USB Joystick Replica of the G2 B8 Style Grip

Instruction Manual

Version: 1.0
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Date: October 7, 2025

References

- Link to the GitHub repository:
  https://github.com/D0c78/G2-B8-USB-joystick-replica

- Link to the Fusion 360 project:
  https://a360.co/4mPd7CI

- The original design for the gimbal architecture:

Creator	olukelo
Thingiverse link	https://www.thingiverse.com/thing:2496028
Licence	CC BY-NC-SA 4.0
Alterations	Lever arm top interface adapted. Magnet socket adapted. Sensor brackets added. Triangular orientation mark added. Tolerances adapted for printing. Chamfers and fillets added for printing.

Contents

Chapter 1

Before starting

1.1 Hardware, Tools, and Materials

1.1.1 Tools and Consumables

Table 1.1.1: Tools and consumables used in the build.

Item	Info
Press (or vice)	Used to seat bearings
3D printer	Build plate: $20 \times 20 \times 25\,cm$
Allen key	$4\,mm$
Wrench	$8\,mm$
Screwdrivers	Flat head $5\,mm$; Phillips (very small)
Wire cutters	For removing print supports
Soldering iron	–
Sand paper	240 grit
Super glue	~ 2 drops, possibly needed to secure magnets
Electrical tape	2 disks, used to isolate magnets from sensors
PLA filament	$\geq 396\,g$ (recommended $500\,g$ for failures/tests)
Heat shrink tubing	For isolating/making junctions
Arduino wire	Enough for connections

1.1.2 Hardware Components

Table 1.1.2: List of hardware components.

Item	Q.ty	Info
Hexagon nut DIN 934 M5	19	Ref. 45080.050.001(High)
Cylinder screw DIN 7984 M5x25	4	Ref. 07090.050.025(High)
Cylinder screw DIN 7984 M5x30	2	Ref. 07090.050.030(High)
Cylinder screw DIN 7984 M5x35	4	Ref. 07090.050.035(High)
Cylinder head screw DIN 912 M5x25	4	Ref. 07065.050.025(High)
Cylinder head screw DIN 912 M5x40	4	Ref. 07065.050.040(High)
Cylinder head screw DIN 912 M5x45	1	Ref. 07170.050.045(High)
Tapping screw DIN 7971 F 2.9x6.5	9	Ref. 26100.029.006(High)
Round head plastic tapping screw	4	$d_1 = 2.2\,mm$, $l = 5\,mm$, $D = 3.6\,mm$
Countersunk head tapping screw	4	$d_1 = 1.8\,mm$, $l = 4.35\,mm$, $D = 3.5\,mm$
Ball bearing (axis)	4	Ref. B6802ZZ_1
Ball bearing (cams)	12	Ref. MR105-2RS
Extension spring	2	$l_0 = 25\,mm$, $\varnothing = 6\,mm$, $\varnothing_{wire} = 0.7\,mm$
Compression spring	2	$\varnothing = 5\,mm$, $h = 15\,mm$, $\varnothing_{wire} = 0.3\,mm$
AS5600 board and magnet	2	Magnetic field lines orthogonal to cylinder axis
Arduino Pro Micro	1	–
Micro switch with roller	2	Ref. SPDT 12X6X6MM
4-way switch	1	Ref. RKJXT1F42001
Push button with click	3	Ref. PS-102
Pivot rod	1	$\varnothing = 3\,mm$, $l = 38\,mm$

Chapter 2

Overview

2.1 Gimbal assembly

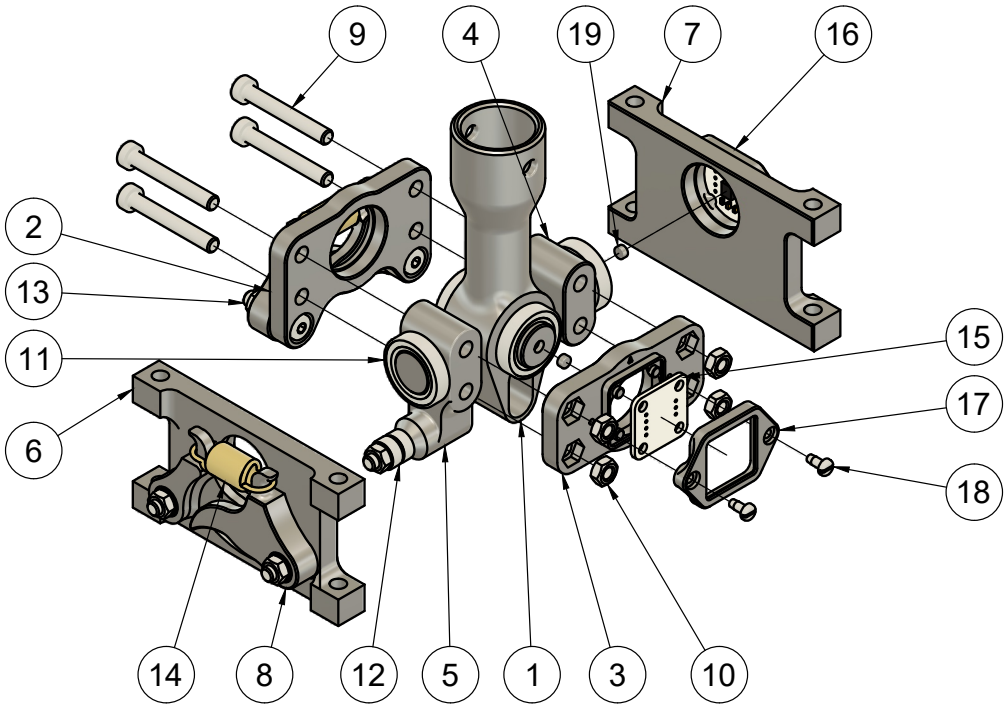

Figure 2.1.1: Gimbal assembly exploded view.

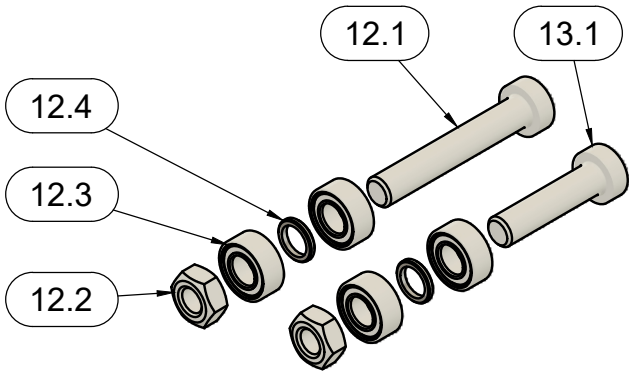

Figure 2.1.2: Rod and shaft assemblies exploded view.

Part ID	Q.ty	Part name
1	1	Gimbal_lever_arm
2	1	Gimbal_core_bearing_carrier_non_pot_side
3	1	Gimbal_core_bearing_carrier_pot_side
4	1	Gimbal_core_pot_side
5	1	Gimbal_core_non_pot_side
6	1	Gimbal_frame_cam_side
7	1	Gimbal_frame_pot_side
8	4	Gimbal_cam
9	4	Zylinderschraube DIN 7984 M5x35 07090.050.035(High)
10	4	Hexagon nut DIN 934 M5 45080.050.001(High)
11	4	B6802ZZ_1
12	2	Rod assembly
12.1	1	Zylinderschraube DIN 7984 M5x30 07090.050.030(High)
12.2	1	Hexagon nut DIN 934 M5 45080.050.001(High)
12.3	2	DMB-68
12.4	1	Spacer
13	4	Shaft assembly A
13.1	1	Zylinderschraube DIN 7984 M5x25 07090.050.025(High)
13.2	2	DMB-68
13.3	1	Spacer
13.4	1	Hexagon nut DIN 934 M5 45080.050.001(High)
14	2	HPC - ET4208 (30.1)
15	2	AS5600 board
16	1	Sensor_brachet_frame
17	1	Sensor_brachet_bearing_carrier
18	4	Tapping screw DIN 7971 F 2.9x6.5 26100.029.006(High)
19	2	Magnet

Table 2.1.1: Gimbal assembly parts list, IDs referring to Figure 2.1.1 and 2.1.2.

2.2 Grip assembly

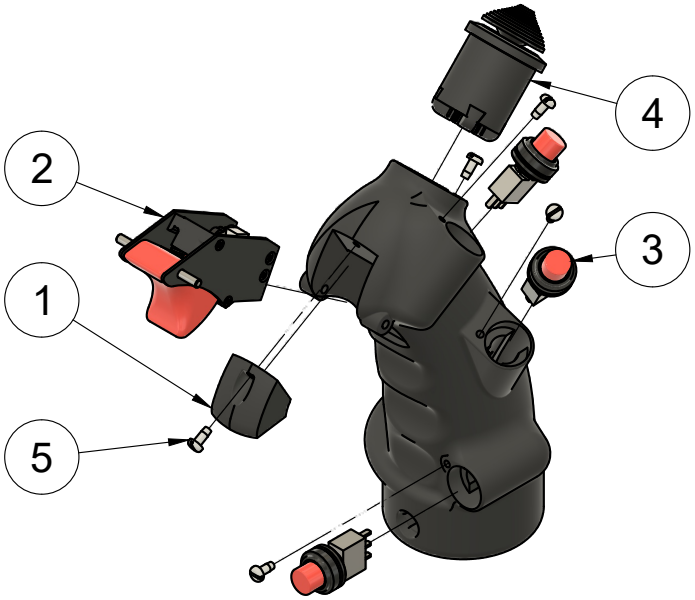

Figure 2.2.1: Grip assembly exploded view.

Part ID	Q.ty	Part name
1	1	Trigger cap
2	1	Trigger assembly
3	3	Push button
4	1	Hat switch assembly
5	5	Self tapping screw

Table 2.2.1: Grip assembly parts list. IDs referring to Figure 2.2.1.

2.2.1 Trigger assembly

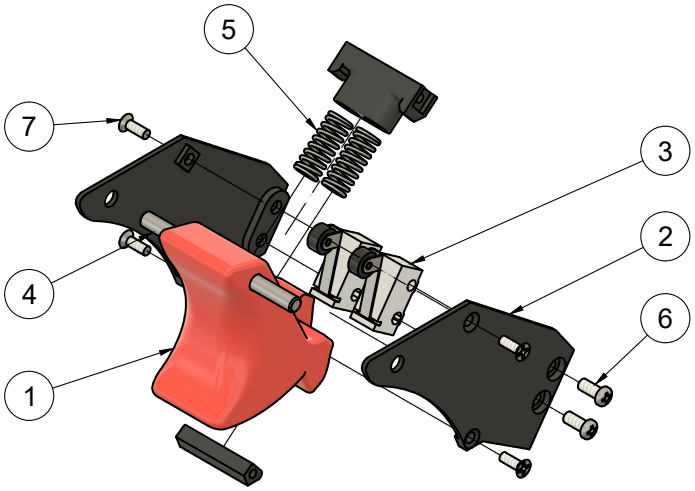

Figure 2.2.2: Trigger assembly exploded view.

Part ID	Q.ty	Part name
1	1	Button
2	1	Case
3	2	Micro switch
4	1	Pivot Rod
5	2	Spring
6	4	Round Head Screw
7	4	Countersunk Head Screw

Table 2.2.2: Trigger assembly parts list, IDs referring to Figure 2.2.2.

2.2.2 Push button assembly

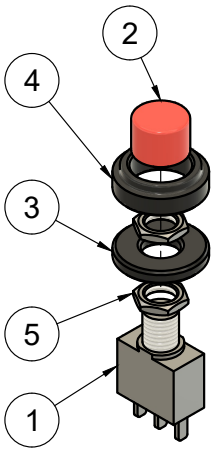

Figure 2.2.3: Push button assembly exploded view.

Part ID	Q.ty	Part name
1	1	Body
2	1	Button
3	2	Anchor plate
4	1	Top cover
5	2	Nut

Table 2.2.3: Push button assembly parts list, IDs referring to Figure 2.2.3.

2.2.3 Toggle switch assembly

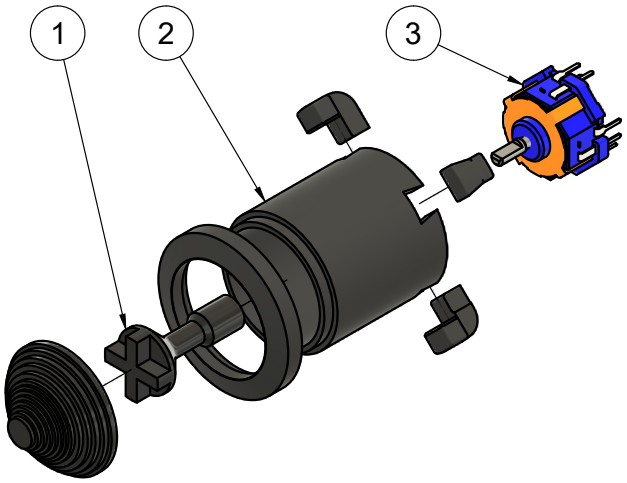

Figure 2.2.4: Toggle switch assembly exploded view.

Part ID	Q.ty	Part name
1	1	4-ways switch
3	1	Toggle
4	1	Case

Table 2.2.4: Push button assembly parts list, IDs referring to Figure 2.2.4.

2.3 Final Assembly

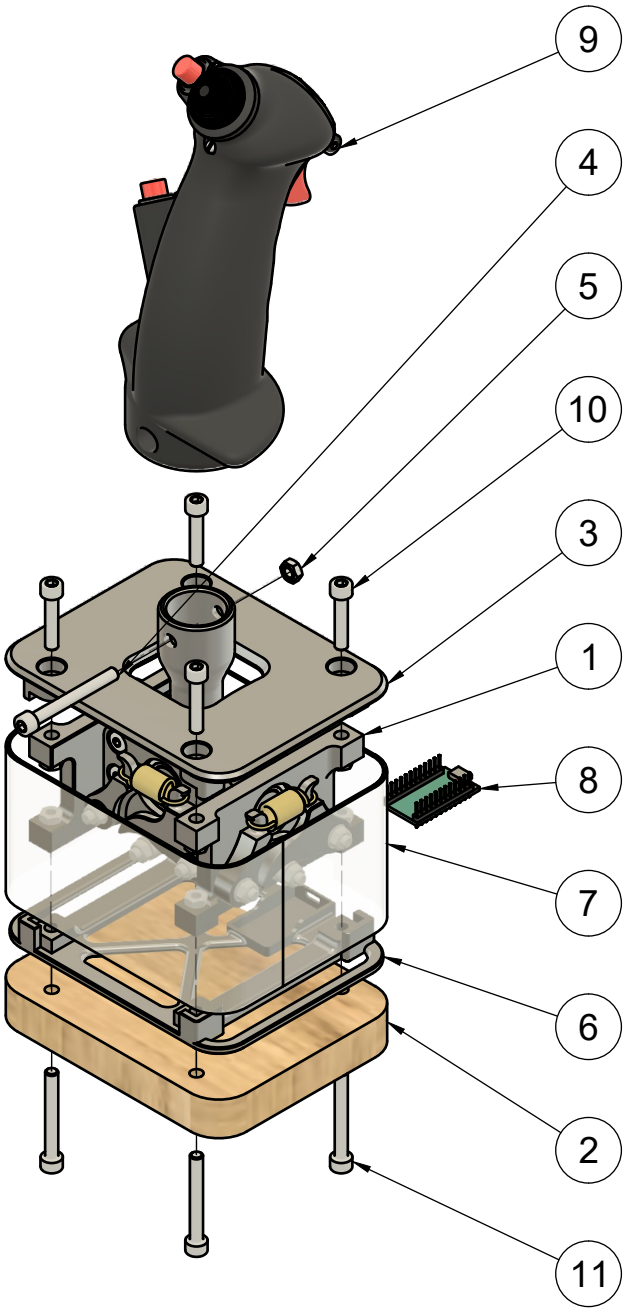

Figure 2.3.1: Final assembly exploded view.

Part ID	Q.ty	Part name
1	1	Gimbal assembly
2	1	Wood base
3	1	Top covering
4	1	Cylinder head screw DIN 912 M5x45 07170.050.045(High)
5	1	Hexagon nut DIN 934 M5 45080.050.001(High)
6	1	Floor
7	1	Side wall
8	1	Arduino Pro Micro
9	1	Body_final_fake attachments
10	4	Top Bolt
11	4	Bottom Bolt

Table 2.3.1: Push button assembly parts list, IDs referring to Figure 2.3.1.

2.4 Complete list of parts

Part ID	Q.ty	Part name	Part ID	Q.ty	Part name
1	1	Gimbal assembly	9.1.2	1	Just body
1.1	1	Gimbal_lever_arm	9.2	1	Trigger Fitted (v23) v14
1.2	1	Gimbal_core_bearing_carrier_non_pot_side	9.2.1	1	Button
1.3	1	Gimbal_core_bearing_carrier_pot_side	9.2.2	1	Case
1.4	1	Gimbal_core_pot_side	9.2.2.1	1	Side left
1.5	1	Gimbal_core_non_pot_side	9.2.2.2	1	End bar
1.6	1	Gimbal_frame_cam_side	9.2.2.3	1	Side right
1.7	1	Gimbal_frame_pot_side	9.2.2.4	1	Springs holder
1.8	4	Gimbal_cam	9.2.3	2	Micro switch
1.9	4	Zylinderschraube DIN 7984 M5x35 07090.050.035(High)	9.2.3.1	1	Body
1.10	4	Hexagon nut DIN 934 M5 45080.050.001(High)	9.2.3.2	1	Lever
1.11	4	B6802ZZ_1	9.2.3.3	1	Bearing
1.11.1	1	BearingB6802ZZ	9.2.4	1	Pivot Rod
1.12	2	Rod assembly	9.2.5	2	Spring
1.12.1	1	Zylinderschraube DIN 7984 M5x30 07090.050.030(High)	9.2.6	4	Round Head Screw
1.12.2	1	Hexagon nut DIN 934 M5 45080.050.001(High)	9.2.7	4	Countersunk Head Screw
1.12.3	2	DMB-68	9.3	3	Fake pushbutton 2 v14
1.12.4	1	Spacer	9.3.1	1	Body (1)
1.13	4	Shaft assembly A	9.3.2	1	Button (1)
1.13.1	1	Zylinderschraube DIN 7984 M5x25 07090.050.025(High)	9.3.3	1	Anchor plate
1.13.2	2	DMB-68	9.3.4	1	Top cover
1.13.3	1	Spacer	9.3.5	2	Nut
1.13.4	1	Hexagon nut DIN 934 M5 45080.050.001(High)	9.4	1	Fake toggle switch v32
1.14	2	HPC - ET4208 (30.1)	9.4.1	1	Toggle
1.15	2	AS5600 board	9.4.1.1	1	Hat
1.16	1	Sensor_brachet_frame	9.4.1.2	1	Stem
1.17	1	Sensor_brachet_bearing_carrier	9.4.2	1	Case (1)
1.18	4	Tapping screw DIN 7971 F 2.9x6.5 26100.029.006(High)	9.4.2.1	1	Drum
1.19	2	Magnet	9.4.2.2	1	Ring
2	1	Wood base	9.4.2.3	1	Latch
3	1	Top covering	9.4.2.4	1	Latch (1)
4	1	Cylinder head screw DIN 912 M5x45 07170.050.045(High)	9.4.2.5	1	Latch (2)
5	1	Hexagon nut DIN 934 M5 45080.050.001(High)	9.4.2.6	1	Latch-dent
6	1	Floor	9.4.3	1	4-ways switch
7	1	Side wall	9.4.3.1	1	Rod
8	1	Arduino Pro Micro	9.4.3.2	1	Body (2)
8.1	1	PCB	9.5	5	Tapping screw DIN 7971 F 2.9x6.5 26100.029.006(High)
8.2	1	Usb port	10	4	Top Bolt
8.3	2	I/O	10.1	1	Cylinder head screw DIN 912 M5x25 07065.050.025(High)
8.3.1	1	Pin track	10.2	1	Hexagon nut DIN 934 M5 45080.050.001(High)
8.3.2	1	Pin	11	4	Bottom Bolt
9	1	Body_final_fake attachments	11.1	1	Hexagon nut DIN 934 M5 45080.050.001(High)
9.1	1	Just body_v3 v8	11.2	1	Cylinder head screw DIN 912 M5x40 07065.050.040(High)
9.1.1	1	Cap			

Table 2.4.1: Complete parts list.

Chapter 3

3D printing

Before starting the build it is first needed to print the parts detailed in Table 3.0.1. The STL files for each part should be available in the *3D_printing* folder that can be found in the GitHub repository. There there should also be found the `.GCODE` files so that one could directly load these on a 3D printer to print one set of parts needed for one joystick [1]. It is strongly recommended to use the part orientation used in the example `.GCODE` files.

Table 3.0.1: List of 3D printed parts needed for one complete assembly.

Part ID	Q.ty	Part name
Gimbal assembly		
1.1	1	Gimbal_lever_arm
1.2	1	Gimbal_core_bearing_carrier_non_pot_side
1.3	1	Gimbal_core_bearing_carrier_pot_side
1.4	1	Gimbal_core_pot_side
1.5	1	Gimbal_core_non_pot_side
1.6	1	Gimbal_frame_cam_side
1.7	1	Gimbal_frame_pot_side
1.8	4	Gimbal_cam
1.12.4	6	Spacer
1.16	1	Sensor_brachet_frame
1.17	1	Sensor_brachet_bearing_carrier
Cover		
3	1	Top covering
6	1	Floor
7	1	Side wall
Body_final_fake attachments		
9.1	1	Just body_v3 v8
9.1.1	1	Cap
9.1.2	1	Just body
Trigger		
9.2.1	1	Button
9.2.2	1	Case
9.2.2.1	1	Side left
9.2.2.2	1	End bar
9.2.2.3	1	Side right
9.2.2.4	1	Springs holder
Pushbuttons		
9.3.3	3	Anchor plate
9.3.4	3	Top cover
Toggle switch		
9.4.1	1	Toggle
9.4.1.1	1	Hat
9.4.1.2	1	Stem
9.4.2.1	1	Drum
9.4.2.2	1	Ring
9.4.2.3	3	Latch
9.4.2.6	1	Latch-dent

After printing, each part shall be properly cleaned, thus freed of any support material and artifacts deriving from the support structures or any other printing action (e.g. stringing when the nozzle moves without extruding to change location within a XY plane; or material build-up when the layer is changed).

[1] This files where made to work for a Creality Ender 3 v2 with PLA filament. Nozzle and build bed temperature where set at $200\,^{\circ}C$ and $50\,^{\circ}C$ respectively. The naming convention refers to the estimated print time and mass (x *hours and* y *minutes extruding* z *grams in total* as $x\mathrm{h}y\mathrm{'}z\mathrm{g}$

Chapter 4

Assembly

4.1 Gimbal

Preparation

- AS5600 Hall-effect sensor boards
  1. Remove the **R4** surface mounted resistor from the board. This allows to use the sensor in analogue output mode without having to pull-up the GPO pin by linking it to the VCC pin later in the wiring part.
  2. Solder the pins onto the boards as shown in Figure 4.1.1; the long portion of the pins shall be opposite of the sensor itself (black surface mounted component of the board).
  3. In order to make the boards snug into their housing, sand down the borders of the boards to get rid of any residual material from manufacture.
- Arduino Pro Micro
  1. Solder the pins on the board leaving the longer portion facing the USB port (refer to Figure 2.3.1 or to the assembly on-line listed under References).

Figure 4.1.1: AS5600 sensor board detail.

Lever arm

1. Press two bearings (1.11) all the way onto the x-axis shafts on each side of the lever arm (1.1). They shall rotate freely and stay in place while doing so.
2. Press a cylindrical magnet (1.19) into the socket that is on one of the end face the x-axis shaft on the lever arm (1.1). If the magnet is loose, it is advised to secure it in the socket with a drop of super-glue.
3. Place a circular peace of electrical tape on top of the face holding the magnet in. This should prevent the magnet from creating short circuits.
4. Mount a road assembly (1.12) at the bottom of the lever arm. Feed the screw through the hole from the inside, then from the outside compose the sequence of bearing-spacer-bearing (1.12.3-1.12.4-1.12.3) and tighten the nut (1.12.2) at the end of it.

Gimbal core

1. Press a bearing (1.11) on each of the y-axis shafts on the gimbal core (1.4 and 1.5).
2. Press a cylindrical magnet (1.19) into the socket that is on one of the end face of the y-axis shaft on the gimbal core (1.4). If the magnet is loose, it is advised to secure it in the socket with a drop of super-glue.
3. Place a circular peace of electrical tape on top of the face holding the magnet in. This should prevent the magnet from creating short circuits.
4. Mount a road assembly (1.12) at the bottom of the gimbal core (1.5). Feed the screw through the hole from the inside, then from the outside compose the sequence of bearing-spacer-bearing (1.12.3-1.12.4-1.12.3) and tighten the nut (1.12.2) at the end of it.

Gimbal core bearing carrier

1. Press one bearing-spacer-bearing sequence (1.12.3-1.12.4-1.12.3) into the pivot seat of each of the two gimbal cams (1.8) to be mounted on the bearing carrier (1.2).

2. Mount the two cams in sequence onto the bearing carrier (1.2) by tightening the bolts, thus completing the shaft assemblies (1.13) in position.
3. Mount the extension spring (1.14) on top of the cams where the dents are.
4. Close the gimbal core by aligning the two bearing carrier sides (1.2 and 1.3) onto the bearings (1.11) on the lever arm (1.1), then put the gimbal core sides (1.4 and 1.5) in between the bearing carriers. Make sure the core bearing carrier on the sensor side (1.3) is the correct way in with the small marked triangle pointing up like the lever arm.
5. Fasten these components using four screws (1.9) and four nuts (1.10).
6. Mount the Hall-effect sensor board (1.15): position it on the core bearing carrier (1.3) and secure it with the appropriate mounting bracket (1.17) using two screws (1.18).

4.1.1 Gimbal frame

1. Press one bearing-spacer-bearing sequence (1.12.3-1.12.4-1.12.3) into the pivot seat of each of the two gimbal cams (1.8) to be mounted on the frame (1.6).
2. Mount the two cams in sequence onto the frame (1.6) by tightening the bolts, thus completing the shaft assemblies (1.13) in position.
3. Mount the extension spring (1.14) on top of the cams where the dents are.
4. Mount the Hall-effect sensor board (1.15): position it on the frame (1.7) and secure it with the appropriate mounting bracket (1.16) using two screws (1.18).

4.1.2 Cover

1. Align the Gimbal frame sides (1.6 and 1.7) with the y-axis bearings (1.11) and press all the way in.
2. Align the top covering (3) on top of the gimbal frame sides (1.6 and 1.7), make sure the holes are aligned.
3. Feed the screws (1.10.1) from the top and tighten the 4 bolts (1.10), one for each hole, securing the covering on the gimbal frame.
4. Align the floor (1.6) and the wooden base (1.2) with the bottom holes on the gimbal frame sides (1.6 and 1.7).
5. Feed the 4 screws (1.11.2) through the holes from the bottom and tighten the 4 bolts (1.11), one for each hole, securing the floor and base under the gimbal frame.

The side wall (1.7) is to be slid from above only after the assembly is completed.

4.1.3 Sensors set-up

This is a good time to set the axis' range on the sensors as the boards and pins are easily reachable now without the walls. Note that the magnet orientation is not critical as the sensor boards can be adjusted in $90°$ steps on its socket, this is enough to exclude the region where the raw angle returns back to $0°$ within the working envelope of the joystick ($45°$).

It is advised to test the output data of the sensor before and after the procedure. An example code to visualize the output data stream can be found in the repository folder named *test_alignment_code*.

⚠ Warning ⚠

The axis limit procedure is permanent after the third time.

Procedure (x2)

1. Connect the Arduino Pro Micro to the PC via USB and load the sketch `test_alignment_code.ico` on the Arduino board.
2. Using some Arduino wires, connect the sensor board to the Arduino Board as indicated by the scheme in Figure 4.1.2: connect the 5V to VCC, the GND to GND and the A0 to OUT.

3. Rotate the lever arm around the sensor axis and make sure the displayed data does not have discontinuities (e.g. it reaches $360°$ and goes back to $0°$ or vice versa). If so, mount the sensor board in a different orientation and test again to make sure there are no discontinuities.
4. Detach the wire end connected to A0, it will be used to ground the output later.
5. Connect the GPO pin on the sensor board to a GND pin on the Arduino board (see Figure 4.1.3).
6. Move the lever arm to the **lower** limit of the axis.
7. Briefly connect the OUT pin on the sensor board to GND on the Arduino board (hold this for $0.5\,s$ circa), then disconnect the end of the wire from the GND pin on the Arduino board.
8. Move the lever arm to the **upper** limit of the axis.
9. Briefly connect the OUT pin on the sensor board to GND on the Arduino board (hold this for $0.5\,s$ circa), then disconnect the end of the wire from the GND pin on the Arduino board.
10. Disconnect the wire that links the GPO pin on the sensor board to the GND on the Arduino board. Rewire the sensor board to the Arduino board as shown in Figure 4.1.2 and test the new axis limits.

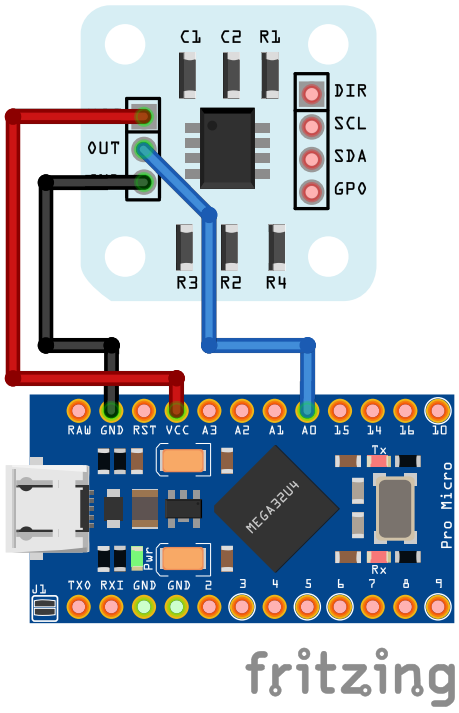

Figure 4.1.2: Wiring scheme for axis test. The Arduino board is powered via USB.

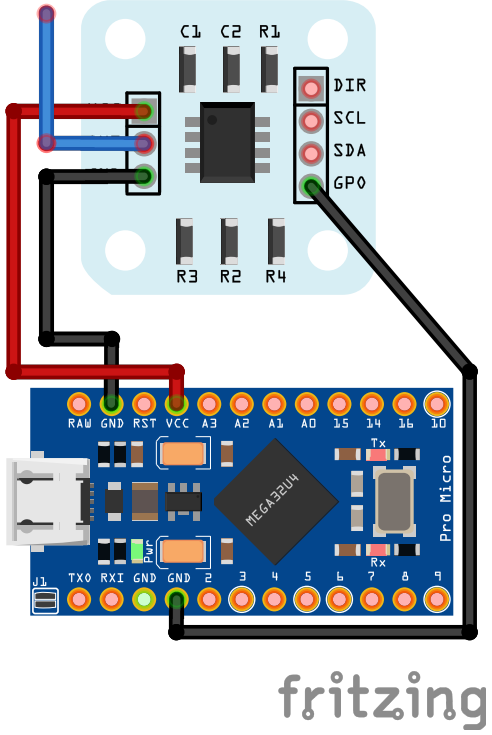

Figure 4.1.3: Wiring scheme for axis setup. The blue wire will be used to set the sensor limits. The Arduino board is powered via USB.

4.1.4 Sensors wiring

To complete this section the sensors are to be wired to the Arduino board as shown in Figure 4.1.4. In order to replicate the scheme, a junction needs to be made for the VCC line, joining the two ends that come from the boards into one. An example of this junction is given in Figure 4.1.5, where a Y shape is formed with a soldered junction enveloped in a heat shrink tube.

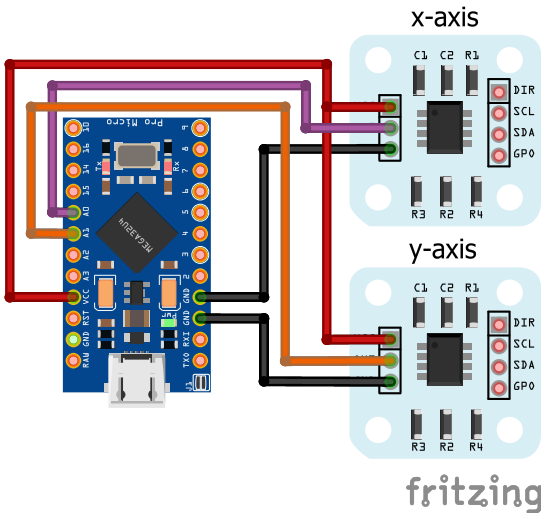

Figure 4.1.4: Wiring scheme between the sensor boards and Arduino board. Note the bifurcation on the red wire for the VCC lines.

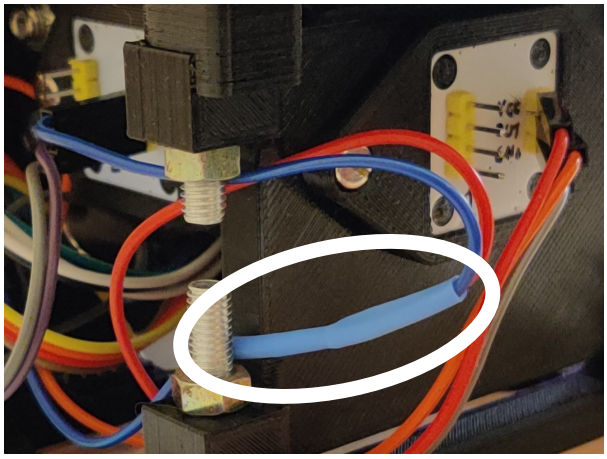

Figure 4.1.5: Close up of the junction example made for the VCC lines.

4.2 Grip

Completing the assembly of each individual grip attachment is already a great accomplishment; however, fitting them onto the grip while also wiring everything is a tedious and skilful job that needs to be undertook with patience and care.

4.2.1 Trigger

1. Screw the sides (9.2.2.1 and 9.2.2.3) onto each micro switch (9.2.3) with two round head screws each (9.2.6). Reference the orientation in Figure 2.2.2.
2. Screw in the springs holder (9.2.2.4) with two countersunk head screws (9.2.7) from the two sides. Note there is a notch on the inner part of the sides to have the holder aligned with the assembly.
3. Screw in the end bar (9.2.2.2) with two countersunk head screws (9.2.7) from the two sides. Make sure to align the bar properly as shown in Figure 2.2.2; note that the profile is asymmetrical.
4. Push the springs (9.2.5) trough the holes in the springs holder (9.2.2.4). Make sure they stick out by the same amount from the holder. If the spring force is unsatisfactory, it could be possible to position two springs in each of the two spring seats in the springs holder by positioning the coils adjacent to each other, doubling the coils.
5. *Wiring*:

   (a) Connect the two ground pins from the micro switches (9.2.3)
   (b) Wire a single ground wire (whole length of the Arduino wire) for the trigger soldering an end to one of the ground pins (that are now linked).
   (c) Wire a male ended wire (about $12\,cm$) to each of the microswitch output pins.

6. Place the trigger body in position and mount the button (9.2.1) and secure everything with the pivot rod (9.2.4).
7. Test the movement of the trigger and make adjustments if necessary.

4.2.2 Push button

1. For each push button screw the two nuts (9.3.5), one at the bottom of the thread and one above the anchor plate (9.3.3), as shown in Figure 2.2.3.

2. Push each button with the anchor plate into their respective seat on the grip body (9.1) and position the top covers (9.3.4) on top of the anchor plates. Fine tune the nuts positions to have the most external front faces of the top covers to be flush with the rest surroundings of the grip body.
3. *Wiring*:

   (a) Top button: feed two wires end that does not have the male end crimped on through the small duct from the bottom to the top. Then solder them to the push button ground and output pins. Make sure the output wire comes out of the grip's bottom opening by about $2.5\,cm$.
   (b) Middle and bottom buttons: solder a ground wire to each of the ground pins of the buttons. Solder a male ended wire to each of the output pins of the buttons. Make sure each of the output wires comes out of the grip's bottom opening by about $2.5\,cm$ by making them of different lengths.

4. Press the button caps (9.3.2) on the stems of each push button.
5. Secure each push button with a tapping screw (9.5).

4.2.3 Toggle switch

1. Push the 4-ways switch (9.4.3) into the back of the case (9.4.2). Make sure the edges are aligned flush with the rest of the body from the back and from the inside.
2. Press in the latches (9.4.2.3 to 9.4.3.6) making sure to use the latch with the cutout dent for where there is an extra pin on the back of the switch body (9.4.3). Make sure the latches are flush with the exterior of the case.
3. Press the ring (9.4.2.2) onto the front of the drum (9.4.2.1).
4. Press the hat (9.4.1.1) on the stem (9.4.1.2).
5. Press the assembled toggle (9.4.1) on the rod (9.4.3.1) of the 4-ways switch. Note the orientation of the flat part of the rod and the stem end.
6. *Wiring*:

   (a) Solder a ground wire to the GND pin.
   (b) Solder a male ended wire to each of the A, B, C and D pins. The pins opposite to the rounded aligning notch on the case's drum need to be $1\,cm$ longer than the other ones.
   (c) Route the wires on the back of the switch to make room for the trigger.
   (d) Feed the wires down the grip's cavity avoiding interferences with the trigger mechanism. Eventually slide the toggle switch in its socket. Mind the orientation.

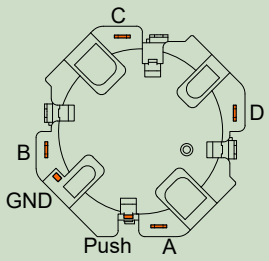

Figure 4.2.1: Scheme of the 4-ways switch output pins. Bottom view.

7. Secure the toggle switch with a screw (9.5).

4.2.4 Final wiring

1. Place the Arduino board in its seat on the floor part (6).
2. Join the ground wires into one single male headed output wire. Make sure it extends as much as the other male headed wires from the other attachments.
3. Take as many wires as the output pins from the grip (9 wires) and feed them through the opening at the bottom of the gimbal lever arm (1.1). The wires need to be female-female headed.
4. Connect the wires from the grip to the female headers exiting the lever arm from the top.
5. Connect the bottom end of the female headed wires to the Arduino board. Connect the ground wire to a GND pin and connect the signal wires (switches associated with the attachments) to the right digital input on the Arduino board.

6. Slide the grip on the lever arm and secure it with a bolt (screw: 4 and nut: 5). Beware not to damage wires running down from the grip with the screw.
7. Check that the joystick can move freely throughout the whole range of motion without damaging connections and.
8. Slide the side wall from the top of the assembly closing the inside components in.

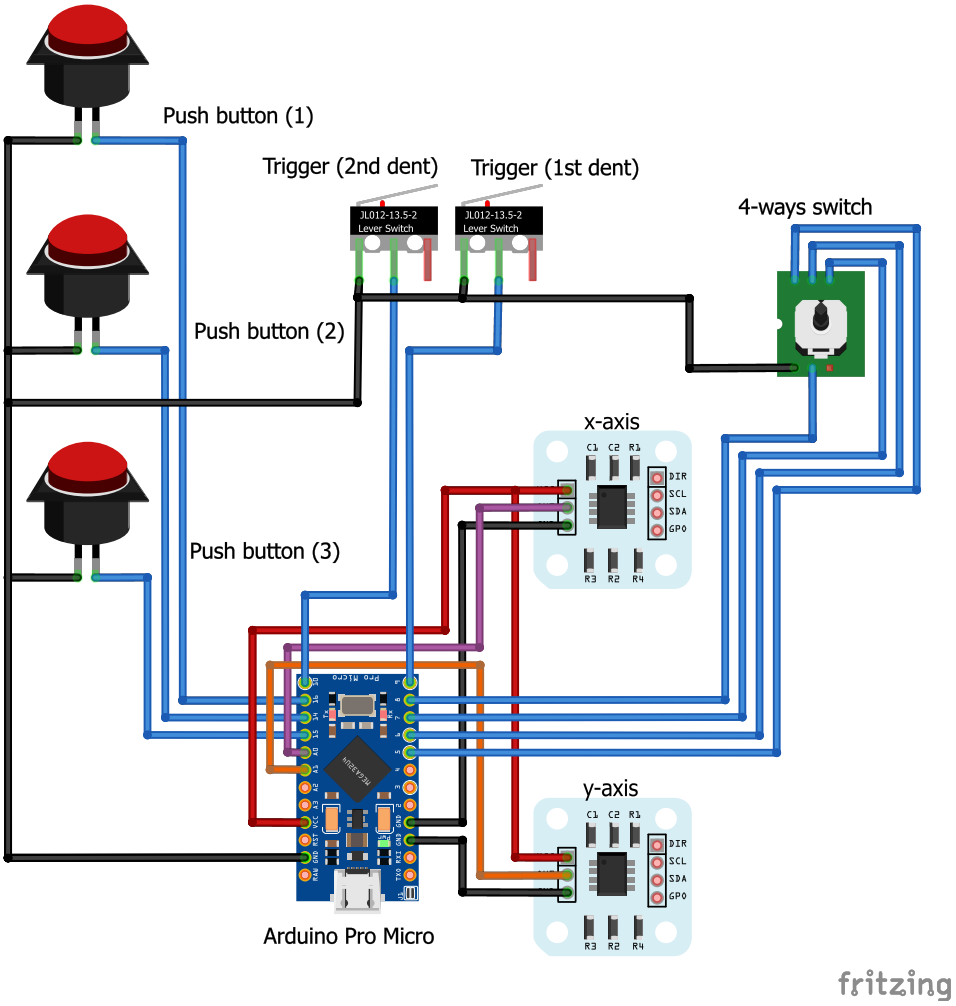

Figure 4.2.2: Complete wiring example schematic of the joystick assembly.

4.2.5 Arduino code

The code for the joystick is available in the folder *Joystick_code*. Inside this folder there is the script to be loaded on the Arduino (*Joystick_code.ino*) and a folder containing the joystick library files. The library folder is only there for redundancy; it should be possible to install the joystick library from the Arduino IDE.

After loading the code on the Arduino, open the game controller setup: check that the joystick is recognised, then open its properties to tune the axis. It is very likely that the mapping of the switches is not right; to make sure the switches behave as expected, check the pin assignments on the code available in the repository (lines 3 to 10). As necessary, remap the pin assignment, especially for the hat switch to function as it was intended to.