

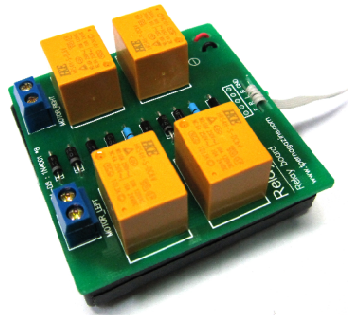


The Affordable Quick Entry Level Robot Kit

The RelayRover (R2) is a great entry level affordable robot kit set that allows any beginner in robotics to experience construction of a basic robot and using the wired switch remote control to control the basic movements of the robot. This kit set can be used during robotic holiday camps where classes of 50 to 100 students can be conducted with a simple competition at the end of the camp.

R2 kit package items

- Relay board

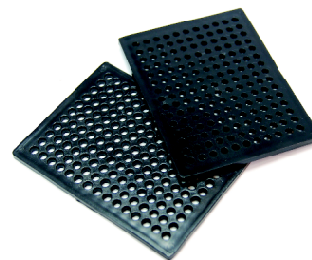


- Push button remote control board



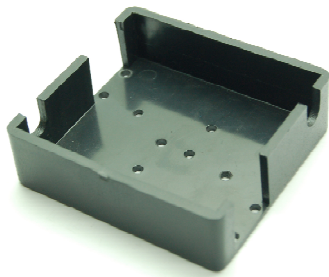
- Circular Chassis

- Square Grid Plate



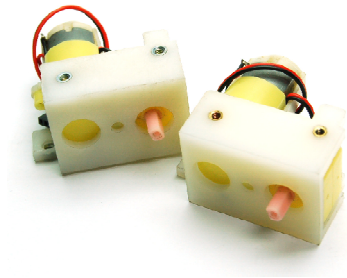
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- Battery Box Holder



- 2M long interface cable

- 48:1 high speed DC Gear Motor with plastic mountings



- DC Motor Tires and High grip Rubber threaded tires



- Screw and Nut set



Includes 2 of 2mm. self-tapping screws, 4 of 3x10mm. M3 screws, 8 of 3x8mm. flat-head screws and 8 of 3mm. M3 nuts.

- Metal spacer



They are metal parts for supporting the plate and box holder. They are made from nikle plating metal. Includes 2 of 33mm. metal spacers. Each standoff has 3mm. thread through-hole.

R2 operation concept

The R2 bot consists of 2 sections.

1. **Electronic circuit**; includes :

- 1.1 Relay driver board
- 1.2 Push button remote control board

2. **Simple robot chassis**; includes :

- 2.1 DC motor gearboxes
- 2.2 Circular chassis
- 2.3 Wheels and tires

The **RelayRover bot** or **R2 bot** is very simple. No requires the programming skills or experiences. Movement control will come from the wired push-button remote control. Relay drives the motor by pressing the switches. You can control the robot forward, backward, turn around, move left or right direction. By direct power control from battery to relay; the R2 will moves with fully power from battery. No heating at the remote-control because the power will be transfer from battery to relay contact and finally to DC motor. Therefore, R2 remote-control is saved and easy to use for everyone.

How the circuit work

Push-button remote control board

The schematic is shown in fig. 1. It consists of independent 4 buttons for R2 direction control.

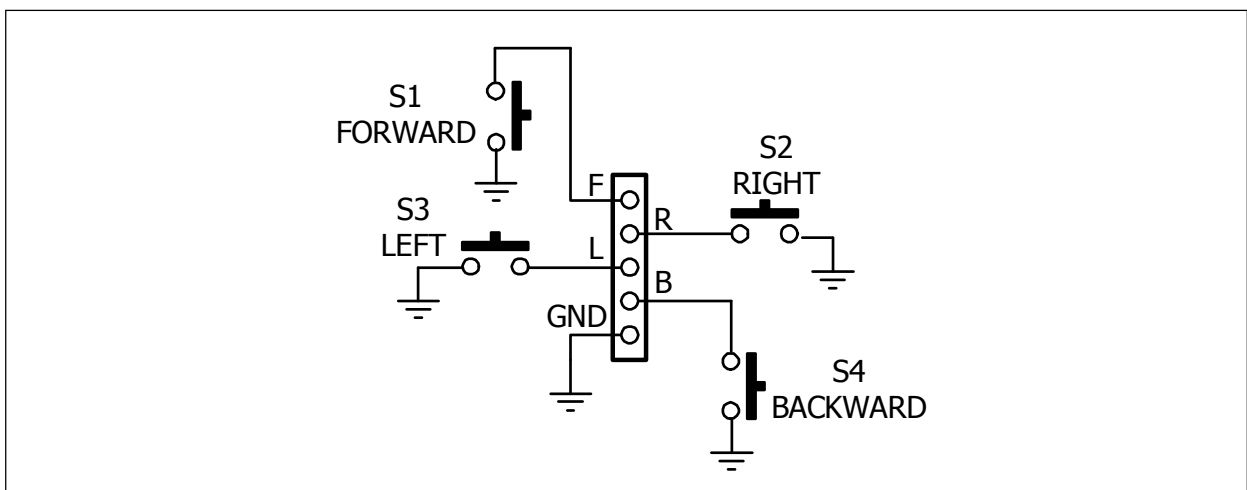


Figure 1 : The R2 push-button remote control board schematic diagram

S1 is **FORWARD**. The R2 is moved in forward direction by pressing this button.

S2 is **BACKWARD** button. The R2 is moved in backward direction by pressing this button.

S3 is **LEFT** button. R2 will turn around in left direction. The FORWARD or BACWARD button pressing also requires for fully turn left control.

S4 is **RIGHT** button. R2 will turn around in left direction. The FORWARD or BACWARD button pressing also requires for fully turn right control.

Relay drive main board

Fig. 2 illustrates the R2 driver main board schematic diagram. The control signal from the remote control board will send to control the relay RY1 to RY4 with some direction control circuit. This circuit consists of D1 to D8. Each diode was used to determine the current flow direction when a switch is pressed in each.

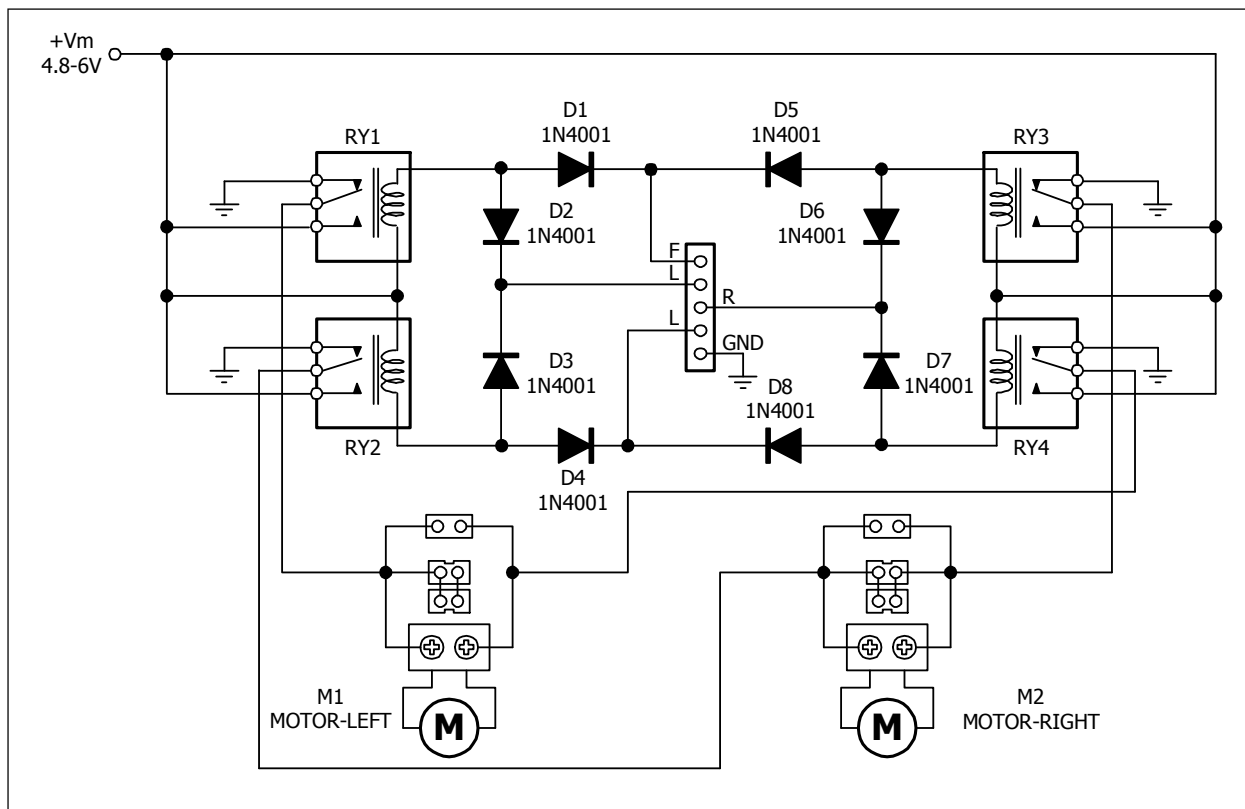


Figure 2 : The R2 main board schematic diagram

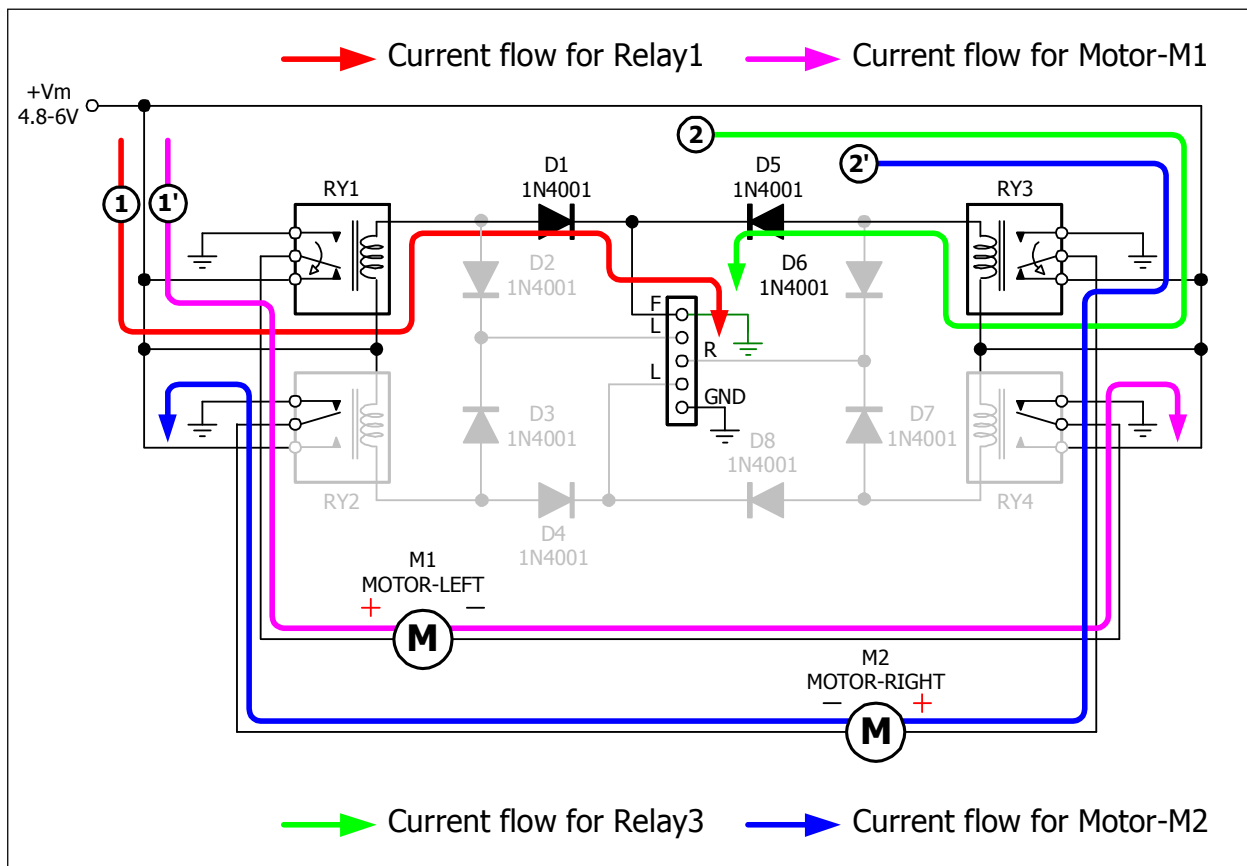
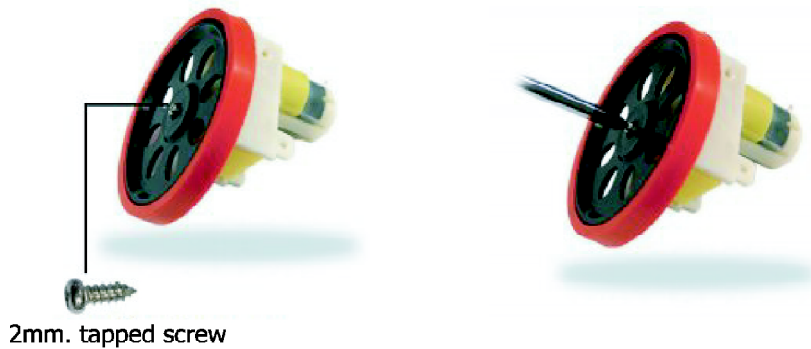


Figure 3 : Example of the operation current flow after the S1 (FORWARD/F) button is pressed. Both relay (RY1 and RY3) must be activated first. See the current flow 1 and 2. After that both motor also work. See the current flow 1' and 2'.

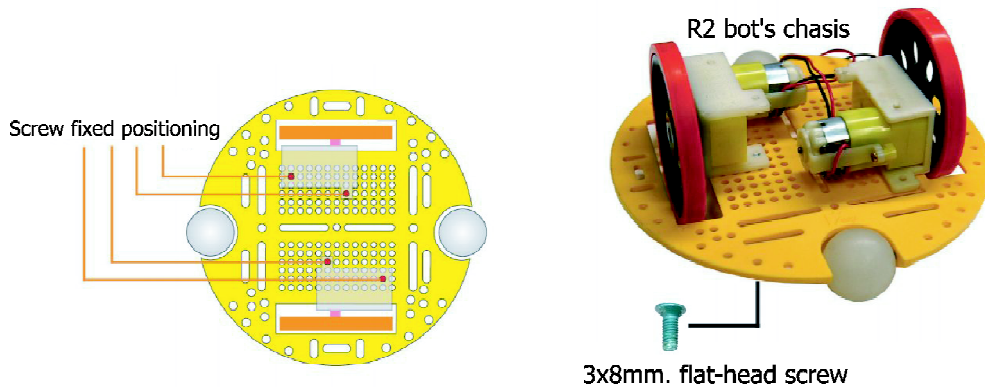
For example, the S1 (FORWARD or F) is pressed. The button is connected to ground. Relay RY1 and RY3 are activated in the other hand RY2 and RY4 off. The voltage are applied to both motor M1 and M2. They are operated and move with different direction. It causes the R2 bot moves forward. The figure 3 shows the current flow of this operation.

Making R2 bot

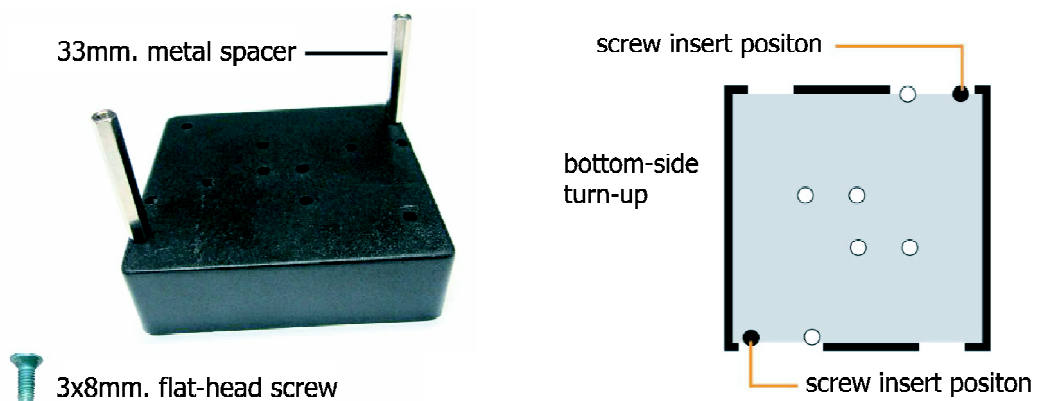
(1) Insert the wheel with DC motor gearbox shaft. Tighten with 2mm. tapped screw.



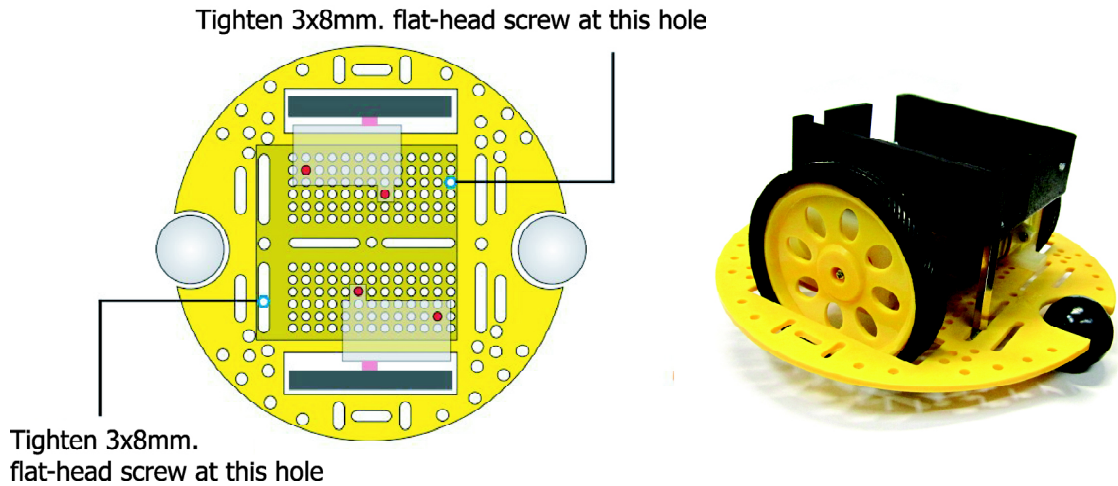
(2) Place the DC motor gearbox on the circular base at the position following the figure below. Fix with 3x8mm. screws



(3) Attach 33mm. metal spacer with the box holder by using 3x8mm. flat-head screws.



(4) Fix the box holder with the circular base also by using 3x8mm. flat-head screws.

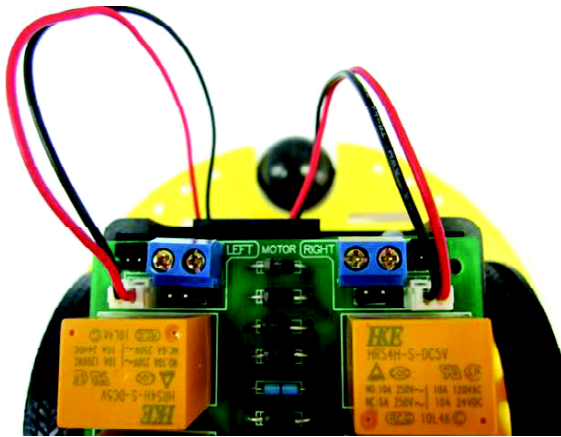


(5) Put 4 pieces of AA batteries into the battery holder at the back of relay driver main board.

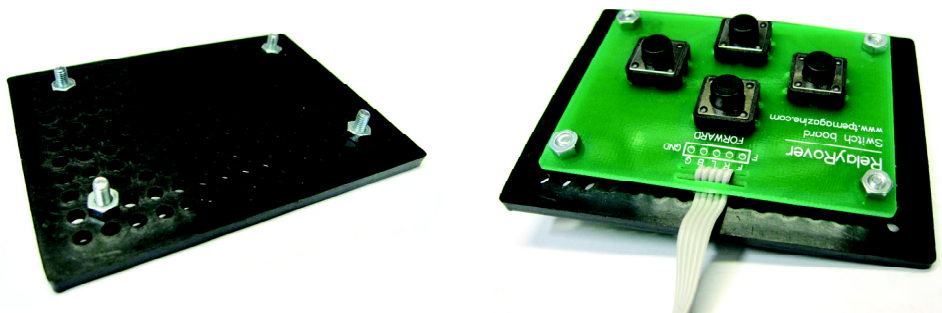
(6) Place the relay driver main board on the box holder at the R2 body chasis.



(7) Connect the motor cable of both DC motor gearboxes with the relay driver main board. The left motor connect with MOTOR-LEFT terminal and the right motor connect with MOTOR-RIGHT terminal.

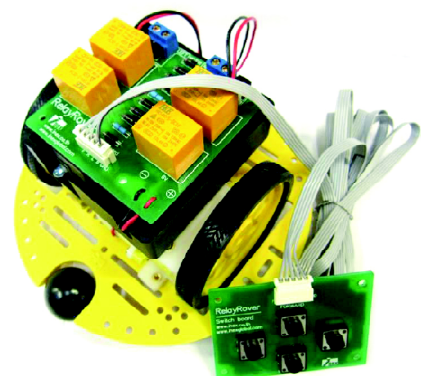


(8) Assembling the remote control; attach the button remote control board with the 80x60mm. grid plate by using 3x10mm. screws and 3mm. nuts with some spacer.



(9) Connect the JST5CC cable between the R2 body and the remote control board.

Now, the Relay Rover or R2 bot is already. Try it by pressing the button on the remote control board.



Testing

(1) Press the FORWARD button. If the motor connections are correct, R2 bot must moves forward direction. If it moves backward, must change the pole of motor connection and try it again. You may want to change many times until the robot move correctly.

(2) Press the LEFT button and hold. The R2 bot must turn around with left direction. If it turns incorrect, means the motor connection are opposite. Require the changing motor connection again.

The incorrect motor connections do not destroy the robot. Only the operations are wrong. The solutions are changing the motor connection both channels and direction until the moving directions are correct.

How to control the R2 bot

It's very easy. Only pressing the buttons on the remote control board; you can control it.

Forward : press only FORWARD button.

Backward : press only BACKWARD button.

Turn left : press the LEFT button and FORWARD button. If only press LEFT button, the robot turn around in left direction and does not move to left direction until the FORWARD button is pressed following.

Turn right : press the RIGHT button and FORWARD button. If only press RIGHT button, similar turn left operation the robot turn around in right direction only and does not move to left direction until the FORWARD button is pressed following.

Applications and Activities

The RelayRover or R2 bot helps to learning about simple robot making, the relay and motor operations and also simple mechatronics concept. In the classroom; teacher possible set some activity for supporting the robot learning such as :

- **The robot racing** : compete the speed and direction control.
- **RelayRover Soccer** : play the soccer robotic game. Require some small ball and field for playing the game.

● **RelayRover Terrain** : challenge about the robot control move over different fields such as sand, slope way, rugged area etc.

With INEX's mechanical materials include many types of plastic joiners, other types of wheel and tires and combine with some simple materials such as wood stick, corrugated Plastic Sheet, chopsticks, tape, rope, paper cardbox, milk boxes and more, you can make or apply the R2 bot to better efficiency and functions.

In addition; you can step to the programmable robot with easy way. Change the relay driver board to the microcontroller board with DC motor driver without changing the robot body.

