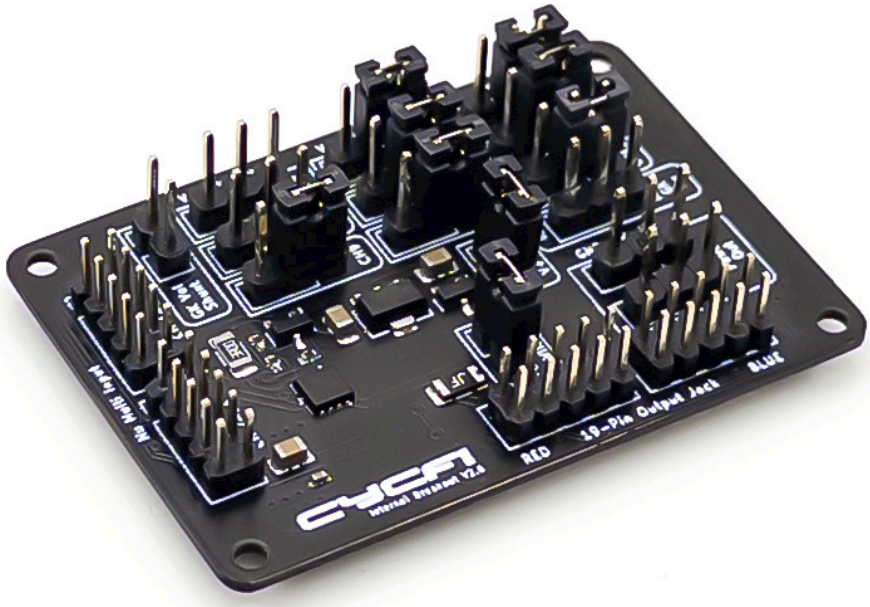
# The Internal Breakout




# Overview

The Nu Multi is an active multichannel pickup utilizing one sensor per string. It is designed for independent processing with separate effects chains for each string, thus allowing different effects settings for distortion, EQ, compressor, delay, pan, pitch-shift, etc. Such extensive processing is now very possible due to advances in signal processing.

The Internal Breakout is the central hub that connects the Nu Multi pickup, monophonic pickups, and other controls to the outside world. The compact breakout board includes pins for 15 channels of combined audio and analog control voltages (CV) and switches (SW). Audio inputs can come from the Nu Multi pickup as well as other monophonic sources like standard active and passive guitar pickups. Control voltages and switches allow remote control of volume, tone, patch, or effects.

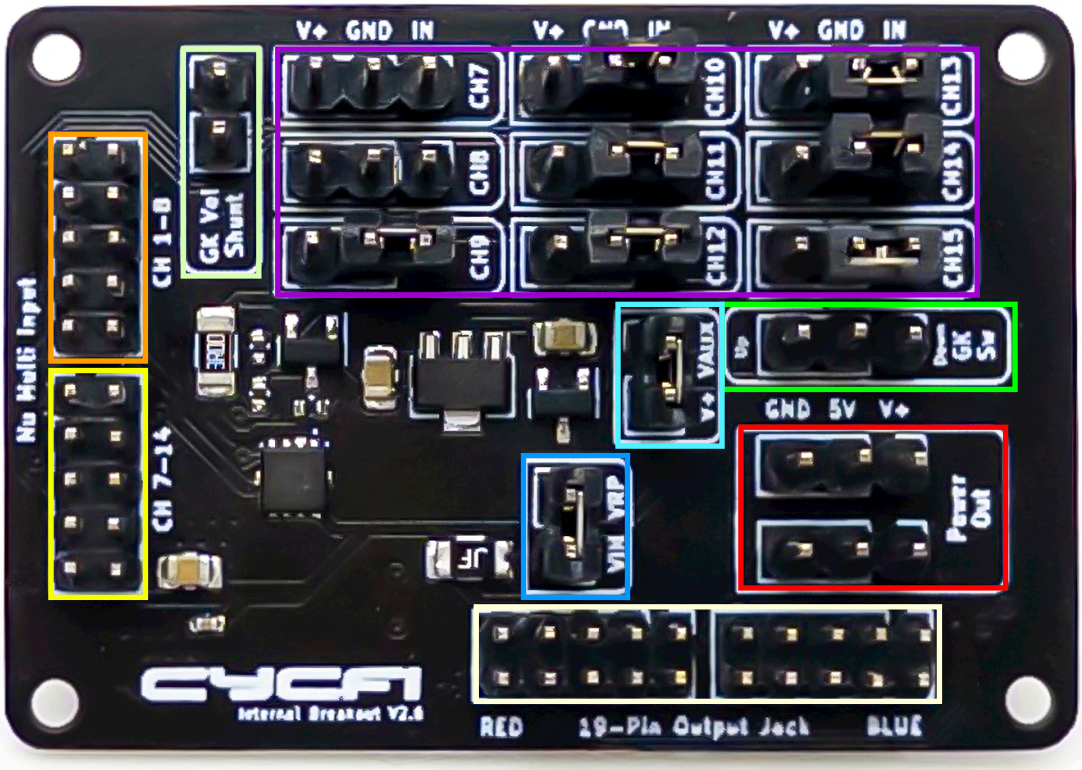
The Nu Multi is connected to the Internal Breakout board through a multicore cable and other sources through EMG-style 3-pin cables. The breakout board allows easy access to all signals via standard header 2.5 mm and 2 mm connectors.

The Internal Breakout can operate from 7V to 18V. The only requirement is a clean supply source. The Internal Breakout board includes power conditioning, reverse polarity protection, short-circuit and overcurrent protection with 2200 mA current limiting, thermal limiting via a resettable polyfuse with a holding current of 500 mA, and an auxiliary 5V regulator that can be utilized for control purposes, e.g., as a source for control voltages.

> ✏️ **Note**: Throughout this document, the terms “control voltage” and “switch” are abbreviated as **CV** and **SW** respectively.

# Internal Breakout Pinouts

As an instructional aid, various connector groups are color-coded for reference purposes only.




| | | | |
|---|---|---|---|
| Nu Multi Ch 1-8 | | V+, VAUX | |
| Nu Multi Ch 7-14 | | VIN, VRP | |
| GK Vol Shunt | | Power Out | |
| Aux Audio / CV Inputs Ch 7-15 | | 19-Pin Output Jack | |
| 2-Way “GK” Switch Ch 7-8 | | | |

# Nu Multi Inputs

The Internal Breakout offers up to 14 audio channels for one or more Nu Multi pickups. These channels are divided into two groups: the first group connects to channels 1 to 8, while the second group connects to channels 7 to 14 via two 2x5P 2mm headers.

It is important to note that channels 7 and 8 are shared between the groups. This pin configuration is intentionally designed to enable easy connection of two Nu Multi 6 pickups to each group, without necessitating any additional signal re-routing procedures. This arrangement allows the first Nu Multi 6 to use channels 1 to 6 in the usual manner, while the second Nu Multi 6 uses channels 7 to 12.

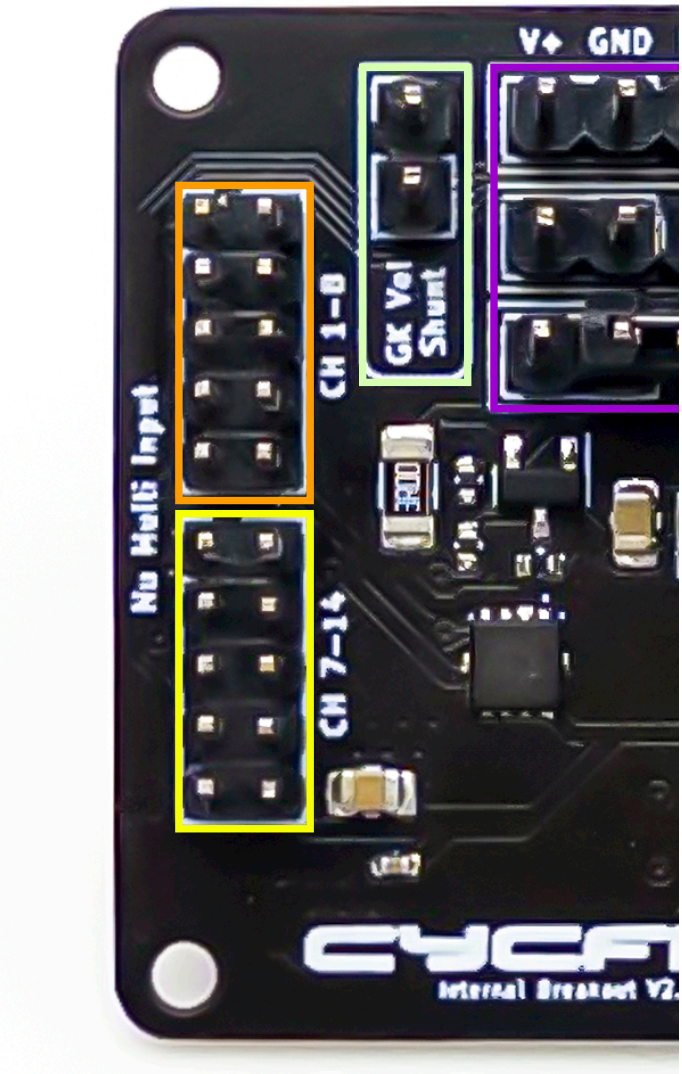
In setups involving 9 channels or more, channels 9 and above may utilize the second group, specifically channels 9 through 14. In this case, channels 7 and 8 in the second group are not used.

Nu Multi Inputs Ch 1-8

| | | |
|---|---|---|
| Ch8 | ■ ■ | Ch7 |
| Ch6 | ■ ■ | Ch5 |
| Ch4 | ■ ■ | Ch3 |
| Ch2 | ■ ■ | Ch1 |
| Gnd | ■ ■ | 10v |

Nu Multi Inputs Ch 7-14

| | | |
|---|---|---|
| Ch14 | ■ ■ | Ch13 |
| Ch12 | ■ ■ | Ch11 |
| Ch10 | ■ ■ | Ch9 |
| Ch8 | ■ ■ | Ch7 |
| Gnd | ■ ■ | 10v |

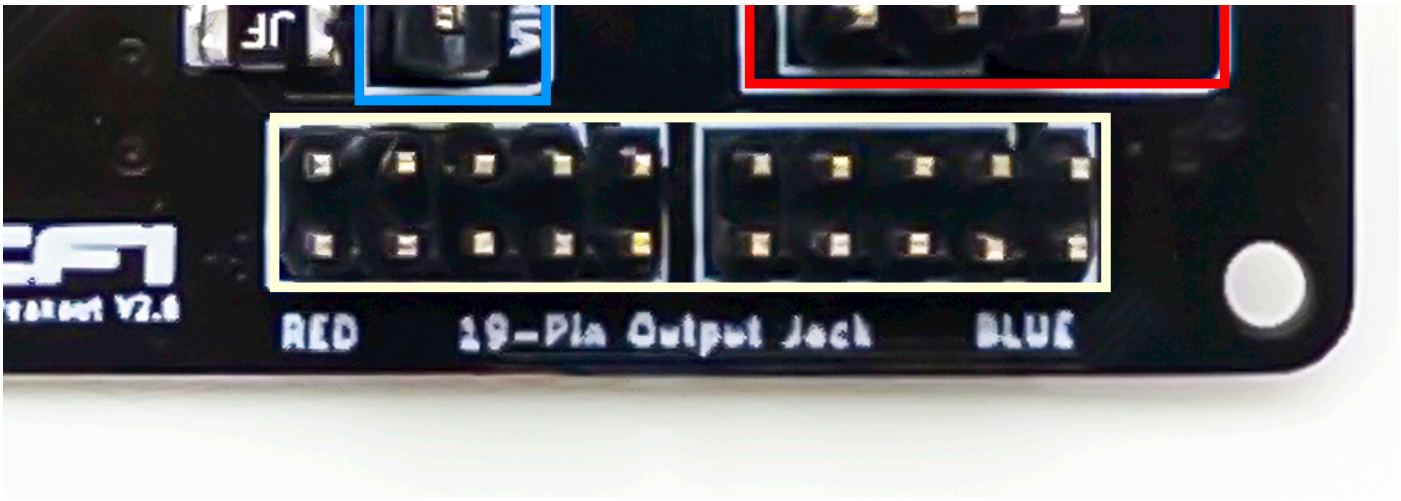


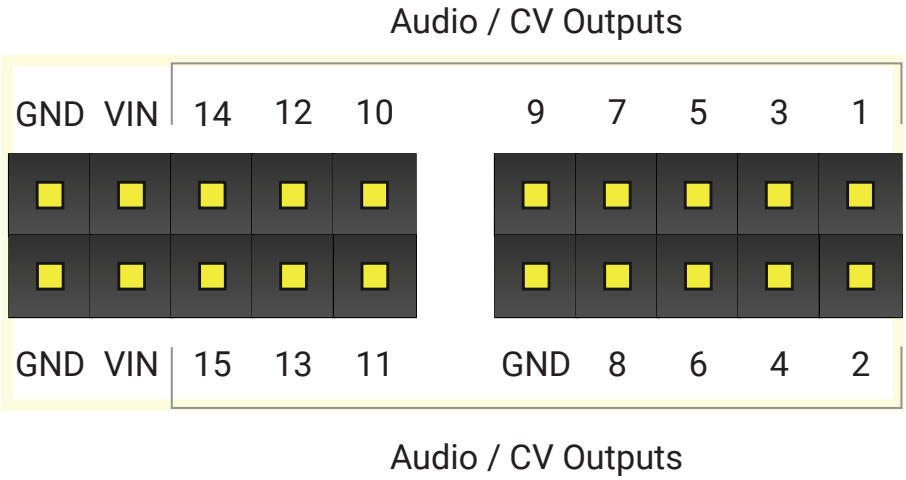

⚠ Shunts to ground are preinstalled from the factory for auxiliary channels 9-15 to prevent noise. These shunts should be removed when connecting to a Nu Multi with more than 8 channels, otherwise, the affected channels will have no sound. See the Aux Audio and CV Inputs section for more information.

# 19 Pin Output Jack

This is the main connector that connects the Internal Breakout to the outside world via a 19-pin multicore connector. All signals, as well as power and ground, pass through this connector via two 2x5P 2mm headers. Two pins are assigned to power (VIN) while three pins are assigned to ground (GND). This redundancy is intentional and makes the system more robust. The remaining pins are for 15 channels of audio or CV.

> ✏️ Take note that while the channels are typically used for sending signals out from the instrument to the outside world, they are bidirectional. Signals can be sent to and from the Internal Breakout.



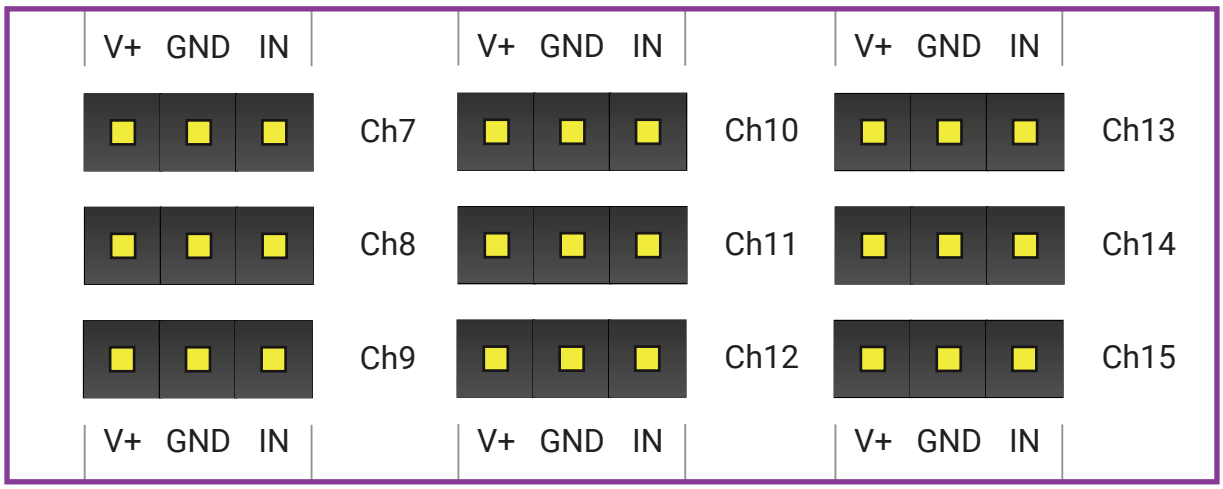

| | |
|---|---|
| Audio / CV Outputs | Audio / CV Outputs (Channels 1-15) |
| VIN | Main Power Source (Clean 7V to 18V power source) |
| GND | Signal and Power Ground |

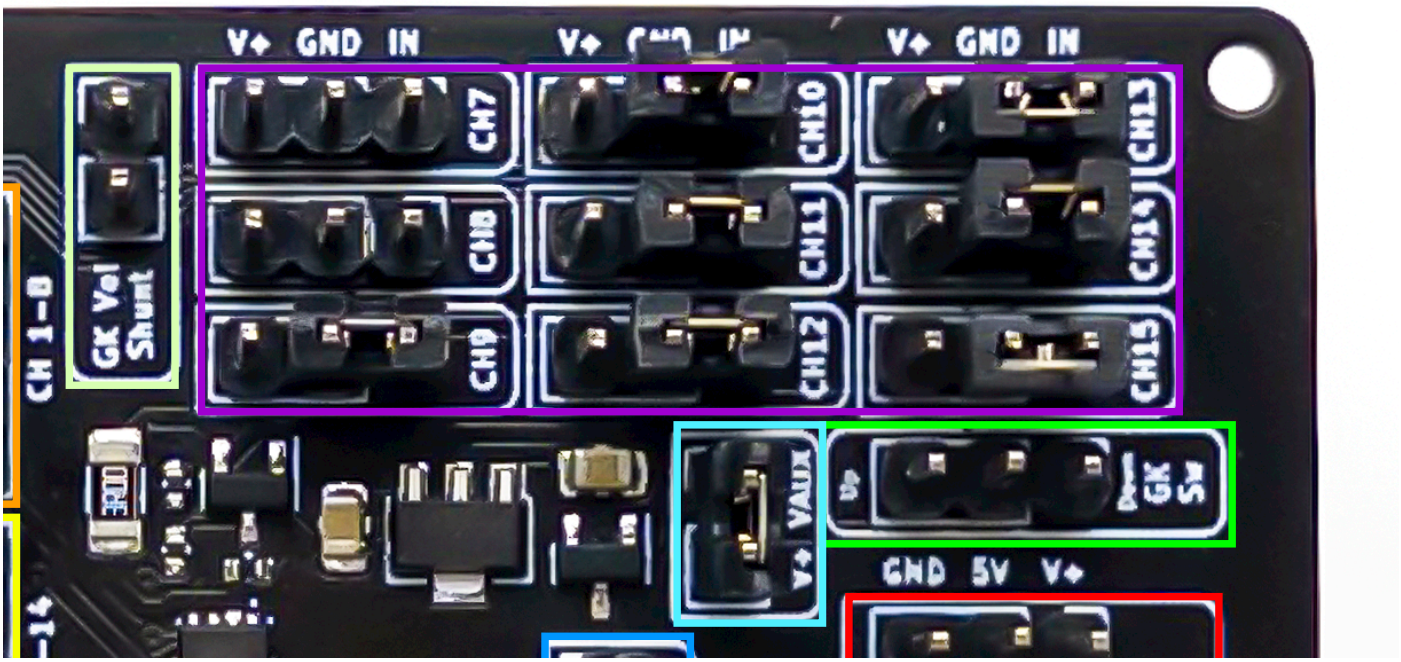
The Internal Breakout incorporates power conditioning, reverse polarity protection, short-circuit and over-current protection with a current limit of 200 mA, and thermal limiting through a resettable polyfuse with a 500 mA holding current.

# Aux Audio and CV Inputs

The Internal Breakout has nine (9) EMG-style 1x3P 2.54mm header connectors for connecting standard monophonic pickups, control voltages (CV), or switches (SW). Take note that some channels are duplicates of the Nu inputs. You have the option to connect to one or the other, but not both.

> ⚠ Unused audio and CV channels should be tied to ground with a shunt in the Internal Breakout to prevent noise. These shunts are preinstalled from the factory for auxiliary channels 9–15. These shunts should be removed when connecting to a Nu Multi with more than 8 channels, otherwise, the affected channels will have no sound.



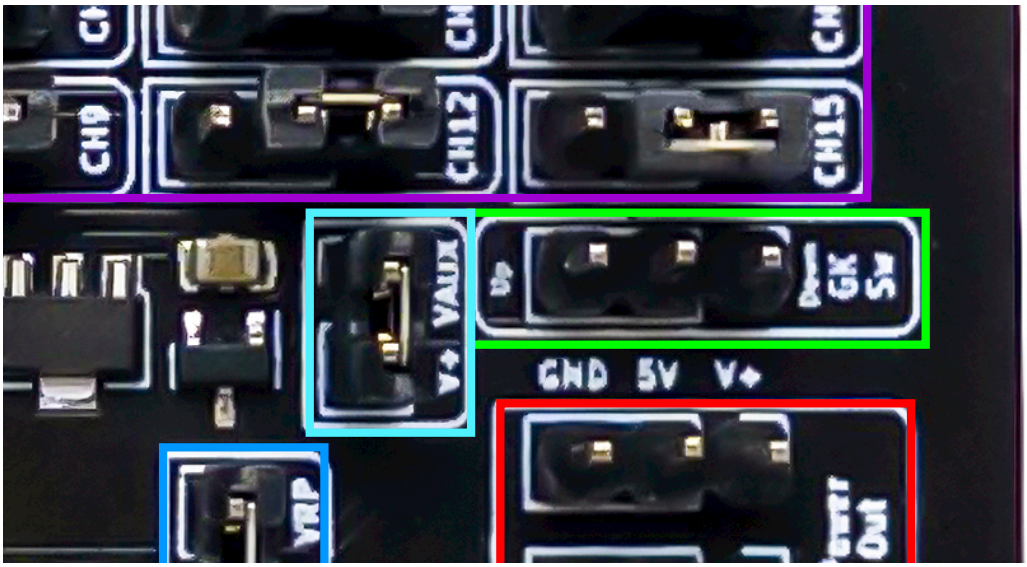
# GK Features

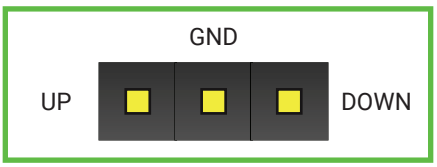
Specific features are integrated to ensure seamless compatibility with Roland/BOSS devices. These features include a 2-Way momentary Up/Down “GK” switch, exclusively designated for SW channels 7 and 8, along with a dedicated CV channel 10, designed to correspond to SYNTH VOL functionality. These are optional.

If desired, the momentary Up/Down switch can optionally be configured to serve as an increment or decrement control for MIDI program change. Similarly, CV channel 10 can also be set up to correspond to MIDI CC-7 (Volume).

# 2-Way “GK” Switch

> ⚠ As previously mentioned, the Nu Multi and Aux connectors also share channels 7 and 8. When utilizing the 2-Way “GK” Switch in your setup, channels 7 and 8 should not be used for other functions.



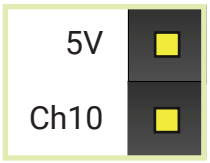




2-Way “GK” Switch

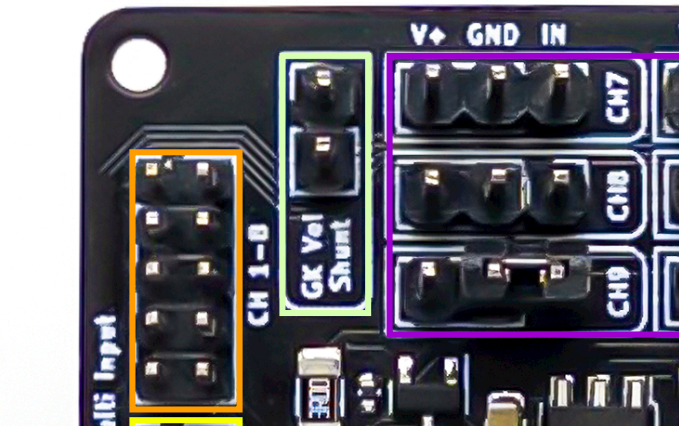
# GK Vol Shunt

When connected to a BOSS/Roland device, a CV control potentiometer is expected to be wired to channel 10 in the Internal Breakout. Without the CV potentiometer connected, the channel will be shunted to ground in the Internal Breakout (channel 10 in the Internal Breakout) and will therefore default to zero, and you will get no sound from the connected device.

The Internal Breakout has this special shunt for GK Vol Shunt for exactly this case. A special connector is provided that will allow you to connect the GK-VOL output to +5V, which sets the CV channel to maximum volume. Simply place a shunt to enable this feature. When installing this shunt, make sure the shunt to ground in CH10 is removed.

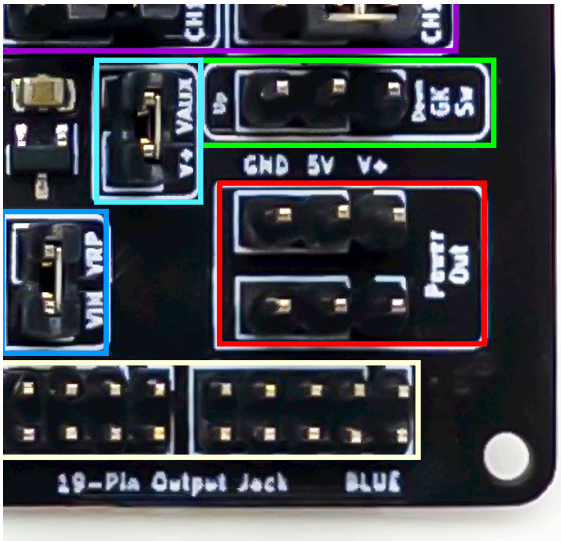


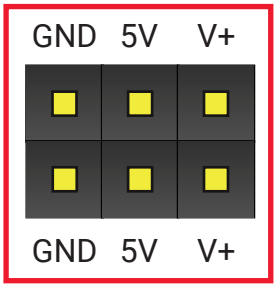

GK Vol Shunt




# Power Out

These pins provide clean power output to auxiliary devices. The power output gives you 5V and V+. Power is protected against reverse polarity, short circuits, and overcurrent with a total current limit of up to 200 mA, as well as thermal limiting with a polyfuse. The V+ level is whatever the voltage input VIN is (there's no voltage dropout). The 5V supply is regulated and delivers up to 150 mA.



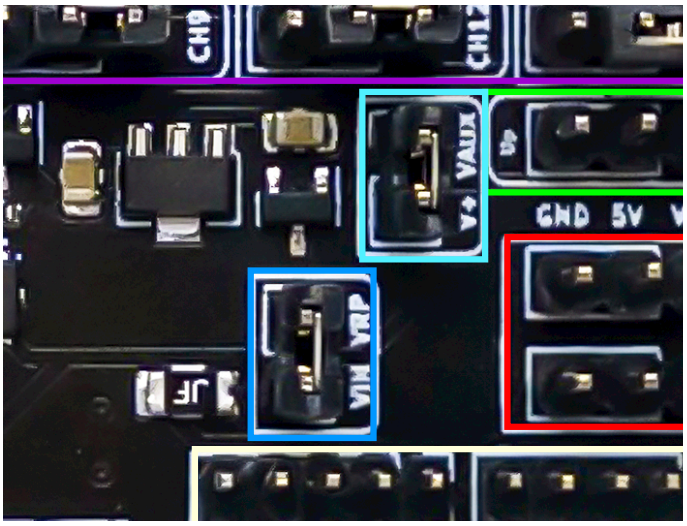



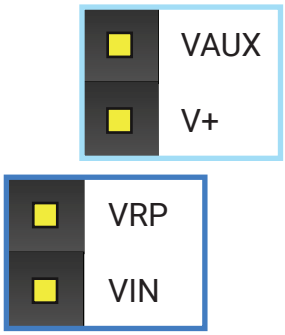
# Power Extras

Two additional headers are provided that allow you to tap into various points in the Internal Breakout circuitry for additional flexibility. These are provided for advanced power users.

1. The first header allows you to tap into VIN (the voltage input source) before any power conditioning. This allows you, for example, to add a power switch, or tap into additional power sources.
2. The second header allows you to tap into VAUX —the point where power is distributed to the Aux Audio and CV headers (see the Aux Audio and CV Inputs section for more info). This allows you to provide additional power sources, such as batteries, to power active monophonic pickups when there is no port power coming from the external power source, VIN.

Shunts are installed by default in these headers from the factory.



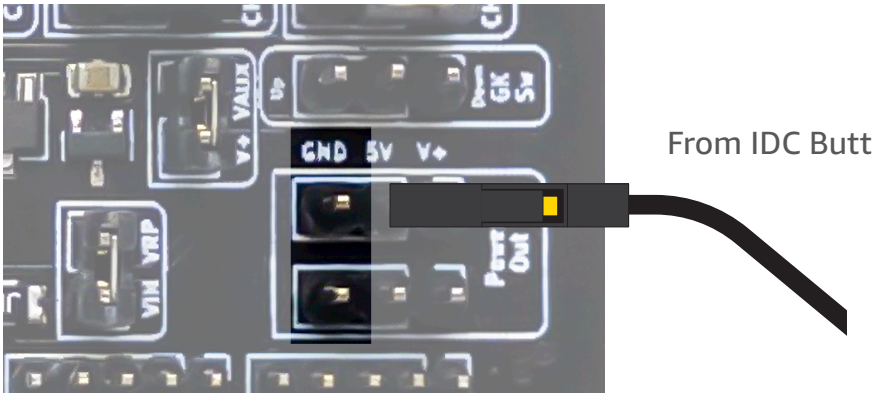




| | |
|---|---|
| VIN | The main power source that comes from the 19-Pin Output Jack. |
| VRP | The first stage of power conditioning: the reverse polarity protection. |
| V+ | The main conditioned power source, after reverse polarity protection, short-circuit and over-current protection, and thermal limiting. The V+ level is whatever the voltage input VIN is. There is no voltage dropout. |
| VAUX | The point where power is distributed to the Aux Audio and CV headers (see the Aux Audio and CV Inputs section for more info). |

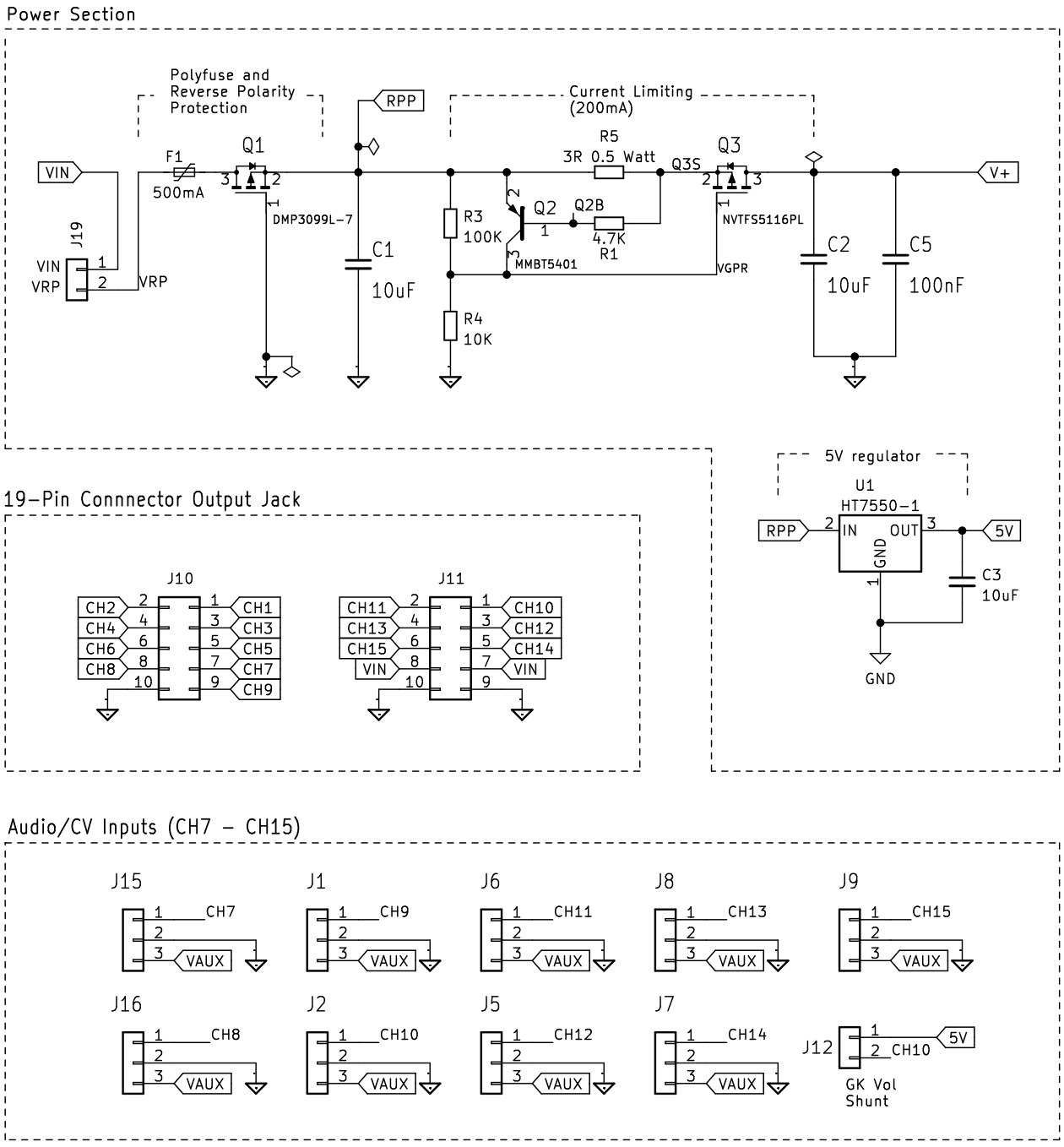
# Grounding

Assuming you have a guitar ground wire connected to string ground (typically the bridge), connect this wire to the supplied 2-Wire IDC Butt. Splice the end of the wire connected to the single-pin header (provided in the package) with the end of the guitar ground wire going to the string ground. To do this, insert the bare wires inside the wire-butt connector and crimp the connector with a pair of pliers until it snaps to make a firm connection.

Insert the other end of the cable with the 1-pin female header connector to one of GND pins in the Internal Breakout. This connects your string, bridge and guitar cavities to ground and helps reduce noise. (Note: Ensure that the bridge and cavities are connected to the guitar ground wire.)

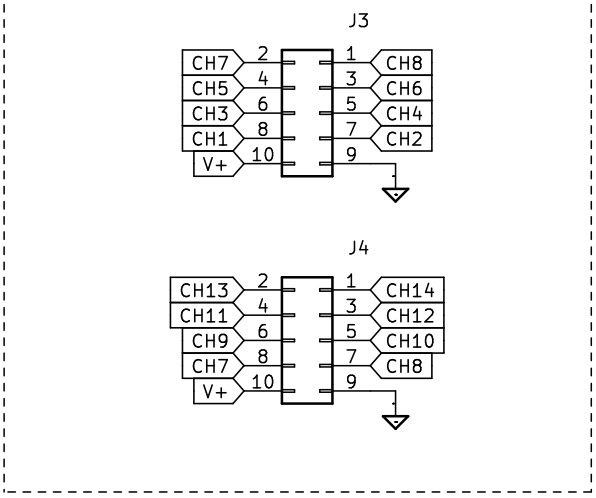


# Schematic Diagram

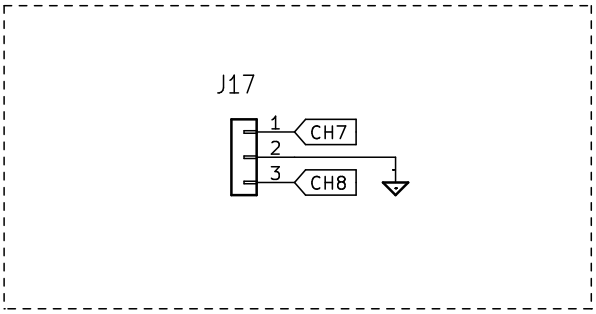


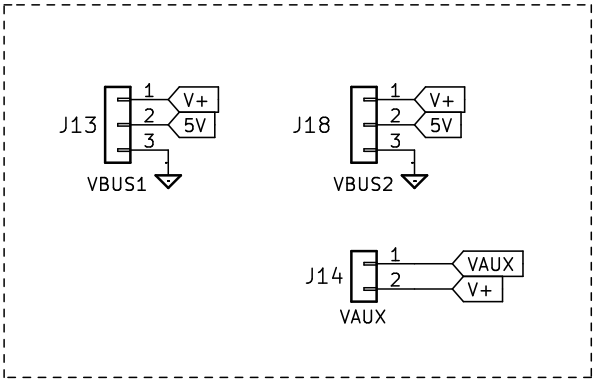
# Schematic Diagrams

Nu Multi Input




2-Way Switch




Power Out