

How to Set up Parallax 2 Axis Joystick with BeagleBone Green

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The parallax 2 axis joystick consists of two separate potentiometers, one for each axis. It is a 5V component, so you must be very careful when connecting it to the ADC pins of the beaglebone which can handle a maximum of 1.8V. A voltage divider is required so that the input to the ADC pins does not exceed 1.8V. This can easily be achieved with a simple calculation and a series of resistors. Once the voltage divider is set up, two adc pins on the beaglebone can be selected to receive the output.

Parts Needed:

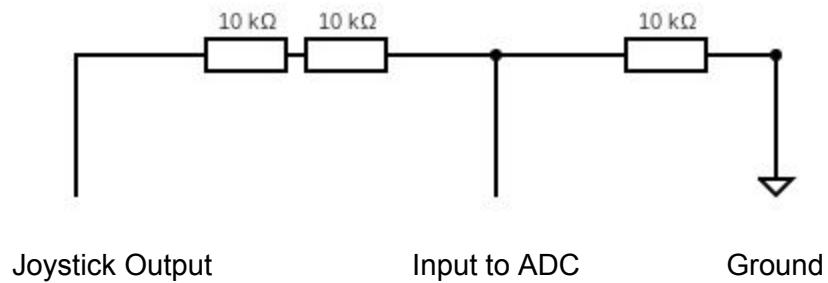
- Parallax 2-axis joystick <https://www.parallax.com/product/27800>
- 6 10k Ohm resistors
- 9 female to male jumper wires
- 2 male to male jumper wires
- breadboard

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Voltage Divider:

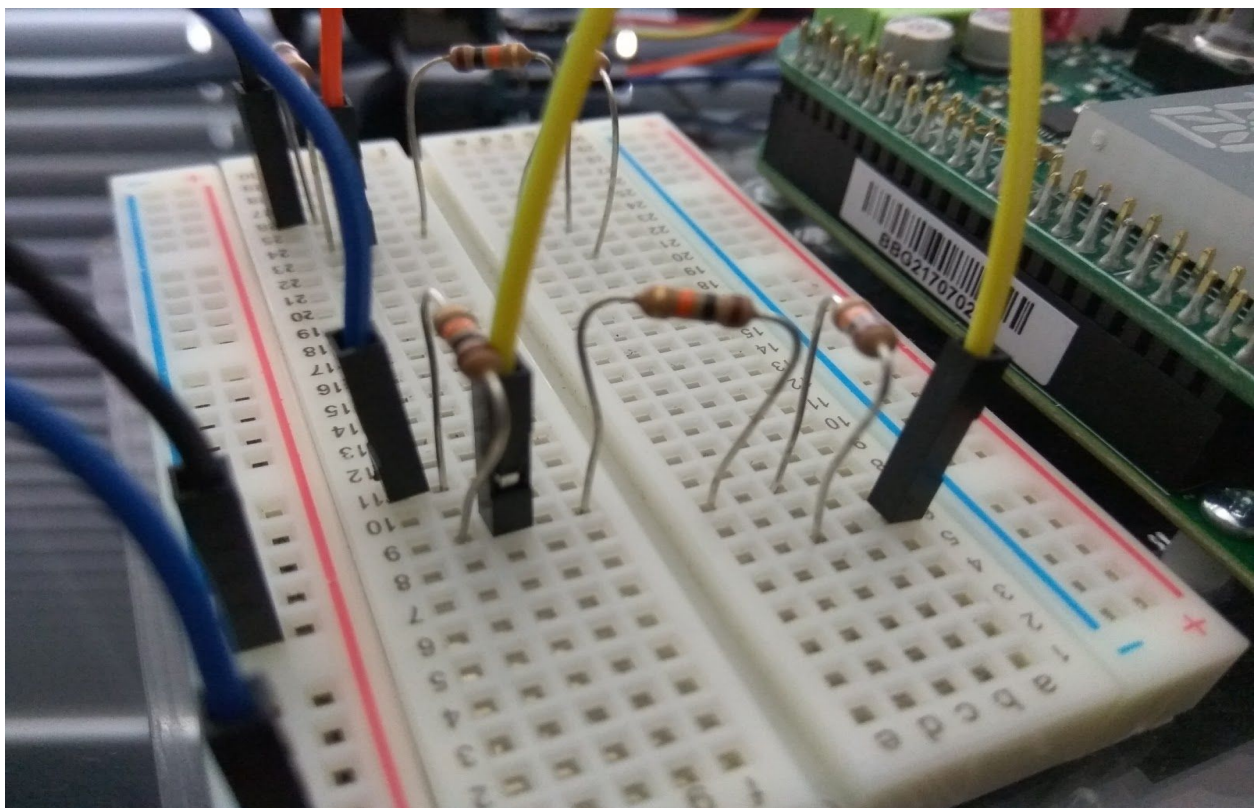
From the formula $V_{out} = V_{in} \times (R_2 / R_1 + R_2)$ the desired maximum output voltage from the joystick can be determined



$R_1 = 20k \text{ Ohm}$, $R_2 = 10k \text{ Ohm}$

$V_{out} = 5V \times (10k / 10k+20k) = 1.66V$

You will need to set up two of these, one for each axis of the joystick.



ADC Input Selection:

7 analog inputs (1.8V)

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3V3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	GPIO_66	7	8	GPIO_67
PWR_BTN	9	10	SYS_RESETN	GPIO_69	9	10	GPIO_68
GPIO_30	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
GPIO_31	13	14	GPIO_50	GPIO_23	13	14	GPIO_26
GPIO_48	15	16	GPIO_51	GPIO_47	15	16	GPIO_46
GPIO_5	17	18	GPIO_4	GPIO_27	17	18	GPIO_65
I2C2_SCL	19	20	I2C2_SDA	GPIO_22	19	20	GPIO_63
GPIO_3	21	22	GPIO_2	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	GPIO_15	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	GPIO_14	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	GPIO_113	GPIO_86	27	28	GPIO_88
GPIO_111	29	30	GPIO_112	GPIO_87	29	30	GPIO_89
GPIO_110	31	32	VDD_ADC	GPIO_10	31	32	GPIO_11
AIN4	33	34	GNDA_ADC	GPIO_9	33	34	GPIO_81
AIN6	35	36	AIN5	GPIO_8	35	36	GPIO_80
AIN2	37	38	AIN3	GPIO_78	37	38	GPIO_79
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	GPIO_7	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	GPIO_70	45	46	GPIO_71

From: <http://beagleboard.org/support/bone101>

In order to enable ADC on the beaglebone green, follow the steps in the A2D Guide:

<https://www.cs.sfu.ca/CourseCentral/433/bfraser/other/A2DGuide.pdf>

AIN0 has been set up for use in the potentiometer of the Zen cape. This leaves AIN1, AIN2, AIN3, AIN4, AIN5 and AIN6 as possible inputs for the joystick. Choose any two of these.

In the following images AIN2 and AIN3 were used.

Wiring:

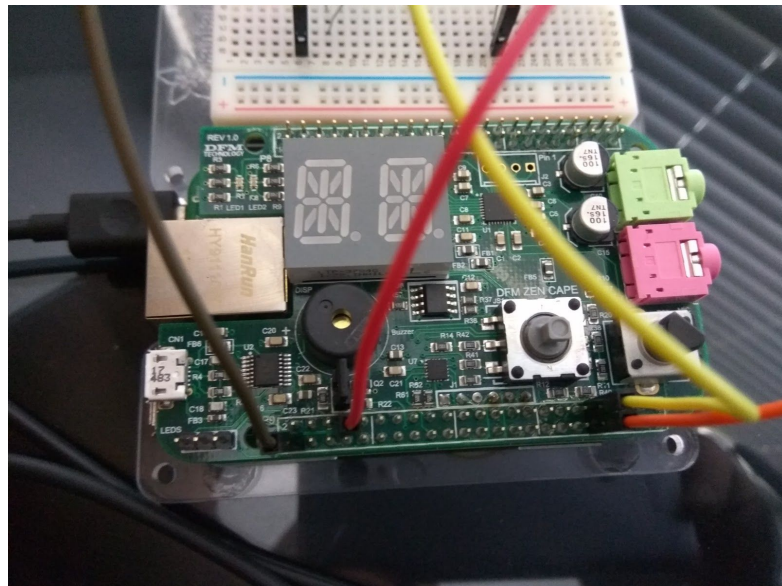
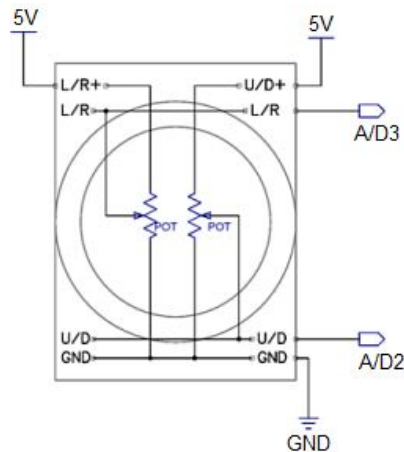


Image from:

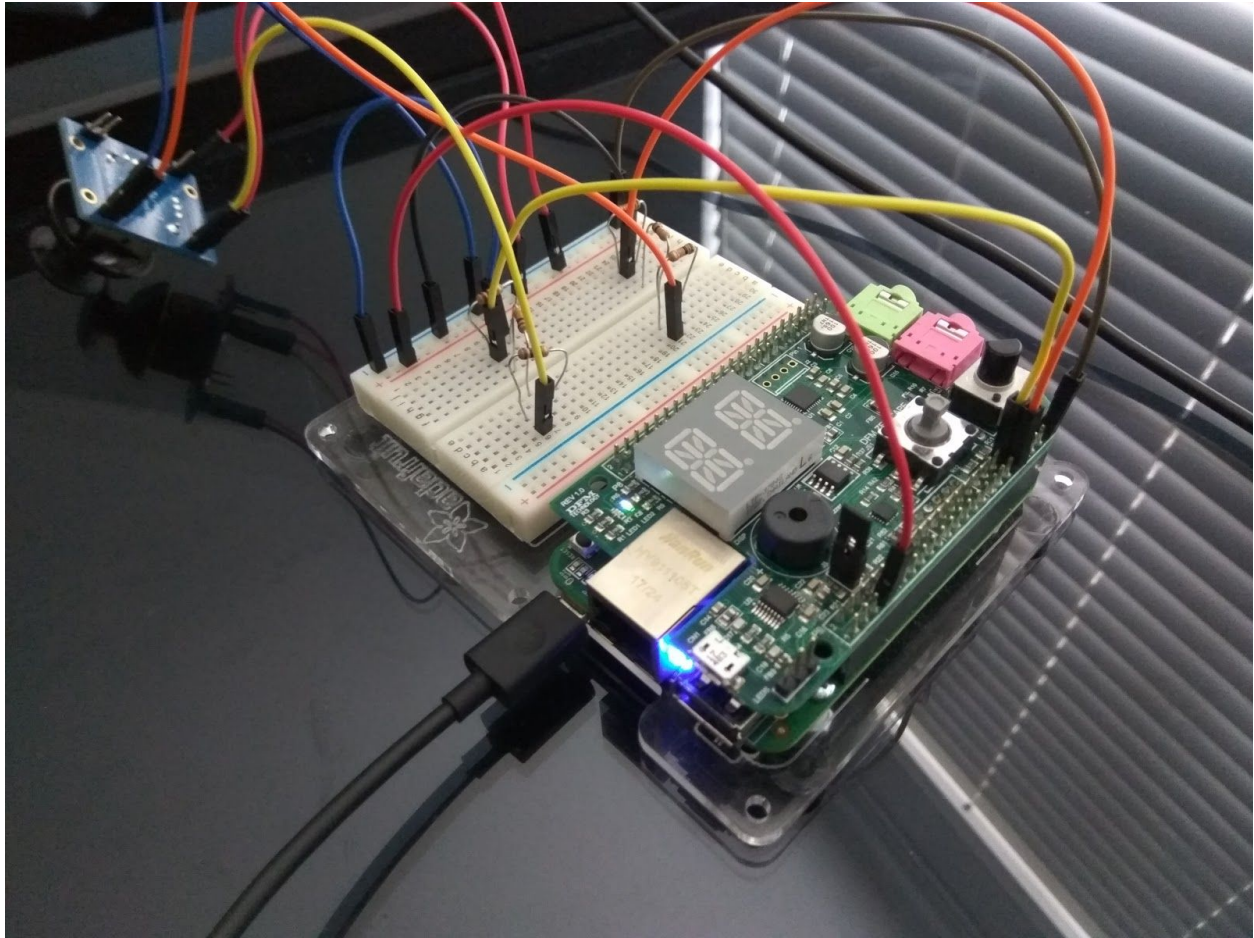
<https://learn.parallax.com/support/reference/propeller-blocklyprop-block-reference/sensor/2-axis-joystick/joystick-wiring>

BeagleBone: Brown=DGND, Red=SYS_5V, Yellow=AIN3, Orange=AIN2

Make sure that your beaglebone is powered down before attempting this.

- Connect SYS_5V, which will be pin 7 or 8 on the P9 header, to a red breadboard rail.
- Connect the L/R+ and U/D+ of the joystick to the red breadboard rail.
- One ground connection is required, choose any DGND pin and connect it to a blue breadboard rail.
- Connect the ends of each voltage divider to the ground rail with the male to male jumper wires.
- Each Output (A/D2 and A/D3) will have to be connected to its own voltage divider. The output of each voltage divider will be connected to the one of the two ADC pins selected above.
- Connect the GND of the joystick to the blue breadboard rail.

End Result:



Reading the Joystick Input:

Once everything is wired correctly (be very careful) you can check the input on each of the ADC pins that you selected previously (in the following examples AIN2 and AIN3). ADC cape must be loaded (see A2D guide).

To get the input on AIN2:

```
# cat /sys/bus/iio/devices/iio:device0/in_voltage2_raw
```

To get the input on AIN3:

```
# cat /sys/bus/iio/devices/iio:device0/in_voltage3_raw
```

When the joystick is centered the value will be close to the midpoint, as the the joystick is moved to one end or the other the value will increase toward the maximum or decrease toward zero. The expected values will be close to those output below but there will be fluctuations.

Joystick Centered

```
root@beaglebone:~# cat /sys/bus/iio/devices/iio:device0/in_voltage2_raw
1742
root@beaglebone:~# cat /sys/bus/iio/devices/iio:device0/in_voltage3_raw
1754
```

Joystick Down / Up

```
root@beaglebone:~# cat /sys/bus/iio/devices/iio:device0/in_voltage2_raw
22
root@beaglebone:~# cat /sys/bus/iio/devices/iio:device0/in_voltage2_raw
3779
```

Joystick Right / Left

```
root@beaglebone:~# cat /sys/bus/iio/devices/iio:device0/in_voltage3_raw
3802
root@beaglebone:~# cat /sys/bus/iio/devices/iio:device0/in_voltage3_raw
14
```

Troubleshooting:

- If when you check the value of your selected ADC pins and it is 0 or 1 and the wiring is correct, then you might have connected the power to VDD_5V. Shutdown the beaglebone and connect the red breadboard rail to SYS_5V.
- If when you try to check the value of a pin and you get an error saying file not found, then the ADC cape is probably not enabled. Follow the steps in the A2D guide to enable the cape.