

Propeller QuadRover (#28195) Example Program Instructions

This documentation contains example code for controlling the Propeller QuadRover Robot with the Propeller Control Board via a standard four-channel RC airplane or helicopter radio system.

Safety Precautions

CAUTION: User must read and understand this entire document before attempting to use the Propeller QuadRover robot. The QuadRover is a heavy-duty robotics test-bed that is intended for research and development including custom user-written programs and control systems. Because of its size and weight, an improperly controlled QuadRover can cause damage to itself and to other property, as well as personal injury, including death. The QuadRover employs a gasoline engine and hydraulic power system, both of which can create high temperatures and high hydraulic pressure. Proper care and safety precautions must be taken when working with these systems.

Please observe the following precautions:

- Parallax Inc. will issue changes to the Propeller QuadRover manual to update its accuracy and apprise the user of new procedures and design changes. It is the user's responsibility to maintain an updated operating manual. Documentation revisions will be posted and available for download from the QuadRover product page at www.parallax.com. Before using the QuadRover, check for the latest documentation.
- When developing and testing programs and applications with the QuadRover, the robot should be elevated and firmly mounted on a platform in such a way that the wheels do not touch the ground and vibrations will not cause the QuadRover to break free.
- The QuadRover must be operated in a controlled area free from people, animals, and property that could be damaged.
- Proper safety equipment must be worn while working on the QuadRover.
- An engine kill-switch pull string and tether have been provided; the tether should be attached to the ring on the pull-string for use as an emergency cut off in the event of an unintended loss of control.
- It is the responsibility of the operator to know and comply with all state and local laws and regulations applicable to the operation of gas-engine equipment, including, but not limited to, requirements for spark arrestors and any restrictions for operating gas-engine vehicles on public property or streets.
- It is the user's responsibility to obtain and properly store all Material Safety Data Sheets for the gasoline, engine oil, and hydraulic oil used.
- Parallax Inc. cannot be held responsible for any harm or injury that may occur due to improper, unsafe, or uncontrolled operation of the QuadRover.

Disclaimer of liability: Parallax Inc. is not responsible for special, incidental, or consequential damages resulting from any breach of warranty, or under any legal theory, including lost profits, downtime, goodwill, damage to or replacement of equipment or property, or any costs of recovering, reprogramming, or reproducing any data stored in or used with Parallax products. Parallax Inc. is also not responsible for any personal damage, including that to life and health, resulting from use of any of our products. You take full responsibility for your Propeller QuadRover robot application, including use of and modifications to the example code referenced here, no matter how life-threatening it may be.

Equipment Required

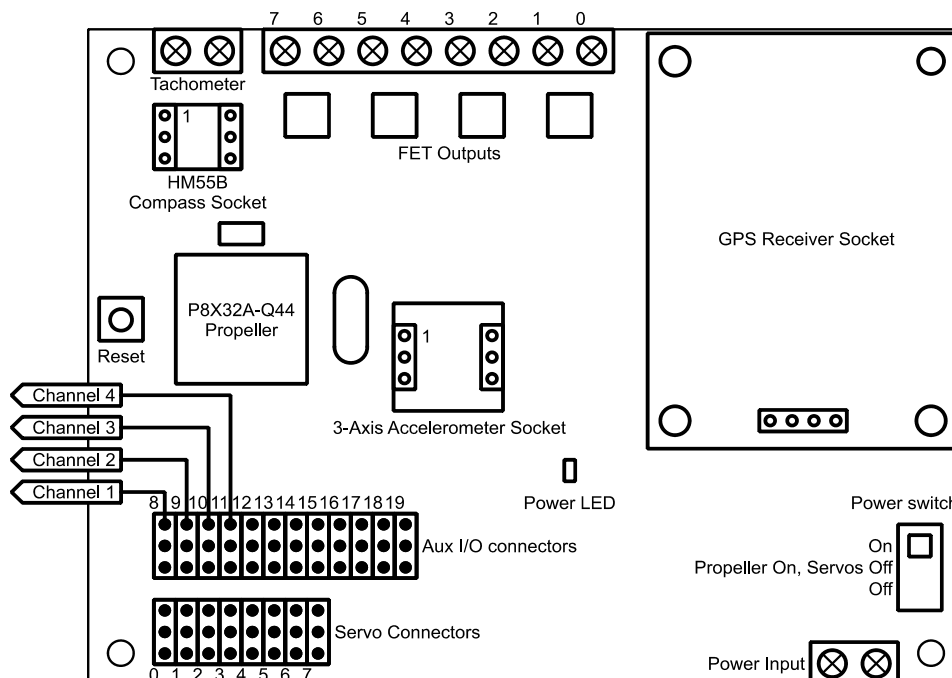
- QuadRover Robot with Propeller Control Board
- A standard digital four-channel R/C airplane or helicopter radio system with some form of error detection to prevent radio interference from causing a loss of control
- The Propeller Tool software v1.1 or higher, and the Parallax Serial Terminal software, running on a computer with an available USB port. The software installers are available free from the Downloads link at www.parallax.com/propeller.
- A Prop Clip (#32200) or Prop Plug (#32201) with a USB A to Mini B cable (#805-00006)
- Four female/female servo extension cables (#805-00012)

Step 1: Preparation

1. Read, understand, and follow all of the instructions in the Propeller QuadRover Robot documentation to prepare the unit for its initial use. The most recent version of this document will be posted on the 28195 product page at www.parallax.com.
2. Firmly mount the QuadRover on a stable, elevated platform so that its wheels can spin freely and it cannot shake loose.
3. Read and understand all of the instructions that came with your RC controller and receiver units.
4. Load your RC controller and receiver units with verified new or fully recharged batteries.
5. Connect your Prop Clip or Prop Plug to the Propeller Control Board, and then connect it to the computer with the USB cable.
6. Extract all Propeller .spin files in this archive into one folder on your computer.
7. Open 'QuadRoverControl_v1.0.spin', then press Ctrl+T to set it as the top object file. When modifying any of the included objects, press Ctrl+F9/F10/F11 compile/load RAM/load EEPROM.

Step 2: Connect the receiver and set the trims on the R/C transmitter.

1. Connect the R/C receiver to the Propeller Control Board.
2. Following the diagram below, use four female to female servo extension cables to connect channels one through four of the R/C receiver to auxiliary connections 8 through 12 on the Propeller Control Board. It is important that channels one through eight are connected in order to connections 8 through 12 on the Propeller Control Board, otherwise the QuadRover will consider the R/C receiver's output to be invalid.



3. Program 'SetTrim_v1.0.spin' into the Propeller Control Board's EEPROM.
4. Open the Parallax Serial Terminal (PST.exe), and then set the COM port to the one connected to Propeller Control Board and set the baud rate to 9,600.
5. Follow the instructions in 'SetTrim_v1.0.spin' to set the trims on the R/C transmitter.

Step 3: Calibrate the throttle and brake servos.

1. Open 'QuadRoverControl_v1.0.spin' and follow all directions in the comments.

Step 4: Check the servos and brakes before every use.

2. Load and 'QuadRoverNavigation_v1.0.spin' into the Propeller Control Board's EEPROM.
3. With the engine off and the Propeller Control Board's Power Switch all the way on (Propeller ON and Servos ON), turn on the R/C transmitter and move the left joystick all the way up. The brakes should fully engage.
4. If they do not, repeat **Step 3: Calibrate the throttle and brake servos.**

Step 5: Check the R/C radio system for signal quality and strength.

1. Load and run 'QuadRoverNavigation_v1.0.spin' into the Propeller Control Board's EEPROM and have someone hold the R/C transmitter at the furthest distance that you will be using the radio.
2. Have them move the brakes and throttle and make sure that the servos respond smoothly.
3. If the servos do not move at all, the radio may not be strong enough.
4. If the servos make jerky movements, even if just occasionally, the signal is receiving too much interference.
5. If either condition occurs, it must be remedied before the radio system can be used with the QuadRover. Refer to your RC radio system's manual.

Step 6: Test the throttle-kill and no-signal conditions.

Before running the QuadRover, its control setup should be thoroughly tested:

1. With the engine off but the Propeller Control Board's Power Switch all the way on (Propeller ON and Servos ON), move the joysticks on the R/C transmitter and check for corresponding movements in the servos on the QuadRover.
2. If everything works appropriately, start the engine and run the same test again making sure that the wheels move as expected.
3. Turn the R/C transmitter off and check to make sure that the engine stalls.
4. After everything is tested, the QuadRover should only be run in a safe, controlled environment, following all of the Safety Precautions.
5. Before running the QuadRover in a new environment, repeat **Step 5: Check the R/C radio system for signal quality and strength** to ensure that there is no radio interference.