



# PAC02 JACKAL

Thank you Pace University for your Jackal robot! As part of the integration, we have prepared this quick reference sheet for you and your team detailing your specific package.

## SYSTEM OPERATIONAL TIPS

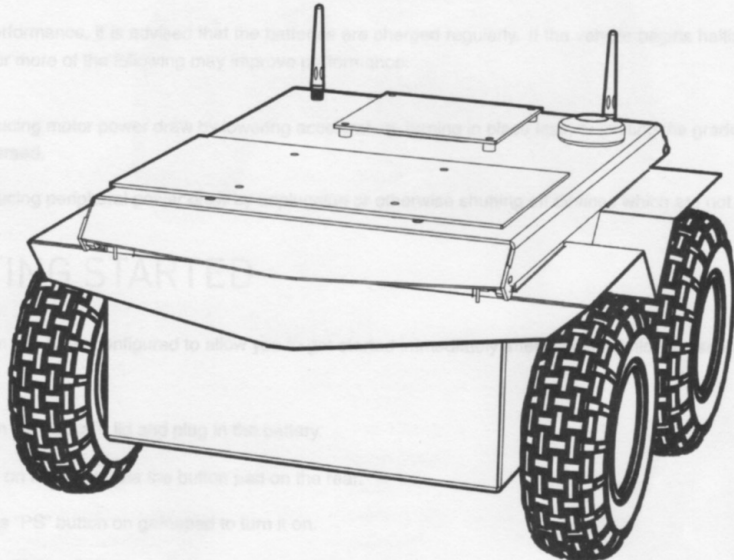
For best performance, it is advised that the batteries are charged regularly. If the robot exhibits halting unexpectedly, doing one or more of the following may improve performance:

- Reducing motor power when the robot is on a steep grade of terrain being traversed.
- Reducing motor power when the robot is on a steep grade of terrain being traversed.

## GETTING STARTED

Your system is configured to allow you to get started quickly. Follow these instructions to get started.

1. Open the battery cover in the battery compartment.
2. Turn the battery switch on the back of the robot.
3. Press "PS" button on gripper to turn it on.
4. Once Bluetooth is connected (solid white light), use the gripper to control the robot's motion.



UNIQUELY INTEGRATED PLATFORM  
CUSTOM ROBOT QUICKSTART GUIDE



## FROM THE DESK OF THE ROBOTSMITHS

Thank you Pace University for your Jackal order! As part of the integration, we have prepared this quick reference sheet for you and your team detailing your specific package.

## SYSTEM OPERATIONAL TIPS

For best performance, it is advised that the batteries are charged regularly. If the vehicle begins halting unexpectedly, doing one or more of the following may improve performance:

- Reducing motor power draw by lowering acceleration, turning in place less, or limiting the grade of terrain being traversed.

Reducing peripheral power draw by unplugging or otherwise shutting off devices which are not in use.

## GETTING STARTED

Your system has been configured to allow you to get started immediately after receipt. Follow these instructions to get moving.

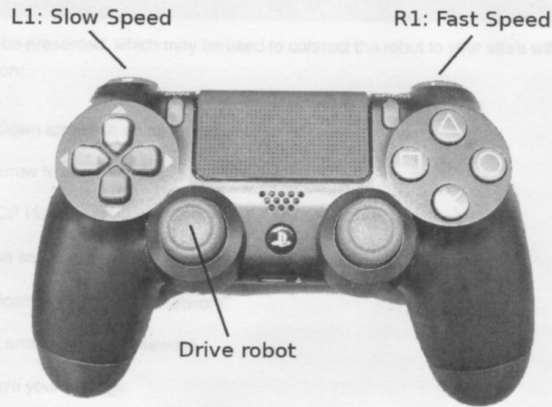
1. Open the Jackal's lid and plug in the battery.
2. Turn on the Jackal via the button pad on the rear.
3. Press "PS" button on gamepad to turn it on.
4. Once Bluetooth is connected (solid white light), use the gamepad to control Jackal's motion.

## WIRELESS

To set up the wireless communications on your Jackal, you must first establish a wired connection. Open the Jackal lid and release the computer tray. Using an Ethernet cable, connect your computer to an Ethernet port on the Jackal's computer and add a static IP on your computer to 192.168.131.15 (for example). If there are no free ports you may temporarily disconnect one of the ports on the robot computer with:

Enter the login password when prompted.

Accept the root access will message.



## NETWORK INFORMATION

Parameter	Value
Robot Static IP	192.168.131.1
Robot Hostname	cpr-j100-0390
ROS Version	Kinetic
Computer Username	administrator
Computer Password	clearpath
Serial Number	j100-0390
Velodyne VLP16 IP	192.168.131.20

## WIRELESS

To set up the wireless communications on your Jackal, you must first establish a wired connection. Open the Jackal lid, and release the computer tray. Using an Ethernet cable, connect your computer to an Ethernet port on the Jackal's computer and set a static IP on your computer to 192.168.131.19 (for example). If there are no free ports you may temporarily disconnect one of the payloads. SSH into the robot computer with:

```
ssh administrator@192.168.131.1
```

Enter the login password when prompted.

Access the wicd-curses wifi manager:



#### wicd-curses

A basic GUI prompt will be presented, which may be used to connect the robot to your site's wifi network. Follow these steps for the configuration:

1. Use the Up and Down arrows to choose your desired network
2. Press the Right arrow to enter the configuration page
3. Enable "Use DHCP Hostname"
4. Enable "Use these settings for all networks sharing this essid"
5. Enable "Automatically connect to this network"
6. In the "Key" field, enter your wifi password
7. Press "F10" to save your settings
8. Wait for your network to connect. Or, highlight your network and press "C" to connect
9. Press "Q" (capital Q) to exit wicd-curses

You may continue working on the robot via the wired connection, or disconnect the Ethernet cable and connect to it via wifi instead. When connecting to the robot computer by wifi, it should be accessible via its hostname:

```
ssh administrator@cpr-j100-0390
```

**If you are having trouble establishing or maintaining a reliable wifi connection, please contact your network administrator. Some building wifi infrastructures require special permissions to be granted before a connection is allowed.**

## COMMUNICATING WITH THE ROBOT

To communicate directly with the robot PC, you can SSH in. It will be necessary to ssh into the robot for tasks such as installing, modifying or removing software and files on the robot. Note that you will not be able to use GUI tools such as rviz over an SSH connection:

```
ssh administrator@192.168.131.1
```

OR

```
ssh administrator@cpr-j100-0390
```

In order to use rviz and other visualization tools, you must declare the robot as master, and set the user computer IP. In a console on the user pc, type:



```
export ROS_MASTER_URI=http://cpr-j100-0390:11311
```

You should then be able to view a list of topics published by the robot with:

```
rostopic list
```

It will be necessary to declare the robot as master in every new terminal window, unless you change the master permanently in your ROS environment variables. If you are unable to connect with the robot via its hostname, your computer or network equipment may not be routing hostnames properly. In Ubuntu on your local computer, open your `/etc/hosts` file:

```
sudo nano /etc/hosts
```

Add the following line immediately below the line that contains 127.0.1.1, substituting in the robot's current wifi IP address. This address may be obtained by connecting directly to the robot via Ethernet, and using the "ifconfig" command. You may want to talk to your system administrator about giving the robot a permanent wifi address to ensure it always connects with the same IP address. The below example shows the setting if wired directly into the robot lan.

```
192.168.131.1    cpr-j100-0390
```

To ease communications between the robot and your computer, you can also add a similar entry in the robot's computer, pointing at one or more development computers.

## SETTING UP YOUR WORKSPACE

There is a workspace installed in your robot for development and custom packages. You will likely want to be able to use these packages on your local machine. To do this, make a new folder on your local computer:

```
mkdir catkin_ws && cd catkin_ws
mkdir src && cd src
```

Then copy all of the packages from the robot to your local machine

```
scp -r administrator@cpr-j100-0390:~/catkin_ws/src/*
```

Now, make sure you have all of the dependencies needed to build these packages:

```
cd ..
rosdep install --from-paths src --ignore-src --rosdistro=$ROS_DISTRO -i -y
catkin_make
source ~/catkin_ws/devel/setup.bash
```



## ZED CAMERA

The ZED camera driver must be launched manually on the robot after ROS has finished booting. SSH into the robot, then launch the driver with:

```
roslaunch zed_wrapper zed_no_tf.launch
```

The ZED camera generates both a pointcloud and live image streams. This data cannot be viewed via ssh. Declare the robot as ROS Master, then from the command line:

```
rosvrun image_view image_view image:=/left/image_rect_color  
rosvrun image_view image_view image:=/right/image_rect_color
```

The ZED image streams may also be viewed from within rviz by clicking "Add," selecting the "By Topic" tab, then choosing the desired "/image" stream (NOT /camera).

The ZED Pointcloud may be viewed from within rviz by clicking "Add," selecting the "By Topic" tab, then choosing the "point\_cloud/cloud\_registered/Pointcloud2" topic.

## VELODYNE VLP16

The VLP16 is a powerful 16-beam 3D lidar. The data it produces is best viewed from within rviz, but you can check that it is publishing data using the hz command. The VLP16 should publish at a rate of about 10Hz:

```
rostopic hz /velodyne_points
```

The Velodyne will also publish a single-beam output to the /scan topic, also at about 10Hz:

```
rostopic hz /scan
```

The Velodyne data may be easily added to rviz, by navigating to the "Sensing" sub-folder and adding the relevant Velodyne topic to "LaserScan" and/or "PointCloud2."

## VISUALIZING IN RVIZ

You can visualize your robot using rviz. To do so, you must first move a copy of any extra customizations from the robot into a workspace on your local computer (See "Setting Up Your Workspace.") Then, source the workspace:

Declare the robot as ROS Master:

```
export ROS_MASTER_URI=http://cpr-j100-0390:11311
```

Launch rviz:

```
roslaunch jackal_viz view_robot.launch
```



You can rotate the model using your cursor, and zoom in or out by scrolling up or down. Strafe by holding down Shift and dragging the model. The robot itself may be driven directly from rviz by changing to interact mode. In this mode, arrows appear around the model. Drag the arrows to make the robot move.

Additional sensor topics may be added to the rviz interface by clicking the "Add" button in the bottom left, selecting "By topic," then choosing the desired topic from the list.

More information on rviz is available here: [wiki.ros.org/rviz](http://wiki.ros.org/rviz)



# LEARNING



If you are new to using ROS, please visit our support page for information on how to get started using your new robot: [support.clearpathrobotics.com](http://support.clearpathrobotics.com)

Please contact our support team directly at [support@clearpathrobotics.com](mailto:support@clearpathrobotics.com) if you have any questions that aren't answered on our support page. For ROS-specific questions, we recommend visiting [answers.ros.org](http://answers.ros.org), which we also keep an eye on.

## SYSTEM

Project Platform Date	PK252 Aurora (100-0250) Tuesday, March 31, 2020
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## NETWORKING TESTS

State	ID	Target
PASS	ClearnetIP_PingTest	192.168.1.1
PASS	PC3Networks_PingTest	192.168.1.100
PASS	MicroVMUP151IP_PingTest	192.168.1.128

## TOPIC TESTS

State	ID	Topic
PASS	BuiltinPG_arguments_AdvertiseTest	builtin_interfaces/msg/Bool
PASS	BuiltinPG_arguments_HelloTest	builtin_interfaces/msg/Bool
PASS	builtin_interfaces/msg/Bool/AdvertiseTest	builtin_interfaces/msg/Bool
PASS	builtin_interfaces/msg/Bool/SubscribeTest	builtin_interfaces/msg/Bool
PASS	builtin_interfaces/msg/Bool/PublishTest	builtin_interfaces/msg/Bool
PASS	builtin_interfaces/msg/Bool/SubscribeTest	builtin_interfaces/msg/Bool
PASS	ZED_zed_image_raw/subscribe_AdvertiseTest	sensor_msgs/Image
PASS	ZED_zed_image_raw/subscribe_SubscribeTest	sensor_msgs/Image

## MISCELLANEOUS TESTS

State	ID	Target
PASS	ROSVMTest	192.168.1.1





# SYSTEM

Project: PAC02  
 Platform: Jackal (j100-0390)  
 Date: Tuesday, March 31, 2020

## NETWORKING TESTS

Status	ID	Target	Notes
PASS	CustomerIP_PingTest	192.168.131.1	Verify IP Address
PASS	PCHostname_PingTest	cpr-j100-0390	Verify IP Address
PASS	VelodyneVLP161IP_PingTest	192.168.131.20	Verify IP Address

## TOPIC TESTS

Status	ID	Target	Notes
PASS	BuiltinGPS_navsatfix_AdvertiseTest	/navsatfix	Verify Topic Existence
PASS	BuiltinGPS_navsatfix_RateTest	10Hz	Verify Topic Frequency
PASS	VelodyneVLP161_velodyne_points_AdvertiseTest	/velodyne_points	Verify Topic Existence
PASS	VelodyneVLP161_velodyne_points_RateTest	10Hz	Verify Topic Frequency
PASS	BuiltinIMU_imudata_AdvertiseTest	/imu/data	Verify Topic Existence
PASS	BuiltinIMU_imudata_RateTest	75Hz	Verify Topic Frequency
PASS	ZED_zed_nodepoint_cloudcloud_registered_AdvertiseTest	/zed_nodepoint_cloud/cloud_registered	Verify Topic Existence
PASS	ZED_zed_nodepoint_cloudcloud_registered_RateTest	15Hz	Verify Topic Frequency

## MISCELLANEOUS TESTS

Status	ID	Target	Notes
PASS	ROSWTFTest	N/A	General ROS Test



## PLATFORM

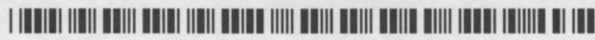
Serial Number



j100-0390

## BATTERIES

Serial Number 1



100103000678

## MINI-ITX

Serial Number



JUPC00045

## VELODYNE VLP16 1

Serial Number



11002200220217

## ZED

Serial Number



4853772