

Air-track setup

In this paradigm, head-fixed mice perform a visual two-alternative forced choice task. This setup can be adapted to accommodate more sensory modalities by using appropriate equipment.

Hardware parts list

Electronics

#	Item	Qty	Part #	Vendor	Ind. Price	Notes
1	Bpod port interface board	3	1008	https://sanworks.io/shop/view/product?productID=1008	33€	Controlling the behavior ports
2	solenoid valves	2	LHDA 05334 15H	https://www.medicalexpo.com/prod/lee-company/product-121993-852475.html	92.81€	
3	Infrared Emitter 880nm Circular Right Angle 2-Pin Side Looker	3	SEP8 736-0 02	https://www.onlinecomponent.com/en/productdetail/honeywell/sep8736002-11941644.html	4.75€	For the behavior ports
4	Phototransistor IR Chip Silicon 880nm 2-Pin Side Looker	3	SDP8 436-0 02	https://www.onlinecomponent.com/en/productdetail/honeywell/sdp8436002-11941347.html		For the behavior ports
5	Ethernet cable	3		https://gr.mouser.com/ProductDetail/Bel/BC-5UK005F?qs=f9yNj16SXrJ9cXLcEW5sg%3D%3D	2,74 €	
6	Cable 0.05 mm ² , Ø 0.8mm	1		https://www.conrad.com/en/p/t ru-components-1567774-strand-lify-1-x-0-05-mm-black-25-m-1567774.html?srsId=AfmBOopTpO0eOTaWBqFmX0DRQ_Vfca76pRcROt6V9fxMz7ht4pL-8TdE		

Other Hardware

#	Item	Qty	Part #	Vendor	Ind. Price	Notes
1	Plexiglas air-table	1		Provided by Mostafa A. Nashaat, Larkum Lab, Larkum Lab, Charite, Berlin		
2	PLA platform	1		Provided by Mostafa A. Nashaat, Larkum Lab, Charite, Berlin		
3	Behavior port	3		https://sanworks.github.io/Bpod_Wiki/assembly/mouse-behavior-port-assembly/		
4	Crimp For Dupont Female	15	05-00090199	https://grobotronics.com/crimp-for-dupont-female.html	0,04€	
5	Tygon S3™ E-3603 Tubing (water) Ø Inner 2.38mm, Ø outer 3.97mm	4 pieces	TY2,38ST3,97	Optubus		
6	Tygon S3™ E-3603 Tubing (water) Ø Inner 0.79mm, Ø outer 2.38mm	2 pieces	TY0,79ST2,38	Optubus		
7	V-Hive Enclosure Base Model	1	HW3303 GK	https://ratrig.dozuki.com/Guide/01.+V-Hive+Enclosure+Base+Model/183?lang=en	118€	
8	Sound insulator ISOLFON foam plate	4 pieces 50x50cm and 2 pieces 50x43cm		https://www.muziker.com/mega-acoustic-pa-pmp-5-50x50x5-dark-gray		for sound and light insulation
9	Heat shrink set		05-00017098	Cyg, Grobotronics	9.90€	

3D printed parts

#	Item	Qty	Filename	Notes
1	screen holders	2	screen_holder_v4.stl	

Step-by-step assembly instructions

You will find the blueprints for the items you should 3D print [here](#).

Step 1: Air-track: the air-table (see [Other Hardware](#), part #1) and platform (see [Other Hardware](#), part #2) of the air-track were developed by Dr. Mostafa A. Nashat and assembly instructions can be found here (<https://doi.org/10.1152/jn.00088.2016>, <https://doi.org/10.1101/2024.08.22.608577>).

Step 2. Set up the [Raspberry Pi Behavioral Setup](#) following steps 1-7, modifying Raspberry Pi Behavioral Setup Step 5 to connect only the valves to the EthoPy Controller Board.

Step 3: Mount the Raspberry Pi Behavioral Setup on the screen holders (see [3D printed parts](#), part #1) in front of the air-table ([Fig.1](#)).

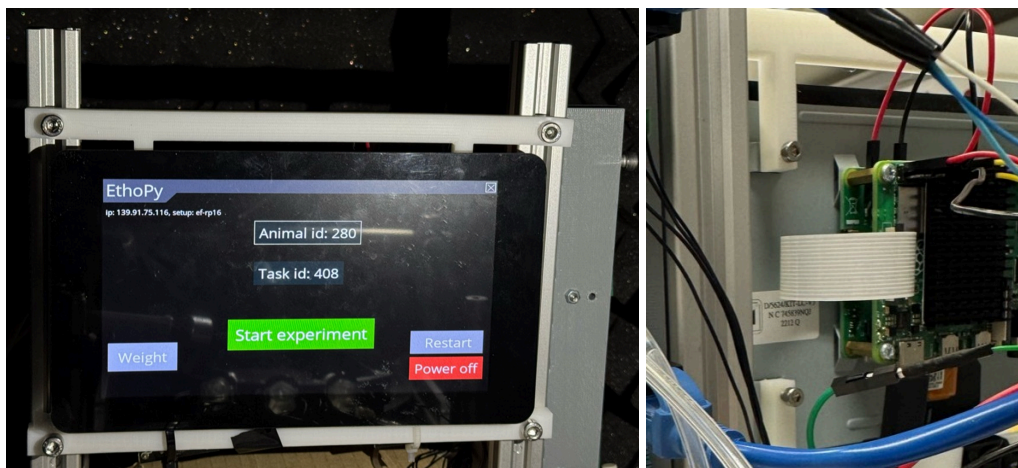


Figure 1: The RP behavioral setup, mounted on the aluminum rails of the air-table using the screen holders.

Step 4: Assembling of a behavior port (see [Other Hardware](#), part #3). Mounting of the infrared emitter (see [Electronics](#), part #3) and phototransistor (see [Electronics](#), part #4) to the port was performed following the instructions provided [here](#). Each platform included three behavior ports.

***Note:** For our experiments, we did not include LED light in the behavior ports.*

Step 5: Set up three Bpod port interface boards (see [Electronics](#), part #1) as per instructions provided [here](#). Place the Bpod port Interface Boards close to the Air-track and the Raspberry Pi Behavioral Setup for convenience.

Step 6: For each port, connect the infrared emitter and phototransistor with a Bpod port interface board.

***Note:** To reduce the tension caused to the platform from these connections, prefer using wires with a cross-section of 0.05 mm² and an outer diameter of 0.8 mm (see [Electronics](#), part #6).*

Step 7: Connecting the Bpod port interface boards to the Raspberry Pi Behavioral Setup. As the connections with the Bpod port interface board are through an Ethernet cable, you will need 3 Ethernet cables, one per port (see [Electronics](#), part #5).

Step 8: Remove the insulation from the edge of the Ethernet wires. Place 13 female terminals (see [Other Hardware](#), part #4) at the end of each wire and cover the exposed terminal with insulation (e.g., heat shrink tube, see [Other Hardware](#), part #9). In the following steps, the identification of the Ethernet cable wires is shown in [Fig.2](#):

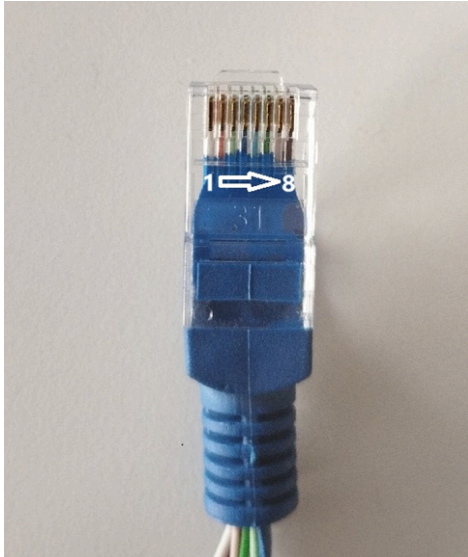


Figure 2: *Ethernet cable wire number ids.*

You will use the wires 1 (signal of the sensor), 4 (power of the emitter), 5 (ground).

Step 10: The wires from the Ethernet cables are connected to the Raspberry Pi Behavioral Setup (see GPIO connections as set in [EthoPy github repository](#)) as follows:

- Connect wire 1 (signal) of each Ethernet cable to the respective GPIO pin for the proximity input of each port.
- Connect wire 4 (power) of each Ethernet cable to a 5V power pin.
- Connect wire 5 (ground) of each Ethernet cable to a ground pin.

Note: Power cables and grounds should be short-circuited together to connect to one pin of the Raspberry Pi.

Step 11: Driving of the valves for ports 1 and 2 using the EthoPy Controller Board ([complete instructions here](#)).

Step 12: Adjust the reward tubes (see [Other Hardware](#), part #5 and part #6) to the behavioral ports and connect the valves (see [Electronics](#), part #2). Bridge the valves and connect to the water supply (see [Fig.4](#)).

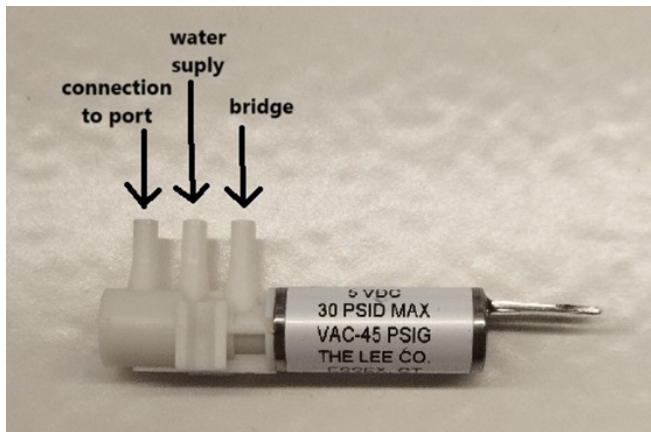


Figure 4: *Solenoid valve with the positions of the tubes.*

Step 13: If sound/light insulation is needed, the Air-track behavioral system can be enclosed in the Rat-Rig V-Hive Enclosure Base Model (see [Other Hardware](#), part #7). Assembly instructions can be found [here](#). For further sound and light insulation, related insulation material (e.g. ISOLFON foam plate, see [Other Hardware](#), part #8) can be used to cover the sides of the enclosure.

Step 14: The behavioral system should be placed in a room with air supply, needed for the floating of the platform on the air-table and the water delivery.