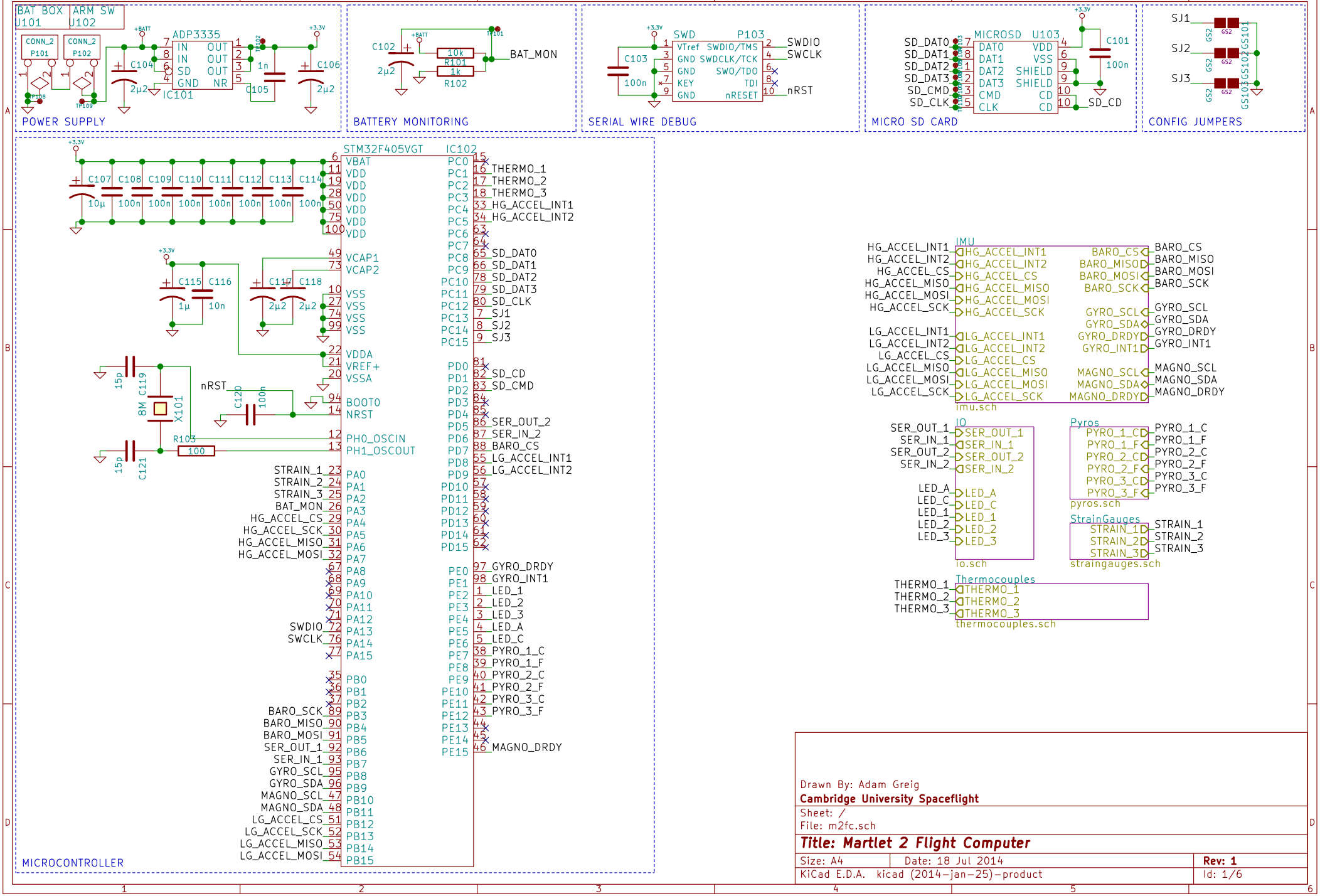
BAT BOX U101
ARM SW U102
CONN_2 P101
CONN_2 P102
ADP3335
IC101
C104 2µ2
C105 1n
C106 2µ2
POWER SUPPLY
C102 2µ2
10k R101
1k R102
BAT_MON
BATTERY MONITORING
SWD P103
VTref SWDIO/TMS
GND SWDCLK/TCK
GND SWO/TDO
KEY TDI
GND nRESET
C103 100n
SWDIO
SWCLK
nRST
SERIAL WIRE DEBUG
MICROSD U103
DAT0 VDD
DAT1 VSS
DAT2 SHIELD
DAT3 SHIELD
CMD CD
CLK CD
C101 100n
SD_CD
MICRO SD CARD
SJ1
SJ2
SJ3
CONFIG JUMPERS
STM32F405VGT IC102
C107 C108 C109 C110 C111 C112 C113 C114
10µ 100n 100n 100n 100n 100n 100n 100n
C115 C116 1µ 10n
C117 C118 2µ2 2µ2
15p C119 8M X101 15p C121
nRST C120 100n
R103 100
VBAT
VDD
VCAP1
VCAP2
VSS
VDDA
VREF+
VSSA
BOOT0
NRST
PH0_OSCIN
PH1_OSCOUT
PA0 STRAIN_1
PA1 STRAIN_2
PA2 STRAIN_3
PA3 BAT_MON
PA4 HG_ACCEL_CS
PA5 HG_ACCEL_SCK
PA6 HG_ACCEL_MISO
PA7 HG_ACCEL_MOSI
PA8
PA9
PA10
PA11
PA12 SWDIO
PA13 SWCLK
PA14
PA15
PB0
PB1
PB2
PB3 BARO_SCK
PB4 BARO_MISO
PB5 BARO_MOSI
PB6 SER_OUT_1
PB7 SER_IN_1
PB8 GYRO_SCL
PB9 GYRO_SDA
PB10 MAGNO_SCL
PB11 MAGNO_SDA
PB12 LG_ACCEL_CS
PB13 LG_ACCEL_SCK
PB14 LG_ACCEL_MISO
PB15 LG_ACCEL_MOSI
PC0 THERMO_1
PC1 THERMO_2
PC2 THERMO_3
PC3 HG_ACCEL_INT1
PC4 HG_ACCEL_INT2
PC5
PC6
PC7
PC8 SD_DAT0
PC9 SD_DAT1
PC10 SD_DAT2
PC11 SD_DAT3
PC12 SD_CLK
PC13 SJ1
PC14 SJ2
PC15 SJ3
PD0
PD1 SD_CD
PD2 SD_CMD
PD3
PD4
PD5 SER_OUT_2
PD6 SER_IN_2
PD7 BARO_CS
PD8 LG_ACCEL_INT1
PD9 LG_ACCEL_INT2
PD10
PD11
PD12
PD13
PD14
PD15
PE0 GYRO_DRDY
PE1 GYRO_INT1
PE2 LED_1
PE3 LED_2
PE4 LED_3
PE5 LED_A
PE6 LED_C
PE7 PYRO_1_C
PE8 PYRO_1_F
PE9 PYRO_2_C
PE10 PYRO_2_F
PE11 PYRO_3_C
PE12 PYRO_3_F
PE13
PE14
PE15 MAGNO_DRDY
MICROCONTROLLER
IMU
HG_ACCEL_INT1
HG_ACCEL_INT2
HG_ACCEL_CS
HG_ACCEL_MISO
HG_ACCEL_MOSI
HG_ACCEL_SCK
LG_ACCEL_INT1
LG_ACCEL_INT2
LG_ACCEL_CS
LG_ACCEL_MISO
LG_ACCEL_MOSI
LG_ACCEL_SCK
BARO_CS
BARO_MISO
BARO_MOSI
BARO_SCK
GYRO_SCL
GYRO_SDA
GYRO_DRDY
GYRO_INT1
MAGNO_SCL
MAGNO_SDA
MAGNO_DRDY
imu.sch
IO
SER_OUT_1
SER_IN_1
SER_OUT_2
SER_IN_2
LED_A
LED_C
LED_1
LED_2
LED_3
io.sch
Pyros
PYRO_1_C
PYRO_1_F
PYRO_2_C
PYRO_2_F
PYRO_3_C
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StrainGauges
STRAIN_1
STRAIN_2
STRAIN_3
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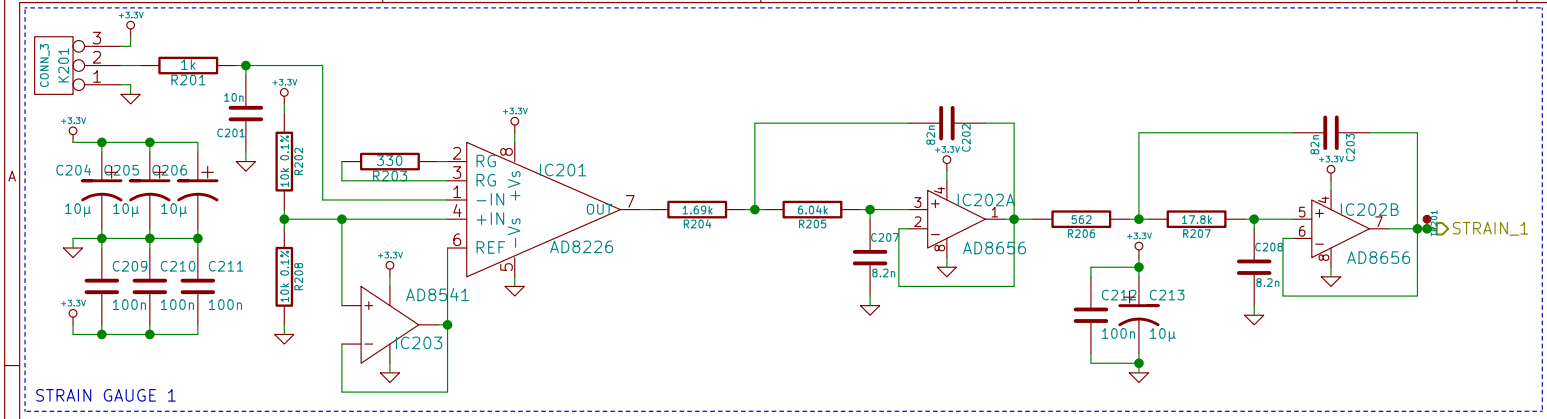
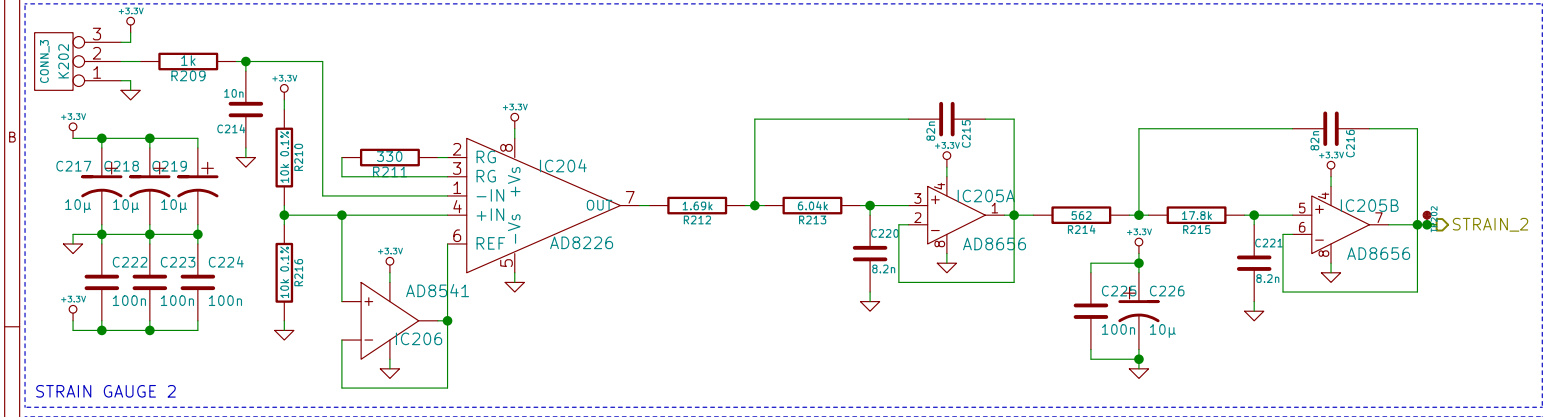
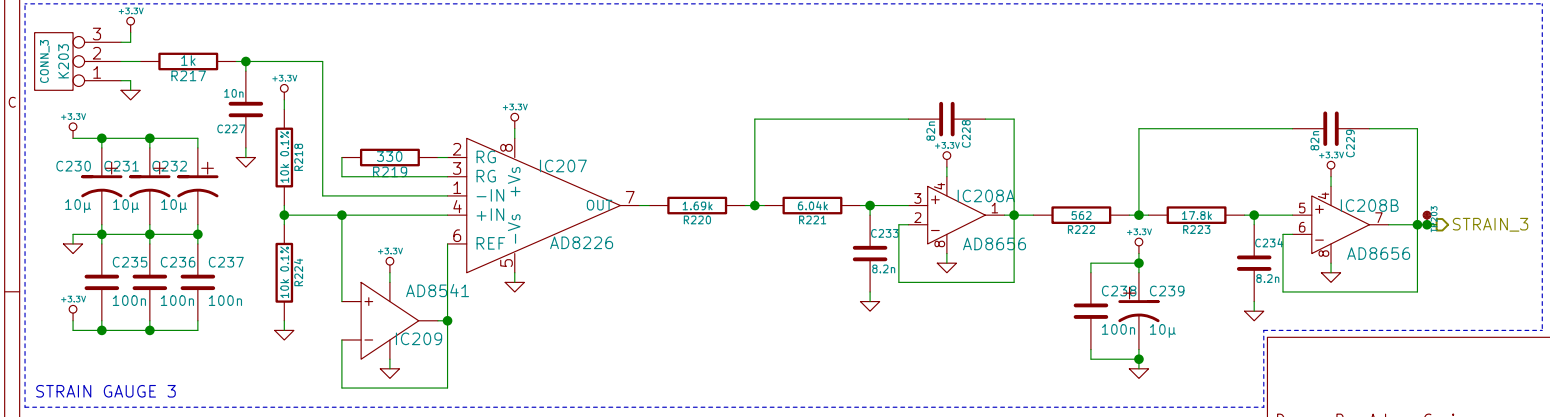
Thermocouples
THERMO_1
THERMO_2
THERMO_3
thermocouples.sch
Drawn By: Adam Greig
Cambridge University Spaceflight
Sheet: /
File: m2fc.sch
Title: Martlet 2 Flight Computer
Size: A4
Date: 18 Jul 2014
Rev: 1
KiCad E.D.A. kicad (2014-jan-25)-product
Id: 1/6







FILTERING
==========
Signals of interest: 0 to 1200Hz
Nyquist: 10kHz
Sample: 20kHz

FRONTEND FILTER

Fc = 1/(2 pi RC) = 16kHz

ANTIALIAS FILTER

−3dB: 2kHz
Rejection at Nyquist: −55dB

INSTRUMENTATION AMPLIFIER
==========

Gain = 1 + 49400/R_G (AD8226 datasheet)

R_G is 330 so G=150.70

Gauge factor GF=2
Max strain 0.23% is 2.3E−3
Change in R therefore 4.6E−3 * R0
Gauges are R0=120
Strained R=(1+4.6E−3)R0=120.552
Giving voltage V=[Rs/(Rs+R0) * Vs] − Vs/2=3.78mV

Errors due to tolerance: as much as 2.47mV
Errors due to temperature: up to 1mV

Total required headroom then say 7.5mV
Max output is 3.3V (supply) − 0.1V (amp limit) = 3.2V
Headroom is 3.2 − (3.3/2) = 1.55V
Highest permissible gain 1.55/7.5E−3 = 206

So gain of 150 leads sufficient headroom:
Max differential signal amplitude: 1.55/150.7=10.2mV

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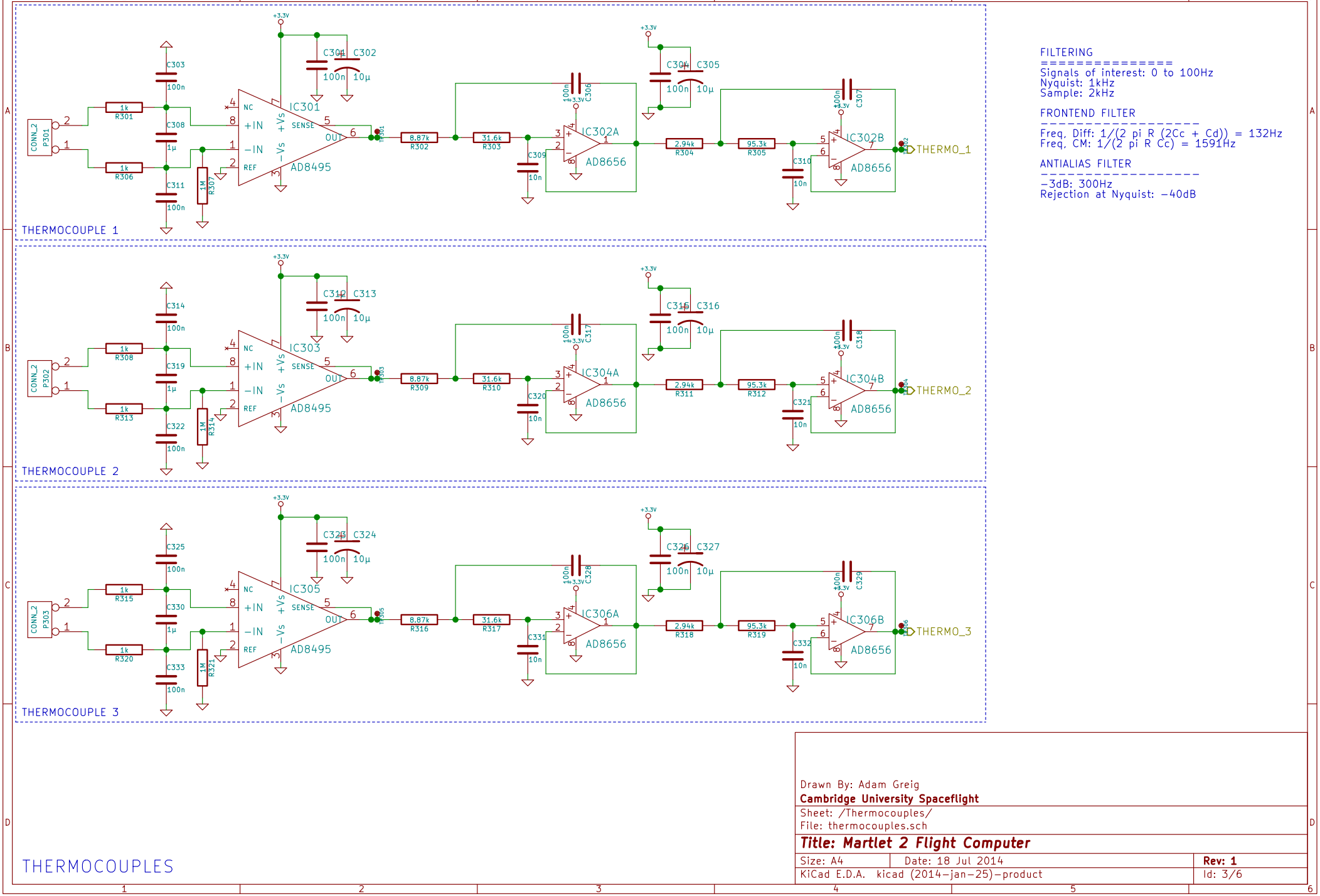
Sheet: /StrainGauges/
File: straingauges.sch

Title: Martlet 2 Flight Computer

Size: A4	Date: 18 Jul 2014	**Rev: 1**
KiCad E.D.A. kicad (2014−jan−25)−product		Id: 2/6

STRAIN GAUGES



FILTERING
==========
Signals of interest: 0 to 100Hz
Nyquist: 1kHz
Sample: 2kHz

FRONTEND FILTER

Freq, Diff: 1/(2 pi R (2Cc + Cd)) = 132Hz
Freq, CM: 1/(2 pi R Cc) = 1591Hz

ANTIALIAS FILTER

−3dB: 300Hz
Rejection at Nyquist: −40dB

THERMOCOUPLES

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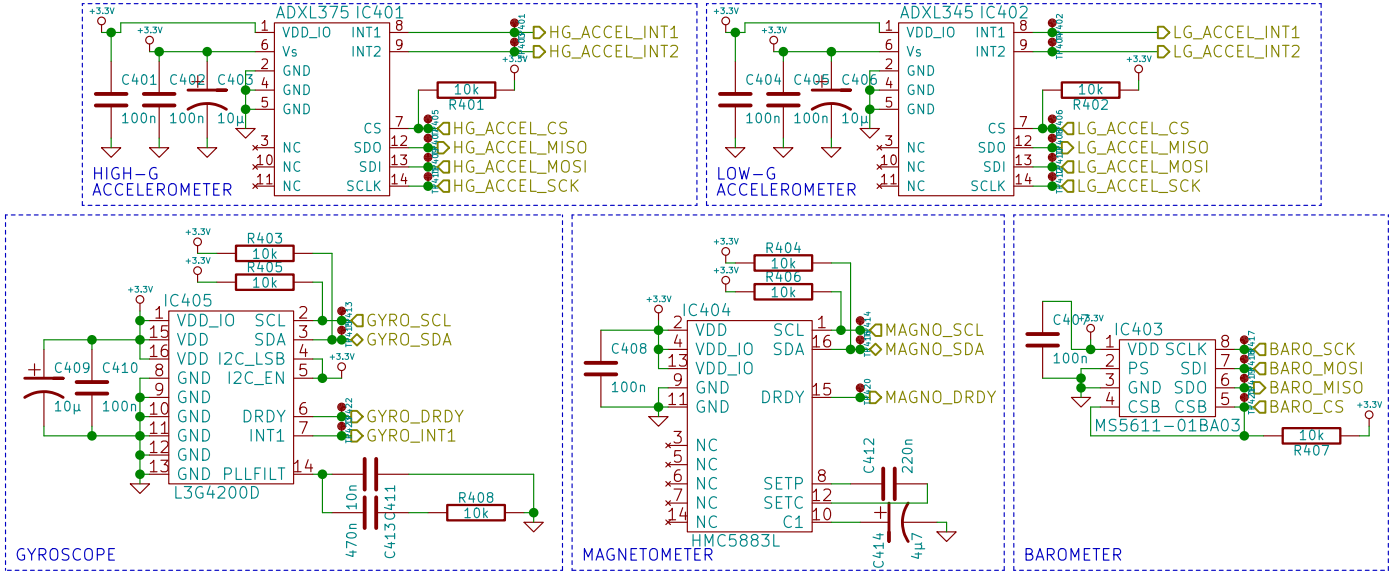
Sheet: /Thermocouples/
File: thermocouples.sch

Title: Martlet 2 Flight Computer

Size: A4	Date: 18 Jul 2014	**Rev: 1**
KiCad E.D.A. kicad (2014-jan-25)-product		Id: 3/6

INERTIAL MEASUREMENT UNIT



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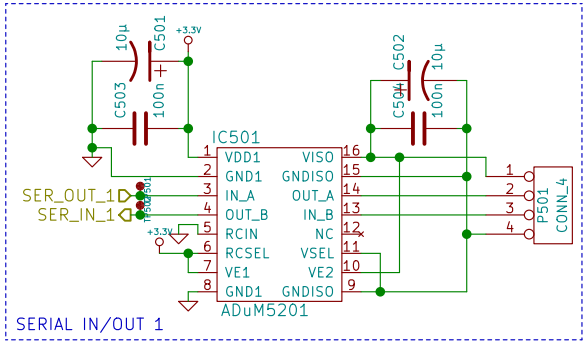
Sheet: /IMU/

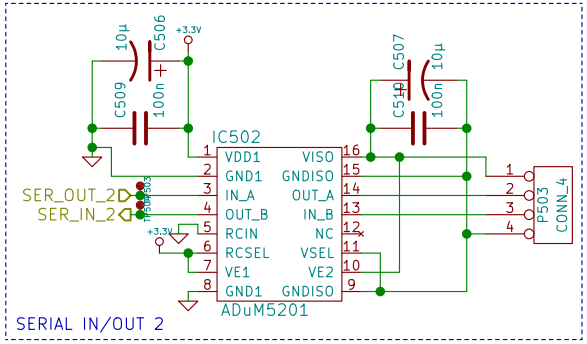
File: imu.sch

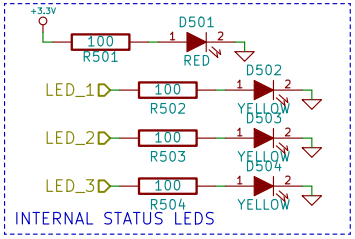
Title: Martlet 2 Flight Computer

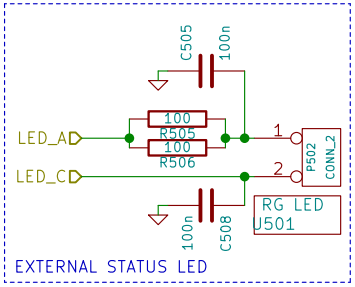
Size: A4	Date: 18 Jul 2014	**Rev: 1**
KiCad E.D.A. kicad (2014-jan-25)-product		Id: 4/6

INPUT/OUTPUT









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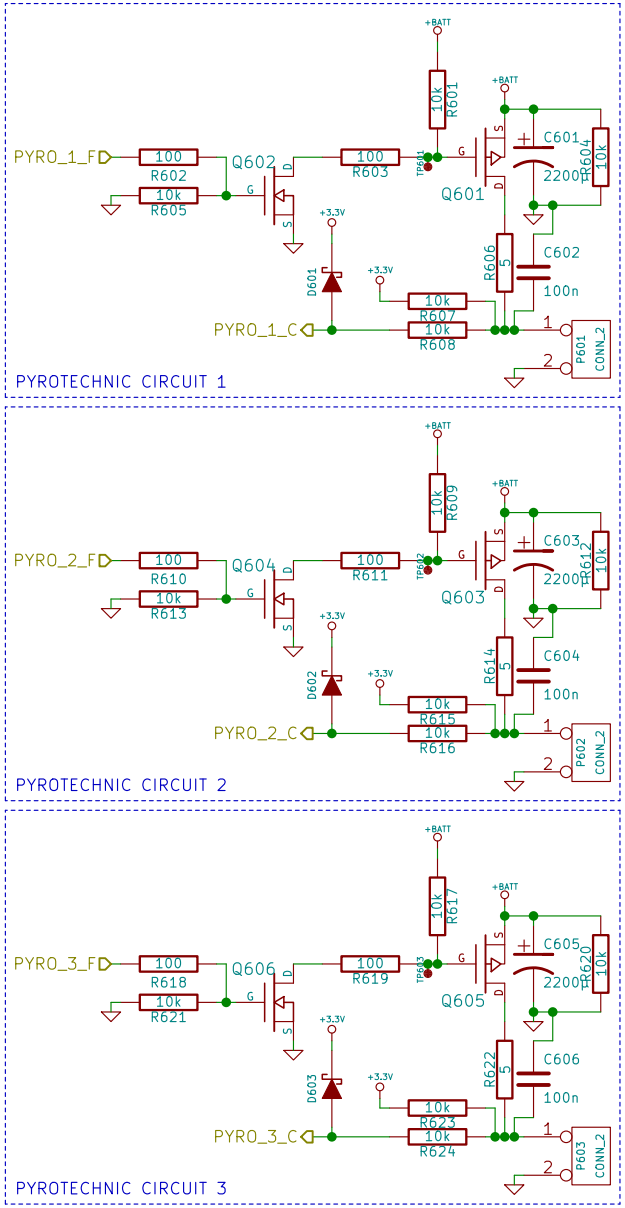
File: io.sch	
Title: Martlet 2 Flight Computer	
Size: A4	Date: 18 Jul 2014
KiCad E.D.A. kicad (2014-jan-25)-product	Id: 5/6
	Rev: 1

PYROTECHNIC CHANNELS



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Title: Martlet 2 Flight Computer	
Size: A4	Date: 18 Jul 2014
KiCad E.D.A. kicad (2014-jan-25)-product	Id: 6/6
	Rev: 1