Kobo/XCSoar - V.Kel Module Notes - www.50k-or-bust.com

These notes relate to the modification of a Kobo ebook reader by fitting a GPS or GPS/GLONASS module for navigation only. The notes are my best shot at the time of writing. I cannot guarantee they are correct or represent ideal solutions but I will correct and update them when I can. Please inform me of any errors or better solutions you may find. The index for other Kobo/XCSoar notes can be found at:

http://www.50k-or-bust.com/Kobo XCSoar/Kobo XCSoar.htm

NB. Since writing the original article below some VKel modules I have purchased have been supplied with configurations different to those I have normally used and it has been necessary to reconfigure the VKel module itself. This is done by using an FTDI adaptor to connect the VKel module to a PC and UBlox U-Centre software available free online. A pdf guide to using the U-Center is available too.

Furthermore the Bluefly GPS V12 uart connecting to the GPS module now has a default baud rate of 115200 (for the Sierra XA1110 module) and the maximum baud rate on the VKel appears to be 57600. This means that the baud rate of the Bluefly needs to be reduced for it to work with the Vkel. This is most easily done using an FTDI adaptor (as for the VKel module) and BFV Desktop software available from the Bluefly web site. The "BFV Hardware Settings Manual" for setting Bluefly parameters is available.

I make the VKel settings using the U Center so that:

The GPS data is sent from the VKel once per second.
(U Center - RATE - Measurement Period = 1000ms.)

The VKel baud rate is 9600.
(U Center - PRT - Baudrate = 9600)
(after changing the VKel baud rate you will have to change the U Center baud rate to continue communication with the module)

The VKel dynamic model set for "airborne" use.
(U Center - NAV5 - Dynamic Model - 8 - Airborne < 4g)

If I am happy that the module is operating properly I then save the configuration in the VKel flash memory.
(U Center - CFG - Save current configuration - "0 - BBR" and "1 - FLASH"

I make the Bluefly settings using the BFV Desktop so that:

Uart 1 (u1) baud rate GPS to Bluefly is 9600 baud.
(BFV Desktop uart1BRG = 204)

There is a function to delay the start of the Bluefly module which can help communication problems on some Kobos. This start delay function is not yet available as an explicit function in BFV Desktop. However a 1 second start delay can be set by putting:

$BDM 1000*

in the “Raw TX:” box and hitting “Execute”.

Other position rates, baud rates, and dynamic models are possible.

NB 2! Bluefly modules are now fitted with the Sierra XA1110 GPS/GLONASS module. I have no experience of this and cannot comment on its effectiveness.

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Original Article Starts Here!

The Problem

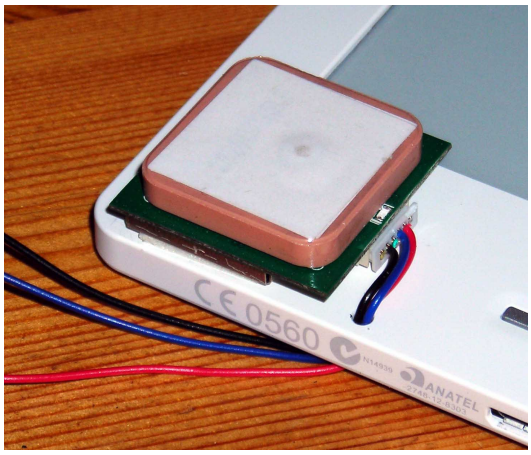
GlobalTop modules (PA6C/PA6H/GMS-G6/GMS-G9) fitted to Kobos have sometimes been reported to indicate that the GPS is locked while giving GPS altitudes with large errors. This is not a big deal as we should really be using barometric altitude, but I had a suspicion that these GlobalTop modules might sometimes be also giving large horizontal errors whilst indicating that the GPS lock was good. This was confirmed after a flight when the IGC log file showed my landing to be about 300m from the actual location and the GPS altitude wrong by about 9000 feet. I also suspected this sort of problem might be worsened by the internal software of the modules failing to recognise the error condition.

The V.Kel VK2828U8G5LF and VK2828U7G5LF Modules

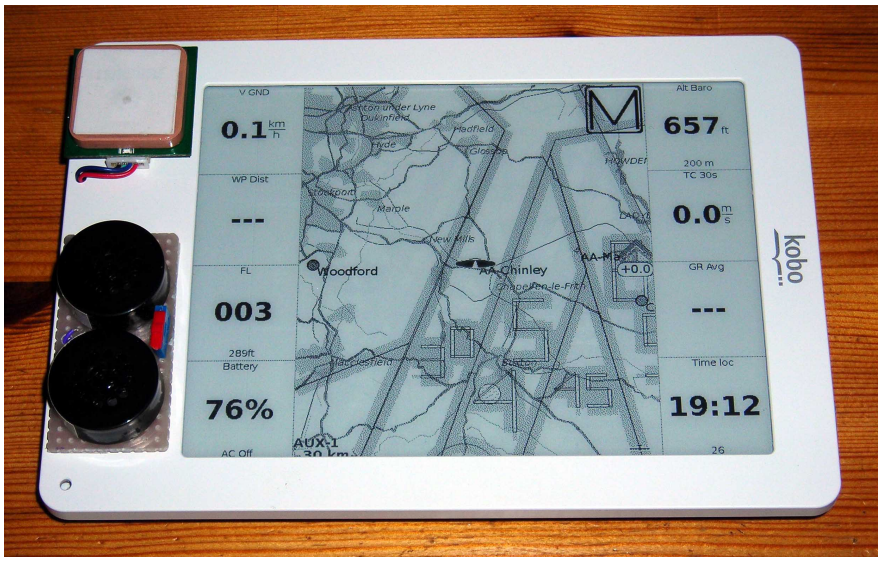
I wanted to try a significantly different GPS/GLONASS module and eventually found the V.Kel VK2828U8G5LF module which is based on the UBlox M8 chip unlike the Globaltop modules which are based on the MTK3339 chip. The Ublox chip has selectable modes of operation ("Dynamic Platforms") optimised for different uses and appears to be set up for "Airborne <4g" in the V.Kel

module. This sounded as if it might be good for hang-gliding and paragliding and was available quite cheaply. The VK2828U7G5LF appears to be a GPS only version of the same module but still seems to work considerably better than the Globaltop GPS/GLONASS modules. The VKel data sheets appear a bit ambiguous between the U7 and U8 modules!

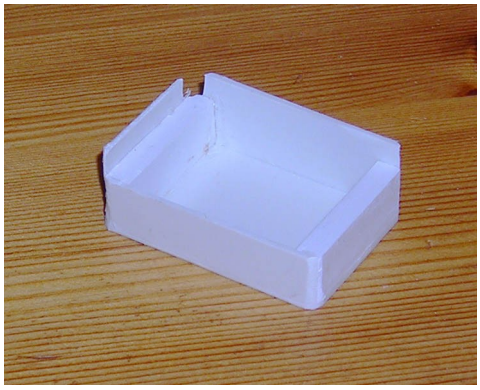
The VKel modules are quite large but the 25mm patch antenna gives better reception than the smaller GlobalTop modules. They just fit on the corner of a Kobo Touch. For the Mini they would have to be fitted with a large overhang.



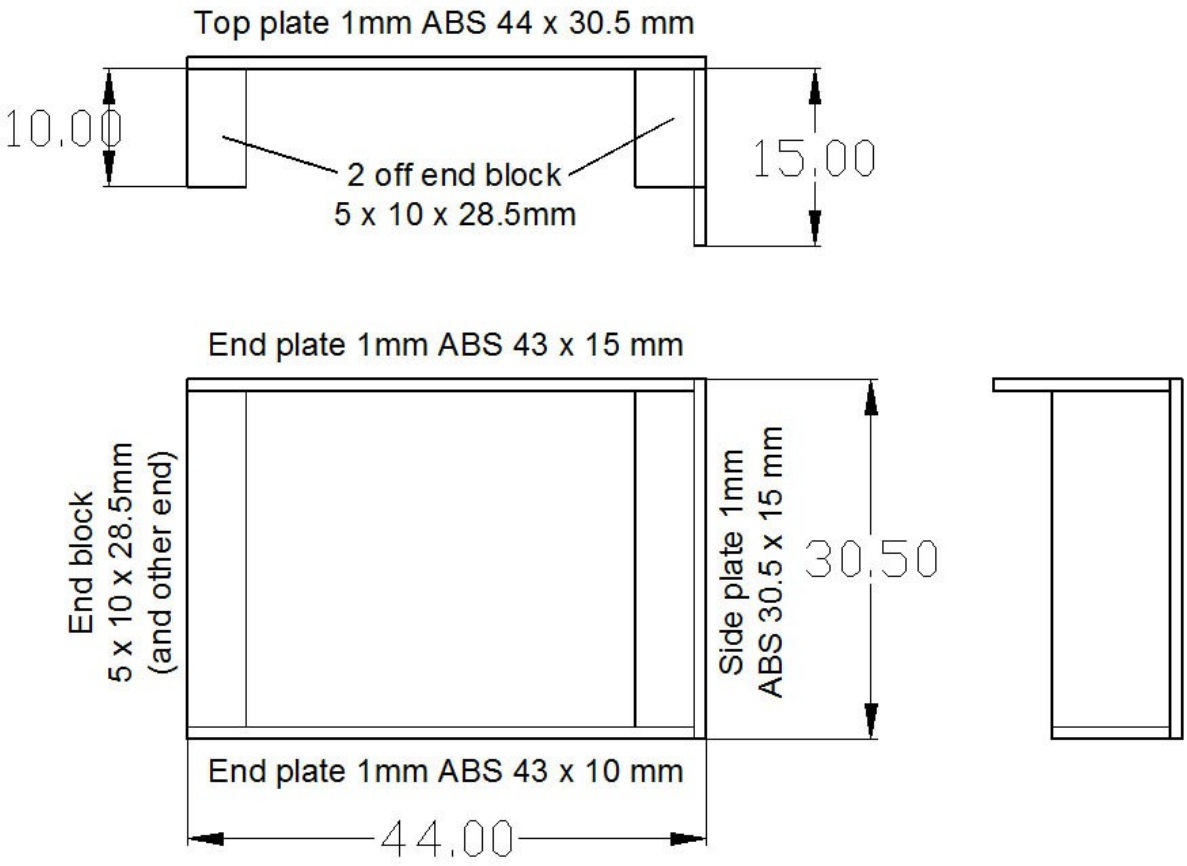
This unit was constructed in a similar way to my other Kobo Touch with a BlueFly vario module mounted internally



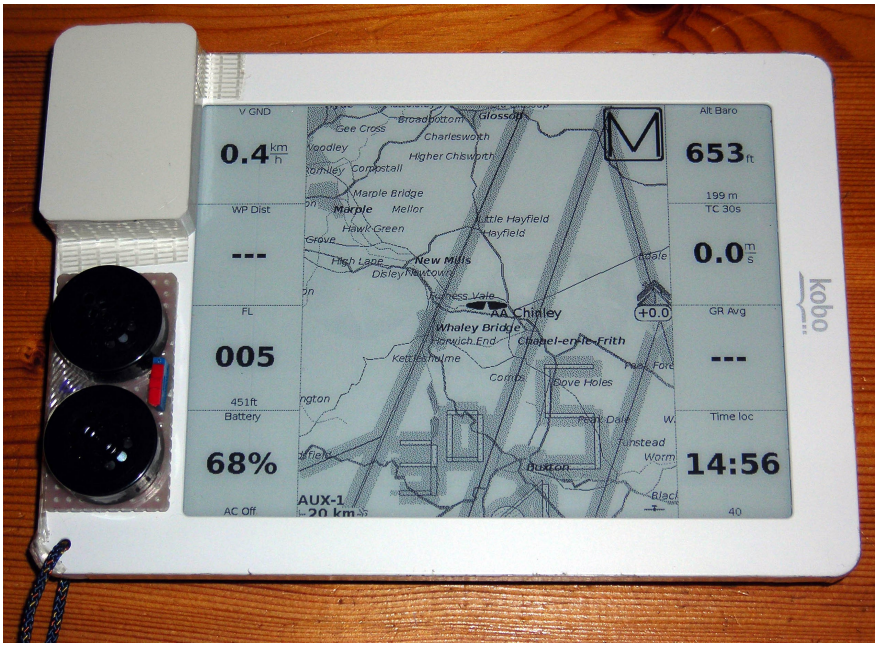
The cover for the V.Kel module was fabricated from UPVC rectangular rod and 1mm thick ABS sheet plastic.



The drawing below shows sections through the cover.



The corners were rounded and the cover fixed to the Kobo using thin double sided tape with two sides overhanging the corner of the Kobo. Glass reinforced tape was then applied externally as reinforcement.

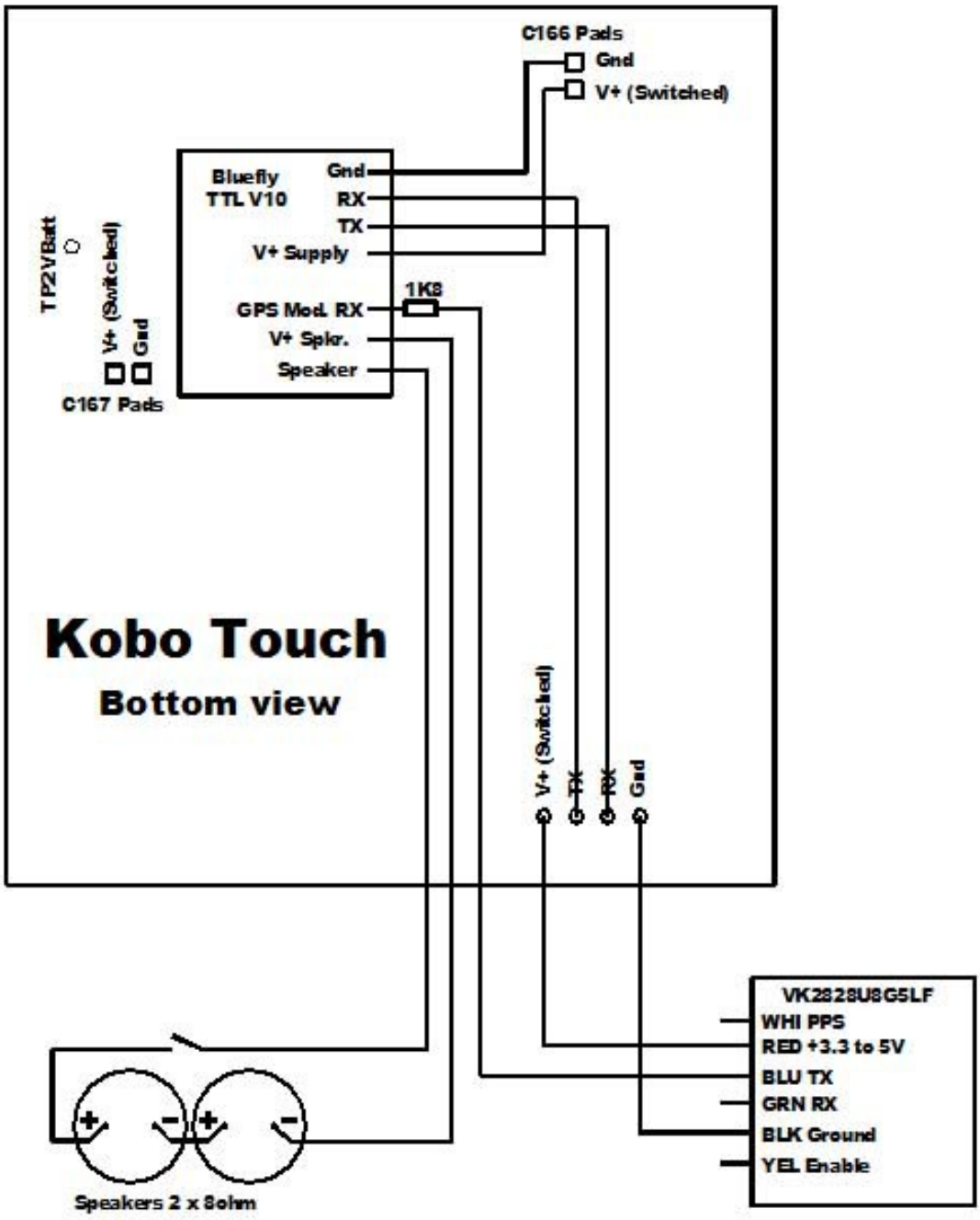


Electrically the module was easy to incorporate and came with a pre-wired connector. Only the ground, TX and supply wires are needed and the power consumption is similar to the GlobalTop modules.

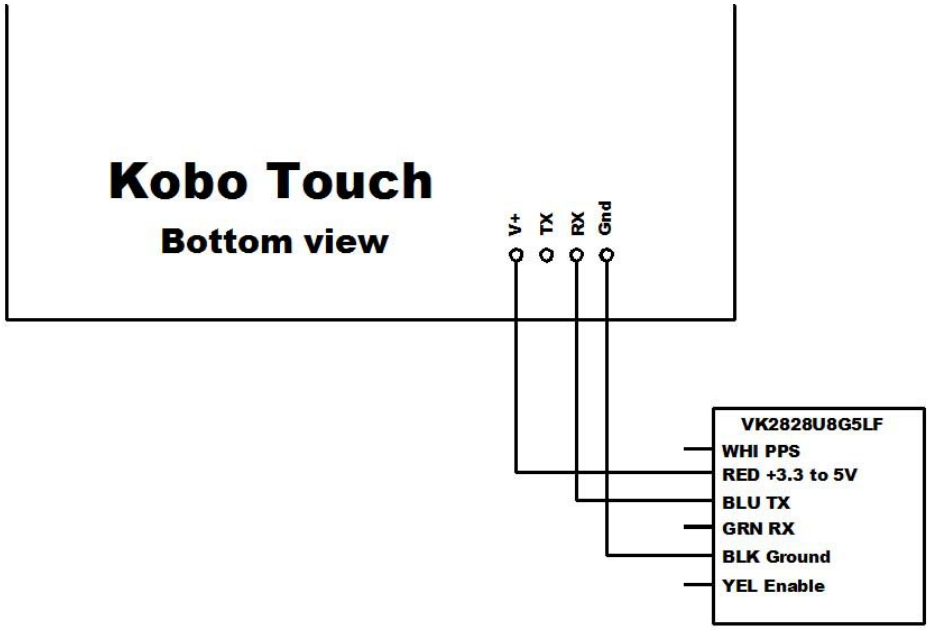
Construction details of a unit using the Kobo Touch are available on:

http://www.50k-or-bust.com/Kobo XCSoar/Kobo Touch With Bluefly XCSoar Notes 01.pdf

In a BlueFly unit the wiring would be like this:



For a non-BlueFly the schematic is like this:



There is no facility for an external backup supply but the module appears to have some kind of internal capacitor backup system. The V.Kel datasheet does not suggest the use of external components as with the GlobalTop modules.

So far these units have worked well and reception appears to be significantly better than units constructed using GlobalTop modules. I believe the sensitivity of GPS modules fitted to Kobo units is generally limited by interference from the Kobo ereaders themselves and that the VKel modules are overcoming this better than the GlobalTop modules. Further improvements might be made if the VKel modules (or at least their aerials) could be mounted on sizeable ground planes at some distance from the Kobo ereaders themselves, but so far their performance seems adequate.