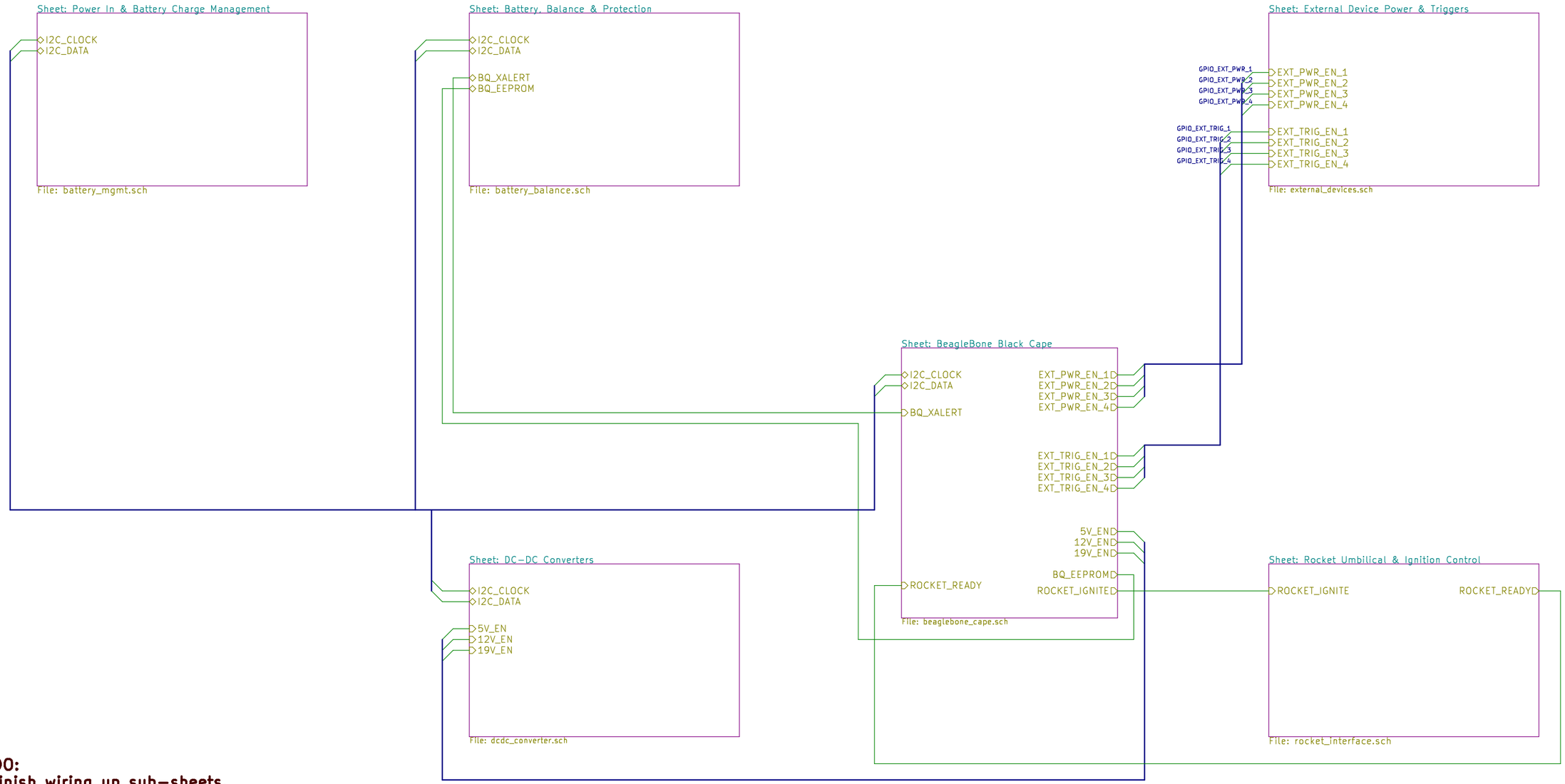

TODO:
*** Finish wiring up sub-sheets.**
*** Bus entries need labels on both sides!**
*** Create style legend.**

Notes:
* LTC3 is a single board represented on multiple sheets.

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Sheet: /
File: Launch_Tower_Computer_III.sch

Title: Launch Tower Computer 3 (LTC3)

Size: B	Date: 2016-02-06	**Rev: A**
KiCad E.D.A. kicad 0.201602050917+6538~~42~~ubuntu16.04.1-product		Id: 1/7

Input Current Sense (p. 20)

Output Current Sense (p. 20)

PV_IN:
Open Circuit = 17 V
Short Circuit = 2.4 A

Supply Detection (p.15, p.34)

Shutdown (p. 27)

Input Feedback (p.14)

Battery Charge Controller
w/ MPPT

LT8490

U202

Output Feedback (p. 17)

Temp Sense (p. 21)

Voltage, Current, & Temp Sense

I2C addr 0x98

Feedback Resistor Disconnect

TODO: no-place 10k resistor in parallel w/ thermistor connector

TODO: label pull-up resistors as no-place?

TODO: place 4-chan buffer between STATUS and FAULT signals, and LEDs and BB GPIOs.

QUESTIONS:
* Safe to use one current-sense resistor for both the LT8490 and the LTC2991?
  * Maybe. Check datasheets for input impedances. Add zero-ohm resistor btw. 2991 and shunt.
* What happens w/out a battery connected?

CHARGING PARAMETERS:
Stage 2 Voltage: 33.6 V
Maximum Charging Current: 11.4 A
Maximum Trickle Current: 3 A
Switching Frequency: 202 kHz

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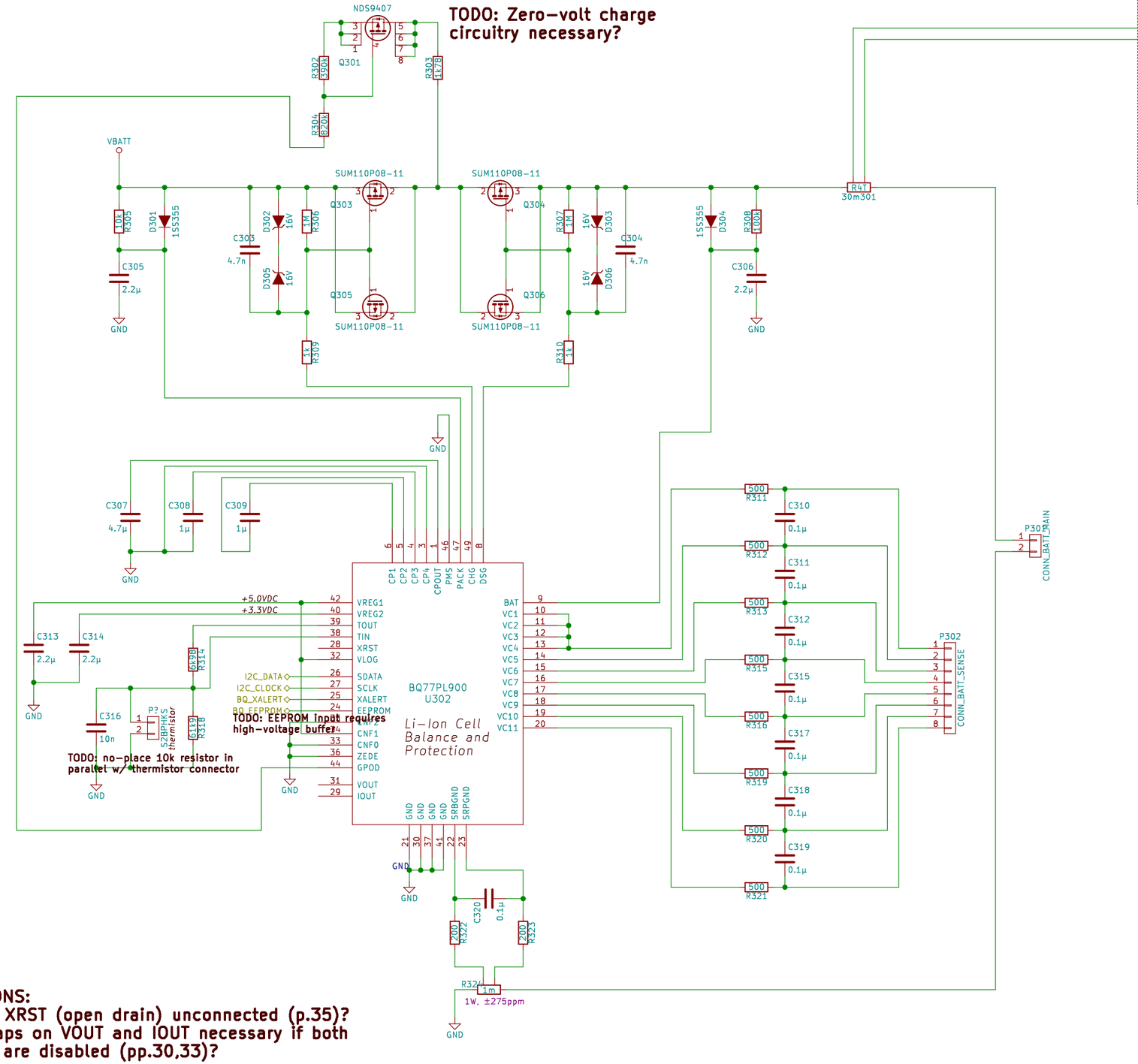
Sheet: /Power In & Battery Charge Management/
File: battery_mgmt.sch

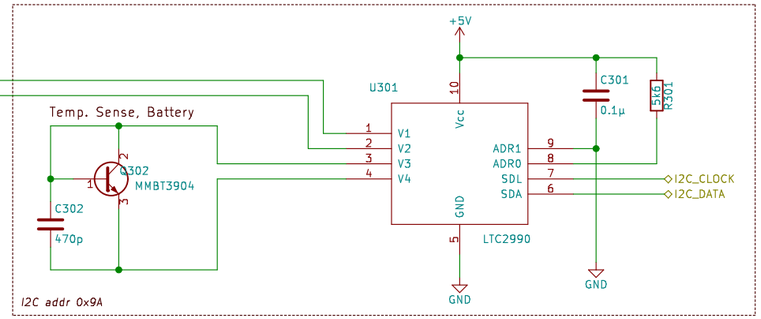
Title: Power In, Battery Management

Size: B	Date: 2016-02-06	Rev: A
KiCad E.D.A. kicad 0.201602050917+6538~42~ubuntu16.04.1-product		Id: 2/7

TODO: Zero-volt charge circuitry necessary?

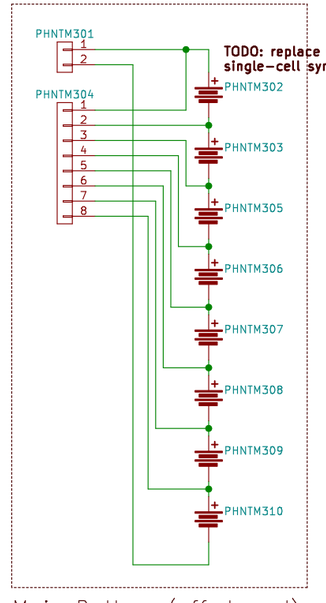


QUESTIONS:
* **Leave XRST (open drain) unconnected (p.35)?**
* **Are caps on VOUT and IOUT necessary if both outputs are disabled (pp.30,33)?**



Voltage, Current, & Temp Sense

TODO: note pack min/max voltages



Main Battery (off-board)

NB:
* Page references are to the bq datasheet.
* "PHNTM" components represent off-board devices. Do not assign footprints to these components.
* bq77PL900 I2C addr is 0x10 (p.38).

UNCONNECTED PINS
* VOUT and IOUT are internally connected to ground when disabled (pp. 30, 33).
* XRST is an open-drain output with an internal 3k pull-up to VLOG (p. 35).

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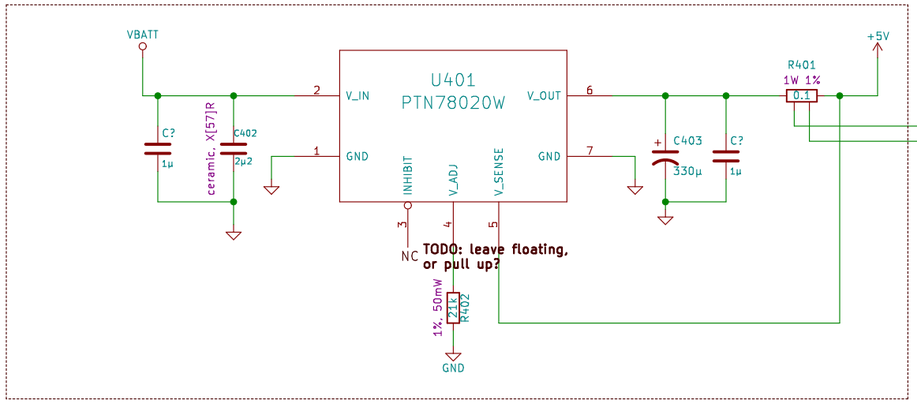
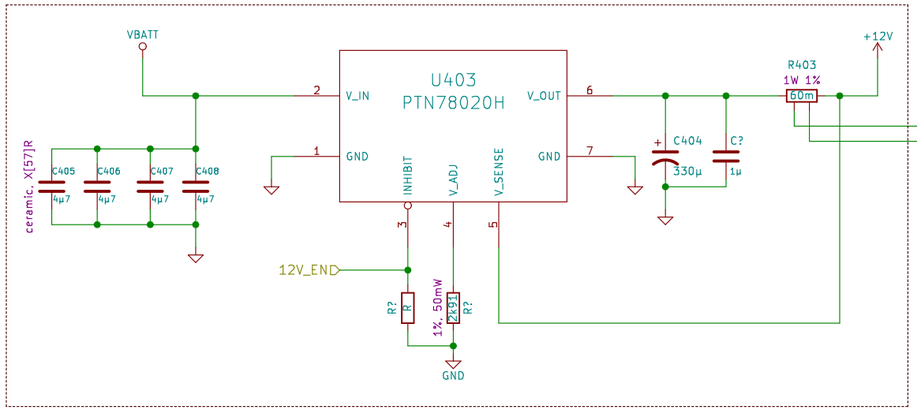
Sheet: /Battery, Balance & Protection/
File: battery_balance.sch

Title: Battery Protection & Charge Balancing

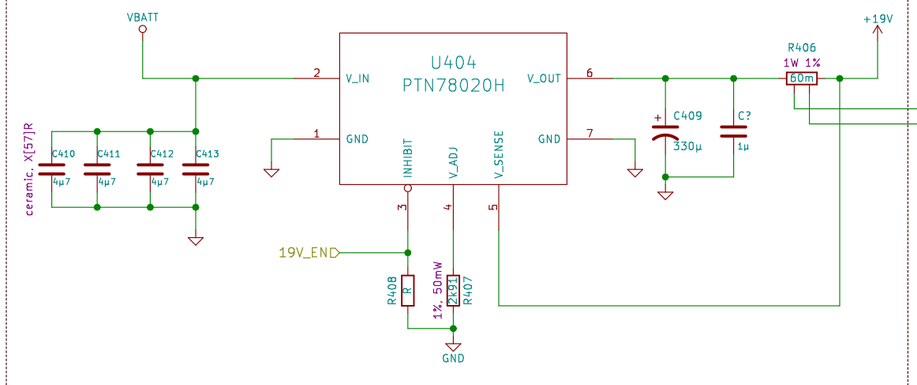
Size: B	Date: 2016-02-06	**Rev: A**
KiCad E.D.A. kicad 0.201602050917+6538~42~ubuntu16.04.1-product		Id: 3/7



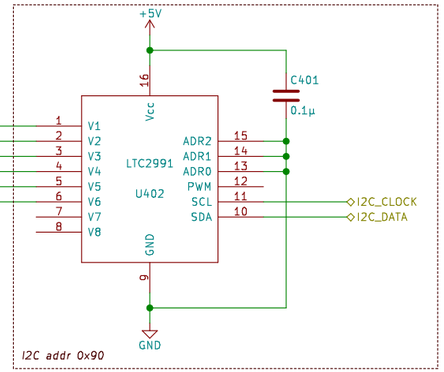
+5V DC Rail



+12V DC Rail



+19V DC Rail



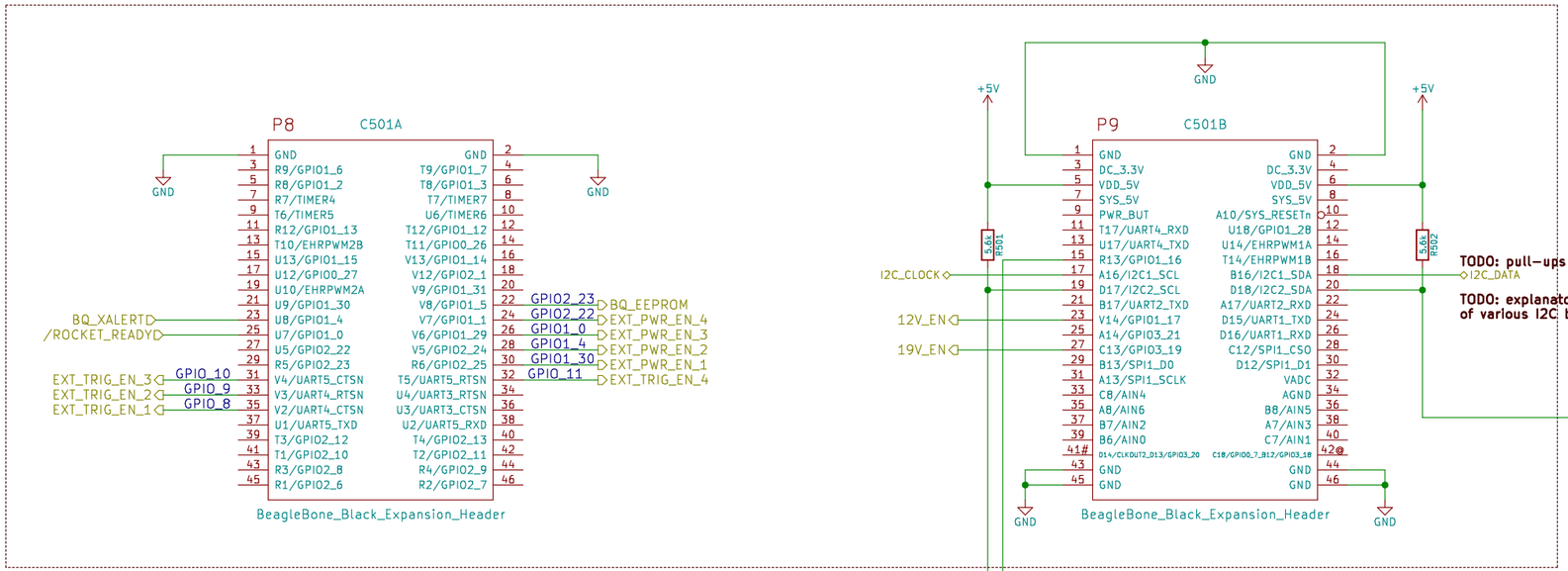
Voltage, Current, & Temp Sense

Current Sense Resistors
full-scale voltage = 0.300 V
R_sense_max = 0.300/Imax
1 A = 300mΩ
3 A = 100mΩ
5 A = 60mΩ
10 A = 30mΩ

NB:
1. V_sense should connect as close as possible to the largest load on the given power rail.
2. Place Rset resistors as close to package pins as possible.
3. Ceramic (Cin) capacitors should be located within 0.5 in of the input pins.
4. We may need heat sinks on the converters. The datasheet indicates a range of 2W to 5W of power dissipation given our specs.
5. Pay attention to the datasheet's recommendations regarding capacitor selection.

TODO:
* Values for converter enable pull-down resistors. Don't exceed the BB's low source max.!
* Capacitor values are minimums. Consider increasing these. Consult datasheet for more info.

Portland State Aerospace Society <http://psas.pdx.edu/>		
Sheet: /DC-DC Converters/ File: dcdc_converter.sch		
Title: LTC3 DC-DC Converters		
Size: B	Date: 2016-02-06	**Rev: A**
KiCad E.D.A. kicad 0.201602050917+6538~2ubuntu16.04.1-product		Id: 4/7



NOTES:
Do NOT change ROCKET_IGNITE,
pin default reset state is High-Z
w/ pulldown resistor. Other pins
can be configured in EEPROM
at boot time.

TODO:
* Buffer btw rocket-ready signal and BB,
  ign. board, etc?
* Umbilical connection state
* Ignition fuse state

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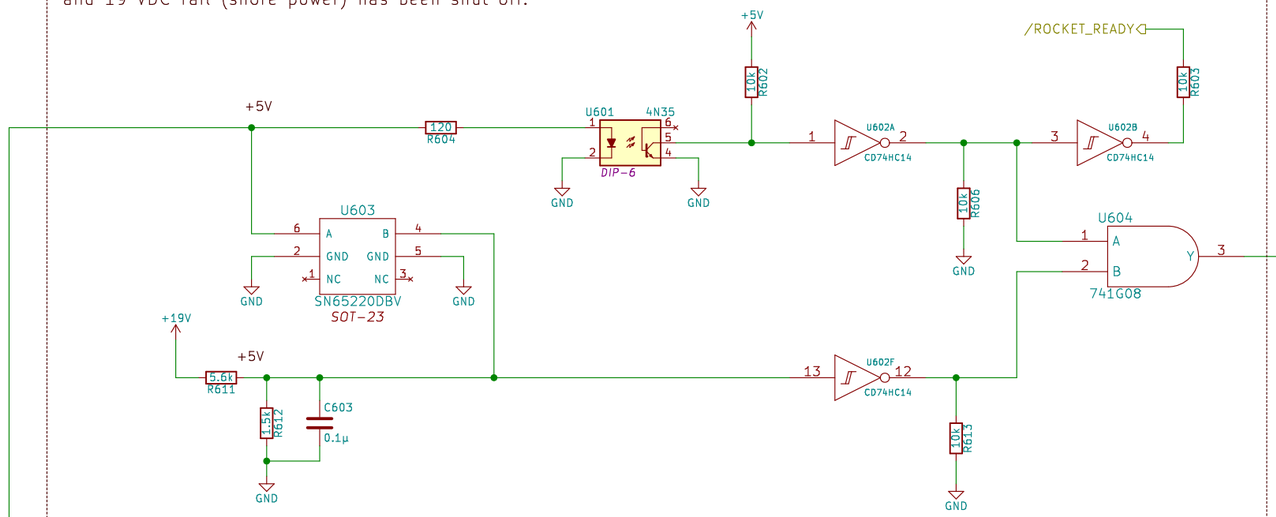
Sheet: /BeagleBone Black Cape/
File: beaglebone_cape.sch

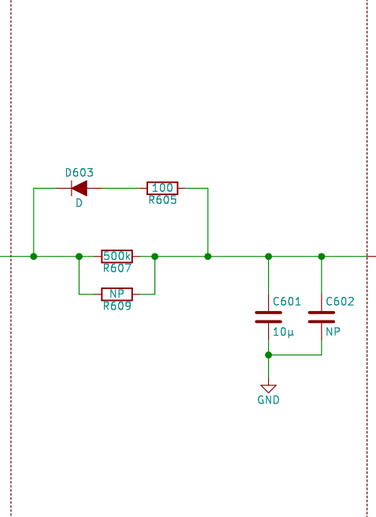
Title: LTC3 BeagleBone Black Cape Interface

Size: B	Date: 2016-02-06	**Rev: A**
KiCad E.D.A. kicad 0.201602050917+6538~42~ubuntu16.04.1-product		Id: 5/7

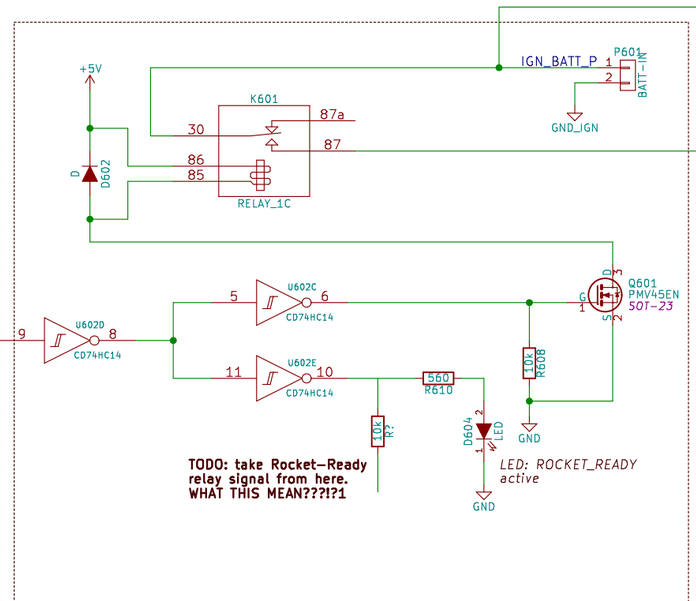
Ignition battery pack disconnected until
flight computer has asserted ROCKET_READY
and 19 VDC rail (shore power) has been shut off.



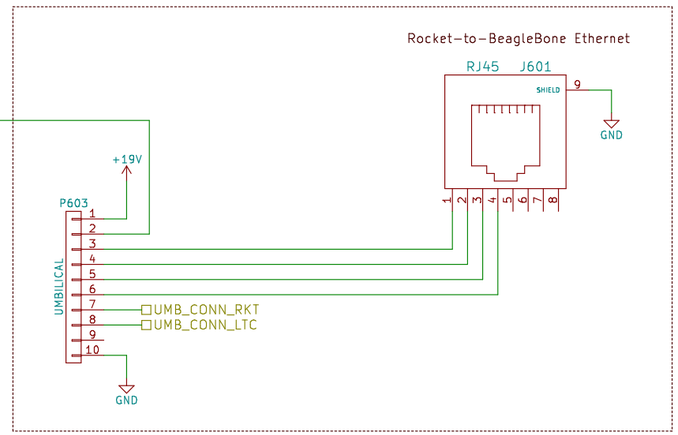
Input Logic



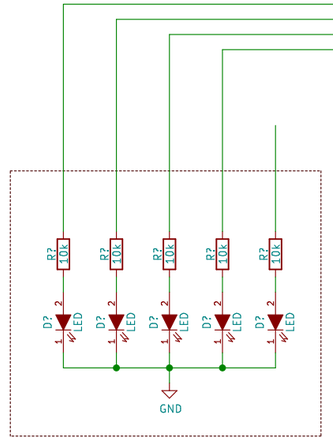
Delay (5s)



Ignition Battery Switch

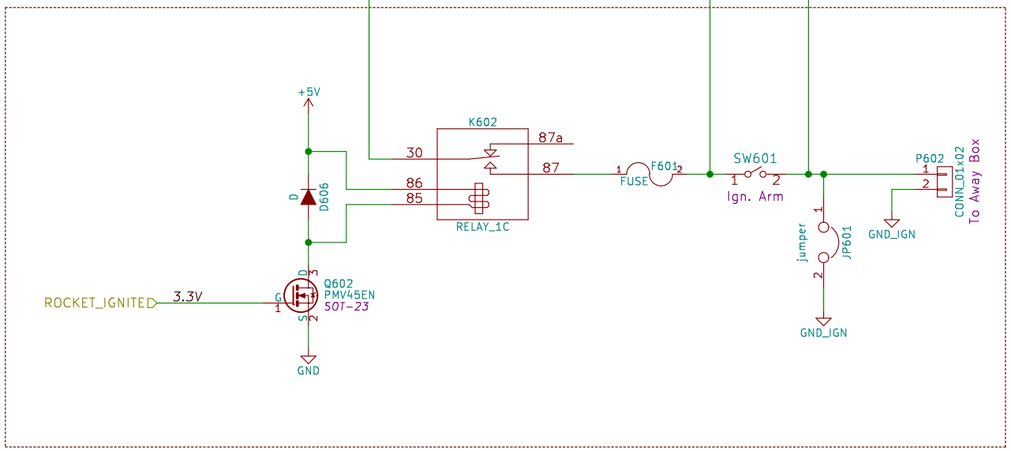


Rocket Umbilical

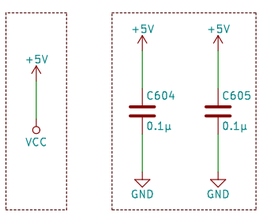


BAKERCON Indicator

1: Ign batt connected
2: RR asserted; power to ign relay
3: Ign relay closed; power to arm switch
4: Arm sw closed; power to shorting bar
5: Shorting bar removed; power to ign connector

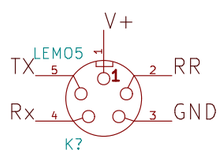


Ignition Switch



VCC for
CD74HC14

Bypass Capacitors
(one per IC VCC)



Reference from LTC2

TODO:
* **Select appropriate component values.**
* **Finish rocket umbilical connector.**
  * **Verify Enet jack "adapter" wiring.**
  * **Add umbilical connect sense lines circuitry.**
* **Label various LEDs.**

QUESTIONS:
  ***Will 5v from schmidt fry BBB GPIO?**

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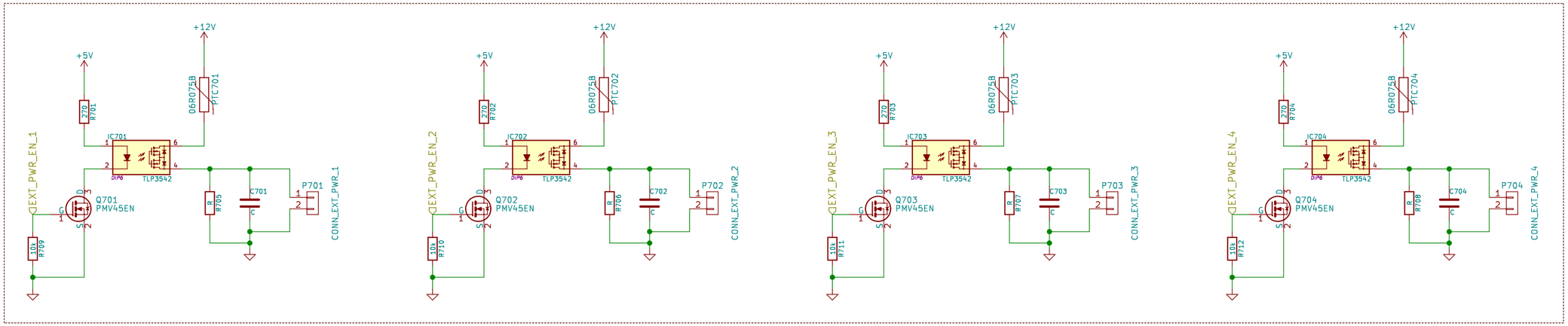
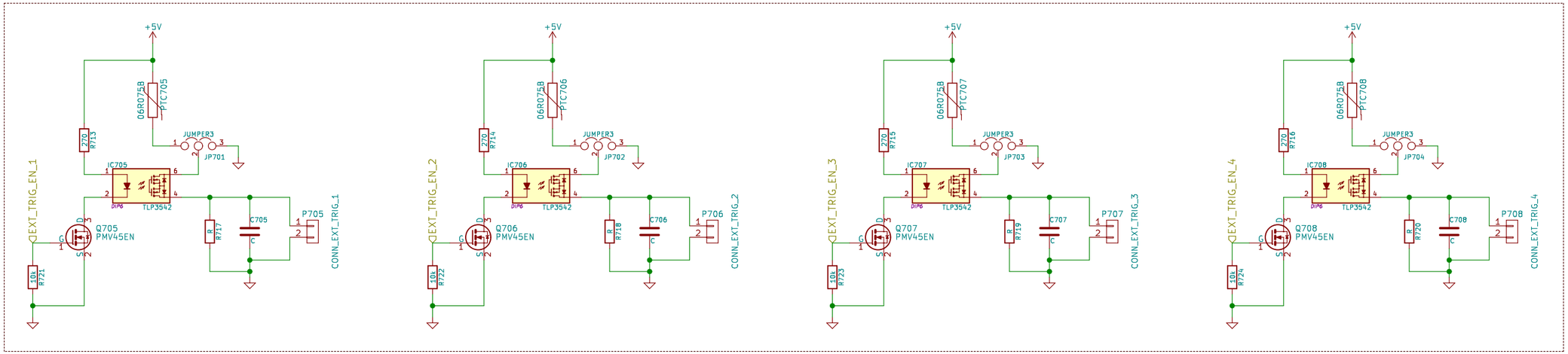
Sheet: /Rocket Umbilical & Ignition Control/
File: rocket_interface.sch

Title: LTC3 Rocket Umbilical & Ignition Control

Size: B	Date: 2016-02-06	**Rev: A**
KiCad E.D.A. kicad 0.201602050917+6538~42ubuntu16.04.1-product		Id: 6/7



External Device Power



External Device Triggers

TODO:
* Determine values for bleeder resistor and filter capacitor on each output connector.
* Pick new PolyFuses, 0.5–1.0A max.

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Sheet: /External Device Power & Triggers/
File: external_devices.sch

Title: LTC3 External Power & Triggers

Size: B	Date: 2016-02-06	**Rev: A**
KiCad E.D.A. kicad 0.201602050917+6538~42ubuntu16.04.1-product		id: 7/7