

Dual Mono-Stereo Adapter

DESIGN RATIONALE

Introduction

Some assistive technology devices are equipped with stereo switch input jacks. Generally, these provide the option to connect one or two input devices. These input devices can be a single switch with a 3.5 mm mono plug, a two-input switch with a 3.5 mm stereo plug. To connect two single switches that each has a 3.5 mm mono plug, an adapter is required.

Research

Commercial adapters are available, but they can be difficult either difficult to source or expensive. Sourcing can also be difficult because there is a type of audio adapter that looks the same but is wired differently.

Commercial Options

Assistive Technology

- <https://cadanat.com/product/mono-to-stereo-adapter/>, \$10 USD + Shipping (No longer available)
- Stereo-to-mono plug adapter (splitter) - <https://www.adaptivetechsolutions.com/cable-kit/> - \$31.08 USD, US Shipping only

Audio

3.5 mm TRS to Dual 3.5 mm TSF Stereo Breakout Cable

- <https://www.amazon.ca/Hosa-YMM-261-Stereo-Breakout-Cable/dp/B00006805H>, ~\$17 CAD

DIY Options

While the basic schematic is available, we were unable to locate any existing plans for creating a DIY adapter.

Assistive Device Compatibility

There are several commercial and DIY assistive devices that have a stereo input jack:

- Origin Swifty™ USB Switch interface
- Origin Tapio™
- Origin HeadMouse
- Darci USB (No longer available, but often still in use)
- LipSync Switch Input Module

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Requirements

Goals

G01	The device components should be easy to source.
G02	The device should be easy to build.
G03	The device should cost less than the commercially available option, or at least comparable.

Functional Requirements

F01	The adapter must have two 3.5 mm female inputs.
F02	The adapter must have one 3.5 mm stereo output.
F03	The inputs must be connected to the output pins using the typical AT wiring (i.e., left input tip to output ring, left input sleeve to output sleeve, right input tip to output tip, right input sleeve to output sleeve.)

Non-functional Requirement

NF01	Design must be easily manufacturable for a person with skills in soldering, 3D printing, and moderate mechanical handwork
NF02	Left and right inputs must be labelled.
NF03	3D printable components should require minimal support material.

Constraints

C01	Single-build cost must be less than \$20 CAD.
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Ideation

There are numerous ways that an adapter with the desired schematic could be constructed:

Cables

- 1X 3.5 mm male stereo plug
- 2X 3.5 mm female stereo or mono jack
- Heat-shrink tubing / tape

The cables need to be cut and the wires stripped and then soldered. Shrink tube or tape is then used to reinforce and cover the connection.

All-Female Jacks

- 1X 3.5 mm stereo jack



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Files available at <https://makersmakingchange.com/project/dual-mono-stereo-adapter/>

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- 2X 3.5 mm mono or stereo jack
- Wire to solder connections
- Something to hold / contain jacks
- 1 X 3.5 mm extension cable (Male-male)

The jacks need to be soldered together to create the proper connections. The jacks should be mounted inside something to make it easy to plug and unplug cables.

Male Plug and Female Jacks

- 1X 3.5 mm stereo plug
- 2X 3.5 mm mono or stereo jack
- Wire to solder connections
- Something to hold / contain jacks

The jacks and plugs need to be soldered together and contained within an enclosure.

Conceptual Design

Schematic

This is not the same as a headphone splitter.

- Left mono tip to stereo ring
- Left mono sleeve to stereo sleeve
- Right mono tip to stereo tip
- Right mono sleeve to stereo sleeve

Detailed Design – Version 1.0

This version of the device consists of three 3.5 mm stereo jacks that are held in a snap-fit 3d printed enclosure. This configuration was selected to take advantage of an abundance of jacks on hand, and to provide some flexibility in positioning cables (i.e., not requiring the enclosure to connect directly to the device).

Jack Selection

This particular jack model was selected because a large number were available on-hand from another project (AT Maker Keypress) and they were also readily available online (i.e., Amazon



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<https://www.amazon.com/Gikfun-Stereo-Female-Connector-Arduino/dp/B01KFP0M4S>). These are now no longer available, so an equivalent part was found on DigiKey.

ID	MPN	Manufacturer	Cost	Link
1	SJ1-3535NG	CUI Devices	\$1.91	https://www.digikey.ca/en/products/detail/cui-devices/SJ1-3535NG/738699
2	SJ1-3533NG	CUI Devices	\$1.86	https://www.digikey.ca/en/products/detail/cui-devices/SJ1-3533NG/738701
3				



Figure 1: SJ1-353NG

Source: Datasheet (<https://www.cuidevices.com/product/resource/sj1-353xng.pdf>)

Enclosure

A simple two-part, 3d-printed, snap-fit enclosure was designed to cover and contain the switch jacks.

Opportunities for Improvement

- This design is cost-effective if the jacks are already on-hand or are purchased as part of a larger order. A single-one off build that incurs shipping charges will be more expensive than the commercial option from Amazon.
- It may be beneficial to include the wiring diagram directly on the 3d printed enclosure somehow to aid the maker.
- The design should be easy to modify to accommodate a different model of switch jack.