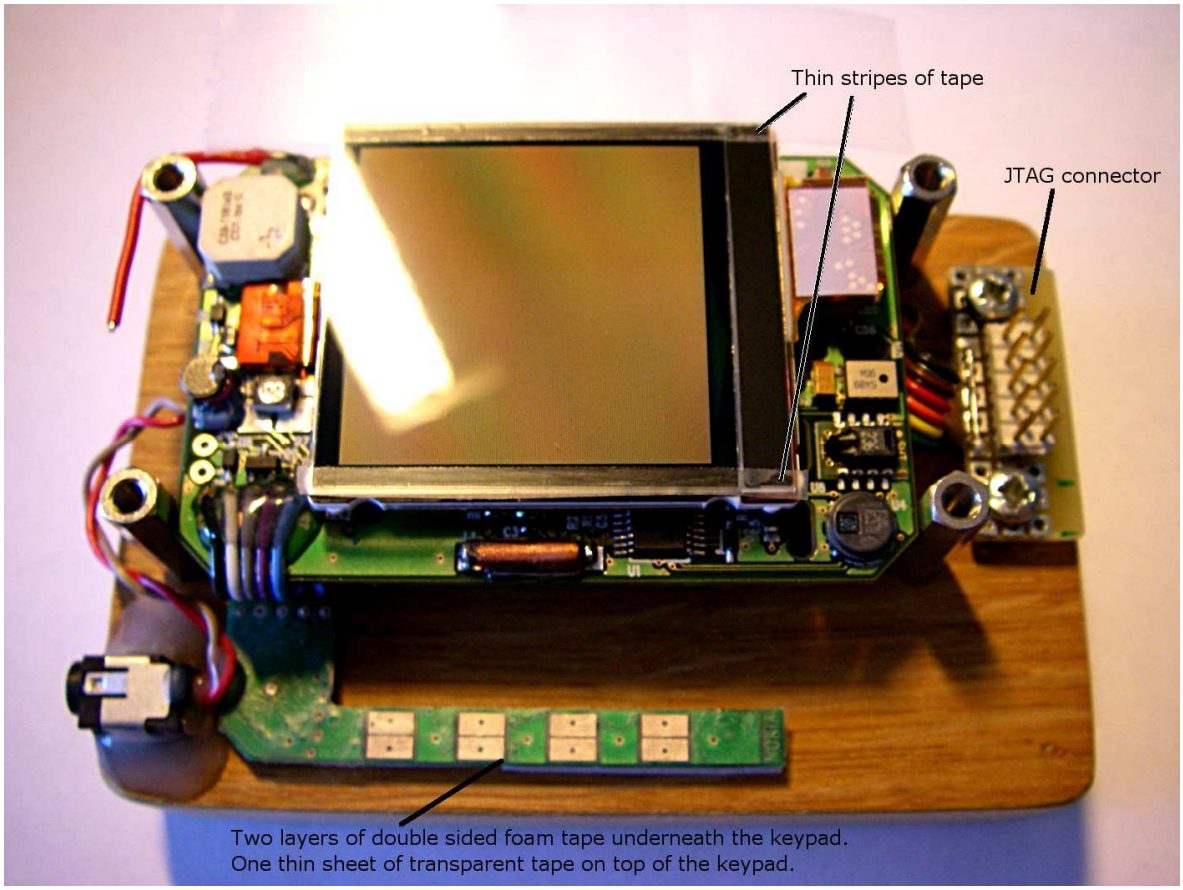

Figure 16 The LCD display attached to the platform

Finally screw the window in place as shown in Figure 17 and the development unit is ready for use.

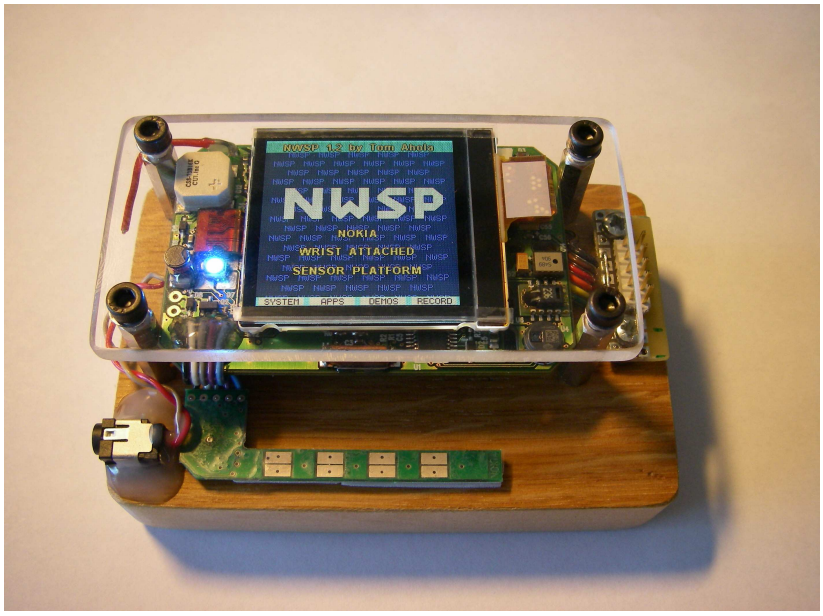

Figure 17 After the window has been screwed in place the development unit is ready