

Komodo Robot Manual

Manual version: 2.2
September 2016

Table of contents

[Safety instructions](#)

[1. Robot Specification](#)

[2. Included Hardware](#)

[3. Getting started](#)

[3.1 Driving in RC mode](#)

[3.2 Using the on-board computer to run the robot](#)

[3.3 Turning the robot OFF](#)

[2. Maintenance](#)

[2.1 Batteries](#)

[4. Warranty](#)

Safety instructions

Safety in operation

Weight: Do not try to pick the robot by yourself, the robot is heavy. This may harm your back and skeleton. Use at least two people to hold the robot off the ground.

Distance: Keep a safety distance of few meters between the robot and people when in operation the robot is strong, heavy, and fast. If it may hit a person, it may cause a substantial injury. Keep your arms, body, and face at least 1.5 meter away from the Komodo arm. The arm may be very fast and strong, and it may cause injury in case of hitting someone.

Batteries safety

All the robot's batteries are of the type LiFePo4. The safety characteristics inherent to LiFePo4 technology result from the incorporation of phosphates as the cathode material. Phosphates are extremely stable in overcharge or short circuit conditions and have the ability to withstand high temperatures without decomposing. When abuse does occur, phosphates are not prone to thermal runaway and will not burn. As a result, LiFePo4 technology possesses safety characteristics that are fundamentally superior to those of lithium-ion batteries made with other cathode materials.

LiFePo4 technology does not contain any heavy metals and does not exhibit the "memory effect" of Nickel-Cadmium and Nickel-metal Hydride solutions. LiFePo4 technology demonstrates excellent shelf life, long cycle life and is maintenance free.

Another key benefit of LiFePo4 technology is its flexibility, both in terms of battery application and cell design. It can be used in wound cylindrical, wound prismatic and polymer battery construction types and manufactured to fit smaller applications.

The advantages of traditional lithium-ion coupled with the safety features of phosphates, make LiFePo4 technology the lithium-ion technology for the future. The LiFePo4 technology utilizes natural, phosphate-based material and offers the greatest combination of performance, safety, cost, reliability and environmental characteristics.

Emergency switch

Pulling the emergency switch out from the robot will cause the robot to stop. The emergency switch only works when the robot running on PC mode, that mean if you're driving the robot manually in RC mode the emergency switch will not stop the robot.



1. Robot Specification

The Komodo Mobile Robotic Platform is designed for indoor and good-weather outdoor operation. The Komodo robot uses skid-steering for maximum maneuverability. The Komodo platform is rugged, light weight, and compact. The robot is equipped with a whole suite of sensors for autonomous navigation. Following are the robot's detailed specifications:

- Size: 59 L X 48 W X 30 H cm (without arm).
- 4 inflatable wheels, differential drive.
- Wheels diameter: 26 cm
- 2 x 250W geared motors.
- High resolution encoders (2048 Counts Per Revolution) for closed loop control.
- Weight: 29 Kg (with battery, without arm).
- Battery: 24V/12Ah LiFePo4 (Charging socket available on the robot, Charger included).
- H-Manipulator Arm.
- Built-in Computer, main features:
 - 5th generation Intel i5/i7 processor.
 - Up to 16GB DDR3 SDRAM.
 - 120GB SSD.
 - 802.11ac Dual Band Wi-Fi + Bluetooth 4.0.
 - Intel HD Graphics 6000, Mini HDMI and Mini DisplayPort connection.
 - 2 Available USB 3.0 ports.
 - Gigabit Ethernet Network connection.
- Available sensors: GPS, 9 DOF IMU (3 Gyros, 3 Accelerometers, 3 Magnetometers), Laser scanner, RGB-D (Kinect like) mounted on pan-tilt system, 3 Ultrasonic Range Finders (URF) mounted on the sides and back of the robot, Webcam, Speaker, Microphone.
- Fully compatible with the ROS (Robot operating system).
- Maximum payload: 20 Kg @ 20 degrees slope.
- Maximum speed: 4 m/s.
- MTBC: 2 Hour.

2. Included Hardware

The included hardware in the box is:

1. Komodo Robot.
2. Case for Komodo robot (optional)
3. 24V LiFePO4 Battery,
4. 24V LiFePO4 Charger.

3. Getting started

3.1 Driving in RC mode

To turn the robot on and use it as a remotely controlled vehicle (RC mode) do the following:

- Turn the remote control on using its power switch. The indication light on the remote should be lit.
- On the back of the rover module (the lower one) turn the power switch to ON position and turn th RC switch to ON (1).

Now you can control the Rover using the remote control. Be careful the robot is very strong and very fast be very gentle when operating the remote.

The right joystick will control the robot; push the joystick forward in order for the robot to move forward. The speed of the robot is proportional to the movement of the joystick. Move the joystick to the right or left in order for the robot to turn right or left respectively.

Warning: Make sure that the PC is turned off while driving in RC mode. Do not use the RC mode while running the robot ROS software.

3.2 Using the on-board computer to run the robot

In this section we describe the required steps in order to operate the Komodo robot using its onboard computer.

To turn the robot on do the following:

- Connect a keyboard mouse and monitor to the back connectors panel of the robot.
- On the back of the robot turn the main POWER switch up to on position. The blue led on the main switch should be lit.
- Turn the computer on by clicking on the PC power button (this is the button just under the power switch), a short push is enough.

While operating the robot one may connect the charger and work directly from the electric outlet, and charging at the same time. This allows continuous working without draining battery life.

3.3 Turning the robot OFF

In order to extend your robot computer life time we recommend the following steps while shutting down your robot:

- If possible, shutdown using the Ubuntu graphic interface or through a terminal session.
- If you don't have access to the computer through a monitor or a remote control session, press and hold the computer power button (not the main power switch) for a few seconds until the computer shuts down.
- Only when none of the above methods works, use the main power switch to turn the computer off.

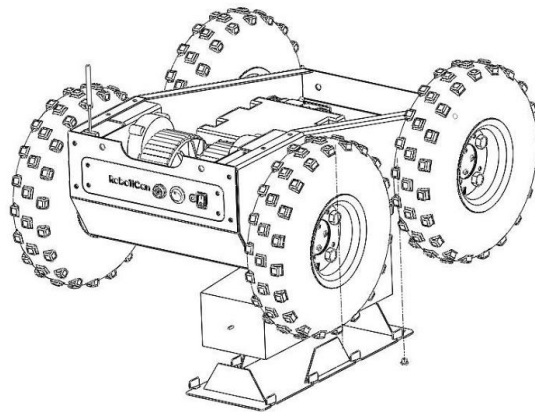
For more details and usage instructions and tutorials see our ROS wiki page <http://wiki.ros.org/robotican>.

2. Maintenance

2.1 Batteries

All the Models of the robot can be charged while connected to the robot, and even when the robot is in ON mode. Hence, for charging the battery of the module you need only to connect the correct charger to the module. Note that the 24V charger is used for charging the Rover's battery.

The battery of the Rover module is located at the lower part of the module. To replace the battery, open the cover by unscrewing the four screws that hold the battery cover in place. Open the screws all the way, and remove them away. Then remove the cover downward. The battery is located in its specific bay. To replace the battery simply disconnect the connector and replace the battery. Finally to close the cover repeats the previous steps in a reversed order.



4. Warranty

Limited Warranty Coverage:

Subject to the limitations provided below, the Komodo Robot is warranted against defects in materials and workmanship, under normal use, from the date of shipment through the period identified in the purchase quote (one year). If warranty period is not specified then the deliverable is "as is" and no warranty is provided.

Where a warranty is provided, RoboTiCan liability for such warranty is limited to: 100% of the parts necessary to repair the covered defect. Technical support by telephone, e-mail, fax or other means of correspondence during the warranty period for issues covered by warranty is provided at no charge for covered defects.

If travel to a location (other than RoboTiCan facility) is required to address an issue determined to be covered by warranty, parts will be covered but all labor and travel expenses will be billed. Travel will be billed at expenses plus \$50.00 per hour for work time and \$20.00 per hour travel. Determination of warranty coverage is the responsibility of RoboTiCan and cannot be assigned or delegated to any other party. If it is required to ship the robot to RoboTiCan facility for repair or maintenance, the shipping costs will be paid by the customer.

The following are specifically not covered by warranty: (1) failure due to abuse and neglect and/or improper operating environment (including, but not limited to, improper power supply, temperature, humidity, and environmental conditions); (2) down time and related costs due to failure; (3) items such as batteries, and (4) software.

RoboTiCan shall have sole authority to determine type and means of repair in the event of a warranty claim. RoboTiCan shall have the right to require the return of the defective part or system to RoboTiCan, transportation prepaid, to establish the claim. RoboTiCan shall in no event be held liable for repairs or alterations made without RoboTiCan's written consent or approval. RoboTiCan shall not be held responsible for repairs made by others. If unauthorized service is performed, the warranty provided herein shall be void. This warranty is void if the equipment is altered, improperly operated, improperly maintained or payments are not made according to the agreement.

Any additional software requirements or options are the responsibility of the end user. RoboTiCan does not warrant or guarantee the performance or functionality of any software, or that Customer is acquiring the legal right to use any software embedded within, or provided in connection with, reconditioned robots. Any software provided to customer is provided "as is" without warranty of any kind, either express or implied, and RoboTiCan specifically disclaims any warranty of merchantability, fitness for a particular purpose, satisfactory quality, lack of viruses, title, quiet enjoyment, and/or non-infringement with respect to any software. Customer acknowledges and agrees that use of any software provided to customer is at customer's own risk. Customer agrees to indemnify and defend RoboTiCan from and against any liability arising from customer's use of software in connection with products sold to customer hereunder.

Except for the warranties expressly provided herein, all other guarantees, warranties, conditions or representations, either expressed or implied, whether arising under statute,

common law, and commercial usage or otherwise, including implied warranties of merchantability and fitness for a particular purpose, are excluded and hereby specifically disclaimed. In addition to writing here RoboTiCan company will not be responsible for any damage, injury, loss of ability to work, disability and even death caused arising directly or indirectly from the use of the product Including the rover module, sensors module or the arm module separately or altogether. RoboTiCan has made no express warranties except as provided herein, and no oral or written information or advice given by RoboTiCan its agents or employees shall create a warranty of any kind or in any way increase the scope of the limited warranty provided herein.

Under no circumstances whatsoever shall RoboTiCan be liable to any person, firm, corporation or other entity for any special, punitive, indirect, or consequential damages, whether for breach of contract, negligence, misrepresentation, or otherwise, and whether resulting in lost profits, loss of interest in money borrowed or invested, impairment of goods, business interruption, work stoppage, or otherwise, in any way arising out of any transaction to which these standard terms apply. RoboTiCan maximum liability for any claim arising hereunder or relating to the products sold to customer hereunder (whether for breach of warranty or otherwise) shall be limited to the obligation to repair the non-conforming product.

Customer agrees that this sale is completely made in the Country of Israel in that the laws of the Israel country shall apply concerning any controversy or claim regarding the equipment. Customer agrees to indemnify and hold harmless RoboTiCan from all claims, damages, liabilities, attorney's fees, and expenses arising from the ownership or use of the equipment.