

MYBOTSHOP

QUADRUPEd ROBOTICS

Unitree BZ1

User Manual



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1 Attention

Attention: Read this document carefully. In case of doubt, it is essential to consult specialists, experts, or the manufacturer (Unitree Robotics) or distributor (MYBOTSHOP / QUADRUPED Robotics) of the assemblies used. The robot must not be put into operation before clarification. Contact information is available in Chapter 8, Getting Help & RMA.

Do not allow persons who are not familiar with the robotics or these instructions to operate the robot. Robots are dangerous in the hands of untrained users.

Do not operate the robot if you are intoxicated, under the influence of drugs, or unable to concentrate. Familiarize yourself with the walking modes and the emergency stop procedure before switching the robot on.

Caution: The BZ1 combines a Unitree B1 quadruped base with a Unitree Z1 arm and gripper on a custom MYBOTSHOP mount. Moving the arm and walking the base are both possible at once under the whole-body MoveIt driver – keep the surrounding area clear and be ready to use the controller's emergency stop.

2 Disclaimer

The BZ1 documented here is a Unitree B1 quadruped fitted with a Unitree Z1 arm via a custom MYBOTSHOP mount bracket, sold and supported by *MYBOTSHOP / QUADRUPED Robotics*. It is not a standalone Unitree product line. Basic ROS 1 (Noetic) understanding is required to operate the software stack covered in this manual — if you are not familiar with ROS, we recommend checking the [ROS documentation](#) first.

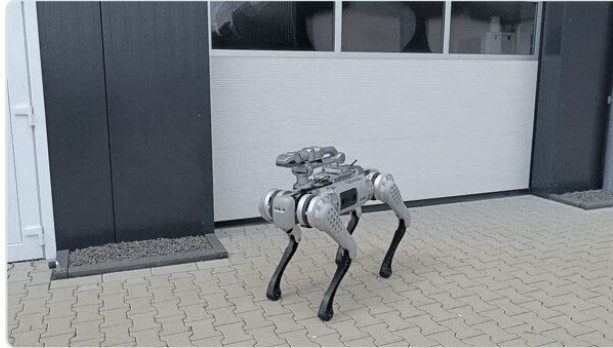
The client acknowledges and agrees that any information or materials provided by MYBOTSHOP / QUADRUPED Robotics are for R&D and development purposes only. Any services are provided "AS IS" and without any representation or warranty of any kind, express or implied, including but not limited to any warranty of merchantability, fitness for a particular purpose, non-infringement, or any other warranty.

This product is intended for civilian use only. Users should avoid making dangerous modifications or using the robot in hazardous ways. The BZ1 software package (bz1_bringup, bz1_description, bz1_gripper_moveit_config, bz1_viz) is distributed by request only — contact support+bz1@mybotshop.de for GitHub access. For terms, policies and compliance with local laws and regulations, refer to the Unitree Robotics website and the RMA/support process in Chapter 8.

MYBOTSHOP / QUADRUPED Robotics shall not be liable for any damages, including but not limited to direct, indirect, special, incidental, or consequential damages, arising out of or in connection with the use or inability to use the information or materials in this document. This limitation on liability shall apply regardless of the form of action, whether in contract, tort, or otherwise.

3 About the BZ1

Overview



_images/bz1_outdoor.gif

This package supplies Sphinx-based tutorial content to assist you with setting up and operating your bz1 quadruped robot. The tutorials topics are listed in the left column, and presented in the suggested reading order.

Important: These tutorials assume that you are comfortable working with ROS. We recommend starting with our ROS tutorial if you are not familiar with ROS already.

4 Pre-requisite Software – ROS Noetic & Workspace Setup

Pre-requisite Software

The ROS driver for the robots is initially supported for the ROS Noetic . All of ROS related software should be installed either on remote PC/Raspberry Pi/Nvidia board on robot. The steps for shown below are for remote PC both boards usually come with pre-installed ROS distribution.

Note: All the ROS related software should be installed/run on remote PC/Raspberry Pi/Nvidia board, nothing needed to be installed on robots control board.

[Ubuntu 20.04 - ROS NOETIC]



_images/ros_noetic.png

The ROS driver for the robots is initially supported for the ROS Noetic . All of ROS related software should be installed in a Remote-PC . The steps for shown below are for Remote-PC or bz1-PC .

Warning: Care should be taken when installing ROS so that it matches with your CPU's architecture (i.e. armhf, amd64, arm6, etc.)

PC Setup

ROS Noetic installation requires Ubutnu 20.04.

1. Download Ubuntu 20.04
2. Follow the Ubuntu 20.04 Installation guide

ROS-noetic Installation

The ros driver provided can be run either on a remote PC or on board robot computer. Usually, the on-board computer already has pre-installed ROS distribution, so the instructions below will be applicable to a remote computer. You may run the following commands to install ROS noetic or you can simply follow the instructions from the roswiki.

1. Enter the Ubuntu terminal and typie in the following command:

```
cd
```

1. The next step is setting up the source list:

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" >
/etc/apt/sources.list.d/ros-latest.list'
```

1. After which you will set up the keys:

```
sudo apt install curl
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc | sudo apt-key add -
```

1. Then, you will install ROS-noetic:

```
sudo apt update
sudo apt install ros-noetic-desktop-full
```

1. Finally, you will add ROS environment to your bash file, what this means is that each time you load up your terminal, it will automatically find the built-in ROS packages.

```
echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

1. Install python dependencies and initialize repo:

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-generator python3-
wstool build-essential
sudo rosdep init
rosdep update
```

Once the ROS packages are set-up the next step would be to set up a workspace in which you can add pre-built packages to control your robot.

Catkin Workspace

1. The first step is to ensure that you have correctly setup you ROS noetic. It can be checked by:

```
cd ..
source /opt/ros/noetic/setup.bash
```

1. Next, install catkin_tools:

```
sudo apt install python3-catkin-tools
```

1. The next step is to create, your workspace. This is typically created in the home directory following the standard ROS convention, once built, you should see a build and devel folder next

to your src folder:

```
mkdir -p ~/catkin_ws/src
cd ~/catkin_ws/
catkin build
```

1. To enable the workspace, you must type in:

```
source devel/setup.bash
```

1. To avoid typing this everytime you start a terminal, you'll add this into the last line of the bashrc file:

```
gedit ~/.bashrc
```

- Add the following line at the end of the bashrc file:

```
source /home/<your_computer_username>/catkin_ws/devel/setup.bash
```

- Everytime you do a catkin build , it is necessary to either restart all your terminals, or source them.
- To verify that everything is working correctly, type the following into the terminal:

```
echo $ROS_PACKAGE_PATH
```

BZ1 Installation

Important: To acquire BZ1 package with installation script please email support+bz1@mybotshop.de with your subject as BZ1 GitHub Access , your GitHub ID and your Invoice Name/ID .

Requirements

Please follow the pre-requisite software section.

- Pre-requisite Software

This driver requires a system setup with ROS. It is recommended to use Ubuntu 20.04 with ROS Noetic.

To make sure that robot control isn't affected by system latencies, it is highly recommended to connect the robot via LAN or via 5G connection.

Building

A script can be found below for automatic installation of all the required dependencies mentioned above and the provided software installation. After downloading and changing directory to the

downloaded folder, installation script can be run by the following command:

You first have to give the script root permission via:

```
sudo chmod +x install.bash
```

```
./install.bash
```

Z1 Remote Enable/Disable

A final step that is required for control of Z1 via ROS moveit is to disable its startup job from the B1. This can be done by sshing into the B1 and following the provided commands:

```
ssh unitree@192.168.123.220
cd Unitree/autostart
ls -la
cat .startlist.sh
nano .startlist.sh # Comment or uncomment z1 in case you want to control it remotely or not
```

5 Quick Start – Driver & Teleop

Quick-Start



_images/bz1.png

Once you are connected to the BZ1 via LAN or 5G and have completed Pre-requisite Software section you can begin operating the BZ1.

BZ1 Driver

To start the BZ1 whole body moveit driver please run:

```
roslaunch bz1_gripper_moveit_config real_bz1_moveit.launch
```

Important: Requires the Z1 to be disabled from remote startup. Instructions are at [Z1 Remote Enable/Disable](#)

Quick-Start Teleop

To tele-operate the B1:

```
roslaunch teleop_twist_keyboard teleop_twist_keyboard.py cmd_vel:=/cmd_vel
```

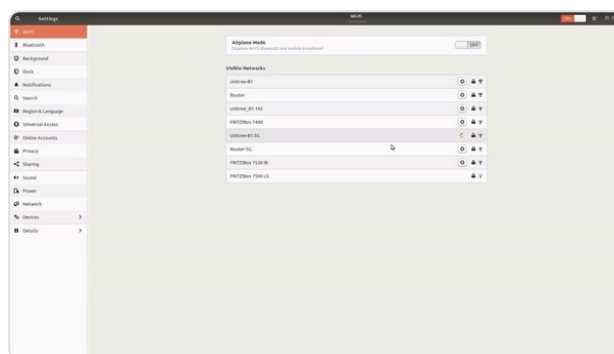
6 Network, Hot-spot & Basic Operation

BZ1 Manuals

Important: The following text are hyperlinks to demonstratory videos. Click on them to get redirected to the websites.

- Manufacturers Documentation (Requires Translation Plugin)

BZ1 Network



_images/b1_wifi_connection.gif

For network setup please connect the ethernet cable that is provided with the bz1 from the bz1 to your computer. After that set-up a static connection as explained below.

Network-IPs

The BZ1 has the following networks as of 17-May-2024 and may vary in future versions, the following table shows the networks

Device	Network Address	Password
BZ1-MCU	192.168.123.220	123

Network via Hot-spot

Once the apps are installed users can connect to the native hot-spot of BZ1 or through the Ethernet port to access its on-board computers. BZ1 has the network address range of 192.168.12.* . The SSID of the Wifi network of BZ1's hot-spot begins with UnitreeRoboticsB1-### , where the hash tags represent the BZ1's model number and the default password is 00000000 or 8 zeros.

Important: It is recommended to connect to the BZ1's 5G network for better connectivity.

BZ1 Basic Operations

The basic operations for the bz1 are provided in the User manual.

Good to know commands:

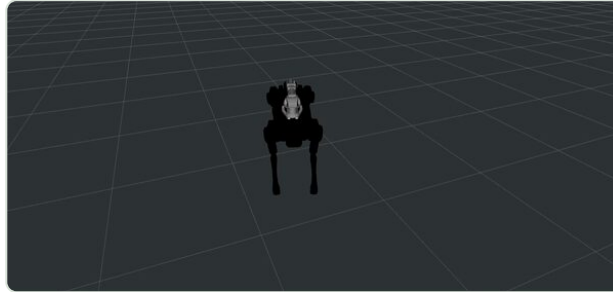
- Walking: START
- Prone position: L2+A (Press double times to go onto standing position)

Note: Some features are bound to the version of the bz1.

Once connected to the WiFi of the bz1. You can access the bz1 website by entering the following in the web address bar 192.168.12.1 . The bz1's Firmware version, motor temperature, vision, and control can all be accessed in here.

7 QRE BZ1 Software Packages

BZ1 Bringup



_images/bz1_viz.gif

This is a ros package that launches the BZ1 Base driver.

```
roslaunch bz1_bringup bringup.launch
```

BZ1 Description

This is a ros package that contains the 3D models of the BZ1. Additionally, the separate 3D models are stitched together into a single entity via the universal robot description format (URDF). Additions to the robot's 3D model can be made in the `xacro/robot.urdf.xacro`. To view the robot with simulated dummy drivers. You can run:

The description is automatically launched with the BZ1 Gripper Moveit Config driver to show the perceived position of the legs with the robot.

```
roslaunch bz1_description description.launch
```

BZ1 Gripper Moveit

This ros package contains the moveit setup configured for the B1, Z1 enabling collision avoidance with the base.

```
roslaunch bz1_gripper_moveit_config real_bz1_moveit.launch
```

BZ1 Viz

This ros package is used for visualization of the robots current state both in simulation and in the real-hardware.

```
roslaunch bz1_viz view_robot.launch
```

8 Getting Help & RMA

RMA / Support

How to Raise a Return Merchandise Authorization (RMA) Case

At QUADRUPED Robotics, we are committed to providing excellent support to ensure your issues are resolved promptly. If you encounter any problems with our products, please follow the steps below to raise a Return Merchandise Authorization (RMA) case:

Step 1: Open a Topic in Our Forum

1. Visit MYBOTSHOP Forum .
2. Open a new topic describing your issue in detail. Our support team and community members will attempt to assist you in resolving the problem remotely.

Step 2: Contact Support for RMA Number

If the issue cannot be resolved remotely through our forum:

1. Email us at support @ quadruped . de .
2. Provide a detailed description of the issue and include any troubleshooting steps already taken.
3. Our support team will evaluate your case and, if necessary, issue a RMA number along with a return address or a shipping label.

Important Shipping Information

Note: Please note: All goods must be sent back to the following address: QUADRUPED Robotics GmbH c / o MYBOTSHOP GmbH Willy - Messerschmitt - Strasse 12 50126 Bergheim Germany Do not ship goods without obtaining a RMA number. Parcels sent without a RMA number will be declined and returned to the sender. Do not ship goods to QUADRUPED Robotics GmbH Office in Leverkusen!

Help Resources

In case of any issues, help can be taken from any of the following forums/resources:

1. MYBOTSHOP Forum : The forum is actively monitored by support teams at MYBOTSHOP GmbH .
2. Github Issues : Issues can be reported in the repository.
3. Online QA Sites: Questions can be asked on any of the QA sites like StackOverflow and Answers ROS .