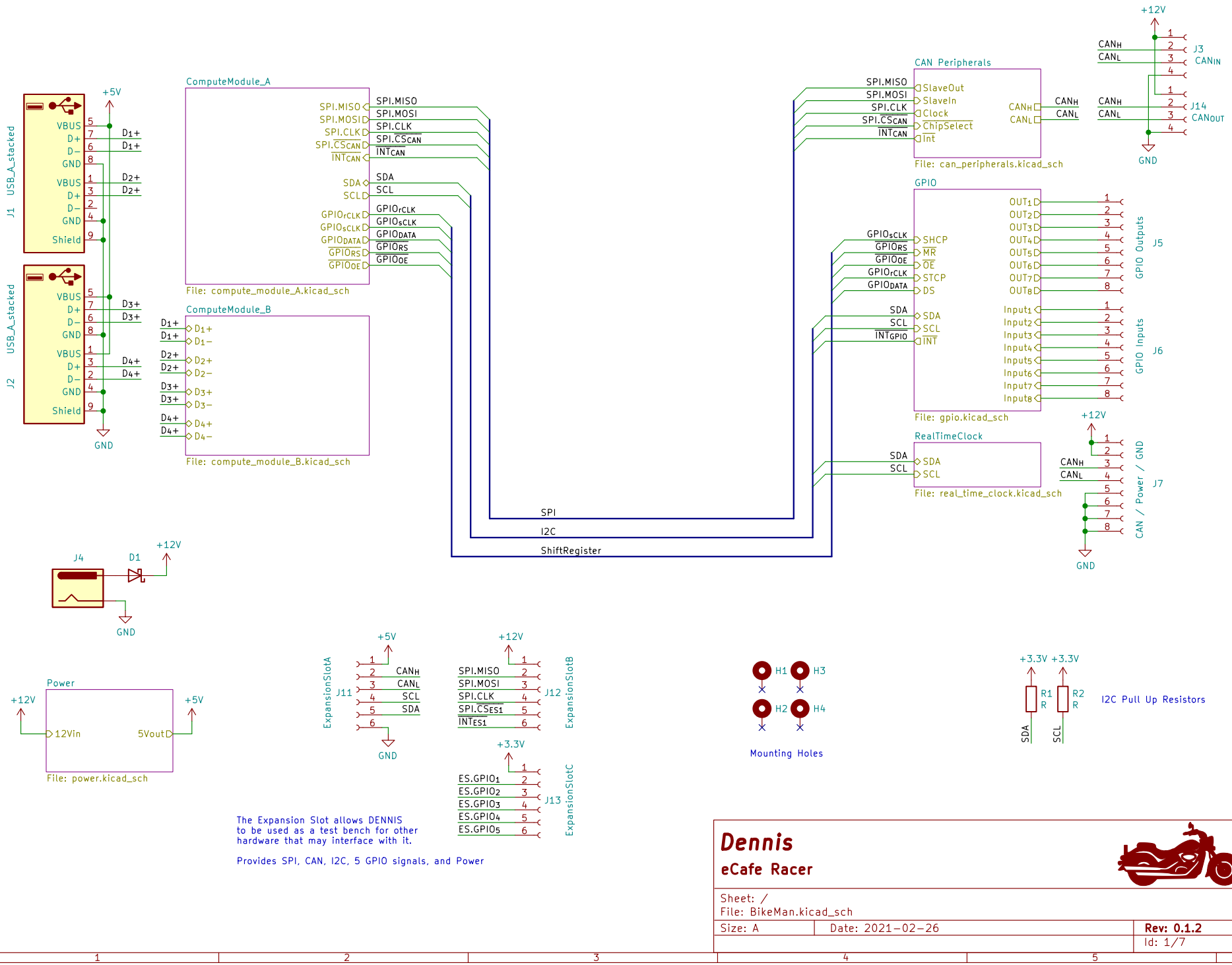
ComputeModule_A
File: compute_module_A.kicad_sch
ComputeModule_B
File: compute_module_B.kicad_sch
CAN Peripherals
File: can_peripherals.kicad_sch
GPIO
File: gpio.kicad_sch
RealTimeClock
File: real_time_clock.kicad_sch
Power
File: power.kicad_sch
SPI
I2C
ShiftRegister
GPIO Outputs
GPIO Inputs
CAN / Power / GND
Mounting Holes
I2C Pull Up Resistors
The Expansion Slot allows DENNIS
to be used as a test bench for other
hardware that may interface with it.
Provides SPI, CAN, I2C, 5 GPIO signals, and Power
Dennis
eCafe Racer
Sheet: /
File: BikeMan.kicad_sch
Size: A
Date: 2021-02-26
Rev: 0.1.2
Id: 1/7

Module1A
ComputeModule4-CM4
Hirose
2x DF40C-100DS-0.4V

GPIO

NB SD signals are only available on modules without eMMC

Pin locations expected to change

This could be on any of the GPIO pins as well

Hopefully I am using the right ethernet pairs

J8
MagJack

J9
Micro_SD_Card_Det

SD card detection circuit
Copied from CM4 io board

U4
RT9742GGJ5

Near U4

Near J9

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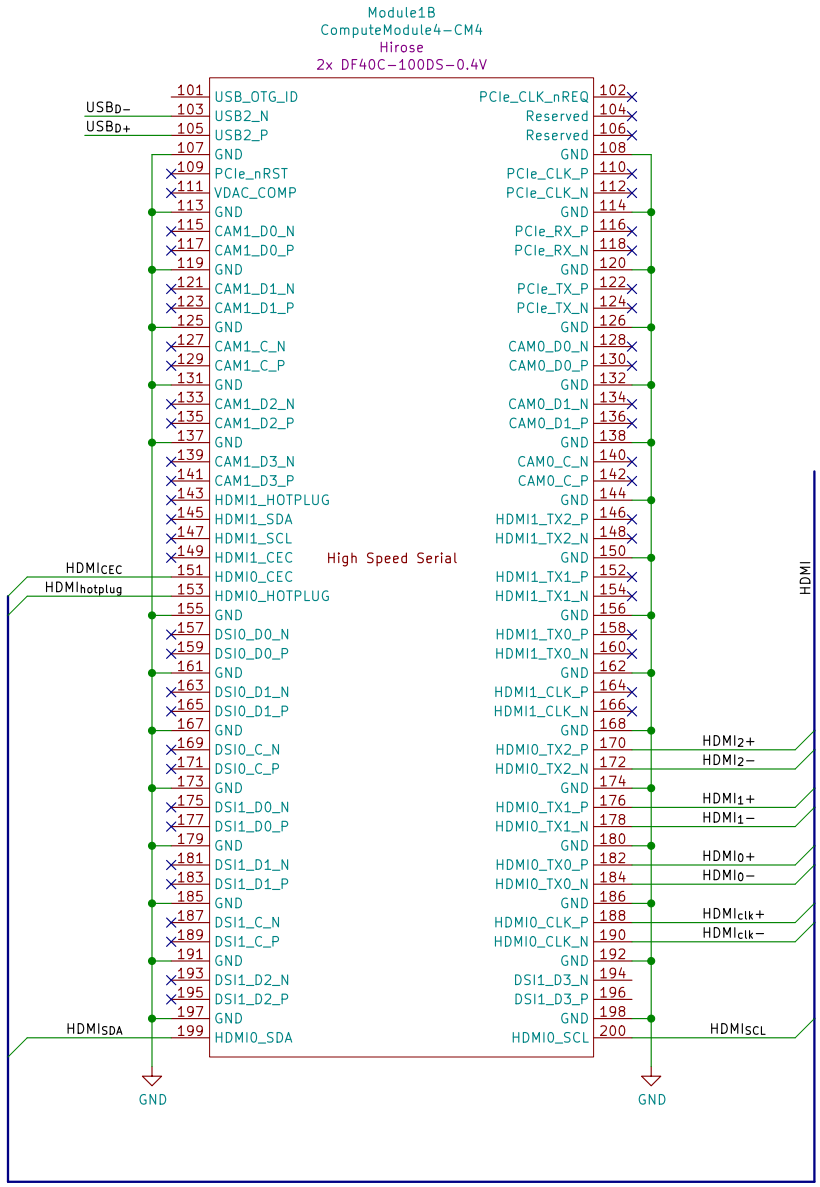
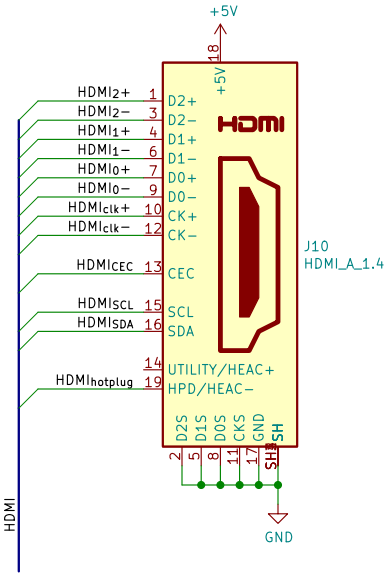
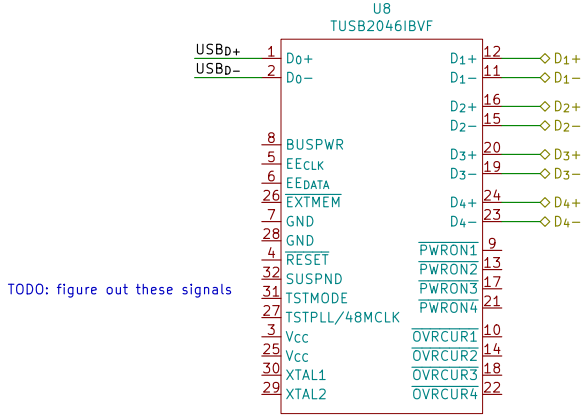
Sheet: /ComputeModule_A/
File: compute_module_A.kicad_sch

Size: A	Date: 2021-02-26	**Rev: 0.1.2**
		Id: 2/7



TODO: make of find footprint





TODO: figure out these signals

USB hub IC allows up to 4 devices to talk to the Pi's USB port.
This is mainly to allow hooking up a keyboard and mouse to the board
for debugging and configuration, and will most likely not be a part of the board
when it becomes a product.

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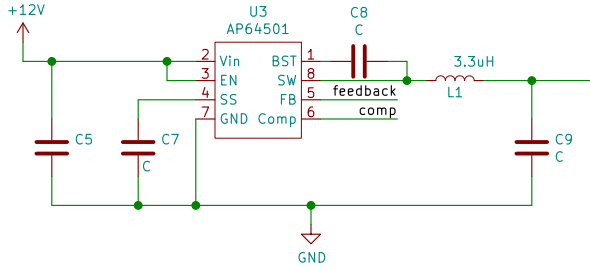
Sheet: /ComputeModule_B/
File: compute_module_B.kicad_sch

Size: A	Date: 2021-02-26	**Rev: 0.1.2**
		Id: 3/7

Buck Converter
12V -> 5V @ 5A max output



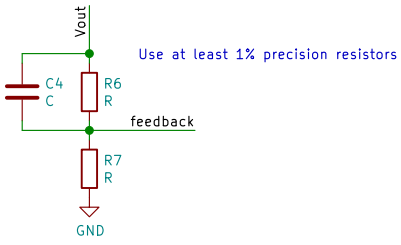
CM4 board uses 4 (10uF) ceramic and 1 (100uF) electrolytic capacitors in parallel

CM4 board uses
EEF-CX0J101R
for electrolytic capacitor

TODO:
- Bus power input (From DC to DC converter in battery
- Bus power delivery

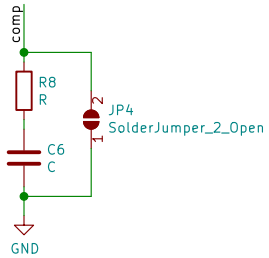
Vout is determined by this feedback divider circuit through the equation: $R_{high} = R_{low} * (V_{out} / 0.8V - 1)$

Optional capacitor can improve transient response



Feedback Circuit

Compensation Circuit
(See Datasheet)



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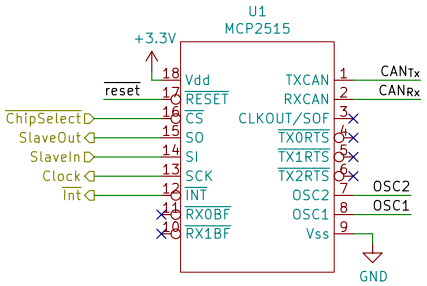
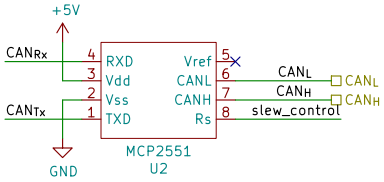
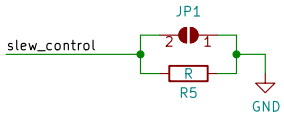
Sheet: /Power/
File: power.kicad_sch

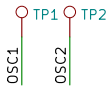
Size: A	Date: 2021-02-26	**Rev: 0.1.2**
		Id: 4/7

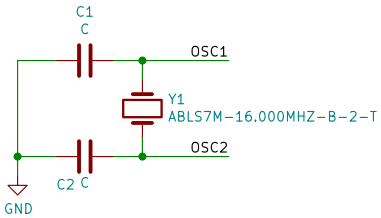




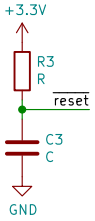


Slew Rate Control circuit.
The slew rate of CAN_H and CAN_L are determined by
the resistance between the Rs pin and ground. Connect directly
to ground for high speed mode, or limit the slew rate to help with EMI
reduction

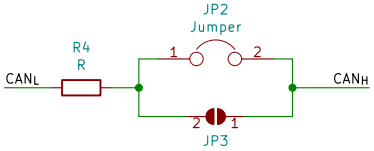




Crystal Oscillator Circuit
(16MHz)



Power On Reset Circuit
Needs to hold reset state for >2us
after power up



120 ohm termination resistor required by CAN bus.
Can be configured with either jumper or solder bridge

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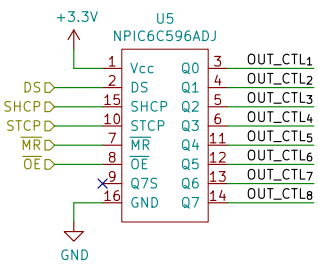
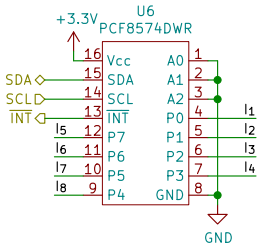
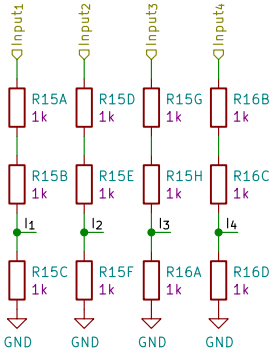
Sheet: /CAN Peripherals/		
File: can_peripherals.kicad_sch		
Size: A	Date: 2021-02-26	**Rev: 0.1.2**
		Id: 5/7

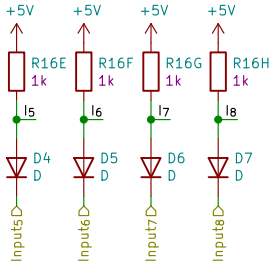




An I2C IO expander is used to read the inputs instead of connecting to the pi's gpio pins directly. This is mainly done for insurance so that the pi's pins cannot be accidentally exposed to the 12V signal.

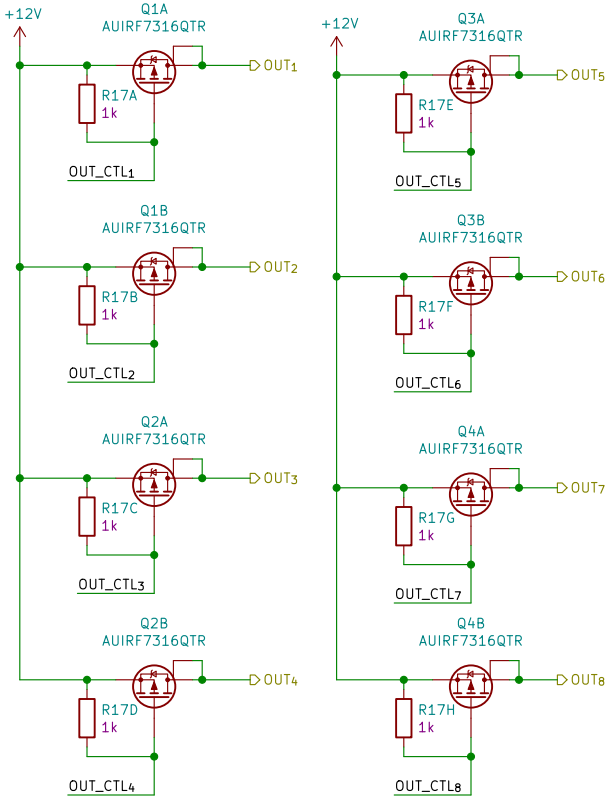


Voltage Divider Network
(1 / 3 : 12V -> 4V)
Used to read 12V digital signals
from other parts of the bike



Switch To Ground Detector
Used to read state of simple
mechanical switches on the bike.

Diodes prevent failure from
miswiring of the two input types



By far the most common use for these inputs will be to read the value of switches. Need to think more about the best way to achieve this, it is most likely not this.

It might be nice to combine Input and Output pins into a single circuit which can be configured in software to act like either, like the gpio modules on microprocessors. Perhaps a "switch detection" mode could be added as well, which measures the resistance to ground instead of voltage

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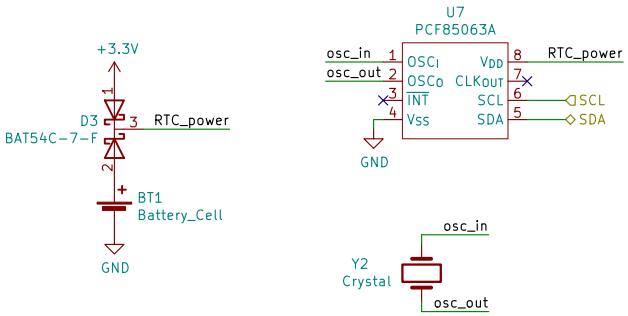
Sheet: /GPIO/
File: gpio.kicad_sch

Size: A	Date: 2021-02-26	**Rev: 0.1.2**
		Id: 6/7



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Sheet: /RealTimeClock/
File: real_time_clock.kicad_sch

Size: A	Date: 2021-02-26	**Rev: 0.1.2**
		Id: 7/7