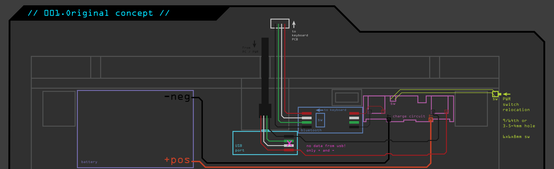
HIGH TECH LOW LIFE \\ USB KEYBOARD TO BLUETOOTH WIRELESS CONVERSION

// PROTOTYPING - R&D //

// 001. Original concept //



1. Wireless only - no wired option for data tx/rx

Will only charge via USB port!

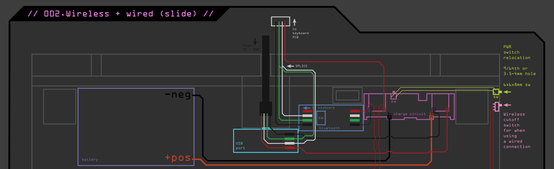
Not all charge circuits are created equal!

I found this out through trial and error, testing different ones to see how they performed

Some will always be on when a load is applied and you cannot turn them off.
This is not ideal for the 'soft power button' setup. If you use one of these
boards, you will need a way to interrupt power to the battery (or the wireless module)
to 'turn off' the keyboard to save power.

Most will not allow you to turn off the device when charging, however I did find one board
that did, which could be nice for charging faster by disabling the output so all the input
charge is fed to the battery without any drain (I've heard this is also better for the batteries)
Although all the boards I have tested do allow 'pass through' charging meaning you can apply
a load and charge at the same time. Some boards however may not, which could get annoying if you
cannot use your keyboard while you are charging.

// 002. Wireless + wired (slide) //



2. wireless + wired via slide switch

Will charge via USB + direct wired
Cannot use BT and charge using computer port (flip flop glitch)

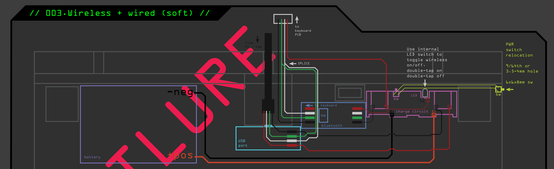
Next I wanted to figure out a way to have the option of going wired as well as wireless.

There might be some scenarios where the computer you were interfacing didn't have a BT card
or there might be times where you just didn't want to use wireless at all.

I thought it would be easy just to splice the data lines (green and white) going into
the keyboard, so I would need a way to turn off the BT module by wiring a slide switch
to cut power to the entire BT module. This did work as expected, however I realized that there
was an issue in a scenario where you still wanted to use BT but also use the PC to charge
the keyboard. I realize this is an edge-case scenario but I also wanted to see
if I could figure out a solution.

// 003. Wireless + wired (soft) //

FAILURE (kinda)



3. wireless + wired via LED 'soft' switch

Did not work consistently due to 50ma limitation of the LED circuit
Cannot use BT and charge using computer port (flip flop glitch)

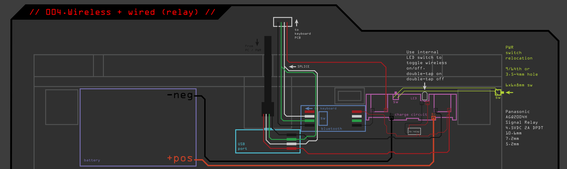
I also had a big brain moment where I realized I could do away with needing two separate
switch (power and turning the BT module off) by hijacking the onboard LED flashlight toggle
to be the switch that turns the BT module on and off, then all you would need for full
functionality is just the small single pushbutton switch.

This was initially a success because it worked as expected on the first board I made, but
the second board I made using this method was turning the BT module on and off randomly.
This would cause the computer to flip flop between connecting wired and wirelessly over
and over in a loop.

I figured out the problem was again due to not all charge circuits being created equal,
even the same exact model of charge circuit PCB must have some variance in amperage output
for this LED circuit as the rated output is 50 milliamps. The amerage requirements for the
BT module is also 50ma, so I suspect that since it's right on the cusp some will fluctuate.

This may work for you but it's not reliable in my testing, so next I figured out
a way to solve for that problem.

// 004. Wireless + wired (relay) //



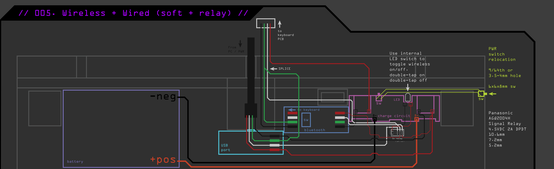
4. wireless + wired via LED switch + relay

Fixes the LED soft switch inconsistency problem,
Still cannot use BT and charge using computer port (flip flop glitch)

Workarounds are to carry two cables - one charge cable only, one data and charge
If you wanted to charge from the PC while also using BT, you'd need to use the
charge cable only - this gets around the flip flop glitch

// REFINEMENT //

// 005. Wireless + Wired (soft + relay) //



5. Wireless + wired via LED switch + relay

Fixes the flip flop glitch with a relay and separation of white data wire
Will work with both wired/wireless options and both have the ability to charge
with a normal data cable.

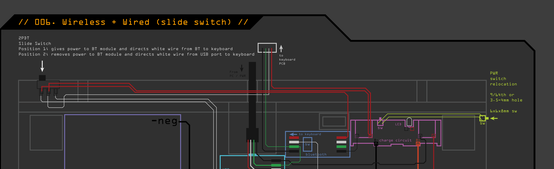
I figured out the issue through trial and error and it had to do with the cable
having the data lines present from the PC.

One way to get around this is to only charge when wired (no charging + wireless) or
to use a power only cable (white wire cut), but annoying because then you need two cables
One for charging, one for wired connection. Another option is to make a data/power cable
by installing an inline toggle on the white wire, then you have a configurable cable.

I thought why not carry this toggle inside the case, that way you don't have to carry
around two different cables, or a 'special' cable that has a toggle switch integrated.

I was able to do this with the help of a very tiny relay which is DPDT, one side is
used to perform the BT power toggle, and now the other could be used to intersect
one of the data lines. Turns out the white wire was the one causing the flip flops.

// 006. Wireless + Wired (slide switch) //



6. Wireless + wired via slide switch (no relays)

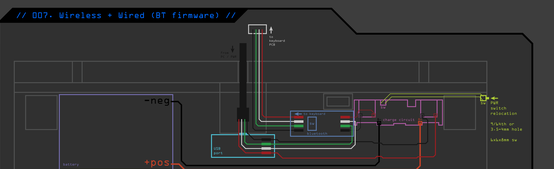
Same as schematic 5, only swaps the relay for a slide switch

If you didn't want to use relays you could add another slide switch to perform the
same function. These relays are very reliable but you can't get much more reliable
than a mechanical switch.

I'm still on the search for a 3P3T slider switch that is very small, this would
allow you to perform all of the functions from one switch, even the on/off of
the entire charge circuit, so you could also use any charge circuit - even one
without the ability to power off (soft off) while a load is attached. All of
the 3P3T sliders I have found are huge and won't fit, or if they are small enough
they only come in toggle style, not lower profile sliders.

// COMPLETION //

// 007. Wireless + Wired (BT firmware) //



7. Wireless + wired using BT module firmware hotkey

Toggle wired / wireless via hotkey
When wired the BT module acts as a bridge, no 'direct' connection
Cannot update keyboard firmware (bridge), Only 6KRO

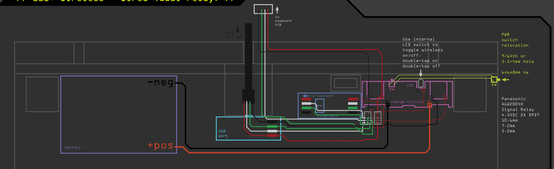
Running through all of these combinations I finally read the manual in-depth
- always RTFM first.

I realized that the BT module already comes with a wired / wireless toggle internally
via the firmware and is activated by a hotkey on the keyboard. Through my testing
I have found that it somehow just 'knows' whether it's plugged in to a PC or not
and changes accordingly. I suppose if you wanted the scenario where you wanted to
plug it into a PC for charging but use the wireless you could toggle the switch
manually via the hotkey.

There are some caveats to wiring this this way though. One is that it's not a
native direct USB connection, the BT module acts as a bridge. This will be fine
for most users, but if your keyboard has firmware you can update, you cannot use
this method as the PID of the board will not be recognized because it's running
through the bridge. Another downside is that using the bridge limits the key
rollover to 6 key (6KRO) so if your keyboard does output NKRO via USB this will
limit it. A lot of keyboards will only do 6KRO so this isn't really a limitation
and most users do not need NKRO so it's a moot point, but it's worth mentioning.

This method is the way I would recommend most people wire up their keyboards,
it's much simpler and less components are used.

// 008. Wireless + Wired (dual relay) //



8. V3 Wireless + wired via LED switch + two relays

V3's need TWO relays - you need to break both green and white wires
green and white wires MUST be soldered on the switch side of the module
clip the USB wires first before removing the USB ports on the module

THE LED SWITCH CIRCUIT CANNOT POWER TWO RELAYS + AN LED

Restores 'direct' connection, ability to update keyboard firmware, native NKRO

I thought I was done, but it turns out that when trying the 006 schematic method did not work
on a WASD V3 (CODE V3). Due to the hardware changes to get it to work you need to intersect
both the white and green data lines. Previously the V2 keyboards only needed to intersect the
white data line. Depending on the keyboard you're using you may be able to get away with only
toggling the white data line off, but if you run into issues most likely you will need to
toggle both wires.

This is the setup you want if you want all the features + native wired connection, all from
the single pushbutton switch. My later revisions included leaving the flashlight LED and
drilling a hole as a tiny port as another visual indicator that "wired" mode was initiated.
I also drilled two smaller holes underneath the BT module for visual indication of BT
operation, plus more LEDs and blinking lights looks cooler.

HIGH\\TECH \\LOW\\LIFE\\