Customized Squidstat Cycler Setup Guide

System Components

1. Customized Squidstat Cycler

2. Bidirectional power supply (Mean Well BIC-2200 single unit pictured, provided model & size varies)

3. Current carrying cables with M6 lugs, two per channel (quantity, gauge, length varies)

4. Sense cables with 2mm terminals, one per channel (quantity, style, length varies)

5. Cable pair to connect Squidstat Cycler to bidirectional power supply (gauge, length varies)

6. USB Type-A to Type-B cable

7. Joiner plates to connect current carrying cables for parallel and bipolar channel operation (quantity varies, only included w/ select systems)

8. Terminal block for BIC-2200 power supply stack connections (only included w/ select systems)

NOTE: A pre-wired power supply is only included in the shipment in rare cases! Customers must usually supply their own plug and wiring to a power source based on their specific electrical panel configuration.
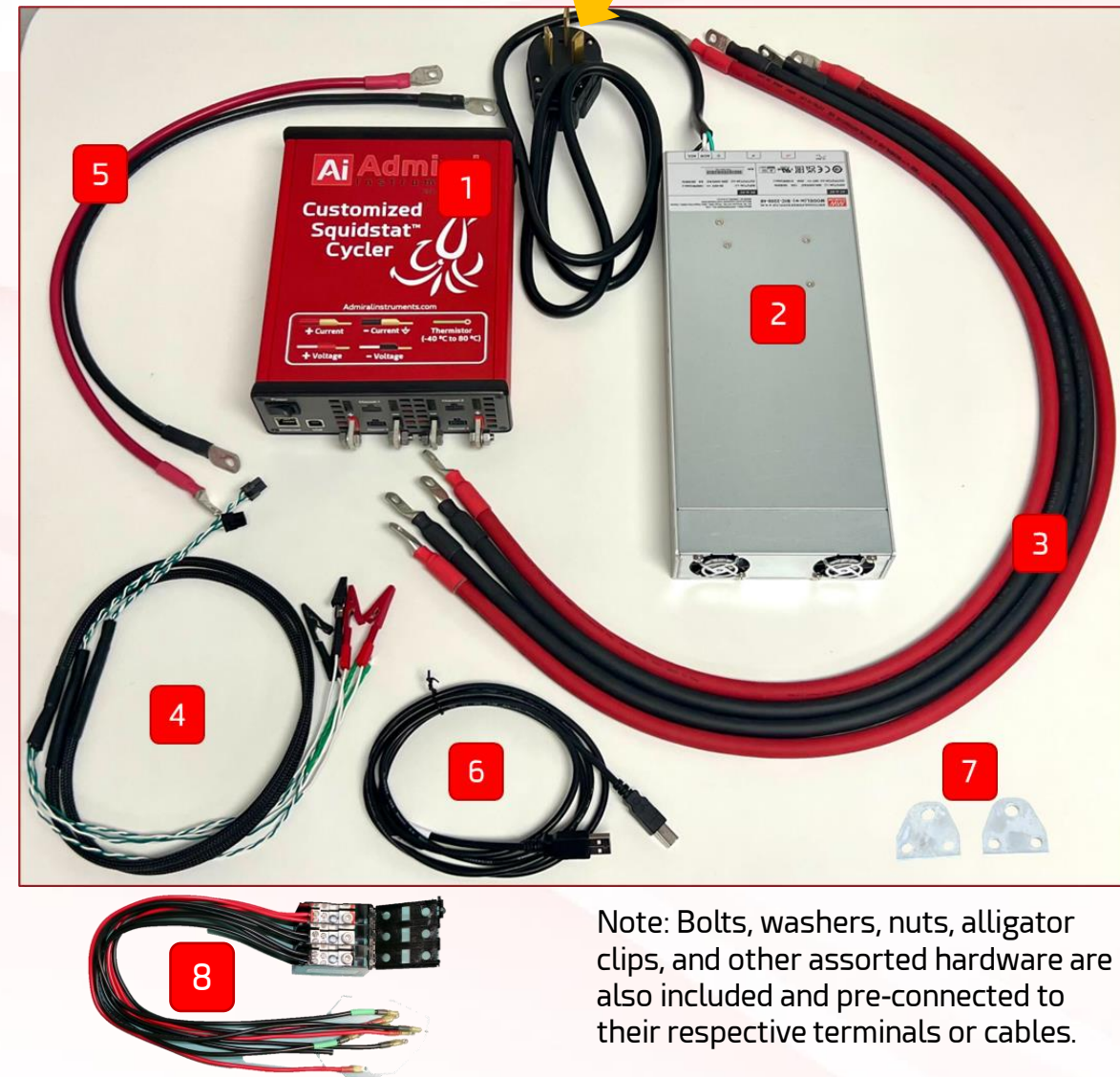
Note: Bolts, washers, nuts, alligator clips, and other assorted hardware are also included and pre-connected to their respective terminals or cables.

# Tools Required For Hardware Setup (not included in box)

- Two wrenches, ideally adjustable size. The wrenches needed to accommodate the M6 and M8 bolt/nut sizes. We use 13 mm and 10 mm wrenches

- 1 Phillips-Head Screwdriver

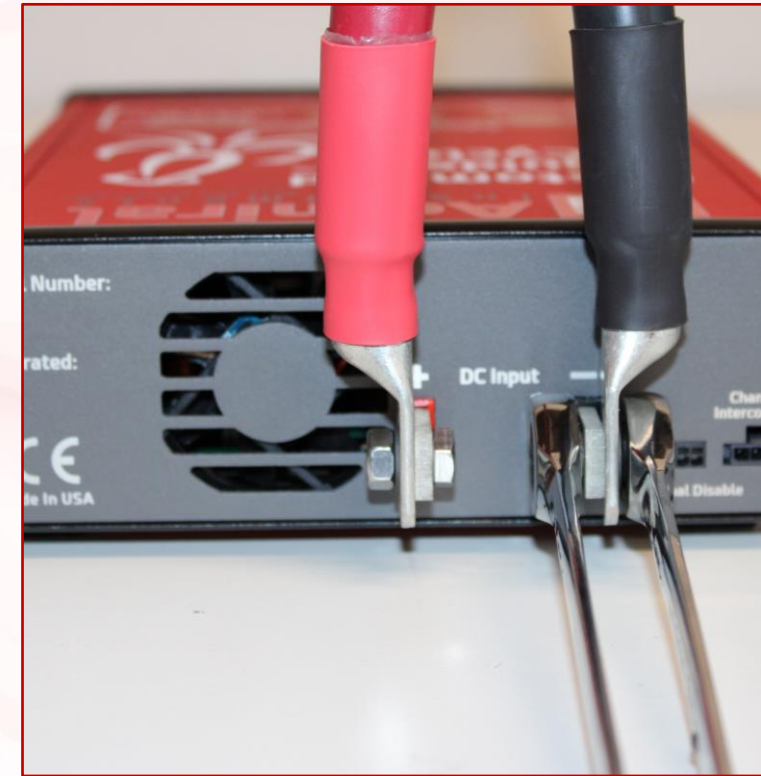- One of each type is shown in the picture for reference

Step 1a: Connect power supply cables to the back of the Squidstat Cycler (for 2-channel custom configuration)

The back of the Squidstat Cycler has two tabs to connect power cables with two sets of M6 bolt/washer/nut assemblies pre-inserted into the tabs, as shown above.
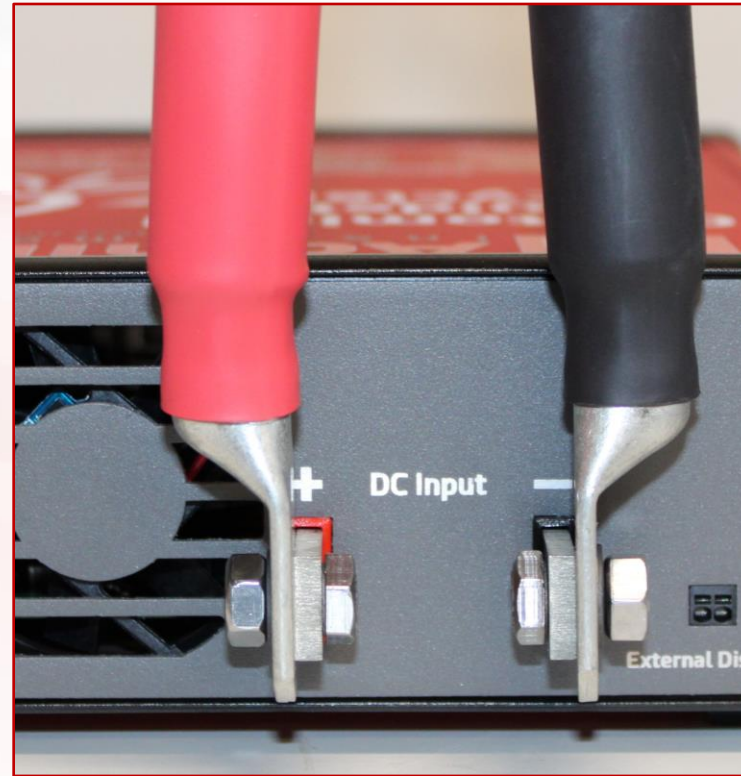
Unscrew the nuts and remove the washers and bolts on both tabs. Then install the red/black cables and reattach the bolt/washer/nut assemblies, as shown above, matching red-to-red and black-to-black.

IMPORTANT: All connections must be tightened with wrenches. **Loose connections may cause excess heat and risk arcing or fire.** DO NOT connect the Squidstat Cycler to the provided power supply yet

Step 1b: Connect power supply cables to the back of the Squidstat Cycler (for 4-channel custom configuration)

The back of the Squidstat Cycler has two tabs to connect power cables with two sets of M8 bolt/washer/nut assemblies pre-inserted into two joiner plates, as shown above.

Unscrew the nuts and remove the washers and bolts on both tabs. Then install the red/black cables and reattach the bolt/washer/nut assemblies, as shown above, matching red-to-red and black-to-black.
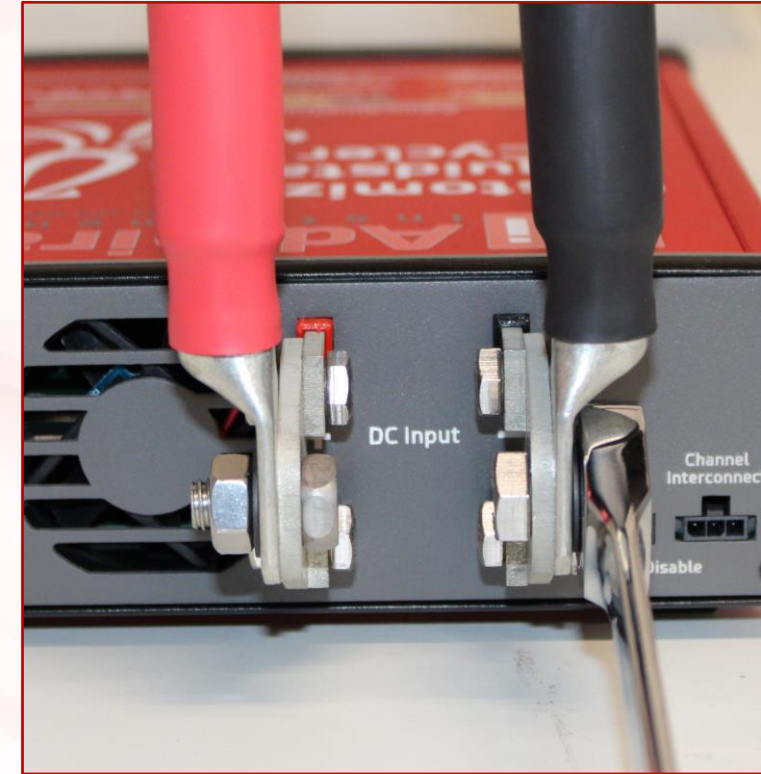
IMPORTANT: All connections must be tightened with wrenches. **Loose connections may cause excess heat and risk arcing or fire.** DO NOT connect the Squidstat Cycler to the provided power supply yet
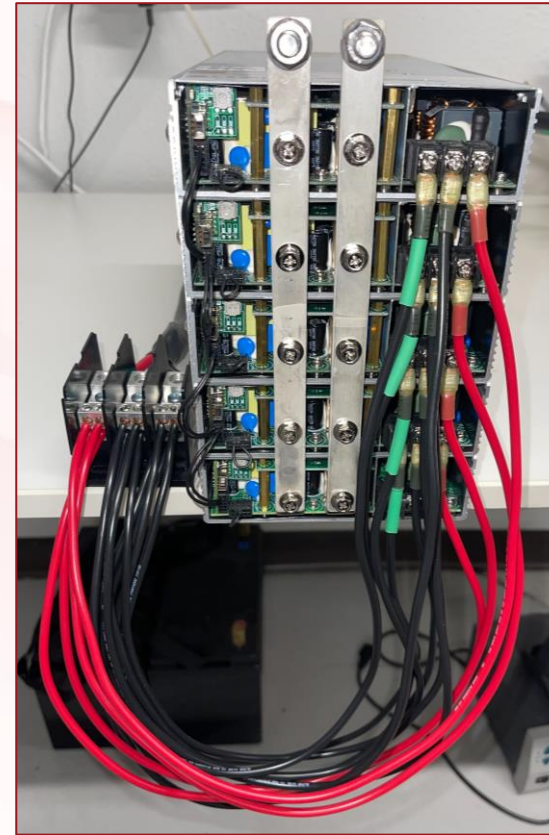
Step 2a: Pre-wire BIC-2200 power supply to accept power from a power source on your electrical panel

The most common power supply used with custom Squidstat Cycler units is the BIC-2200 manufactured by MeanWell Enterprises Co., LTD.

The BIC-2200 can be operated as a single unit, or as a stack of up to five units connected in parallel. Your BIC-2200 will be delivered pre-configured as specified from your order.

Wiring instructions and other documentation for the BIC-2200 is available via this link. Examples of how customers wire the BIC-2200 are shown to the right. **Admiral Instruments does not supply a plug connection for the power supply unless explicitly stated in your order.**

BIC-2200 Manual For Wiring Documentation: https://www.meanwell.com/Upload/PDF/BIC-2200-E.pdf

Step 2b: Connect terminal block (only included with select systems) to BIC-2200 power supply stack
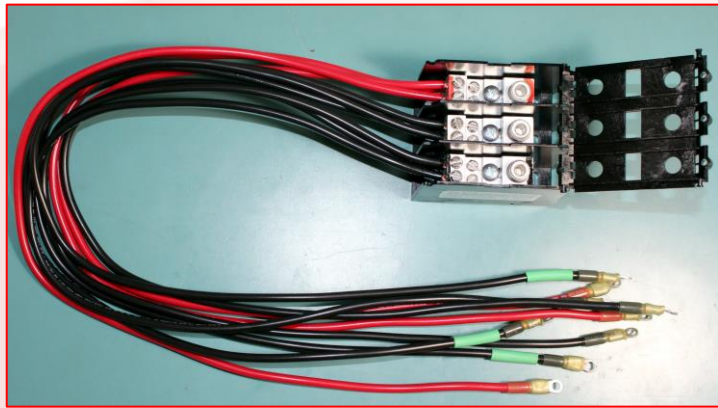
Some Squidstat Cyclers will include a pre-wired terminal block designed to simplify the electrical connections between the BIC-2200 and differing electrical panel configurations.

The terminal block has three 10 AWG wires per the number of BIC-2200 power supplies in the stack. The wires are color coded as **black AC/N**, **green ground (⏚)**, and **red AC/L**. Each wire has a ring terminal to connect to each BIC-2200 in the stack.
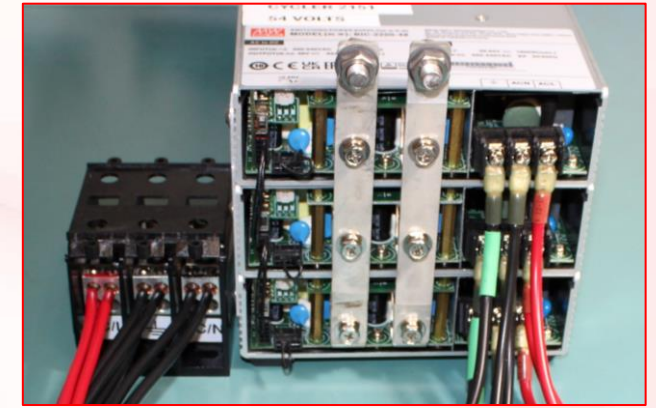
Connect the wires as shown above, matching the wires on the terminal block with the BIC-2200 AC/N, AC/L, and ground connections. The terminal block features three line connections supporting up to 2/0 AWG to an electrical panel.

www.admiralinstruments.com

Step 3a: Connect the Cycler to the provided power supply for a single BIC-2200 power supply unit
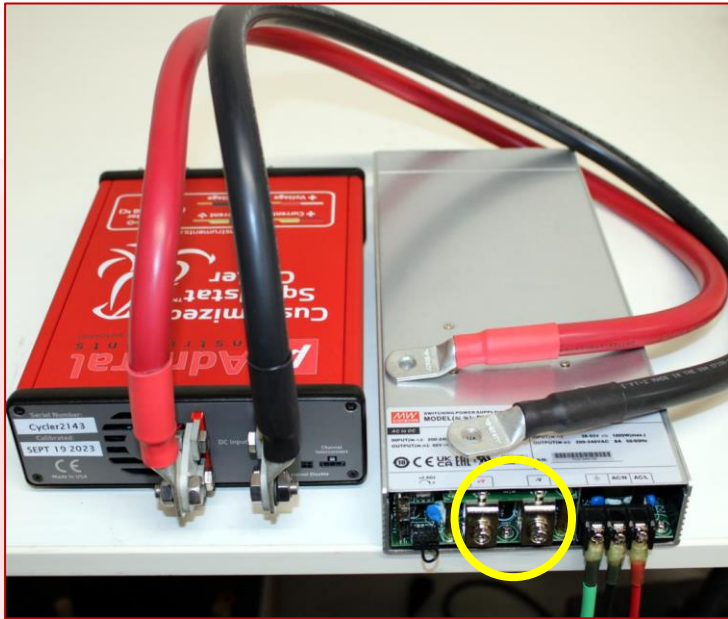
The power supply features V+ and V- terminals to connect to the Cycler, as shown circled in yellow above.

Unscrew any hardware that may be attached to the terminals. Then take the ends of the red/black cables from the Cycler and install them as shown above. V+ is **red** and V- is **black**.

IMPORTANT: All connections must be tightened with a screwdriver. **Loose connections may cause excess heat and risk arcing or fire.** DO NOT connect the power supply to a power source yet.

Step 3b: Connect the Cycler to the provided power supply for a stack of BIC-2200 units

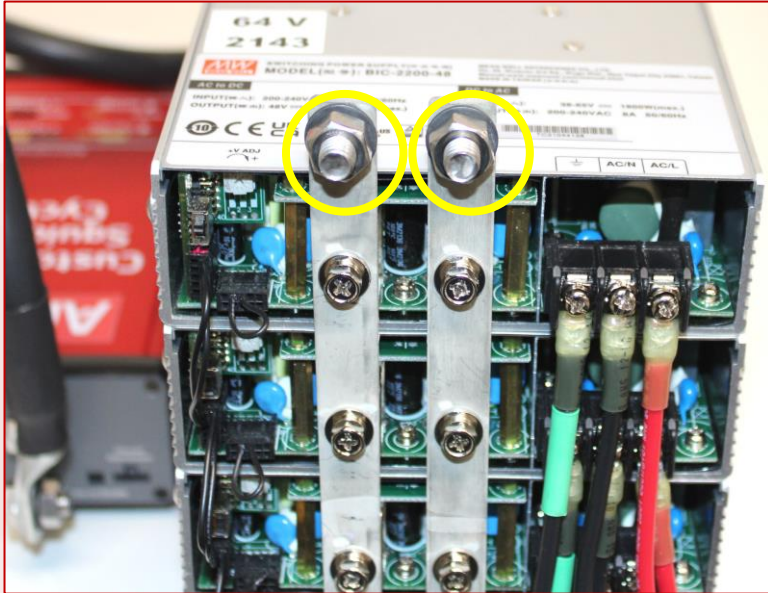The power supply features V+ and V- terminals to connect to the Cycler, as shown circled in yellow above.

Unscrew any hardware that may be attached to the terminals. Then take the ends of the red/black cables from the Cycler and install them as shown above. V+ is **red** and V- is **black**.
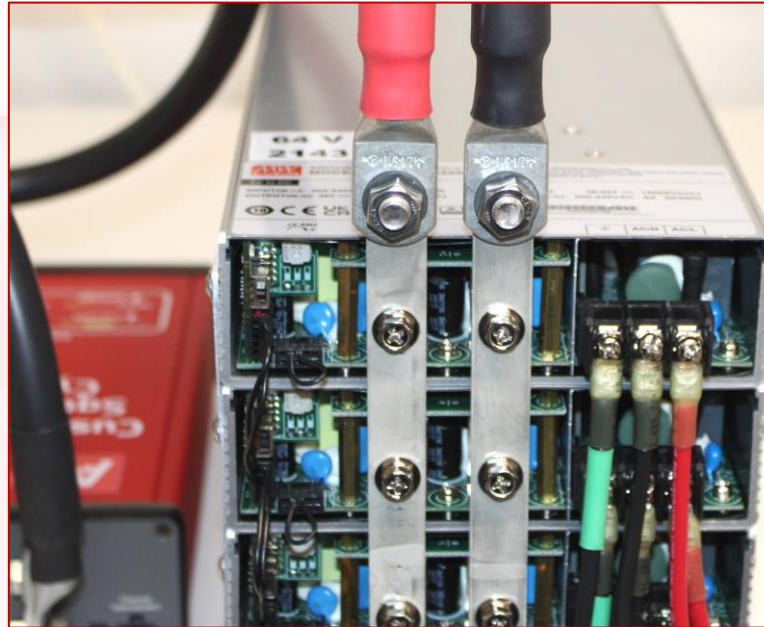
IMPORTANT: All connections must be tightened with a screwdriver. **Loose connections may cause excess heat and risk arcing or fire.** DO NOT connect the power supply to a power source yet.
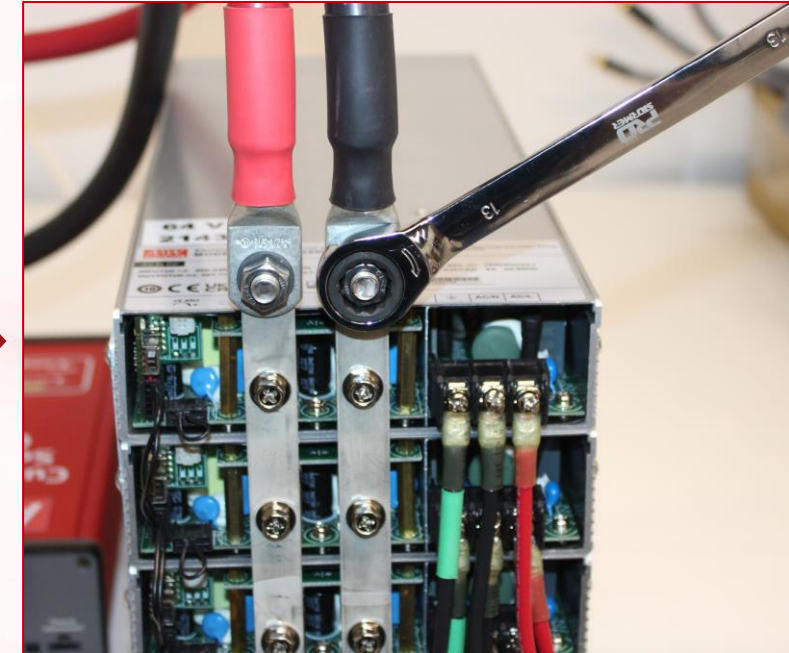
Step 4: Connect current carrying cables on each channel
<mark>Only applies to channels configured at or above ±10A</mark>

- Make sure to match the **red** and **black** color labels with the cables and metal tabs, as shown in the picture. **Notice that the red/black configuration is mirrored between channels.**

- We recommend hand-tightening all connections first. Once all are hand-tightened, securely tighten all connections using two M6 or adjustable wrenches.

- IMPORTANT: All connections must be tightened with wrenches. **Loose connections may cause excess heat and risk arcing or fire.**

- Do not plug in the sense cables (the cables with Molex connectors shown in Step 5) until the current carrying connections are completed first.
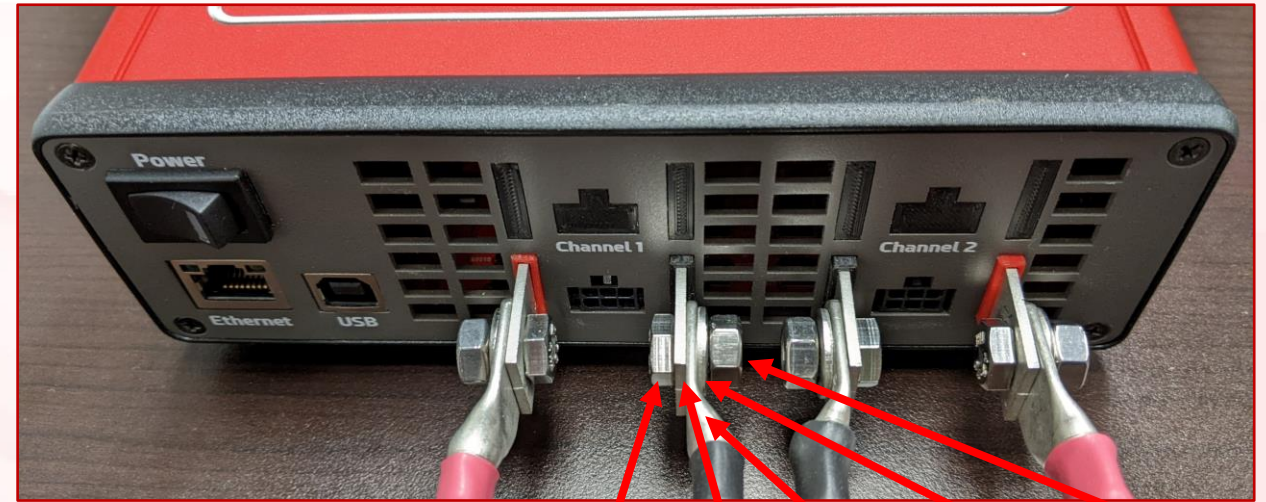

Please precisely match the bolt ↔ tab ↔ lug ↔ washer ↔ nut parts orientation shown in this picture to ensure proper fit and clearance. The bolt heads should be facing the Molex connectors, and the lug/washer/nut combination is on the exterior of the tabs

Although properly connecting all the cables takes dexterity and patience, it is only required for first-time setup.

Step 5: Connect sense cables and USB cable to the Cycler

- Insert the sense cables into the Molex connector slots. Any cable may be used with any channel. ==Squidstat Cycler units configured below ±10A per channel have the power and sense connections contained in a single cable, and thus will not match the picture to the right.==

- Listen for a subtle clicking sound when the connection is fully made between the Cycler and Molex connector.

- Plug in the USB cable to the Cycler, but do not plug in the other end of the USB cable to your computer until Step 8 of this setup process.

- The color-code legend on the top of the Cycler indicates which cable corresponds to its associated electrode connection for experiments (V+, V-, I+, I-, temperature).
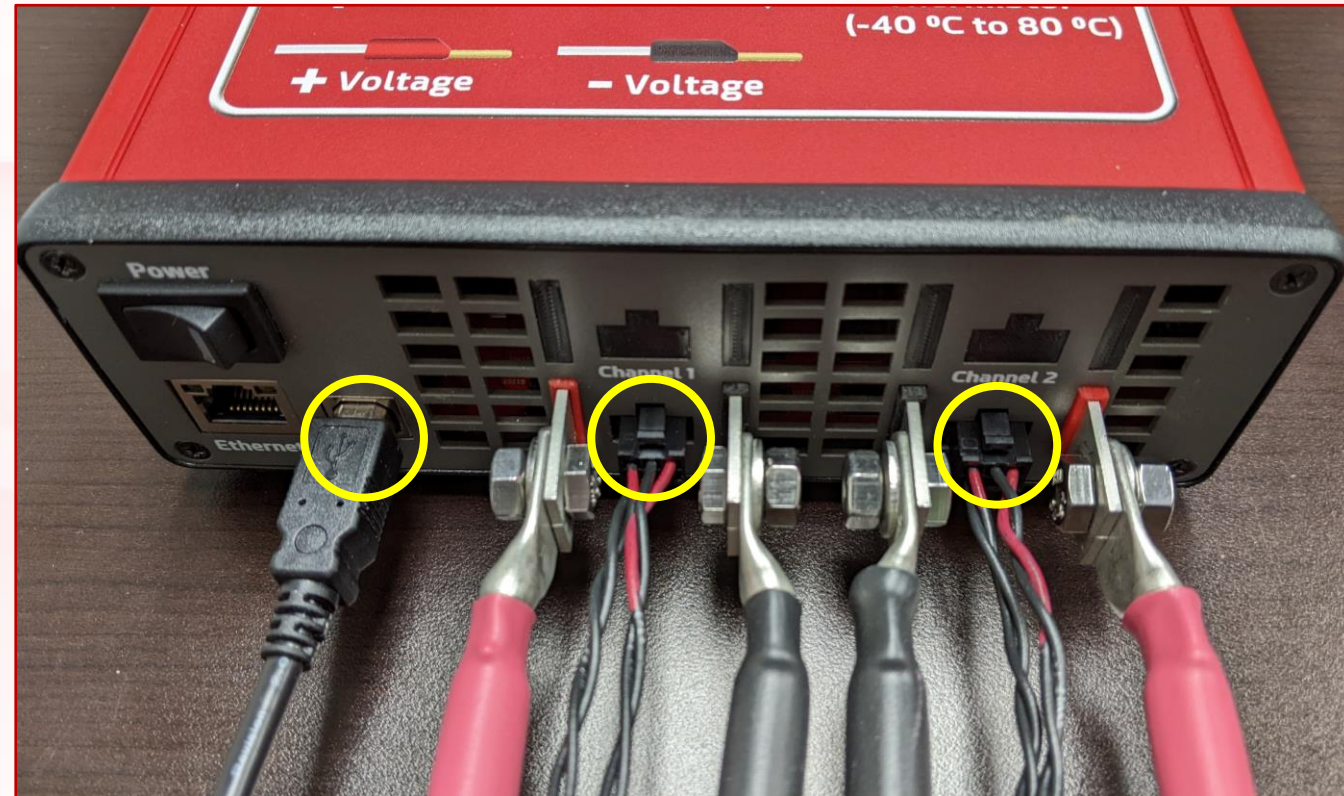
# Step 6: Connect the power supply to a power source

- Connect the provided power supply to a 200-240 VAC power source. The BIC-2200 is the most commonly-included power supply used with the Squidstat Cycler, either as a single unit or in a stacked configuration.

- The BIC-2200 will automatically activate when plugged in. Other power supplies will have a power switch to activate. **Ensure that all other Cycler connections are secured before turning on the power supply!**

- Customers must arrange for their own plug and wiring to a power source based on the power supply included in their order and their electrical panel configuration.
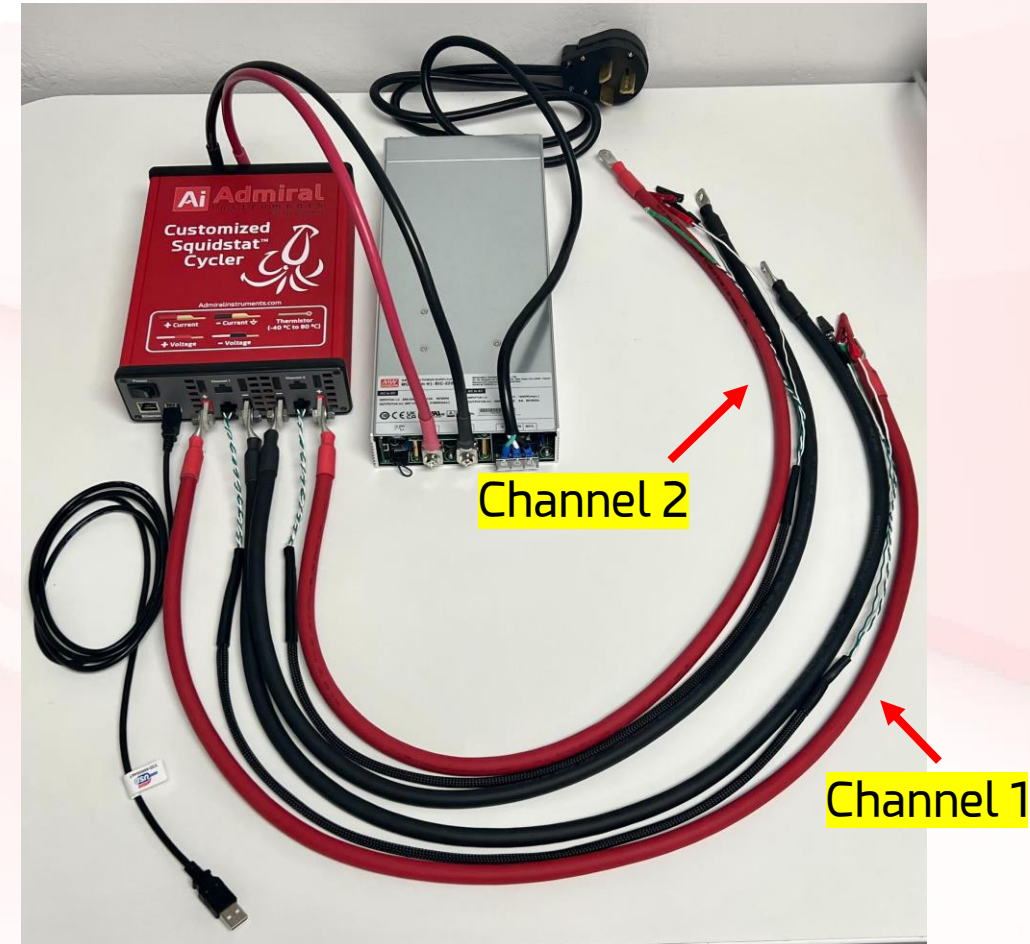
Channel 2

Channel 1

This picture shows how everything should look for a 2-channel configuration above ±10A per channel with a single BIC-2200 at this stage of setup.

Step 7: Install the most up-to-date Cycler software

- Click this link to go to the Admiral Instruments website and navigate to the Squidstat User Interface downloads:
https://www.admiralinstruments.com/software

- Download the correct installer according to the operating system of the computer.

- Run the installer and follow the on-screen instructions.

- After installation is complete, there is a checkbox option available to immediately launch the software. Or you may launch it from the desktop icon that should automatically appear.

Copyright © Admiral Instruments
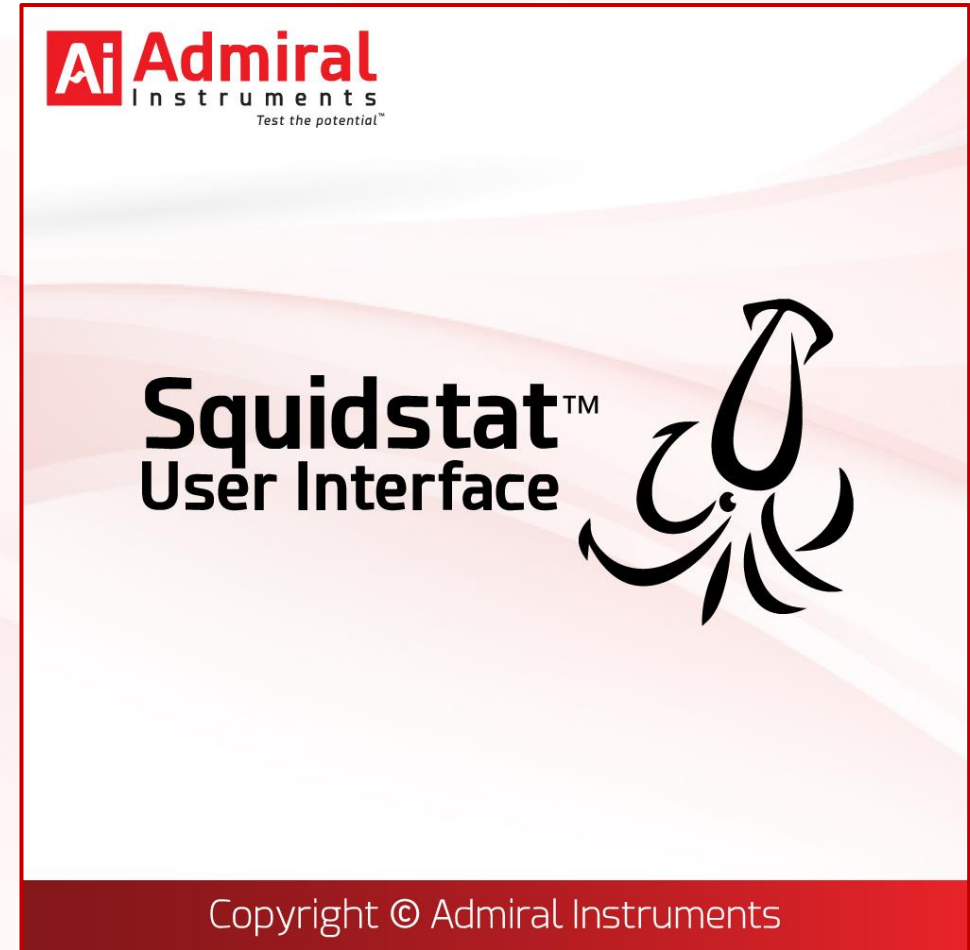
# Step 8: Connect the USB to your PC and turn on the Cycler

- With the Cycler powered off, connect the USB cord between the Cycler and your computer.

- Power on the Cycler using the rocker switch on the front. A firmware update prompt may appear on your computer. If it does, allow it to complete without interference.

- Look for a connection notification on the bell icon shown on the top right of the program.
  - *Note: when connecting the Cycler to your computer for the first time, it may take up to a few minutes for your computer to install the USB drivers. If your computer is firewalled or not connected to the internet, the USB drivers may need to be installed manually.*

- If the connection was successful, the setup is now complete and you are now ready to ***Test the potential™***

Setup Instructions for Special Parallel Channel Configuration To Increase Maximum Current

Introduction to Parallel Channel Operation

- Parallel channel operation uses two or more individual channels as a single channel with a combined maximum current equal to the sum of the individual channel current limits.

- For example, if a customized 2-channel Squidstat Cycler has voltage and current limits of 0-5 V and ± 60 A per channel, the two channels can be connected to increase the operating limits to 0-5 V and ±120 A.

- The graphic to the right shows the lead setup for parallel channel operation. The voltage sense leads can be stacked or connected individually while the current leads must be connected individually.

(-) $V_{Ch\,2}$ (-) $V_{Ch\,1}$ (-) $I_{Ch\,2}$ (-) $I_{Ch\,1}$

(+) $V_{Ch\,2}$ (+) $V_{Ch\,1}$ (+) $I_{Ch\,2}$ (+) $I_{Ch\,1}$
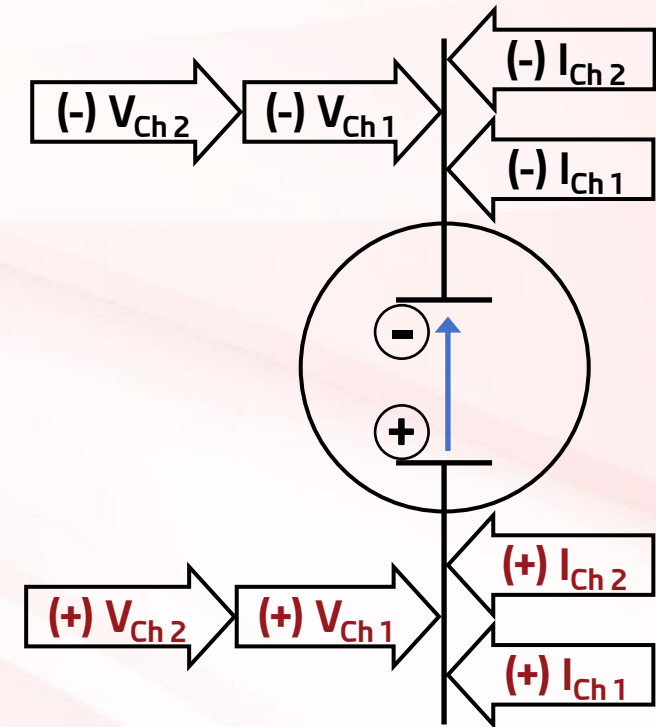
# Setup for Parallel Operation (4-channel Base Model)

- Connect current supply leads from both channels **individually***

  - *Negative supply leads (black wire, black connectors) attach to the negative terminal while positive supply leads (black wire, red connectors) attach to the positive terminal.*

- Connect voltage sense leads either individually, or stacked as shown (white wire, red or black connectors)

  - *Negative voltage sense leads (white wire, black connectors) attach to the negative terminal while positive voltage sense leads (white wire, red connectors) attach to the positive terminal.*

- The temperature recorded by the software is from the temperature sense probe on the lowest numbered channel in the parallel group (green wire, silver lug)
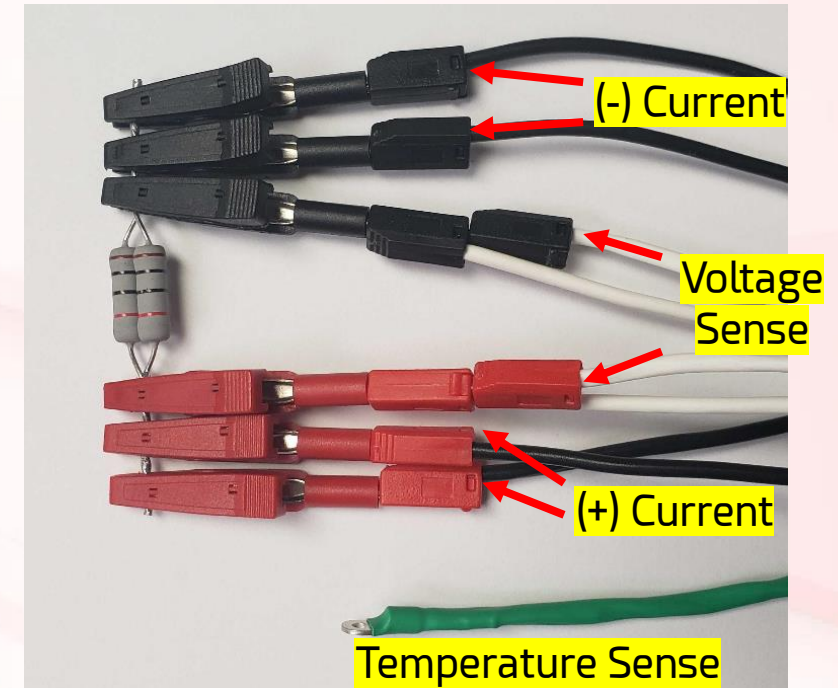
The standard 2mm alligator clip shipped with the device is rated for no more than 10A. The standard cable wiring is rated for no more than 6A. Individual current connections per channel are **required when using the standard cable/alligator clip. A custom cable designed for a single current carrying connection is available for purchase.*

Setup for Parallel Channel Operation (2-channel Custom)

- Connect current supply cables from both channels individually. Joiner plates are provided with select Customized Squidstat Cycler shipments.
    - *Negative supply cables (black) attach to the negative terminal while positive supply cables (red) attach to the positive terminal.*

- Connect voltage sense leads either individually, or stacked as shown (white wire, red or black connectors)
    - *Negative voltage sense leads (white wire, black connectors) attach to the negative terminal while positive voltage sense leads (white wire, red connectors) attach to the positive terminal.*

- The temperature recorded by the software is from the temperature sense probe on Channel 1 (not pictured)
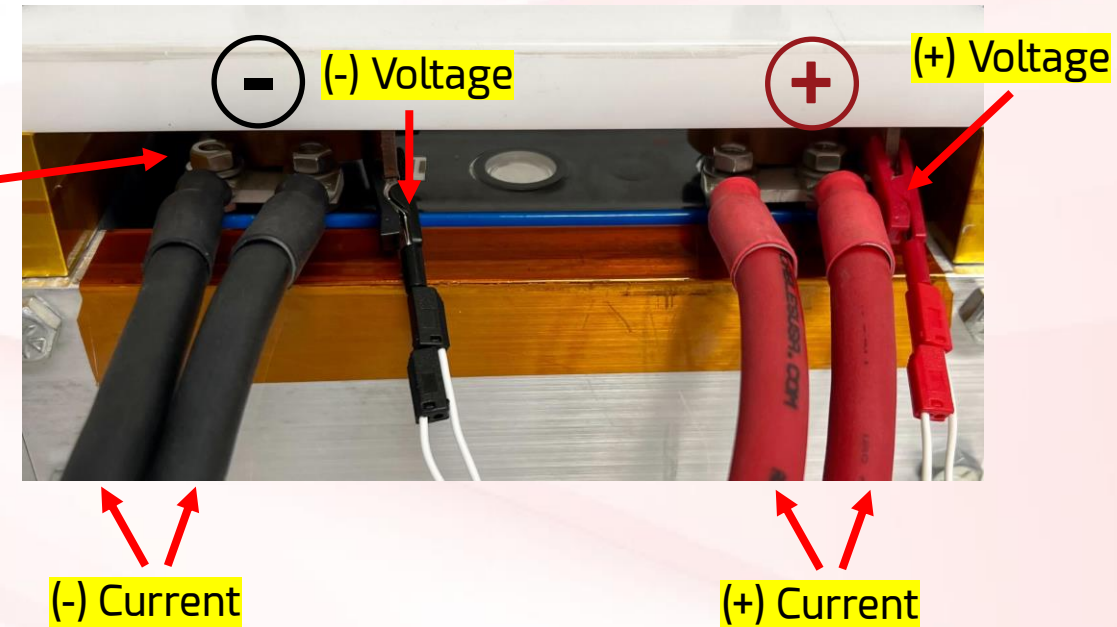
IMPORTANT NOTE: The thick gauge cabling we provide is only rated to carry the amount of current from a single channel. **When running in parallel mode, DO NOT attempt to bypass these configuration instructions by running a single current carrying cable from the channel to the device under test.** Doing so risks melting the cable.

Software Configuration for Parallel Channel Operation

- Open the Squidstat User Interface. Navigate to the "More Options" tab and select "Channel Link for Squidstat Cycler" from the list of Options

- Select the correct Cycler from the drop-down menu.

- For Parallel Channel Operation, select each channel individually and click "Add"

- Active configurations will be listed under "Multi-Channel Outputs." To remove a configuration, select it and click "Remove"

- The Device/Channel list in the "Run an Experiment" tab will update to reflect active configurations as shown to the right. Select the desired configuration when starting an experiment.


In this example, Channels 1 and 2 are configured for bipolar mode, and Channels 3 and 4 are configured for parallel channel operation

Setup Instructions for Special Bipolar Operating Mode To Operate at Negative Voltage Values

Introduction to Bipolar Operation

- The default channel configuration does not allow for negative voltage operation, but bipolar operation uses a pair of channels to expand the available voltage range of a single channel to operate at negative voltages.

- For example, if a 2-channel Squidstat Cycler has voltage and current limits of 0-5 V and ± 60 A per channel, the two channels can be combined to run as a single channel in bipolar operation. This single bipolar channel would be capable of operating from -5 V to +5 V with a current limit of ± 60 A.

- The graphic to the right shows the leads setup for bipolar operation. Only the positive output channels are connected to the battery or other device under test, while the negative output channels are stacked and set aside.

(+) $V_{Ch\,2}$

(+) $I_{Ch\,2}$

(+) $V_{Ch\,1}$

(+) $I_{Ch\,1}$
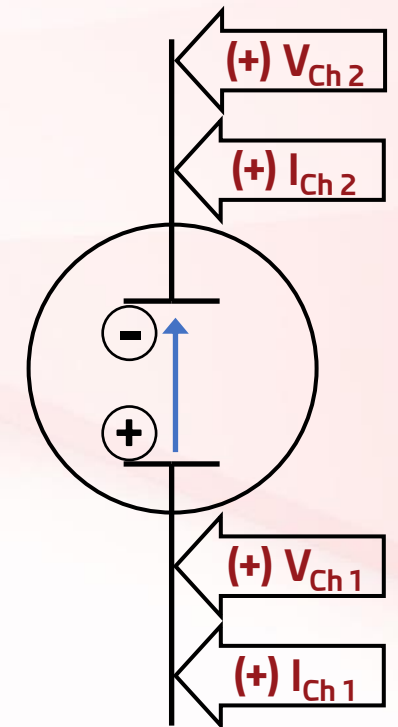
Setup for Bipolar Operation (4-channel Base Model Cycler)

- Bipolar operation requires the use of a synchronized pair of channels. Only channels horizontal to one another can be paired (Ch 1 and 2, or Ch 3 and 4). Channels vertically oriented to one another cannot be combined.

- Connect the **negative** current (I-) and **negative** voltage sense (V-) from both channels together and set aside (this connection is required).

- Connect **positive** current ($I+_{Ch\ 1/3}$) and **positive** voltage ($V+_{Ch\ 1/3}$) sense from the lower numbered channel (Ch 1 or 3) to the **positive terminal.**

- Connect **positive** current ($I+_{Ch\ 2/4}$) and **positive** voltage ($V+_{Ch\ 2/4}$) sense from the higher numbered channel (Ch 2 or 4) to the **negative terminal**.

- The software reads the temperature from the temperature sense probe on the lower numbered channel (Ch 1 or 3) (green wire, silver lug).

- The result is turning what was a 4-channel device (0-5 V, ±5 A per channel) into a 2-channel device (±5 V, ±5 A per channel)


Temperature Sense
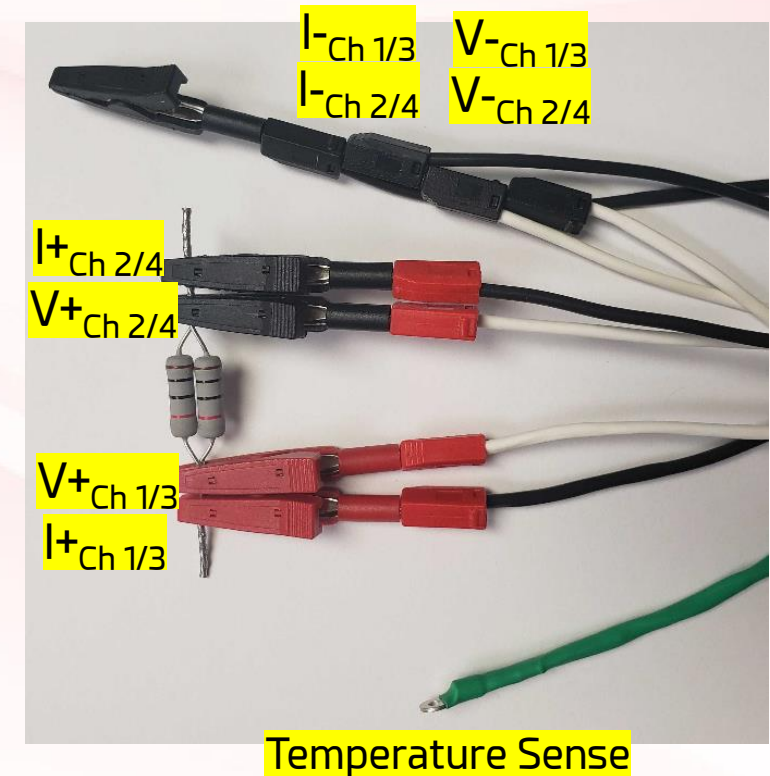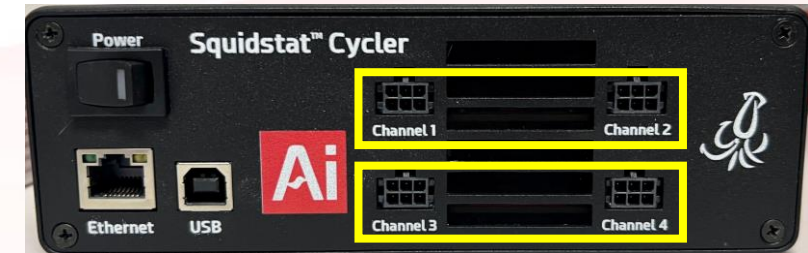
Setup for Bipolar Operation (2-channel Custom Cycler)

- Connect the **negative** current cables (I-) and **negative** voltage sense cables (V-) from both channels together and set aside. Joiner plates are provided with select Customized Squidstat Cycler shipments to combine current carrying connections.

- Connect **positive** current ($I+_{Ch\,1}$) and **positive** voltage ($V+_{Ch\,1}$) sense from Channel 1 to the **positive terminal**.

- Connect **positive** current ($I+_{Ch\,2}$) and **positive** voltage ($V+_{Ch\,2}$) sense from Channel 2 to the **negative terminal**.

- The software reads the temperature from the temperature sense probe on Channel 1 (green wire, silver lug)

- The result is turning what was a 2-channel device (0-5 V, ±60 A per channel) into a single-channel device (±5 V, ±60 A per channel)
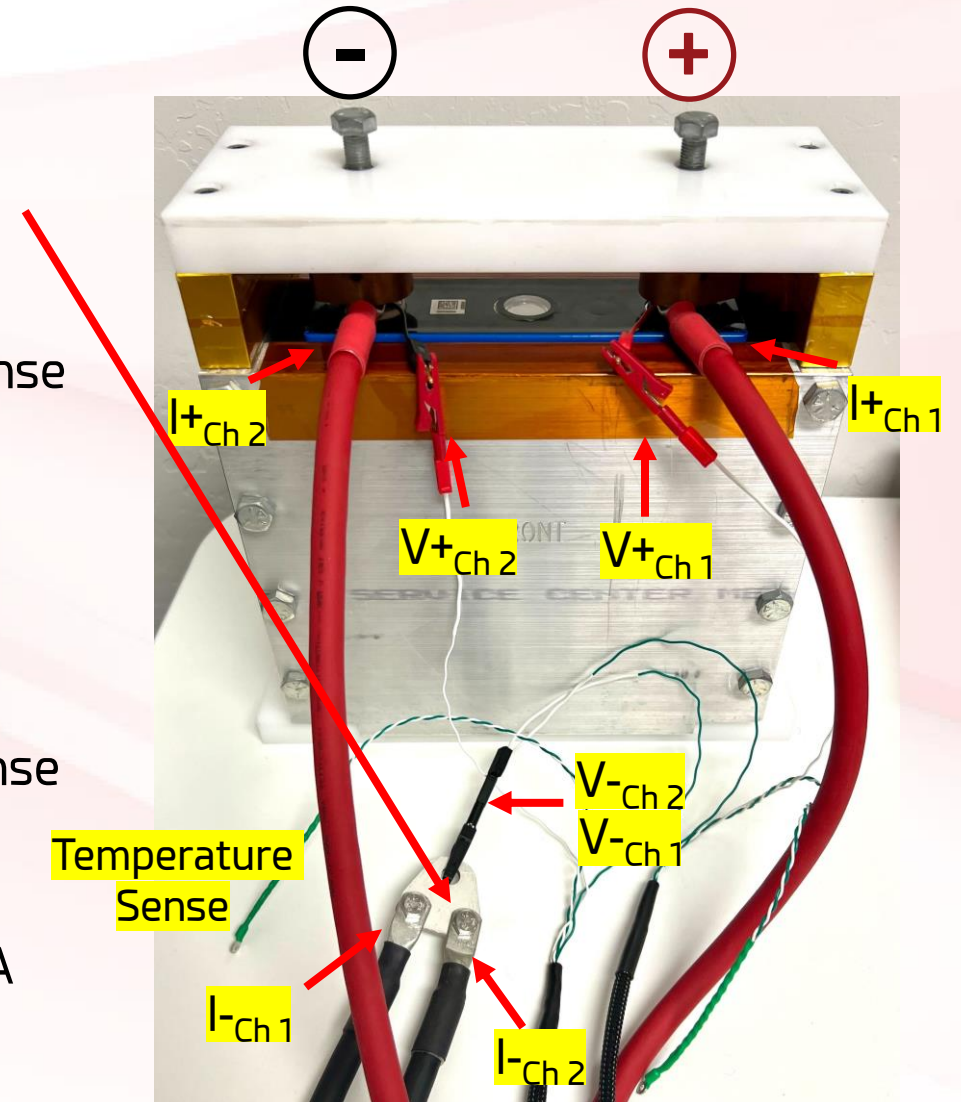
Software Configuration for Bipolar Operation

- Open the Squidstat User Interface. Navigate to the "More Options" tab and select "Channel Link for Squidstat Cycler" from the list of Options

- Select the correct Cycler from the drop-down menu.

- For Bipolar Operation, select the correct channel pair and click "Apply"

- Active configurations will be listed under "Multi-Channel Outputs." To remove a configuration, select it and click "Remove"

- The Device/Channel list in the "Run an Experiment" tab will update to reflect active configurations as shown in the photo to the right. Select the desired configuration when starting an experiment.
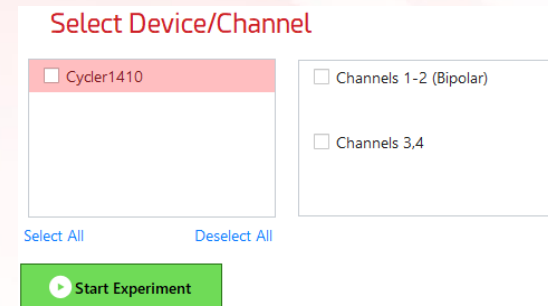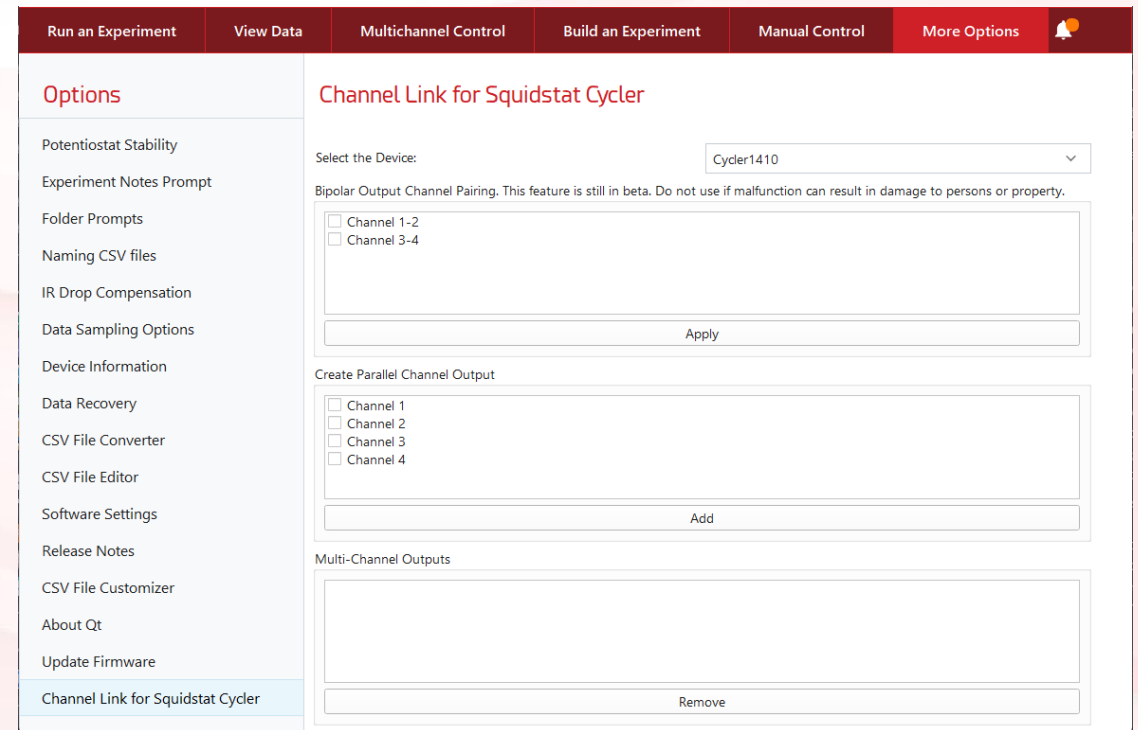
In this example, Channels 1 and 2 are configured for bipolar mode, and channels 3 and 4 are configured for parallel channel operation

Useful Links

- [Squidstat User Interface software walkthrough video](#) (starts at time index 4:30)

- [Squidstat User Interface user manual](#) (content revisions in-process)

- Technical Support email: support@admiralinstruments.com

- Technical Support phone: +1 480-256-8706
  - Available Monday-Friday 9am to 5pm UTC-07:00

FORWARD-THINKING HARDWARE. INTUITIVE SOFTWARE.

We're Devoted to Making Your Job EASIER

Mark Sholin
Co-founder & President
mark@admiralinstruments.com
Office: +1 480 256 8706

Follow @potentiostats

AdmiralInstruments.com

Ai
*Making the next generation of electrochemistry instruments **truly accessible worldwide***