

**A fully adapted headstage for electrophysiological experiments with custom and scalable electrode arrays to record widely distributed brain regions.**

**Supplementary Material – Tutorials**

**Authors:** Flávio Afonso Gonçalves Mourão<sup>a</sup>, Leonardo de Oliveira Guarnieri<sup>ab</sup>, Paulo Aparecido Amaral Júnior<sup>ab</sup>, Vinícius Rezende Carvalho<sup>a</sup>, Eduardo Mazoni Andrade Marçal Mendes<sup>ab</sup>, Márcio Flávio Dutra Moraes<sup>a</sup>.

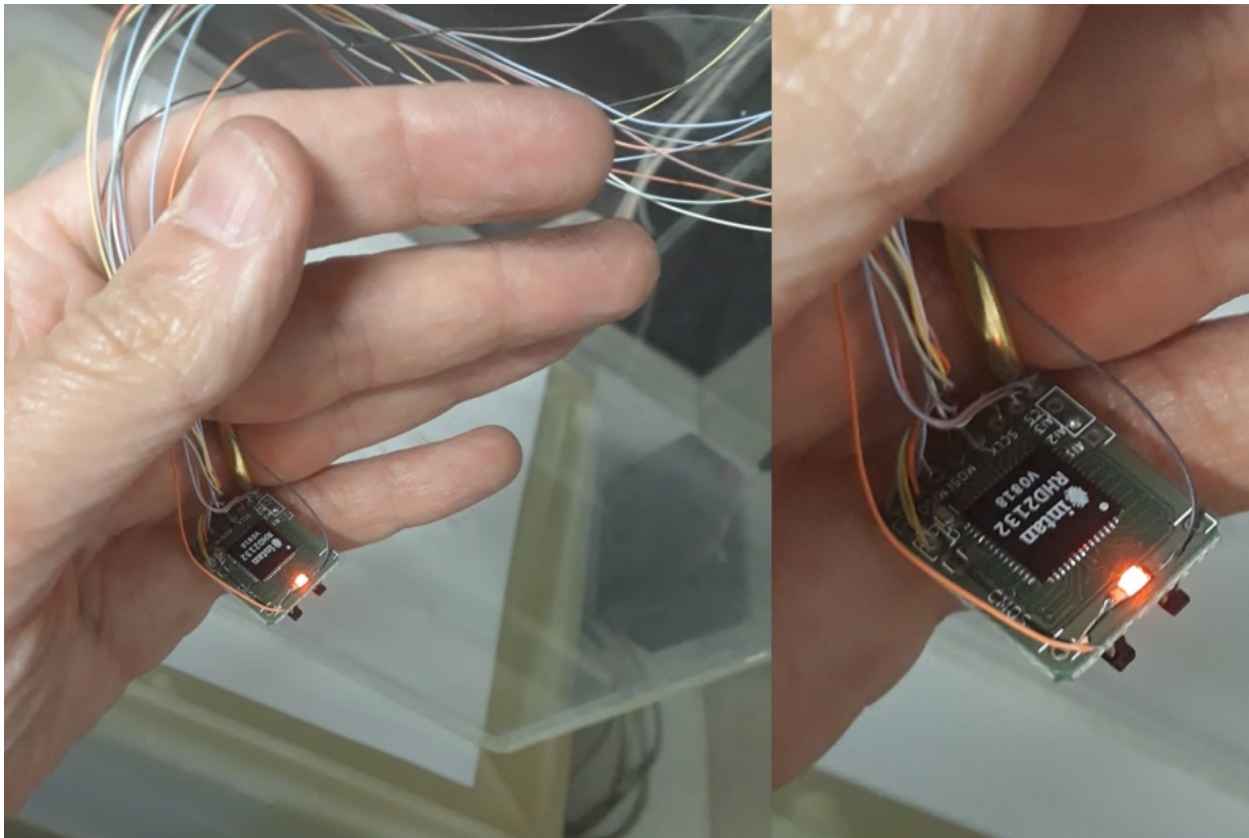
- a. Núcleo de Neurociências, Departamento de Fisiologia e Biofísica, Instituto de Ciências Biológicas (ICB), Universidade Federal de Minas Gerais (UFMG). Av. Antônio Carlos, 6627 - CEP 31270-901. Belo Horizonte, Minas Gerais, Brazil.
- b. Programa de Pós-Graduação em Engenharia Elétrica, Departamento de Engenharia Eletrônica (DELT), Escola de Engenharia, Universidade Federal de Minas Gerais (UFMG). Av. Antônio Carlos, 6627 - CEP 31270-901. Belo Horizonte, Minas Gerais, Brazil.

**Correspondence:**

Flávio Afonso Gonçalves Mourão, PhD  
Email: fagm@ufmg.br

Márcio Flávio Dutra Moraes, PhD  
Email: mfdm@icb.ufmg.br

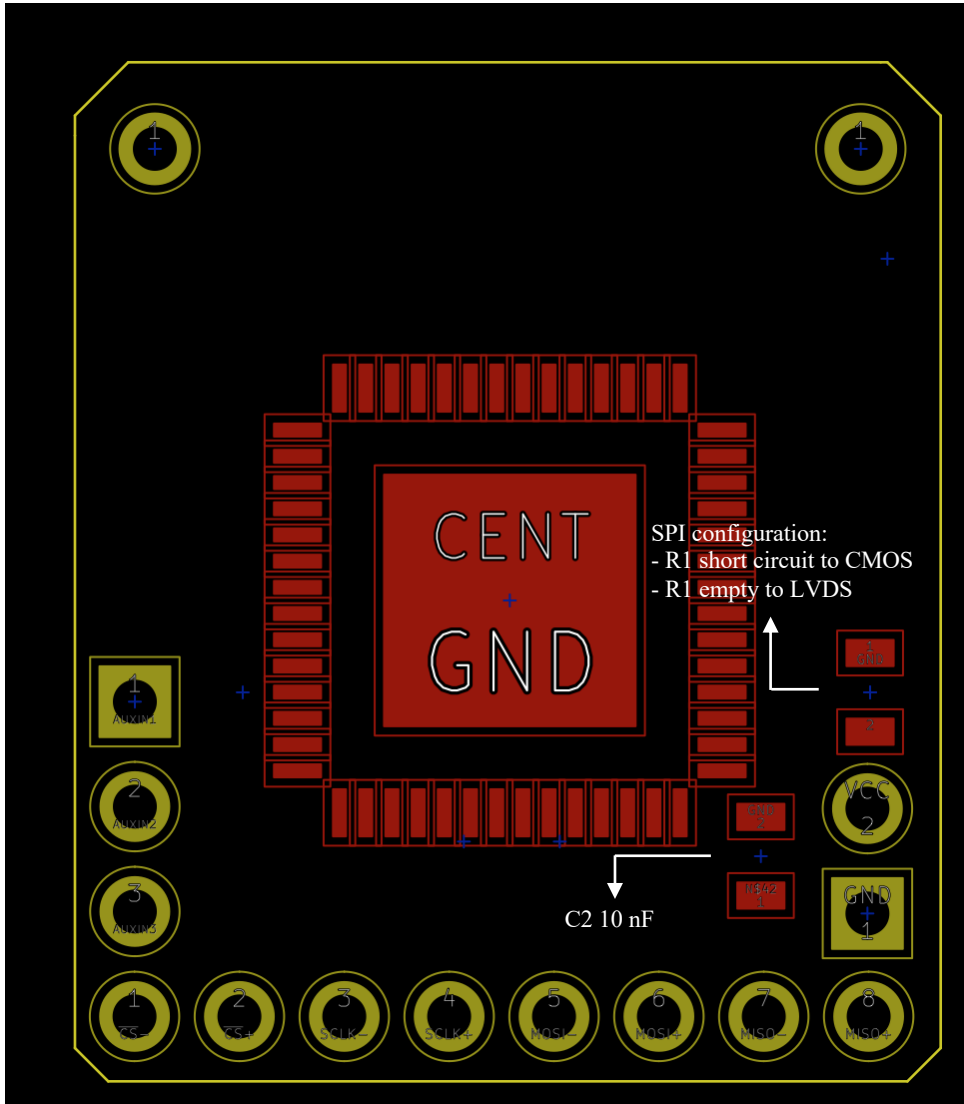
## Recording Headstage



*\* Led is not in the original project*

Component	Specification	Supplier	Price	Quantity	Link
FPC connector (Flexible Printed Circuits)	SMD vertical type 0.5mm pitch 2mm height	mktechnic	\$0.79(un)	2	<a href="https://cutt.ly/Xx55qQE">https://cutt.ly/Xx55qQE</a>
RHD2132 amplifier chip	32-channel unipolar inputs and common reference	Intan Technologies	\$390 (un)	1	<a href="https://cutt.ly/Yx6qief">https://cutt.ly/Yx6qief</a>
RHD2216 amplifier chip	16-channel differential inputs	Intan Technologies	\$260 (un)	1	<a href="https://cutt.ly/Yx6qief">https://cutt.ly/Yx6qief</a>
Resistor	SMD – 0 $\Omega$	Digikey	\$0.22(un)	1	<a href="https://www.digikey.com">https://www.digikey.com</a>
Capacitor	SMD – 10 nF	Digikey	\$0.17(un)	1	<a href="https://www.digikey.com">https://www.digikey.com</a>
Capacitor	SMD – 100 nF	Digikey	\$0.17(un)	2	<a href="https://www.digikey.com">https://www.digikey.com</a>

## Components

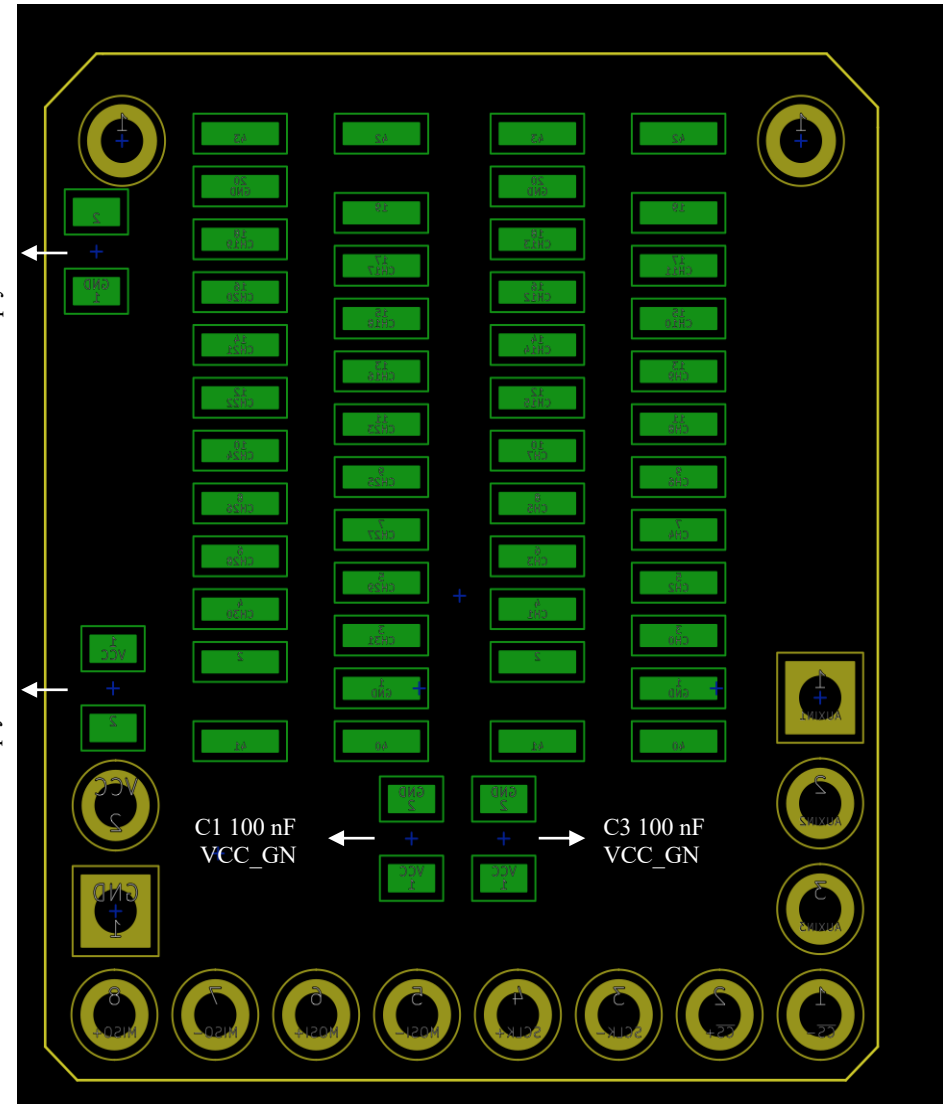


Select between RHD2216 and RHD2132:

- R3 short circuit to RHD2216
- R3 empty to RHD2132

**SPI configuration:**

- R2 short circuit to LVDS
- R2 empty to CMOS



## Handmade cable

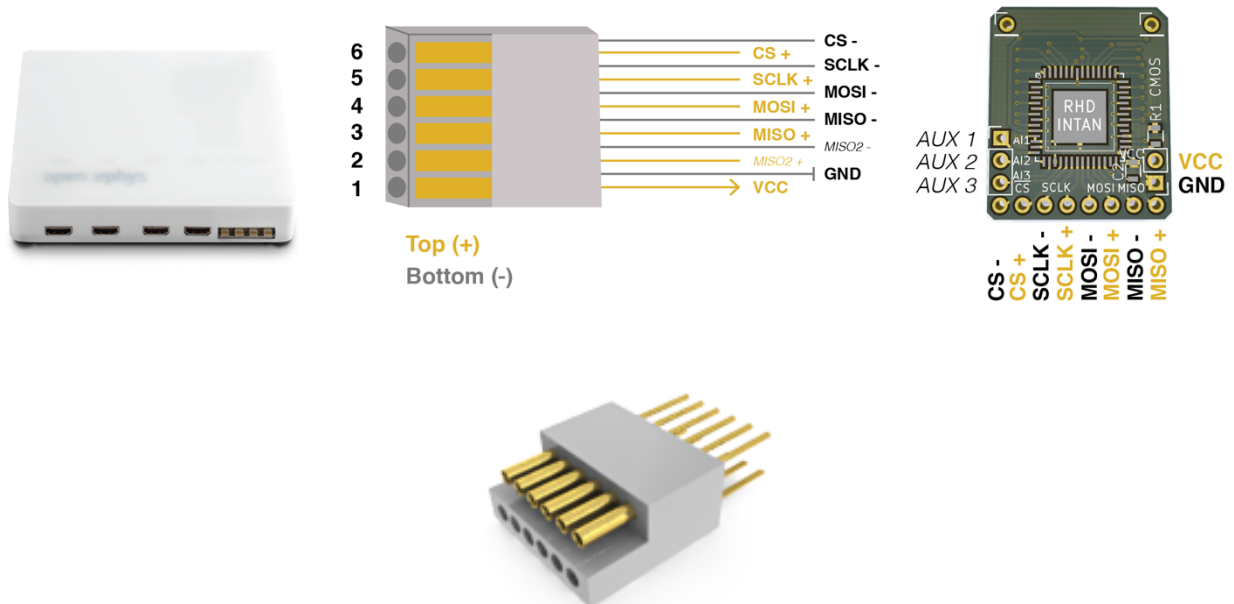
We strongly recommend the following tutorial:

- <https://open-ephys.atlassian.net/wiki/spaces/OEW/pages/491587/Fine+wire+tether>

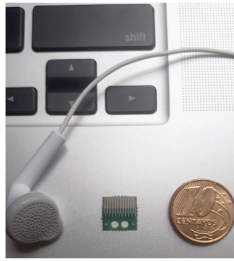
Component	Specification	Supplier	Price	Quantity	Link
Omnetics Polarized PZN	Straight Thru-Hole (Type DD) 12 contacts	Omnetics Connector Corporation	<i>on request</i> ~\$40 (un)	1	<a href="https://cutt.ly/FcqiCNQ">https://cutt.ly/FcqiCNQ</a>
Micro bare copper wire	CZ 1187 wire series	Cooner Wire	<i>on request</i>	1	<a href="https://cutt.ly/lcqq9Pz">https://cutt.ly/lcqq9Pz</a>

**However, in our adapted board, each contact needs to be checked**

Wiring diagram:

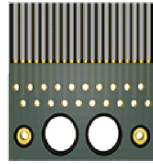


## Flat-Grid Connector – V2 – Current Version



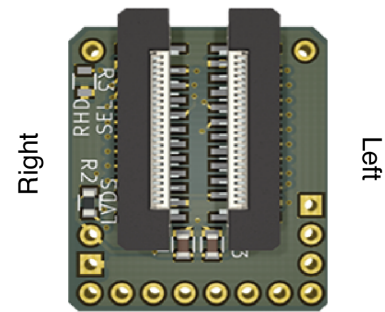
**Channels Map**

Be careful with the board position

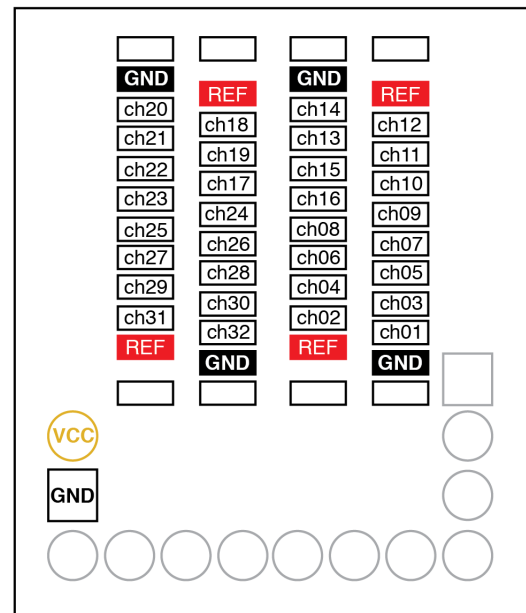
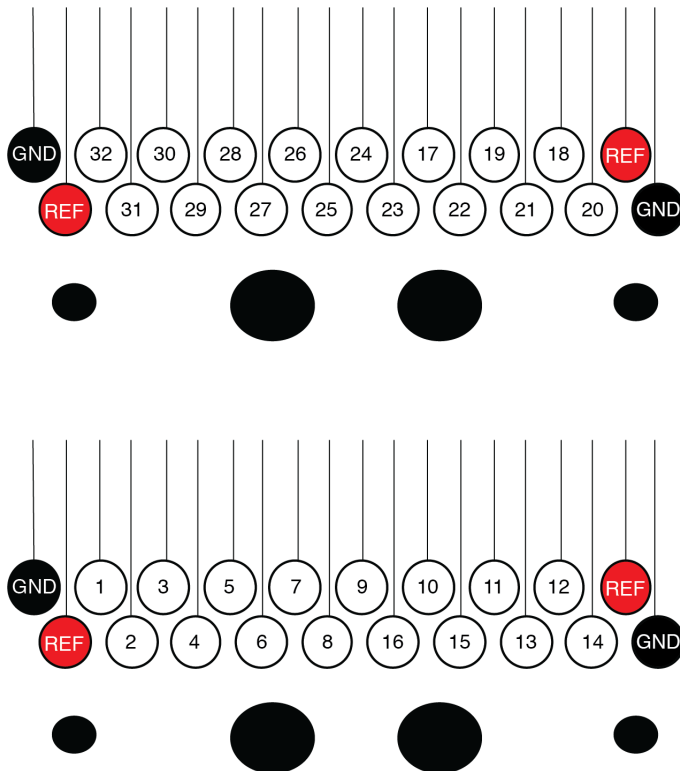


**Bottom view**

Front



Back

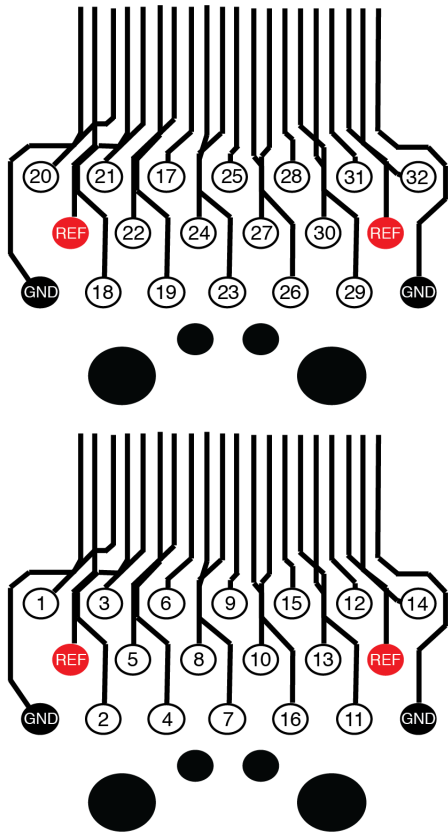


Component	Specification	Supplier	Price	Quantity	Link
Stainless steel wire	0.127 mm internal diameter, teflon-coated. 100 feet. Model 7914	A-M Systems Inc	\$140 (un)	1	<a href="https://cutt.ly/5x6eloR">https://cutt.ly/5x6eloR</a>
Tungsten microwires	99.5% S-Formvar 50 µm ID	California Fine Wire Co.	<i>on request</i>	-	<a href="https://cutt.ly/FbJxLBi">https://cutt.ly/FbJxLBi</a>
Silver paint	1 troy oz. (31.1g)	SPI Supplies®	~\$50 (un)	1	<a href="https://cutt.ly/Ox6sup1">https://cutt.ly/Ox6sup1</a>
Thermosetting polymer	5 minute Epoxy	Devcon	~\$20 (un)	1	<a href="https://cutt.ly/Zx6ltrE">https://cutt.ly/Zx6ltrE</a> <a href="https://cutt.ly/mx6zobJ">https://cutt.ly/mx6zobJ</a> <a href="https://cutt.ly/Rx6zFZZ">https://cutt.ly/Rx6zFZZ</a>
Scissors	Tungsten Carbide 3.5 inches	Dr. Slick Co.	~\$30 (un)	1	<a href="https://www.drslick.com">https://www.drslick.com</a>

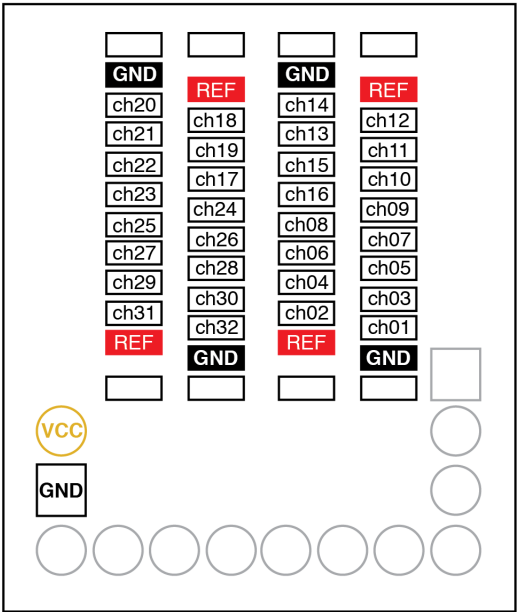
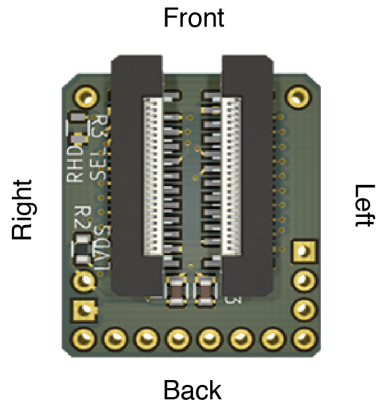
Flat-Grid Connector – V1 – Old Version



Channels Map  
Be careful with the board position



Bottom view



**SMD/FPC connector ← → Omnetics**  
**Adapters for the original RHD headstage**

Component	Specification	Supplier	Price	Quantity	Link
FPC connector (Flexible Printed Circuits)	SMD vertical type 0.5mm pitch 2mm height	mktechnic	\$0.79(un)	2	<a href="https://cutt.ly/Xx55qQE">https://cutt.ly/Xx55qQE</a>
Omnetics Neuro Nano Strip	A79042-001 NPD-18-VV-GS	Omnetics Connector Corporation	<i>on request</i> ~\$60 (un)	1	<a href="https://cutt.ly/UcqDO66">https://cutt.ly/UcqDO66</a>
Omnetics Neuro Nano Strip	A79046-001 NPD-36-DD-GS	Omnetics Connector Corporation	<i>on request</i> ~\$90 (un)	1	<a href="https://cutt.ly/UcqDO66">https://cutt.ly/UcqDO66</a>

**RHD 16-Channel Recording Headstages**



**RHD 32-Channel Recording Headstages**

