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micro-controller using CAN bus data for ancillary control

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By 2X044,

7 hours ago in General

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Sharing this semi-complete project now that it is up and running. Before getting into it, I owe thanks to

@Lukeyson and @jakka351, they don't know me but I relied heavily on the information they

shared and to the team at ForScan it would have been a lot harder/impossible without there work!

Peers are on me.

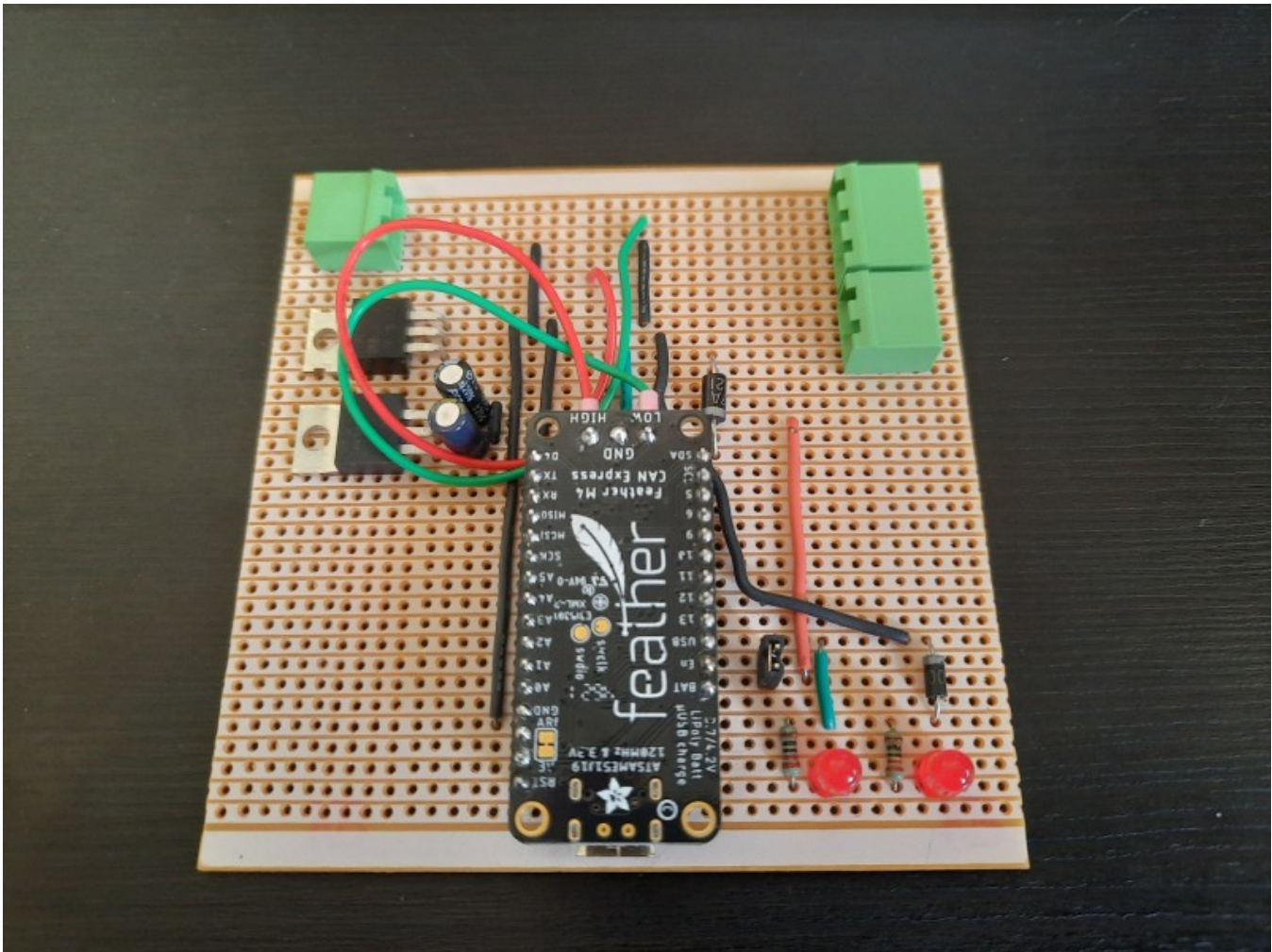
I completed a manual conversion on my BA Mk2 XR6T, for some reason, the PCM would not ground the reverse lockout wire. I understand that the PCM is supposed to ground the pin when the car is travelling less than 7km/h and the clutch is depressed. I read that most people use the brake light circuit to ground the wire but I didn't like this idea.

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The data I required is available via the CAN bus so I bought a micro-controller with a native CAN bus interface and put together a prototype board that does the following:

- Listens on the CAN bus for the vehicle speed.
- When the vehicle speed is below 5km/h, once per second, sends a query to the PCM asking the status of the clutch pedal.
- When the vehicle speed and clutch status are correct, pulls the reverse lockout wire to ground using a MOSFET (and turn on an LED to show me it's working).

Here is the proto-board:

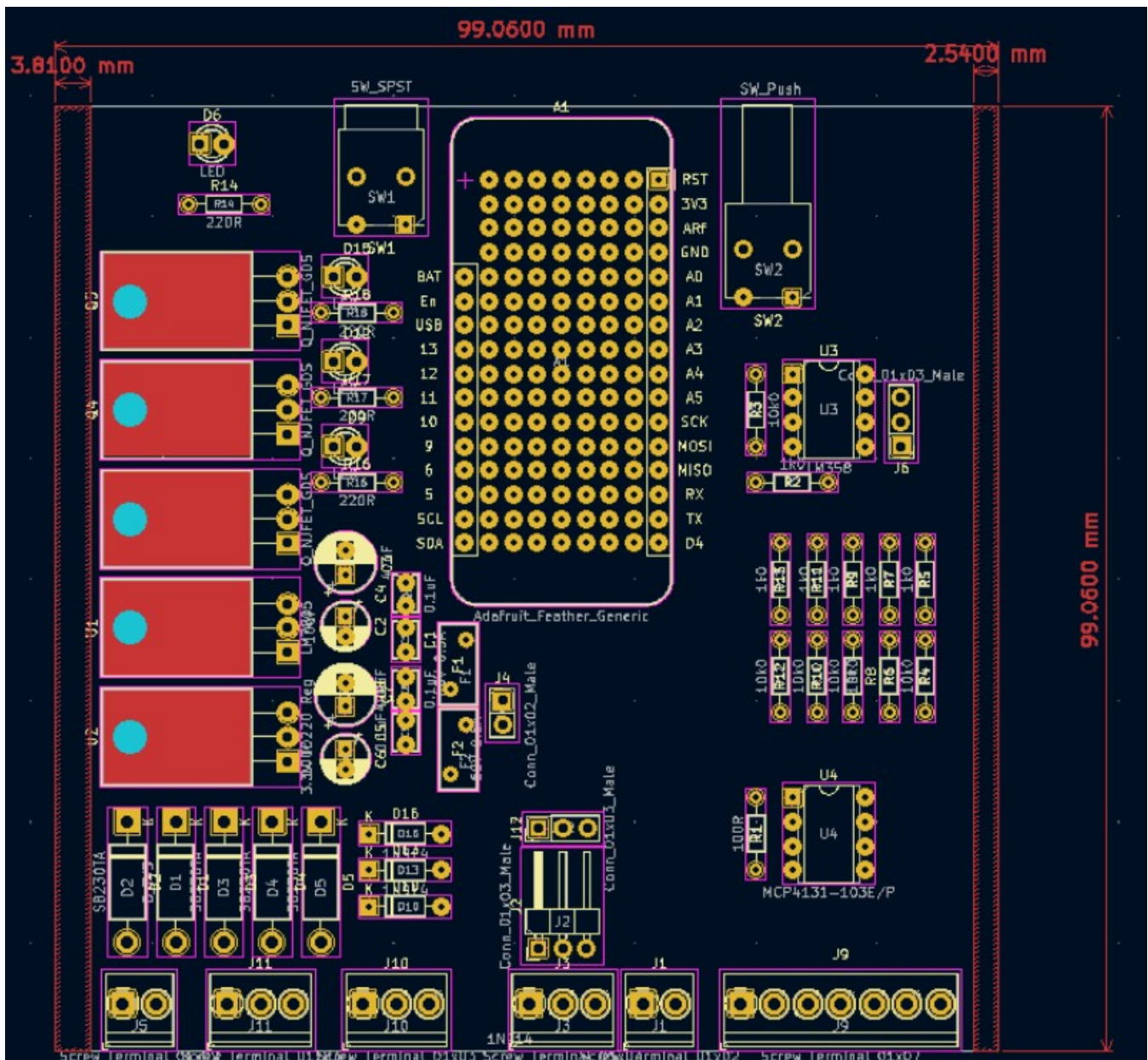


Here it is hidden in the console with all the wires coming in the back:



Now that it is all working, my mind is running on all the possibilities having a programmable micro-controller hooked into the cars CAN-bus with a bunch of analog and digital ins/outs so I am currently designing a PCB that breaks out a lot more of the micro-controllers pins. My design brings out the following:

- 3x digital outputs via MOSFETs that will ground up to 2A each
- 1x 0-12V analog output (op-amp)
- 1x 0-10k variable resistance (to ground)
- 5x analog inputs (with voltage dividers so that it is 12V tolerant).



More inputs/outputs are possible in the future but I would change to surface-mount components.

My ideas on things that I can do with it are:

- Progressive shift-light using a string of 8xWS2812 LEDs
- Slow down the fuel-pump via PWM and a solid state relay when off-boost
- Spoof the F6 oil pressure sensor signal to the PCM (don't think this one is needed with PCMtec)
- Factor style PID boost control (for the NA + T crowd)
- Yaw control using the input from an IMU (needs a lot more thought and big cajones while tuning)

I'll post up code and designs on github shortly and update this with a link then.

I hope this inspires someone, I will try to answer any questions however this isn't a beginners project.

Edited 7 hours ago by 2X044

typo

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Cheap closed loop boost control. This puts and end to the shortage of turbo PCMs.

Intercept the oil temp and pull it high eg 255c on failure modes like low fuel pressure or other conditions that rely on external sensors not present on the factory pcm.

You could wire in low oil/fuel pressure analog inputs with pre configured ranges for sensors you include in the kit.

Lean out detection via wideband when load > 1.5 etc

Make it all configurable easily via simple dials, no usb, no laptop. Super simple. Sell the full kit, fittings, boom that is the right length for each model, make everything truly plug and play.

Package it up with IP rated case, obtain power from an existing plug (eg the oil/cht temp sender) then sandwich plate for obd/can and make it a 20 minute job to install and wire up. No crimping, no wiring. Use off the shelf oil pressure and fuel pressure sensors .

I can send you the broadcast packets to sniff to get this data at 16ms intervals for ba/bf/fg.

We would happily push this product on our facebook page/website at no cost if it was robust, reliable and didn't have stock issues.

This would effectively implement all the most important parts of an after market pcm at a low cost. People would make it almost a mandatory add on for a stock pcm tune.

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<Crawls out of the woodwork, tips hat....>

+ Quote

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You've got my mind churning now! Some interesting "wishes" there.

I'd been thinking about how to trip "limp home" mode through spoofing a sensor but hadn't thought of the oil temp. I'd been thinking about intercepting throttle position signals but if the PCM will respond to a change in the oil temp that would no doubt be easier. If anyone has a surplus oil temp sensor (BA if there are differences) kicking around send it my way and I'll work out how to intercept and mimic it. I suspect either the analog voltage outputs or the variable resistor that I've included on the PCB will do the trick. I just need to work out ranges, slopes and offsets.

The closed loop boost control is an interesting challenge, including making it fail to safe should anything happen to the micro-controller. I'll probably need to talk to you about how it is implemented by the factory PCM to try to match it and make sure I have all the inputs needed.

Other sensors should be straight forward, again ranges, slopes and offsets will be needed to ensure the PCB is designed correctly as the micro-controller analog inputs are natively only 3.3V tolerant. I've got a SAAS oil pressure sensor and an autometer fuel pressure sensor kicking around so can start with them.

By far the hardest part will be the packaging, QC, etc. to make it a commercial offering. I'm sure there will be some special "gotcha's" in the implementation, but that is half the fun.

I'd given a little thought to how configuration could be made easy but hadn't got to simple dials. Depending on what is possible with the Tactrix, my first thought was that the configuration could be sent over the CAN bus via unused identifiers (extended?). It may even be possible to make it seamless for PCMtec users.

This is only a hobby for me, I'll keep you informed of progress but it may be slow. My turbocharger is fubar at the moment so that will need my immediate attention.

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