

MODULE 03 FIELD EXERCISE

Motion-Triggered Switch: PIR to Pi to Relay to Load

TASK: Build a motion-triggered switch: the PIR from Build 4 feeds the Pi, the Pi drives the relay from Build 3, and the relay throws an isolated siren.

CONDITION: Given your four proven builds, a Pi Zero 2 W, a breadboard, jumper wires, the relay module, the HC-SR501, a siren with its own 9 volt supply, and a multimeter.

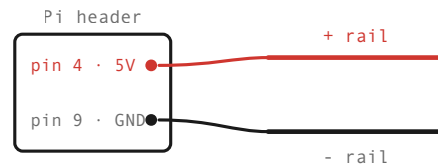
STANDARD: Motion in front of the sensor closes the relay and sounds the siren; the siren releases after the set delay; every connection matches your KiCad drawings; and the keeper is soldered to perfboard, not left on the breadboard.

SAFETY FIRST

This exercise never touches mains. The switched load stays a 9 volt siren on its own supply; keep it that way. When the portable pack powers the system, apply the cell rules from Unit 1: switch off before rewiring, keep anything metal away from the cell terminals, and stop if the cell gets warm.

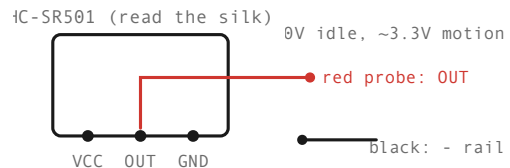
Task 1 · Set the rails

1. Power the Pi down before you wire anything.
2. Jumper Pi pin 4 (5V) to the breadboard's + rail.
3. Jumper Pi pin 9 (GND) to the breadboard's - rail.
4. Both modules will feed from these rails, which leaves pins 2 and 6 free for the portable pack in Task 6.



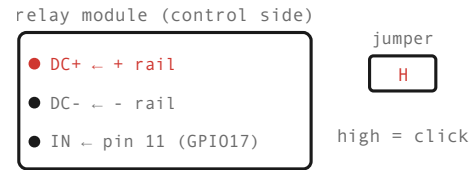
Task 2 · Wire and prove the PIR (Build 4)

1. Wire the HC-SR501: VCC to the + rail, GND to the - rail, OUT to Pi pin 12 (GPIO18). Read the silkscreen; pin order varies by board.
2. Power the Pi. Set the meter to DC volts, black probe on the - rail, red probe on OUT.
3. Hold still until the sensor settles, then move a hand in front of the dome.
4. The reading snaps from about 0V to about 3.3V, holds for the delay set on the time trimmer, then drops.



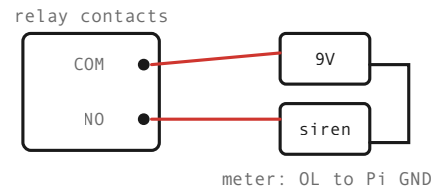
Task 3 · Wire and prove the relay (Build 3)

1. Power down. Wire the relay module: **DC+** to the + rail, **DC-** to the - rail, **IN** to Pi pin **11** (GPIO17). GPIO18 now belongs to the PIR, so the relay moves to its own pin.
2. Set the board's trigger jumper to **H** (high level trigger).
3. Power up. Drive GPIO17 high and low with the same GPIO tool you used to prove Build 3.
4. The relay clicks on high and releases on low, and the board's indicator LED follows.



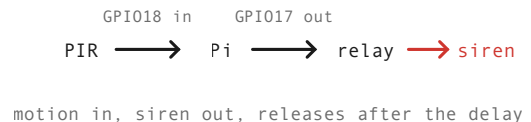
Task 4 · Wire the isolated load and prove the isolation

1. Power everything down, siren supply included.
2. Wire the siren's own 9 volt supply positive to the relay's **COM** screw terminal.
3. Wire the relay's **NO** terminal to the siren's + lead, matching the + printed on the buzzer, and the siren's - lead back to its supply's negative.
4. Set the meter to continuity. Probe from the siren's - lead to the Pi's - rail: the meter reads OL, no tone, because the two circuits share nothing.



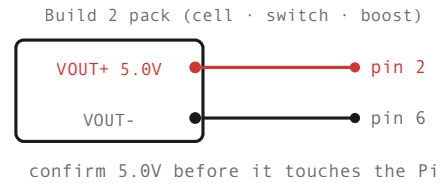
Task 5 · Close the chain: motion in, siren out

1. Power up all of it. First prove the chain by hand: watch the PIR's OUT with the meter, and when motion drives it high, drive GPIO17 high. The relay closes and the siren sounds.
2. Now automate the bridge: a short loop, in any GPIO tool or three lines of Python, that reads GPIO18 and writes its state to GPIO17.
3. Walk in front of the sensor. The siren sounds, holds for the delay on the PIR's time trimmer, then releases.
4. Adjust the sensitivity and time trimmers until the response suits the room.



Task 6 · Cut over to the portable pack (Build 2)

1. Power down and disconnect the bench supply from the Pi.
2. Confirm the pack's boost output reads 5.0V with the meter before it touches the Pi.
3. Wire the pack exactly as Build 2's diagram shows: boost VOUT+ to Pi pin 2, VOUT- to Pi pin 6.
4. Flip the pack's slide switch on and rerun Task 5.
5. The whole system now runs from one lithium cell. Note the switch rating from the module: a mini slide switch is a 0.5 amp part, so watch for sag if the Pi works hard.



Task 7 · Field notes

Log the delay time you set, any connection that did not match your KiCad drawing on the first try, and the boost output voltage under load. The standard is not met until the keeper is soldered to perfboard; record the date you commit it to solder.

#	Task	Meter Setting	Expected	Your Reading	Pass / Fail
1	Rails	DC Volts	~5.0V across + and - (Pi powered, Task 2)		
2	PIR OUT	DC Volts	~0V idle ~3.3V on motion		
3	Relay coil	Listen / LED	Clicks on high Releases on low		
4	Isolation	Continuity	OL / no tone between siren circuit and Pi GND		
5	Full chain	Observe	Motion sounds siren Releases after delay		
6	Pack under load	DC Volts	5.0V at pin 2 while siren fires		