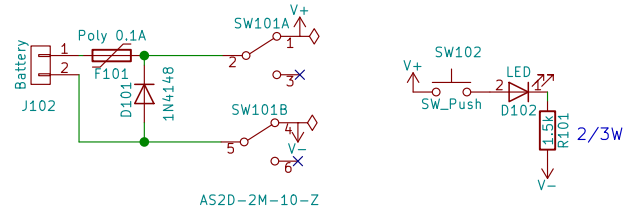
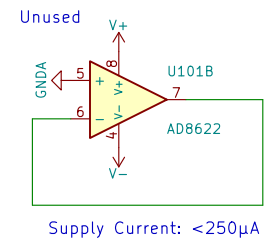
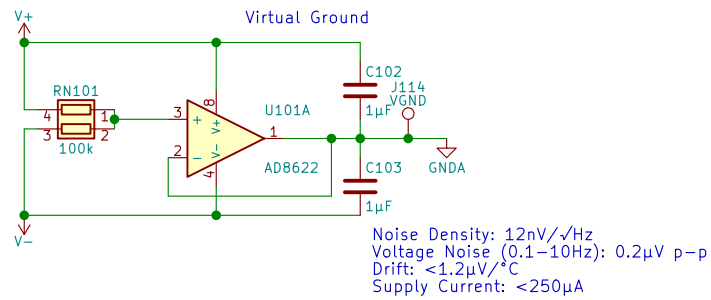
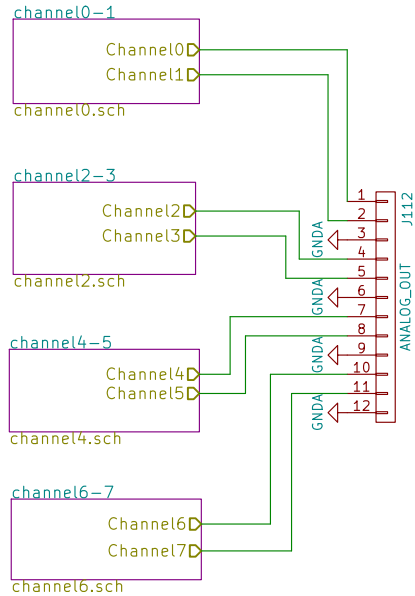


Battery Voltage: 5-30V
Output is $\pm V_{batt}/2$



Mounting Holes

- ×1 J103
- ×1 J104
- ×1 J105
- ×1 J106



Copyright 2017 University of Western Ontario

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License.

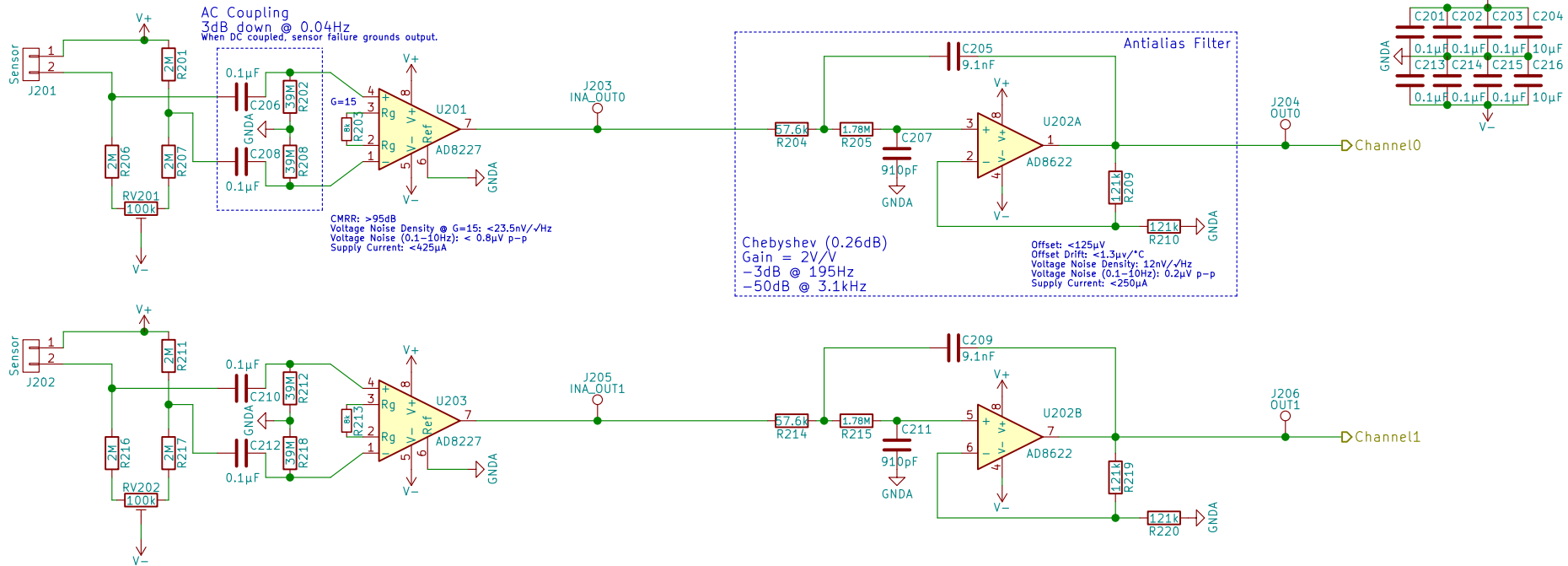
Monadnock Systems

Sheet: /
File: bmi-8ch.sch

Title: Polymer Sensor Amplifier

Size: USLetter Date: 2017-03-31
KiCad E.D.A. kicad 4.0.6

Rev: AB
Id: 1/5



Problems:

- USB-1208FS has fixed single-ended range of ±10V
- Drop in upgrade to USB-1608FS (16bit and variable range)
- Mitigated initially by running on 18V via two 9V batteries.
- R202, R208, R212, R218: 39M only available in thick film.
- More (slightly) 1/f noise and ±5% accuracy.
- AC coupling isn't optional in this design. Rhodri keen to try AC route first; add cost / complexity later if needed.

Assumptions:

- (Initial) DAQ is MCC USB-1208FS (available at BMI)
- 11-bit, max 6250 S/sec for each channel; sequential
- Target Bandwidth: 195Hz
- Sampling Rate 6240 S/s
- Sensor resistance 2MΩ
- Respiration motion changes sensor resistance by < ±10%
- Sensor resistance changes with handling; would require at least per-subject trimming if DC coupled.

Notes:

R203, R213: 0.1%
Other R: 1%
C205, C206, C207, C208, C209, C210, C211, C212: 50V NP0
Bypass Caps: 50V X7R X5R

Open Questions:

- AC vs DC Coupling:
 - AC; no trimming, better UX, better tempco, cheaper
 - DC; captures all low-frequency signal that may be of interest
- Use chopper amps in signal path: Probably bad
 - Lower total noise for *extremely* small bandwidths (<5Hz?)
 - Lower offset (if DC coupled)

Copyright 2017 University of Western Ontario

Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

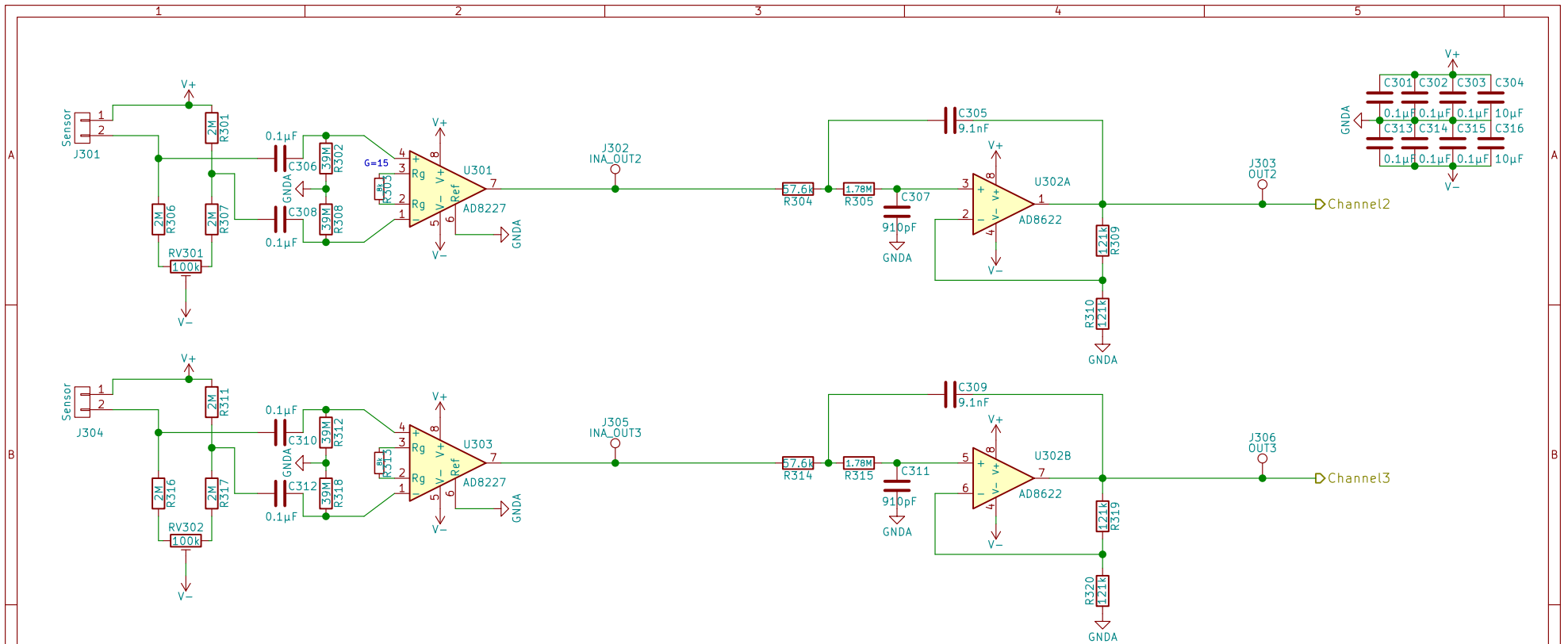
Monadnock Systems

Sheet: /channel0-1/
File: channel0.sch

Title: Input Channel 0 & 1

Size: USLetter Date: 2017-03-31
KiCad E.D.A. kicad 4.0.6

Rev: AB
Id: 2/5



Notes:

- R303, R313: 0.1%
- Other R: 1%
- C305, C306, C307, C308, C309, C310, C311, C312: 50V NP0
- Bypass Caps: 50V X7R or X5R

Copyright 2017 University of Western Ontario

Licensed under the Apache License, Version 2.0 (the "License");
 you may not use this file except in compliance with the License.
 You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software
 distributed under the License is distributed on an "AS IS" BASIS,
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 See the License for the specific language governing permissions and
 limitations under the License.

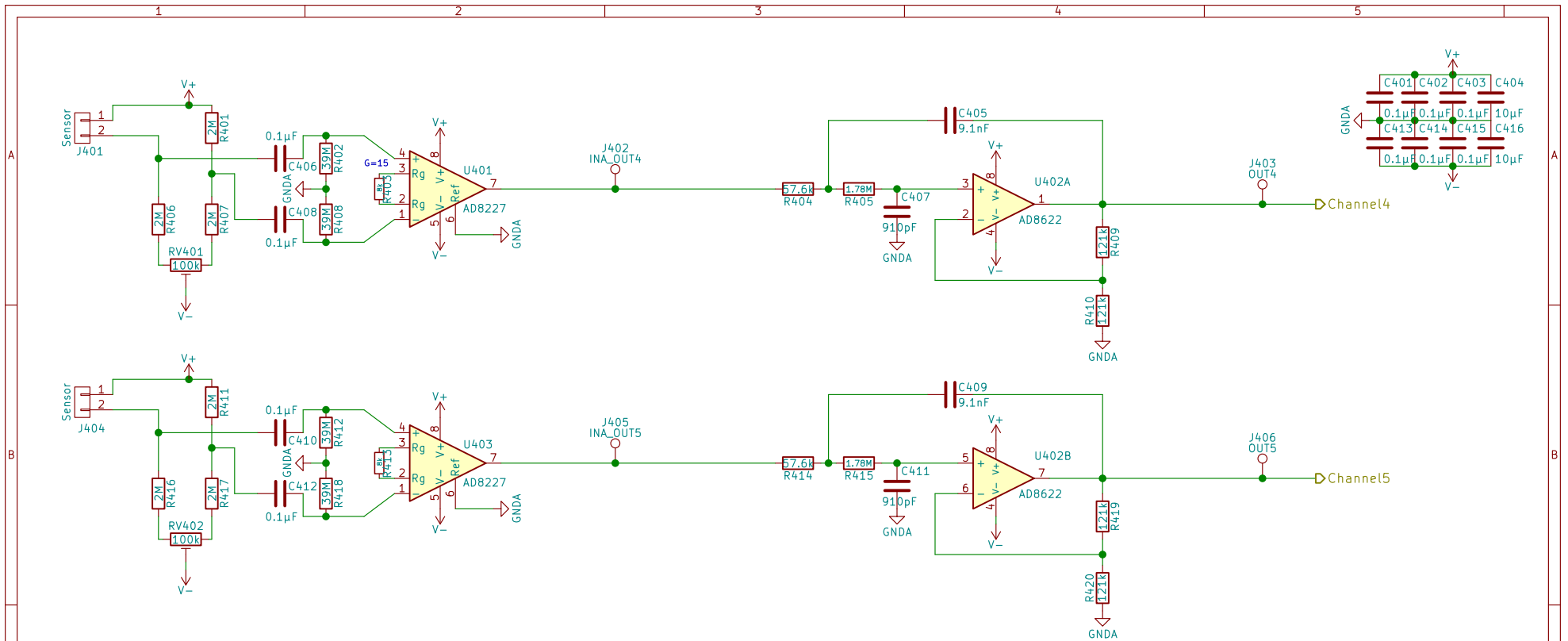
Monadnock Systems

Sheet: /channel2-3/
 File: channel2.sch

Title: Input Channel 2 & 3

Size: USLetter Date: 2017-03-31
 KiCad E.D.A. kicad 4.0.6

Rev: AB
 Id: 3/5



Notes:

- R403, R413: 0.1%
- Other R: 1%
- C405, C406, C407, C408, C409, C410, C411, C412: 50V NP0
- Bypass Caps: 50V X7R or X5R

Copyright 2017 University of Western Ontario

Licensed under the Apache License, Version 2.0 (the "License");
 you may not use this file except in compliance with the License.
 You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software
 distributed under the License is distributed on an "AS IS" BASIS,
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 See the License for the specific language governing permissions and
 limitations under the License.

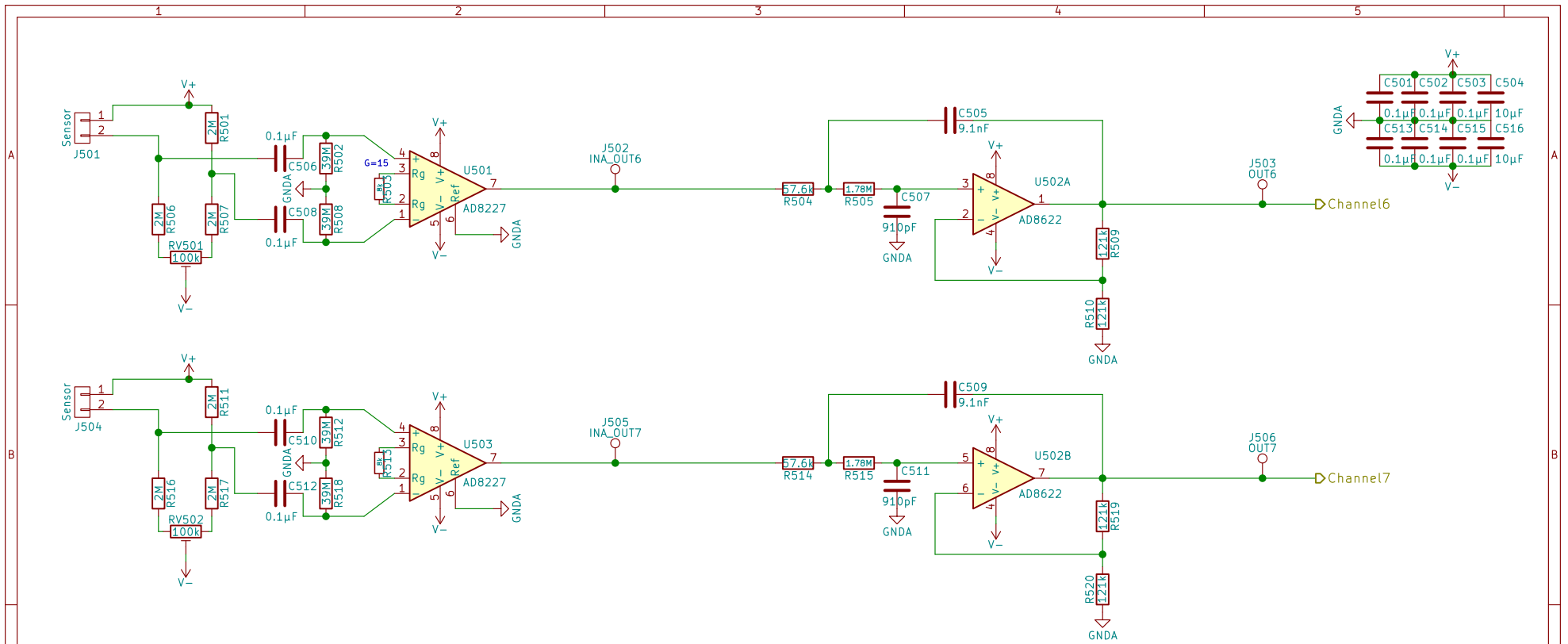
Monadnock Systems

Sheet: /channel4-5/
 File: channel4.sch

Title: Input Channel 4 & 5

Size: USLetter Date: 2017-03-31
 KiCad E.D.A. kicad 4.0.6

Rev: AB
 Id: 4/5



Notes:

- R503, R513: 0.1%
- Other R: 1%
- C505, C506, C507, C508, C509, C510, C511, C512: 50V NP0
- Bypass Caps: 50V X7R or X5R

Copyright 2017 University of Western Ontario

Licensed under the Apache License, Version 2.0 (the "License");
 you may not use this file except in compliance with the License.
 You may obtain a copy of the License at

<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software
 distributed under the License is distributed on an "AS IS" BASIS,
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 See the License for the specific language governing permissions and
 limitations under the License.

Monadnock Systems

Sheet: /channel6-7/
 File: channel6.sch

Title: Input Channel 6 & 7

Size: USLetter Date: 2017-03-31
 KiCad E.D.A. kicad 4.0.6

Rev: AB
 Id: 5/5