



## Installation Guide

# Breakout Box

## Connector Accessory for Tecella's Pico 2

This installation guide describes how to install, configure, and use the optional Breakout Box accessory for Pico 2. Tecella's Pico 2 is a full-featured, USB-powered, low-noise patch clamp amplifier with an integrated digitizer and headstage. The passive Breakout Box allows the Pico 2 to be used by external multifunction data acquisition (DAQ) systems as well as to control external peripherals. The Breakout Box has 14 signal-labeled BNC inputs for connecting to the extended I/O channels of a Pico 2.

The Breakout Box has the following features:

- Shielded Connector Block with BNC for Pico 2
- 14 BNC connectors for I/O connection
  - Two BNC connectors for analog input connection
  - Four BNC connectors for analog output connection
  - Four BNC connectors for digital input connection
  - Four BNC connectors for digital output connection
- Direct coupled signals
- Signal-labeled BNC connectors for easy connectivity
- A Mini-HDMI connector that connects to Tecella's Pico 2
- A high quality Mini-HDMI cable (length: 1 m) - long cables on request (up to 5 m)
- Reusable dust caps on each BNC connector

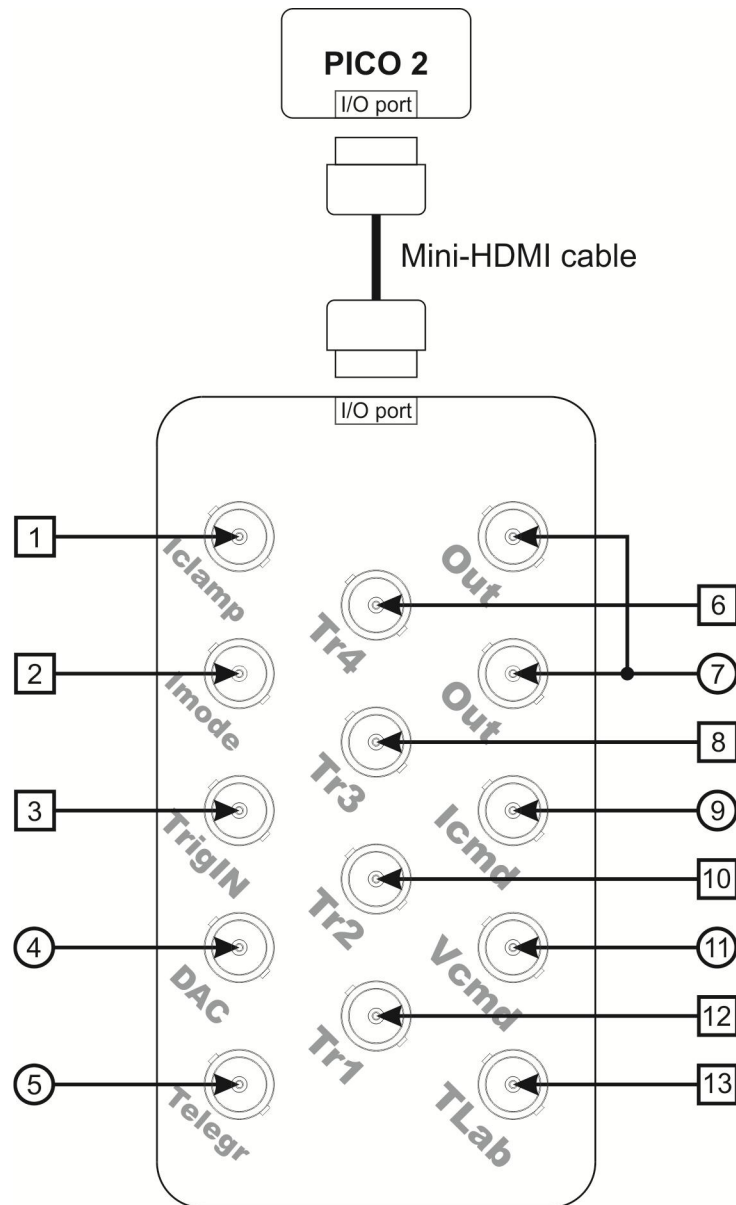
## What You Need to Get Started

To set up and use your Breakout Box, you need the following:

- Pico 2 ([www.tecella.com](http://www.tecella.com))
- Breakout Box
- High quality Mini-HDMI cable (Type C)
- Breakout Box Installation Guide
- High quality BNC cables

## Installing the Breakout Box

Figure 1 shows the front panel of your Breakout Box.



**Figure 1.** Breakout Box Front Panel

- |                      |                    |                     |
|----------------------|--------------------|---------------------|
| 1 Iclamp ON          | 6 Trigger Out 4    | 11 Vcmd Input       |
| 2 Iclamp Mode        | 7 Amplifier Output | 12 Trigger Out 1    |
| 3 Trigger IN         | 8 Trigger Out 3    | 13 Allow TecellaLab |
| 4 Utility DAC Output | 9 Icmd Input       | ○ analog signal     |
| 5 Gain Telegraph     | 10 Trigger Out 2   | □ digital signal    |

To connect the Breakout Box to your Pico 2, complete the following steps.

**Caution** Do *not* connect the Breakout Box to any device other than Tecella's Pico 2. Doing so can damage the Breakout Box, and all devices connected to it. PoreGenic is *not* liable for damage resulting from these connections.

1. Connect the Breakout Box to your Pico 2 using an appropriate Mini-HDMI cable.
2. Insert one Mini-HDMI connector into Pico's I/O port. The I/O port can be found next to the USB port.
3. Insert the remaining Mini-HDMI connector into the I/O port of the Breakout Box. This I/O port can be found at the side of the Breakout Box, see **Figure 1**.
4. Launch Tecella's TecellaLab acquisition software, WinWCP (University of Strathclyde), jClamp (SciSoft Company) or any additional 3rd party software, confirm that your Pico 2 is recognized, and configure your device settings. Refer to [www.tecella.com](http://www.tecella.com) for more information.
5. Connect BNC cables to the BNC connectors of interest on the front panel. Please see **Figure 1** and **Table 1**.
6. Connect the BNC cables to the appropriate port of your external DAQ system.

**Caution** Do *not* connect input voltages greater than the specified values in **Table 1** to the Breakout Box and consult the Pico 2 device specifications for more information. Input voltages greater than the specified values can damage the Breakout Box, and all devices connected to it. Overvoltage can also cause an electric shock hazard for the operator. PoreGenic is not liable for damage or injury resulting from misuse.

7. Connect signals to the BNC connectors as described in **Table 1**.

**Caution** The Breakout Box provides *no* additional protection such as fuses against overvoltage or short circuits. Consult the Pico 2 device specifications ([www.tecella.com](http://www.tecella.com)).

## Applications

- Controlling external devices via Pico's integrated digitizer
- Monitoring the analog Output e.g. with an oscilloscope
- Interfacing Pico to 3rd Party Digitizers
- Synchronizing of two or more Picos
- etc.

## Connecting Analog and Digital I/O Signals

**Table 1.** I/O signals on the Breakout Box.

All signal voltages are with respect to ground. The shielding of all BNC connectors is connected to Pico's system ground. The signal direction (*Input* or *Output*) is seen from the perspective of the Pico. Digital logic levels are 0 V for LOW and 3.3 V for HIGH. Digital logic is 3.3 V, but all digital inputs are 5 V tolerant. Consult the Pico 2 device specifications for more information or visit [www.tecella.com](http://www.tecella.com).

	Direction	Signal Name	Description	Label	Figure 1		
Analog	Input	Icmd Input	External Icmd. Input range is +2.5 V to -2.5 V. Icmd translation: $\pm 2.5$ nA Range: 1 pA/mV $\pm 25$ nA Range: 11 pA/mV $\pm 250$ nA Range: 100 pA/mV	Icmd	9		
		Vcmd Input	External Vcmd. Input range is +5 V to -5 V. Damping ratio: <b>50:1</b> ( $\pm 5$ V input translates to $\pm 100$ mV) <b>20:1</b> ( $\pm 5$ V input translates to $\pm 250$ mV) Please contact Tecella for your damping ratio.	Vcmd	11		
	Output	Utility DAC Output	Output range of 0 V to 5 V (rail-to-rail). 10-bit resolution. Signal to control external peripherals.	DAC	4		
		Amplifier Output	Monitor amplifier's output with an external peripheral, such as an oscilloscope.	Out	7		
		Gain Telegraph	Analog signal to telegraph Gain to external DAQ.			Telegr	5
			Output Voltage in V	Configuration	Gain		
Digital	Input	Iclamp ON	In Iclamp Mode, drive this signal HIGH to enable Iclamp. Drive this signal LOW for I=0 "voltage follower". Floats to LOW, so you can keep this unconnected, if not using Iclamp or I=0 modes.	Iclamp	1		
		Iclamp Mode	Drive this signal HIGH to put Pico into Iclamp Mode. Floats to LOW, so you can keep this unconnected, if not using Iclamp or I=0 modes.	Imode	2		
		Allow TecellaLab	When HIGH or Floating, TecellaLab controls the Pico (100 k $\Omega$ pull-up to 3.3 V on the Pico). When LOW, external DAQ controls the Pico. BNC terminator can be used to tie this signal to ground (LOW) for external DAQ control.	TLab	13		
		Trigger IN	Used to start protocols in TecellaLab (Active High or Active Low).	TrigIN	3		
	Output	Trigger Outs	TecellaLab	Digital signals to control external peripherals. Outputs 0 V for LOW and 3.3 V for HIGH.  Trigger Outs (Digital Outs) only work in "Version 1 GUI" of TecellaLab.			
		Trigger Out 1	Digital Out 4		Tr1	12	
Trigger Out 2		Digital Out 5	Tr2		10		
Trigger Out 3		Digital Out 6	Tr3		8		
Trigger Out 4		Digital Out 7	Tr4		6		

## Physical

Dimensions.....	11.3 cm × 6.1 cm × 5.1 cm 4.4 inch × 24.1 inch × 20.1 inch
Weight.....	200 g (without cable)
I/O connector.....	Mini-HDMI (Type C)
BNC connectors.....	14

## Environment

Operating temperature.....	0 °C to 50 °C
Storage temperature.....	-10 °C to 60 °C
Relative humidity.....	5 % to 70 %, noncondensing

## Environmental Management

PoreGenic is committed to designing and manufacturing products in an environmentally responsible manner. PoreGenic recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to our customers. This page contains the environmental regulations and directives with which PoreGenic complies.

### ***Waste Electrical and Electronic Equipment***



**EU Customers** The crossed out wheeled bin symbol is used to indicate that the product must not be treated as general household waste. By ensuring that this product is disposed of correctly you will be helping to prevent potentially negative consequences for the environment and human health, which could otherwise be caused by incorrect waste handling of this product.

### ***RoHS (Restriction of Hazardous Substances)***

The European Directive 2002/95/EC restricts the use of hazardous materials in the manufacture of various types of electronic and electrical equipment. PoreGenic declares that, to its knowledge as of the date of this document, the Breakout Box conforms to the requirements of this directive. This declaration is based on PoreGenics understanding of the requirements of the RoHS directive and knowledge of the materials that go into its products. PoreGenic bases its knowledge on information provided by third-party suppliers and makes no representation or warranty as to the accuracy of such information. PoreGenic continues to take steps to obtain accurate information from suppliers but has not conducted destructive testing or chemical analysis on incoming materials to verify material composition.