Adafruit Arcade Bonnet for Raspberry Pi

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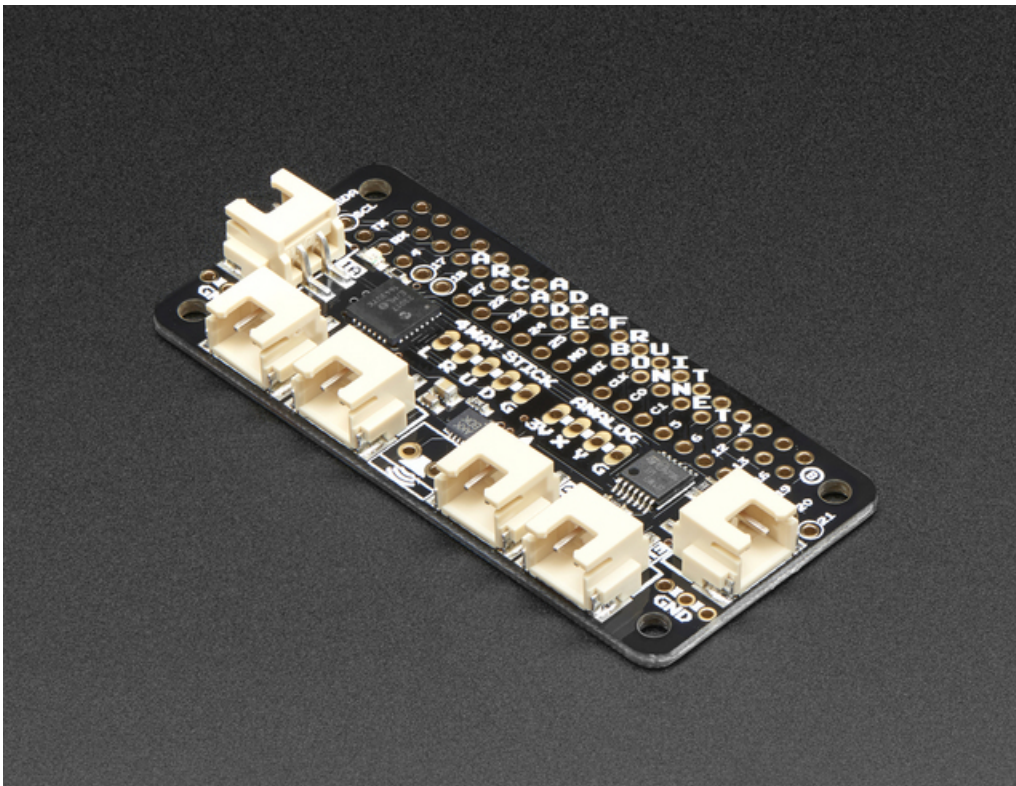
Guide Contents

Introduction

Playing retro games is easy on a Raspberry Pi - and the pocket computer is pretty good at it too! All you need is a little help to connect buttons and a joystick up and you can custom design your own arcade console, desktop or stand-up machine, even just a simple controller box. It makes for a fun weekend project that will last all year.

This Adafruit Arcade Bonnet is designed to make small emulator projects a little easier to build. Here's what you can look forward to!

- It is the same size as a Pi Zero, so for really compact builds, this is super small. You can use it with a Pi 2, 3, B+ or any 2x20 connector Pi.
- It has JST sockets so you can plug in six arcade buttons easily using our quick connects (https://adafru.it/dMr)
- Header breakouts for use with both clicky-type switched joysticks *and…*
- Header breakout and converter for using analog-type joysticks or thumbsticks with potentiometers inside
- A 3W speaker output that can drive 4-8 ohm speakers for when using with a TV output, HDMI display or PiTFT
- Switches are all managed with an I2C-GPIO converter with interrupt out. The converter is very fast and frees up all the pins so you can use this Bonnet with a PiTFT or any other accessory/device that uses a lot of pins!

If you don't need an amplified speaker output, analog-joystick input or minimal pin usage, check out our plain-jane Retrogame tutorial which just plugs all the buttons and joysticks right into the Pi directly (https://adafru.it/uyC).
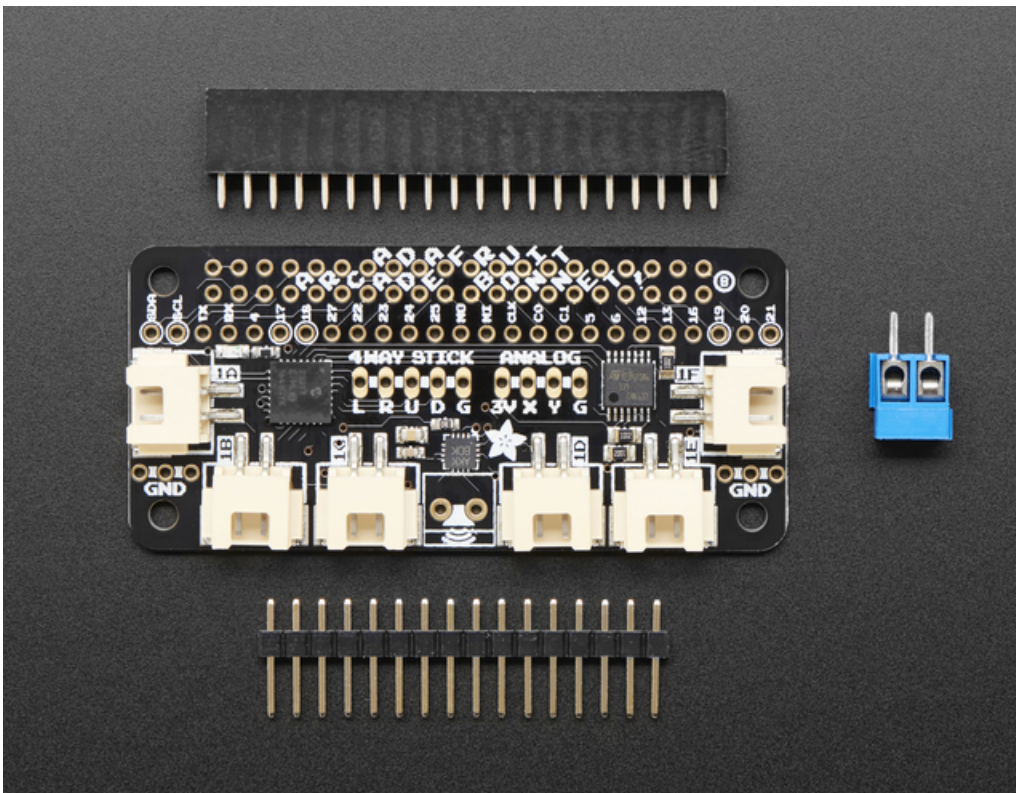
This item as sold as a mini-kit, with a Bonnet and headers that need to be soldered in to attach it to a Raspberry Pi! It only takes a few minutes but soldering iron and solder are required.

It also doesn't come with any of the extras, so you can choose which buttons/joysticks/speaker you want! Here is a list of the items you can use:

Joysticks:

- Small Arcade Joystick (http://adafru.it/480)
- Mini Analog Joystick (http://adafru.it/3102)
- Assembled 2 Axis Joystick (http://adafru.it/245)
- Analog Thumbstick (http://adafru.it/2765)

- 2 Axis Joystick (http://adafru.it/512)
- PSP Analog Joystick (http://adafru.it/444)
- PSP3000 Analog Joystick (http://adafru.it/3103)

to connect them, you may want some 20 x 12" Female jumper wires (http://adafru.it/1949)

Speakers

- 4 ohm 3 Watt speaker (http://adafru.it/1314)
- 8 ohm 1 Watt speaker (http://adafru.it/1313)
- Mono enclosed speaker (http://adafru.it/3351)
- Mini Metal speaker (http://adafru.it/1890) (may need to turn the volume down in Emulation station)
- Thin Plastic speaker (may need to turn the volume down in Emulation station) (http://adafru.it/1891)

Arcade Buttons

The JST connectors on the Bonnet mate perfectly with these quick-connects, which we really like. (http://adafru.it/1152)

Any of our Arcade buttons will work. (https://adafru.it/uyD)You can use any switch you like, really - doesn't even need to be a button!

The translucent 30mm ones work nicely with the quick-connects and are recommended! (http://adafru.it/1152302020)

Connections

Buttons

Around the edges of the Arcade Bonnet are plugs for up to **6 buttons**, labeled **1A** through **1F**. These work directly with our arcade button quick-connect wires (http://adafru.it/1152).
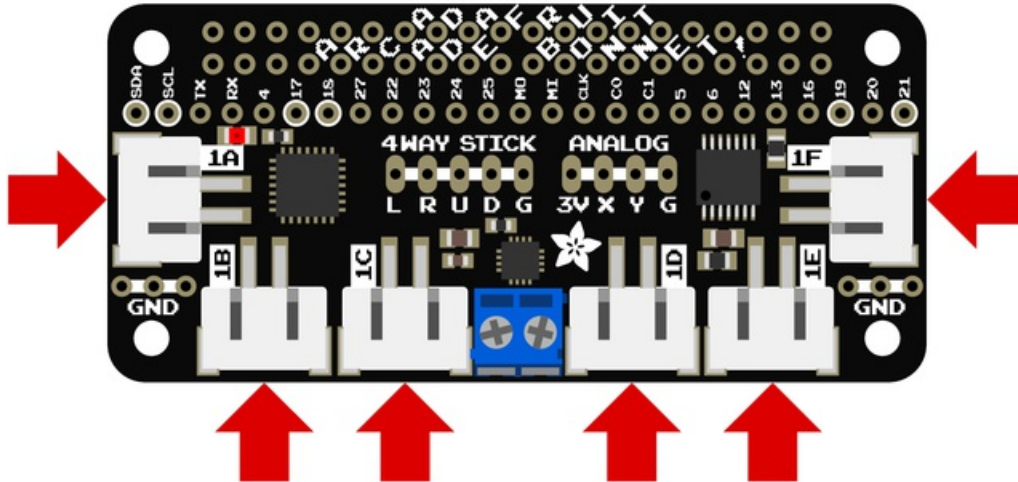
Arcade Button Quick-Connect Wire Pairs - 0.11" (10 pack)

$4.95
IN STOCK

ADD TO CART

### Arcade Button - 30mm Translucent Clear

$5.95
IN STOCK

ADD TO CART

These cables plug right in, and then you can quick connect to many switches or arcade buttons. For the **1F** connection, plug this cable in before plugging the Bonnet into your Pi 3 or Pi 2 since the USB ports will make it tougher once its installed.

Joystick / D-Pad

Any four or eight-way "clicky" joystick can be connected to the **4WAY STICK** header. "**G**" is the joystick's common ground pin, while **L**, **R**, **U** and **D** are the four cardinal directions. (Yes, diagonal works as well, in games that require it.) We recommend soldering some of the male header that comes with the bonnet and then using Female-Female wires to plug directly into the joystick

Or you can solder the wires directly from the joystick
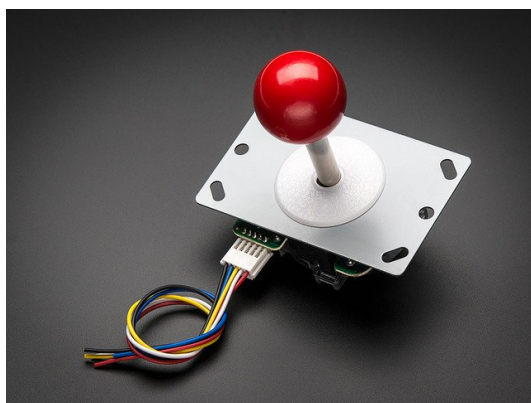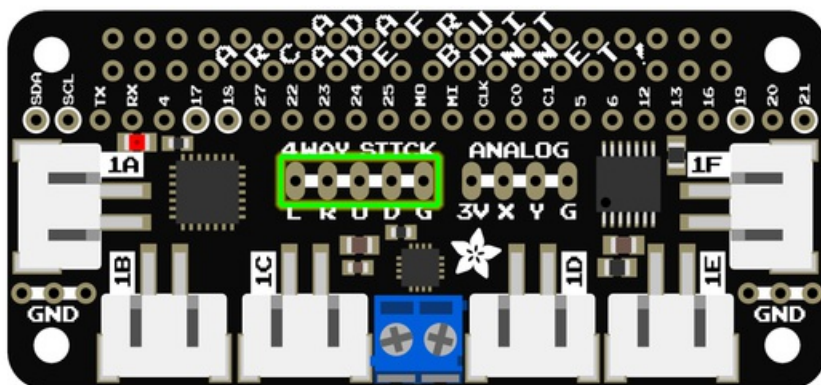
Small Arcade Joystick

$14.95
IN STOCK

ADD TO CART

Premium Female/Female Jumper Wires - 20 x 12" (300mm)

$3.95
IN STOCK

ADD TO CART

Analog-style Joystick

Some lower-profile joysticks are available only in analog versions. These can be connected to the **ANALOG** header. **3V** and **G** are 3.3 Volts and ground from the Pi, respectively, while **X** and **Y** are the stick's analog outputs for the two

axes.

The analog joystick input is processed and handled as a 4-way stick. Most vintage games operate with a 4-way stick; *there is no option here for a "true" analog input.*

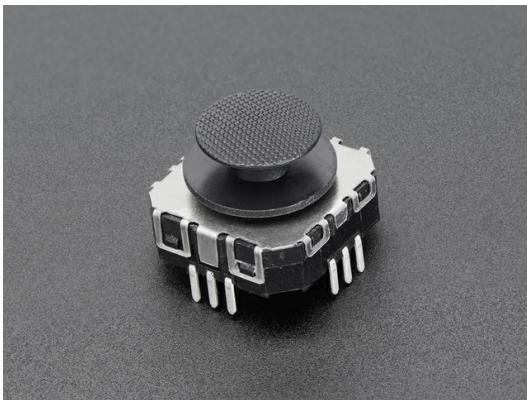**Note that we convert the analog voltage into digital switches without an analog-to-digital converter so we can detect when the joystick is moved around but we do not measure how 'hard' it is being pushed in a direction!**
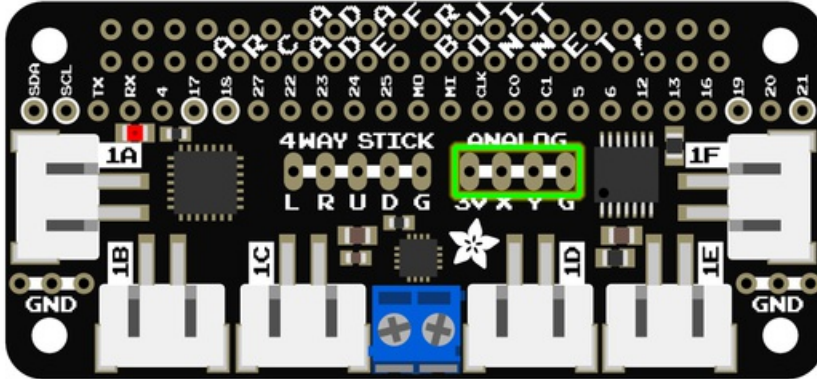
Analog 2-axis Thumb Joystick with Select Button + Breakout Board

$5.95
OUT OF STOCK

OUT OF STOCK

Mini 2-Axis Analog Thumbstick

$2.50
IN STOCK

ADD TO CART

Mini Analog Joystick - 10K Potentiometers

$19.95
IN STOCK

ADD TO CART

Speaker

The Arcade Bonnet's mono class D amplifier can handle a single **4 or 8 Ohm speaker**, up to **3 Watts**. The amplifier's "I2S" interface provides extremely clear sound…better than you'll get from the Raspberry Pi's headphone jack.

Most early arcade games had monaural sound. For anything with stereo, the two channels will be mixed to a single channel for the amplifier.
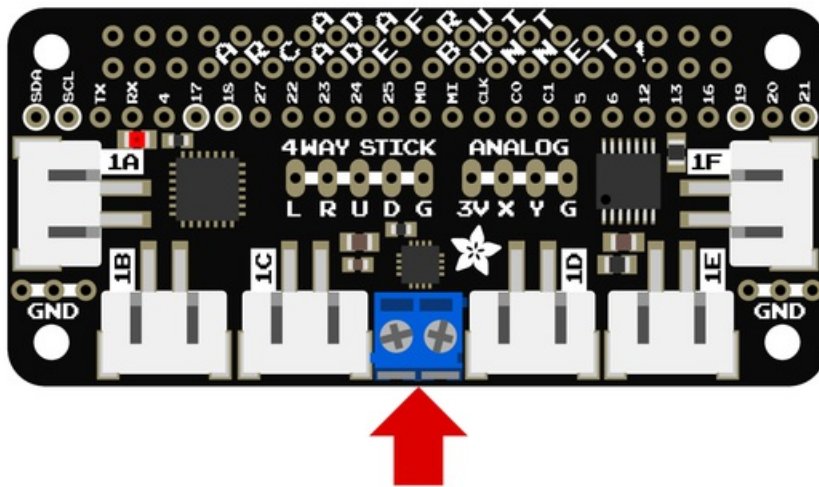
Speaker - 3" Diameter - 4 Ohm 3 Watt

$1.95
IN STOCK

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Mono Enclosed Speaker - 3W 4 Ohm

$3.95
IN STOCK

ADD TO CART

Other Connections

If you have a need to interface other hardware, most of the Pi's GPIO pins are broken out to this header. There are also some spare ground points near the corners.

Be mindful of the pins marked with a circle — SDA, SCL, 17, 18, 19 and 21. These are used by the chips on the Arcade Bonnet. Some — like SDA and SCL, used for I2C communication — can usually be shared by multiple devices. The others should be avoided unless you very specifically know what you're after.
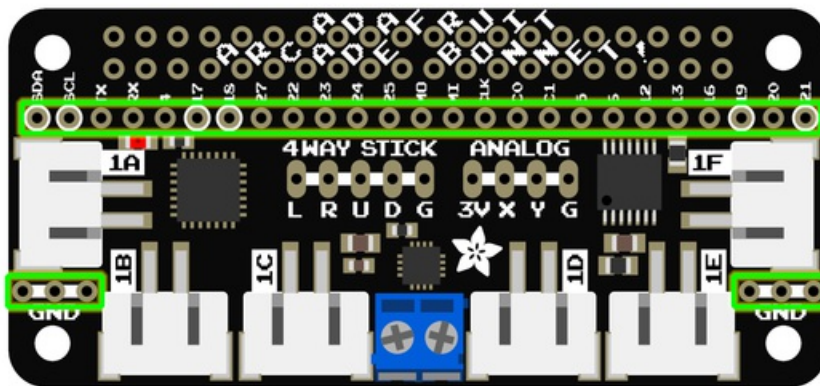
Software

Software installation for the Arcade Bonnet requires an internet connection. That's a frequent topic already covered in other Pi getting-started guides, so we'll assume here that your Pi is already booted and networked, running Raspbian or a gaming-ready OS like RetroPie.

You may find this easiest if **ssh** is enabled on the Pi, and then log in with a terminal app. This lets you**copy-and-paste** the commands that follow, as they're very exact about spelling.

Support for the buttons and the audio amplifier are installed separately. If you don't need the bonnet's speaker support, you can just skip that step and use the regular headphone jack or HDMI audio in that case.

Buttons and Joysticks

Enter the following two lines to install support for the six button connectors and the 4WAY and ANALOG joystick connectors:

```
curl https://raw.githubusercontent.com/adafruit/Raspberry-Pi-Installer-Scripts/master/arcade-bonnet.sh >a
sudo bash arcade-bonnet.sh
```

When run, this script will offer a couple of options:

- **Disable overscan?** If you answer "Y" this removes the black border around the screen (common on HDMI monitors). Takes effect on next boot.
- **Install gpio-halt utility?** Linux-based systems like the Raspberry Pi don't like it when you just switch off power… there's a specific shutdown process, else the SD card may get corrupted. The gpio-halt tool lets you add one more button between ground and any unused GPIO pin (*not* one of the six button sockets) to initiate an orderly shutdown. Gaming OSes like RetroPie already include a shutdown command among their menu options, so you may not need this.

When the script finishes you'll be asked whether to reboot. Answer "N" if you plan on installing audio support, and follow the next section ("Audio Amplifier," below).

If you need to change the key assignments: edit the file **/boot/arcadeBonnet.py** say with `sudo nano /boot/arcadeBonnet.py`

Near the top of the code you'll see this table:

```
key = [ # EDIT KEYCODES IN THIS TABLE TO YOUR PREFERENCES:
        # See /usr/include/linux/input.h for keycode names
        # Keyboard          Bonnet          EmulationStation
        e.KEY_LEFTCTRL, # 1A               'A' button
        e.KEY_LEFTALT,  # 1B               'B' button
        e.KEY_Z,        # 1C               'X' button
        e.KEY_X,        # 1D               'Y' button
        e.KEY_SPACE,    # 1E               'Select' button
        e.KEY_ENTER,    # 1F               'Start' button
        0,              # Bit 6 NOT CONNECTED on Bonnet
        0,              # Bit 7 NOT CONNECTED on Bonnet
        e.KEY_DOWN,     # 4-way down    D-pad down
        e.KEY_UP,       # 4-way up      D-pad up
        e.KEY_RIGHT,    # 4-way right   D-pad right
        e.KEY_LEFT,     # 4-way left    D-pad left
        e.KEY_L,        # Analog right
        e.KEY_H,        # Analog left
        e.KEY_J,        # Analog down
        e.KEY_K         # Analog up
]
```

'#' lines are human comments and do nothing for the code. The first six actual elements in the table correspond to the six button inputs (labeled "1A" through "1F" on the Bonnet). Then two "0" values (these do nothing, but need to be there, don't delete them) and another 8 elements corresponding to the 4-way and analog joystick/d-pad inputs.

Audio Amplifier

If you'd rather use the heaphone jack or HDMI audio output, this step can be skipped. Otherwise, to enable Arcade Bonnet speaker output, it's one line:

```
curl -sS https://raw.githubusercontent.com/adafruit/Raspberry-Pi-Installer-Scripts/master/i2samp.sh | bas
```

There are no install options; it simply does its one thing. Confirm installation when prompted and reboot when done. Then **re-run** the script again after rebooting to test the speaker output. After the speaker test **reboot once more** to activate the speaker volume control

Audio will then be channeled through the Arcade Bonnet amp.

If you're curious about what the script is doing behind the scenes, this guide lays out in detail each step performed (https://adafru.it/uvD).

Advanced Usage - Other Inputs

Additional button inputs are possible using the GPIO pin header and our *retrogame* utility.

This guide shows how to install and configure retrogame. (https://adafru.it/sct)

This **requires** configuring retrogame to **only read the extra GPIO inputs!** The six main buttons and joystick are already handled by the previously-installed Arcade Bonnet software; retrogame is a separate thing and they'll interfere if accessing the same pins.

Try to use the 6 button inputs on the Bonnet. Much easier. retrogame is guru-level stuff.

Downloads

Files

- EagleCAD PCB Files on GitHub (https://adafru.it/uyF)
- Arcade Bonnet GPIO & I2S Amplifier install scripts (https://adafru.it/uza)

Schematic & Fabrication Print