



# **AMP-I User Manual**

Hstar Technologies Corp.



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# Quick Start

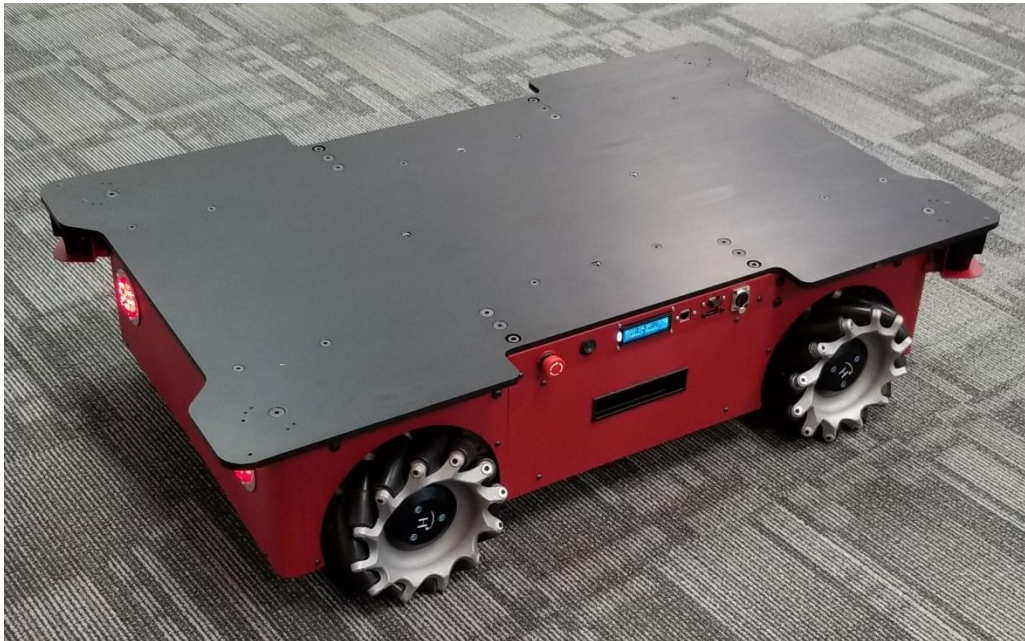
On the Switch Panel,

- the 'ON/OFF' switch (❶) turns on the PC and logic power
- the 'Emergency Off' switch (❷) controls power to the motors (push-in: off, pull-out: on )

**Note:** a script to automatically run the base driver will run when the EMO switch is pulled out (within 10-15 seconds), but there may be a timing issue which only occurs once while the PC is booting up, so if not all motors respond after turning on the base, you may need to push in & pull out the EMO once.



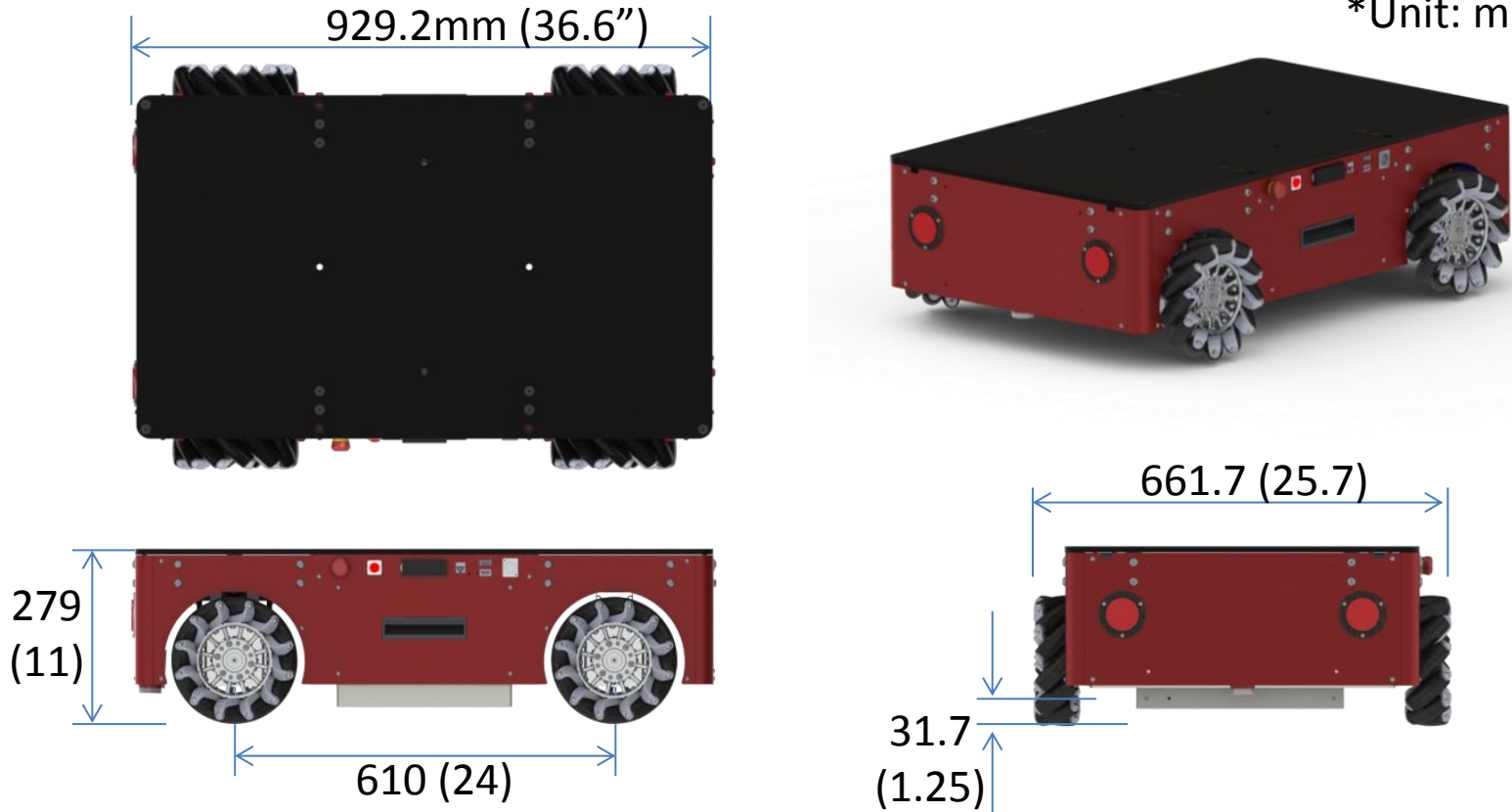
# System Specifications



<b>Max Payload</b>	<b>400 lbs.</b>
<b>Top Speed</b>	<b>4 mph</b>
<b>Climbing</b>	<b>15° (w/o payload)</b>
	<b>5° (max payload)</b>
<b>Run Time</b>	<b>2 hours continuous operation</b>
<b>Main voltage</b>	<b>24v</b>
<b>Weight</b>	<b>200 lbs.</b>
<b>Terrain</b>	<b>Paved, tiled, carpeted surfaces</b>
<b>Acceleration time</b>	<b>&lt;2s</b>
<b>Braking time</b>	<b>1s</b>
<b>Dimension L x W x H</b>	<b>41.5" x 25.7" x 11"</b>

# Key Dimensions

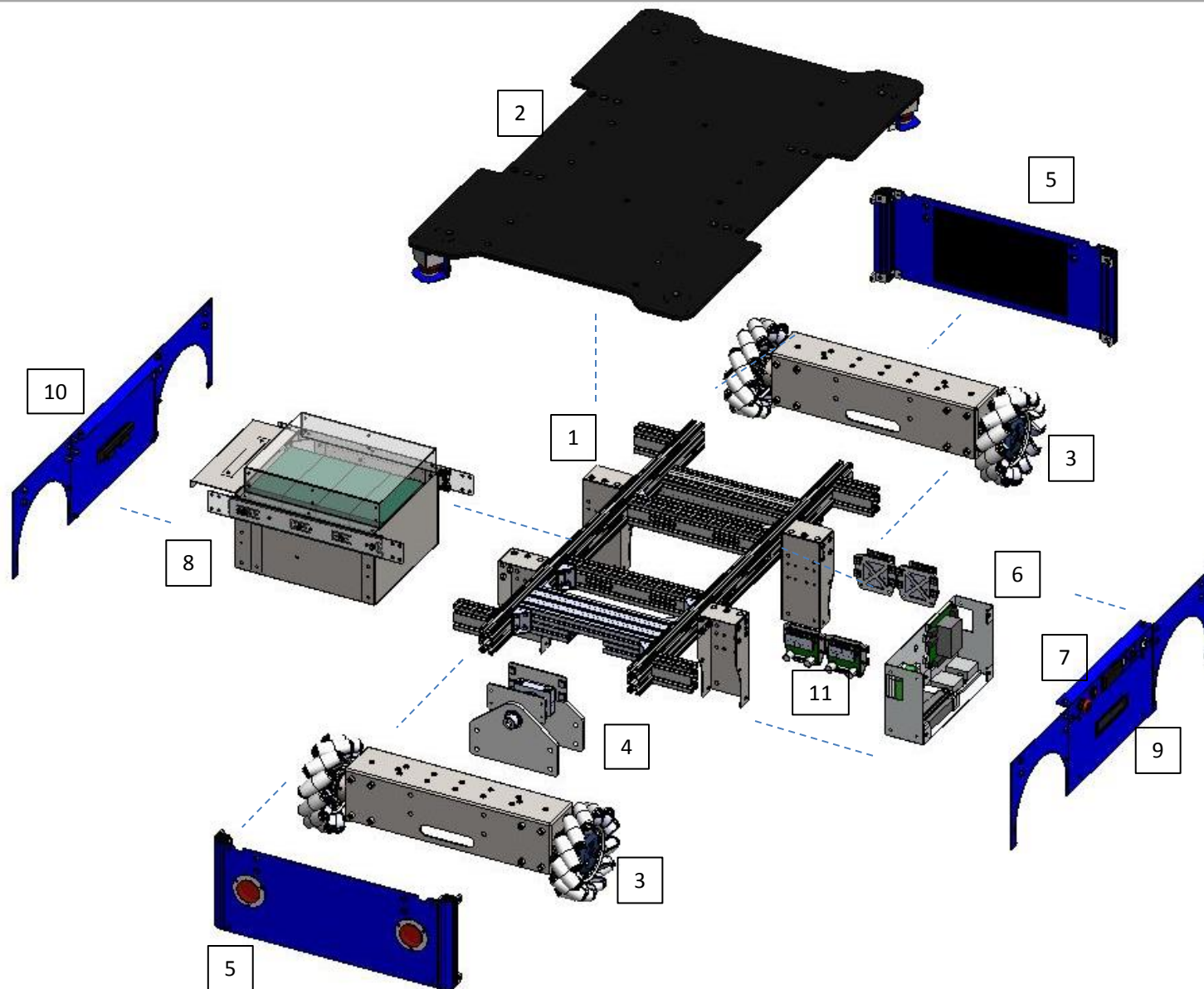
\*Unit: mm (inch)



**Wheel base:** AMP-I has a wheel base (contact point to contact point) of 24 inches Front-Back, and 23 inches Left-Right Wheel center-to-center.

**Ground clearance:** AMP-I must be able to pass over objects (between the wheels) up to 1.25 inches high without making contact.

# Hardware System



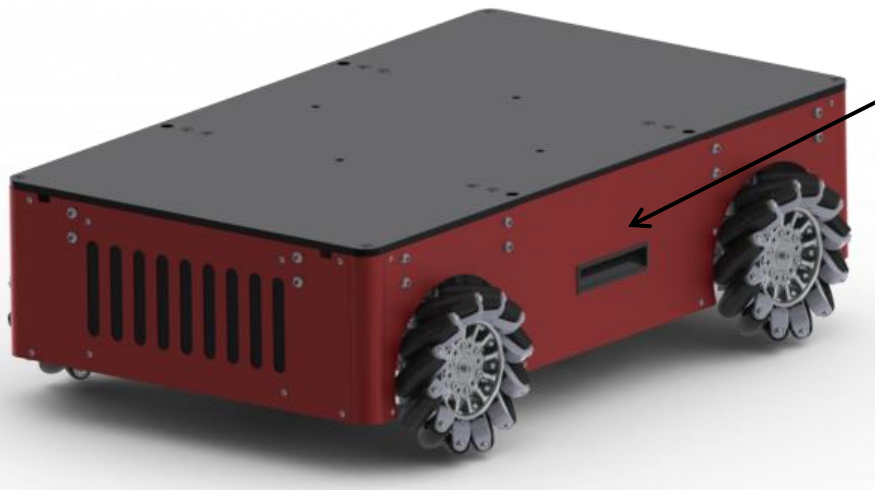


# Hardware System

Part Number	Part Name
1	Chassis
2	Plate – Top, Bracket-Hokuyo, and Hokuyo
3	Assembly – Wheel
4	Bracket – Hinge
5	Cover – Front & Rear
6	Housing – Electrical
7	Panel – Electrical Switch
8	Holder – Battery
9	Cover – Electrical
10	Cover – Battery
11	Controller - Motor

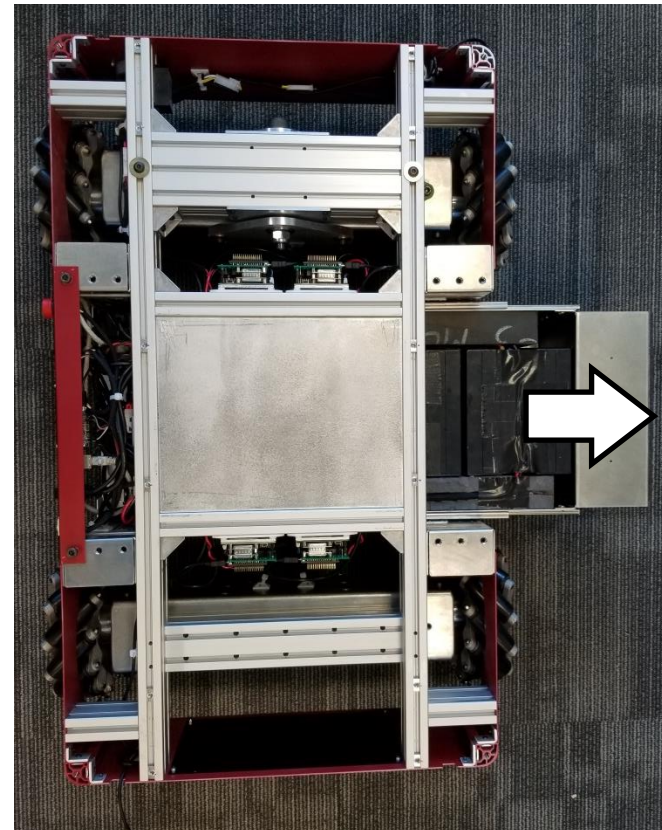


# Battery Package



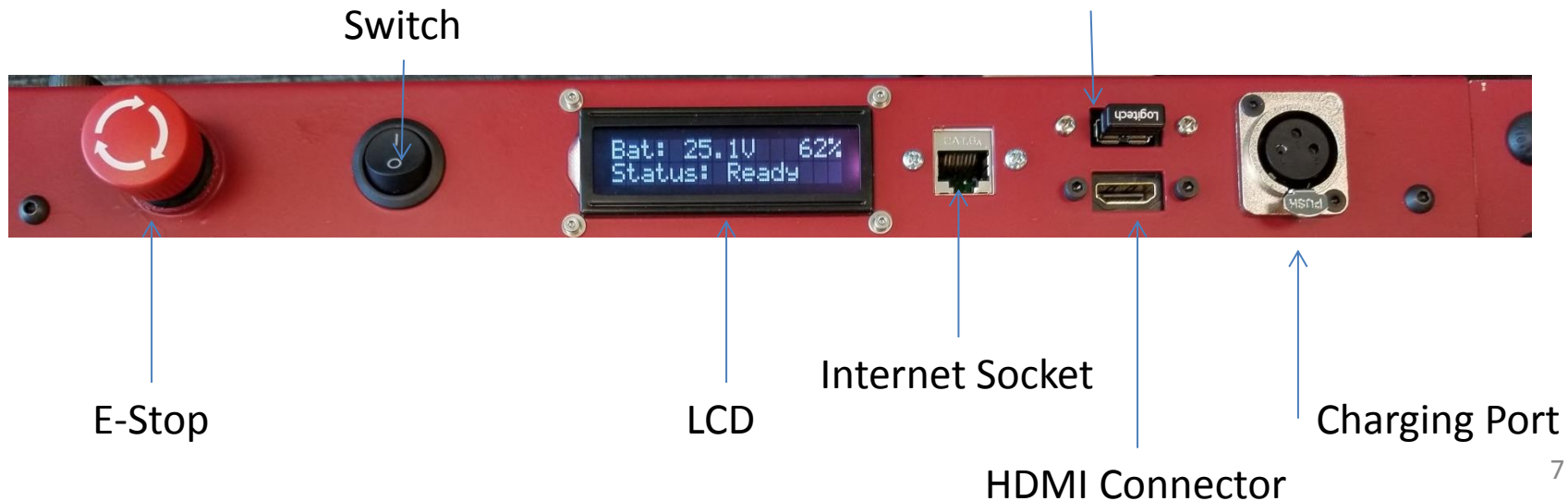
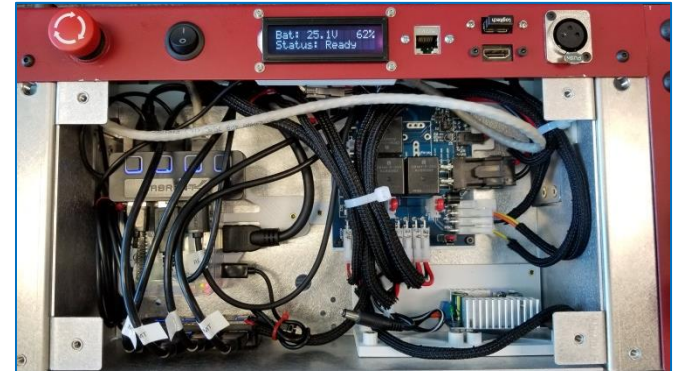
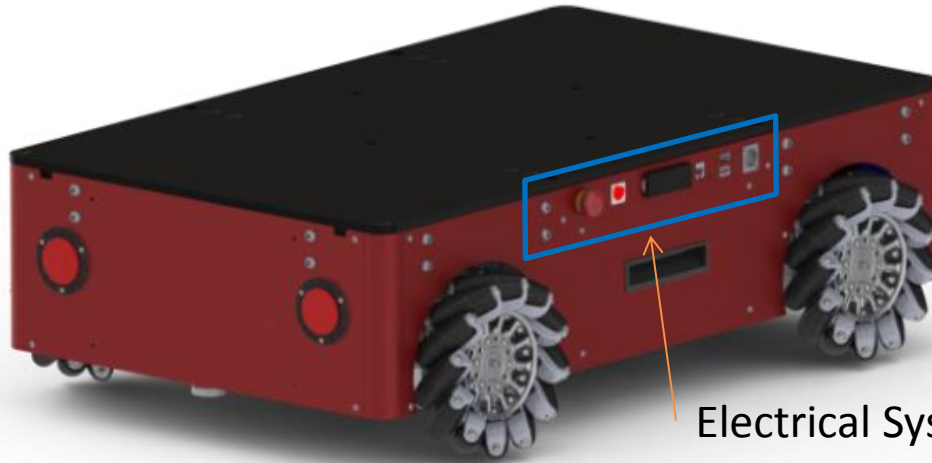
Battery Package Access Panel

Slide the Battery Package Holder  
out to access

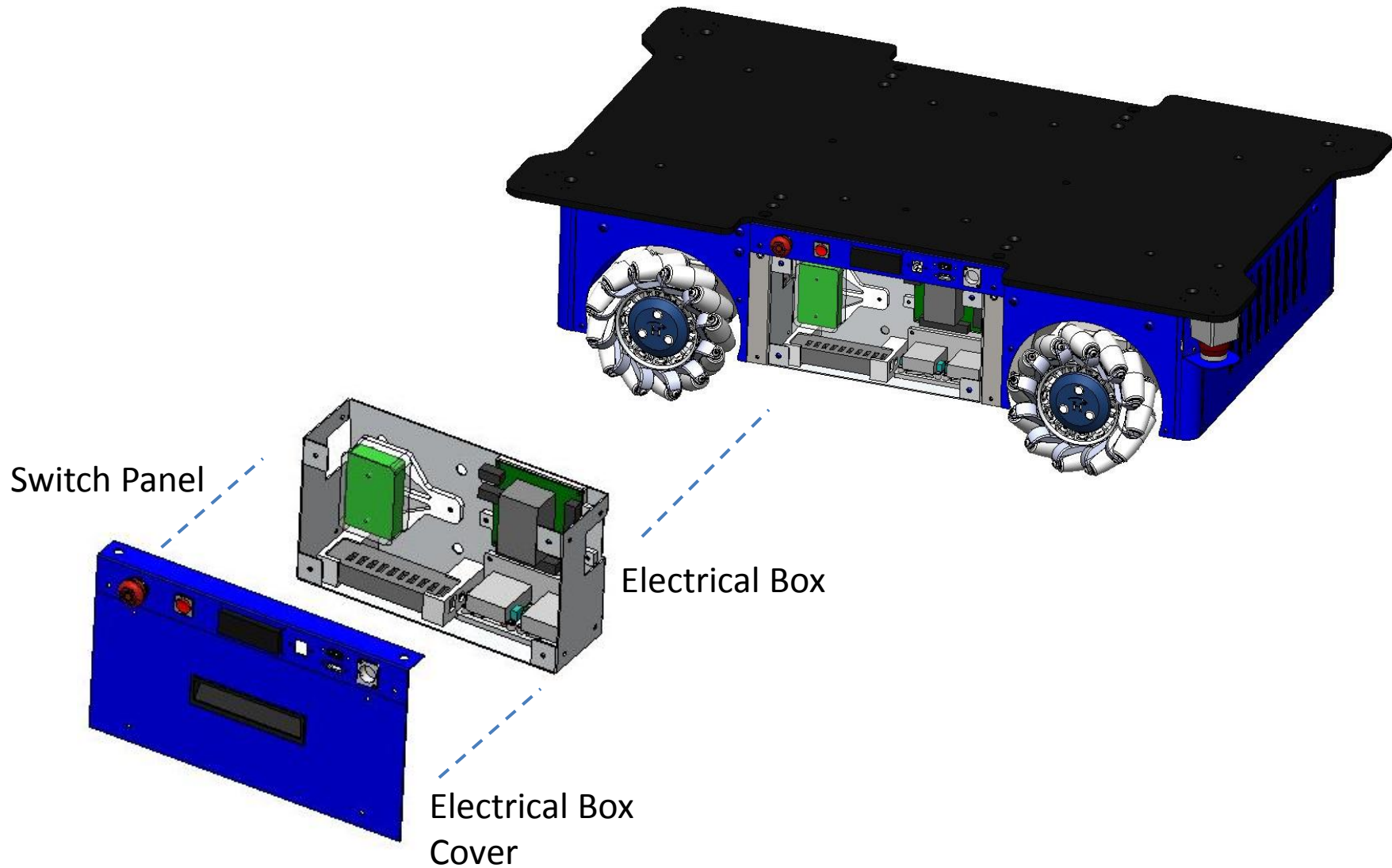




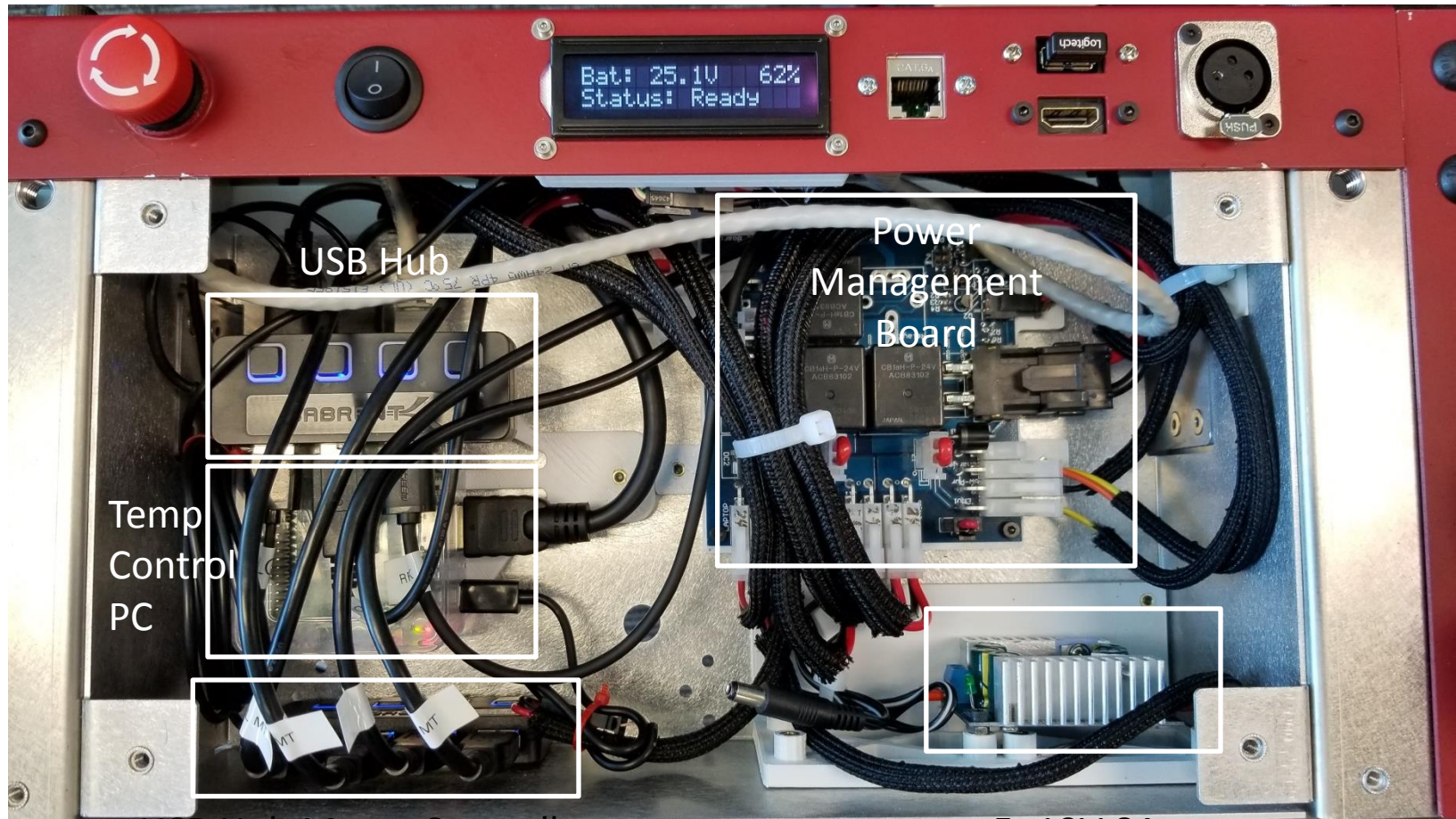
# Switch Panel & Electrical Parts Access



# Switch Panel & Electrical Parts Assembly



# Control Panel & Electrical Parts



USB Hub

Power  
Management  
Board

Temp  
Control  
PC

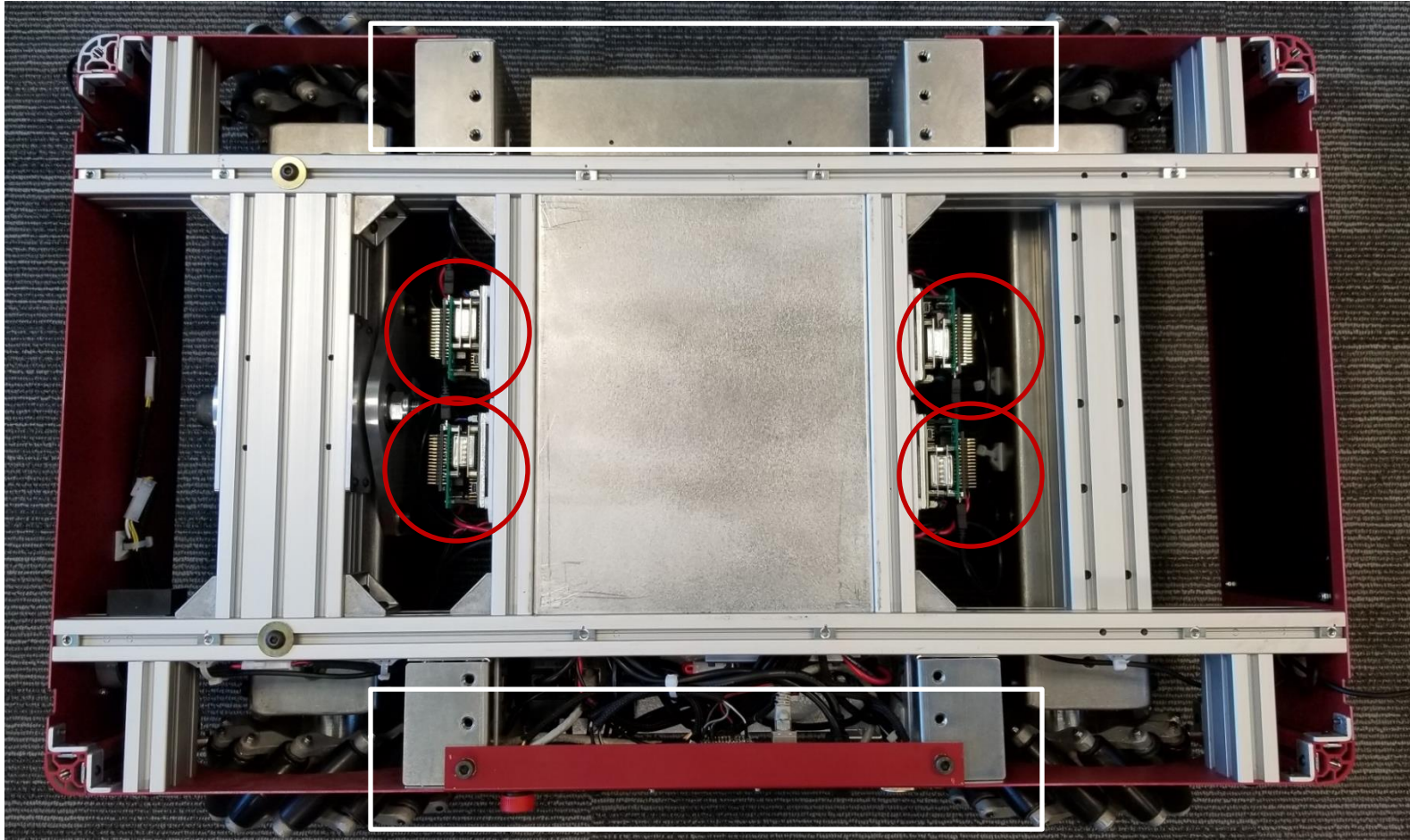
USB Hub Motor Controller

5~19V 8Amp  
Regulator



# Control Panel & Electrical Parts Access

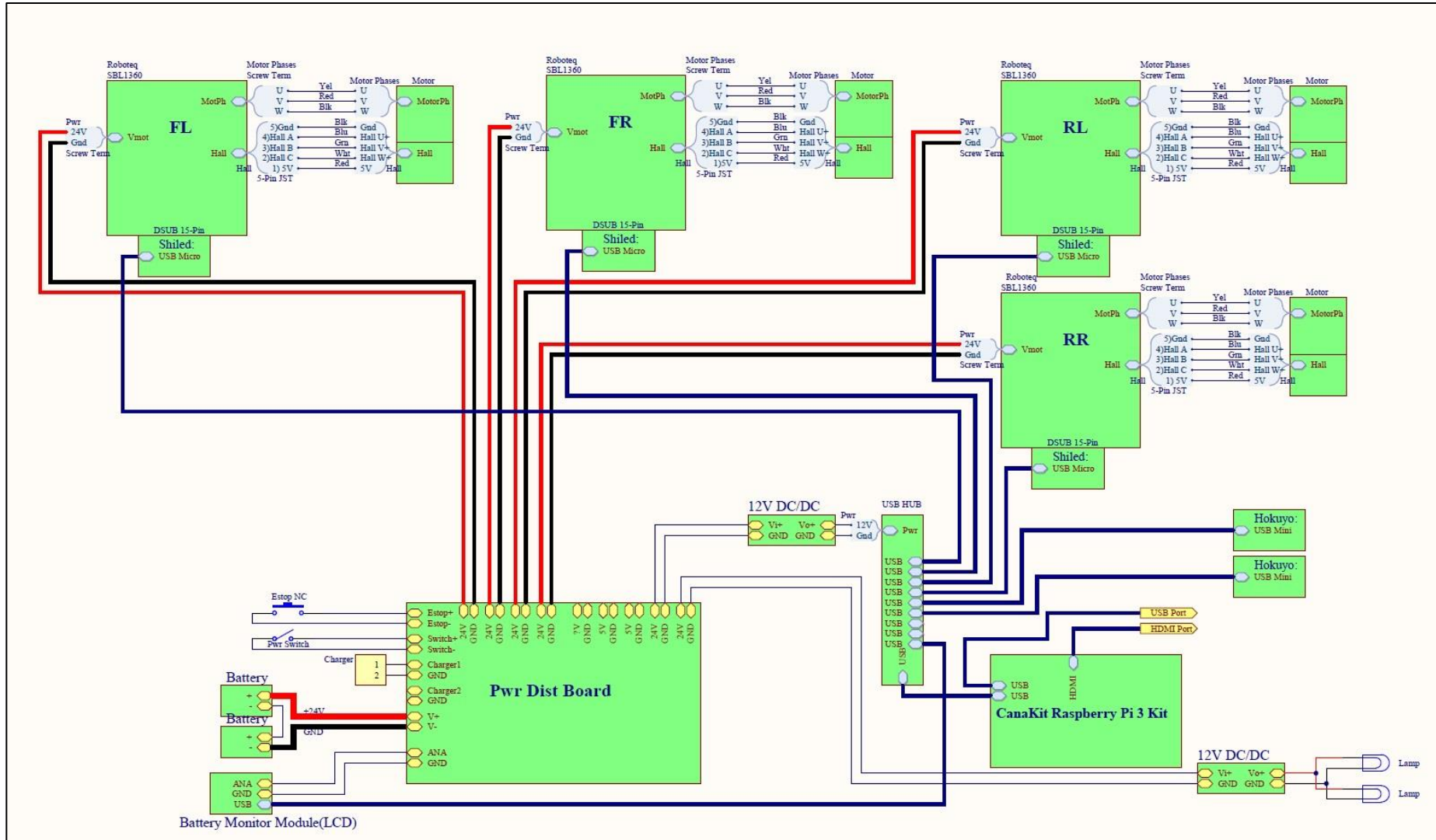
Battery Package Access



Control Switch Panel & Electrical Parts

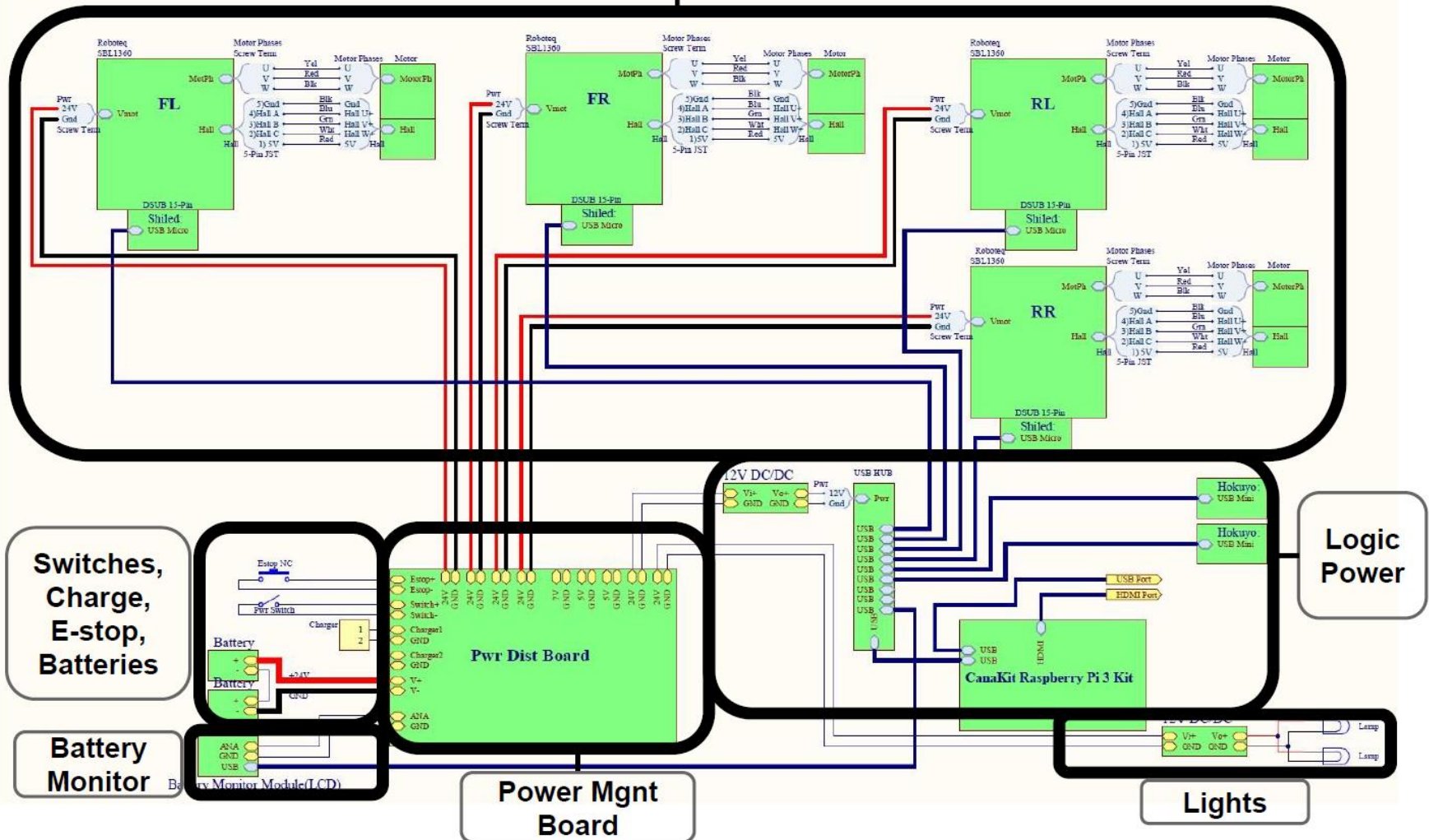
 :Motor driver

# Electrical Diagram



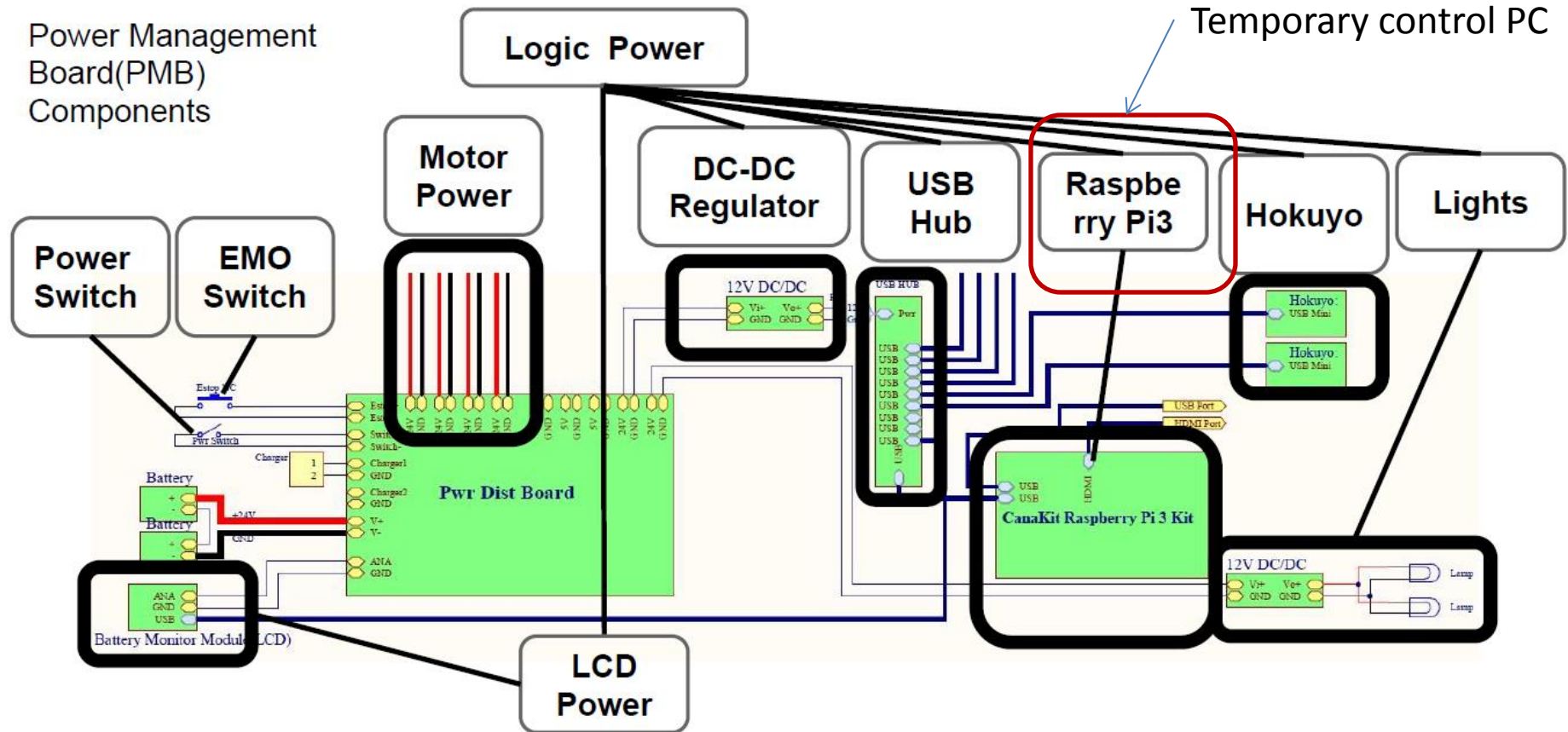
# Electrical Diagram

## Motor Power



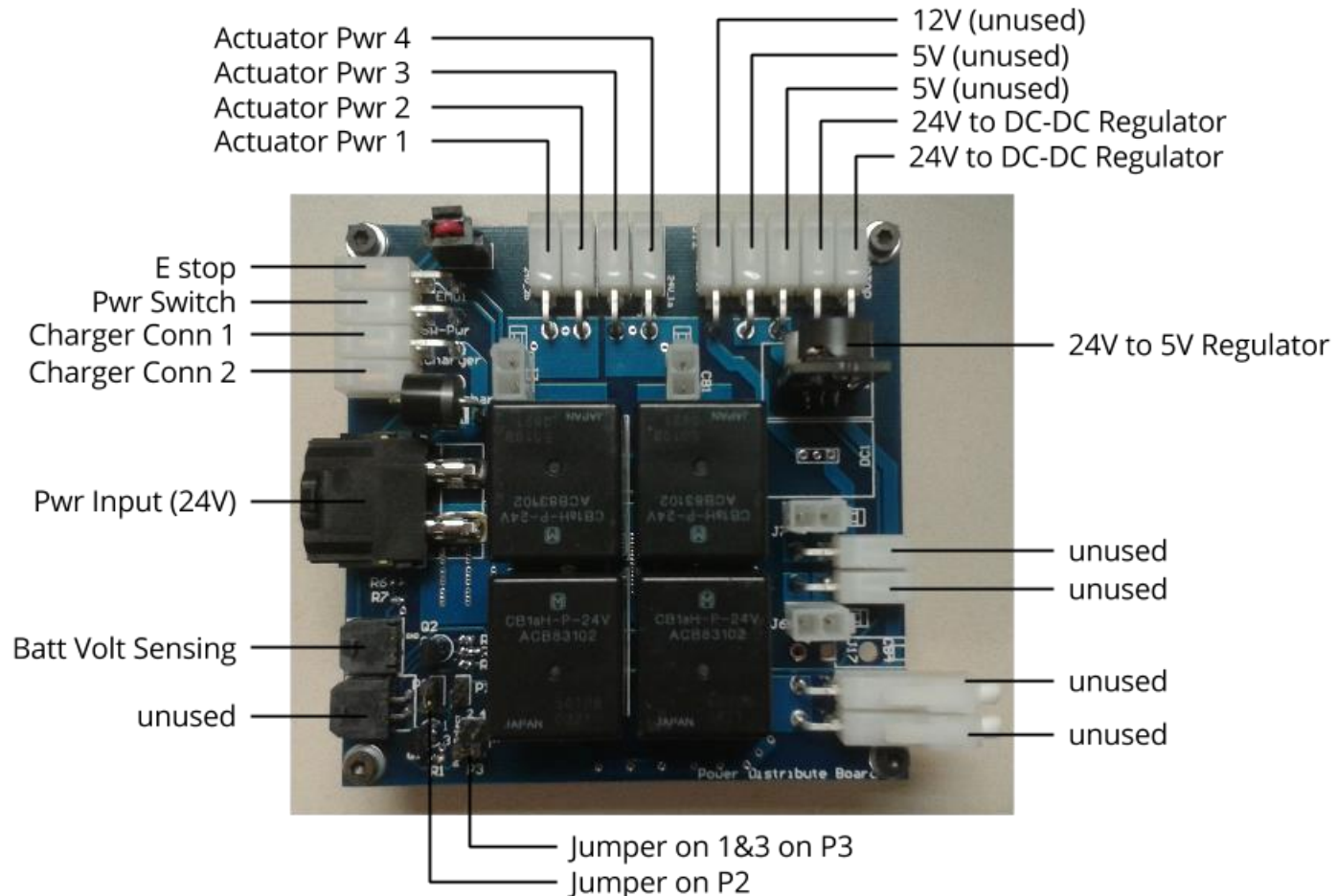


# Electrical System

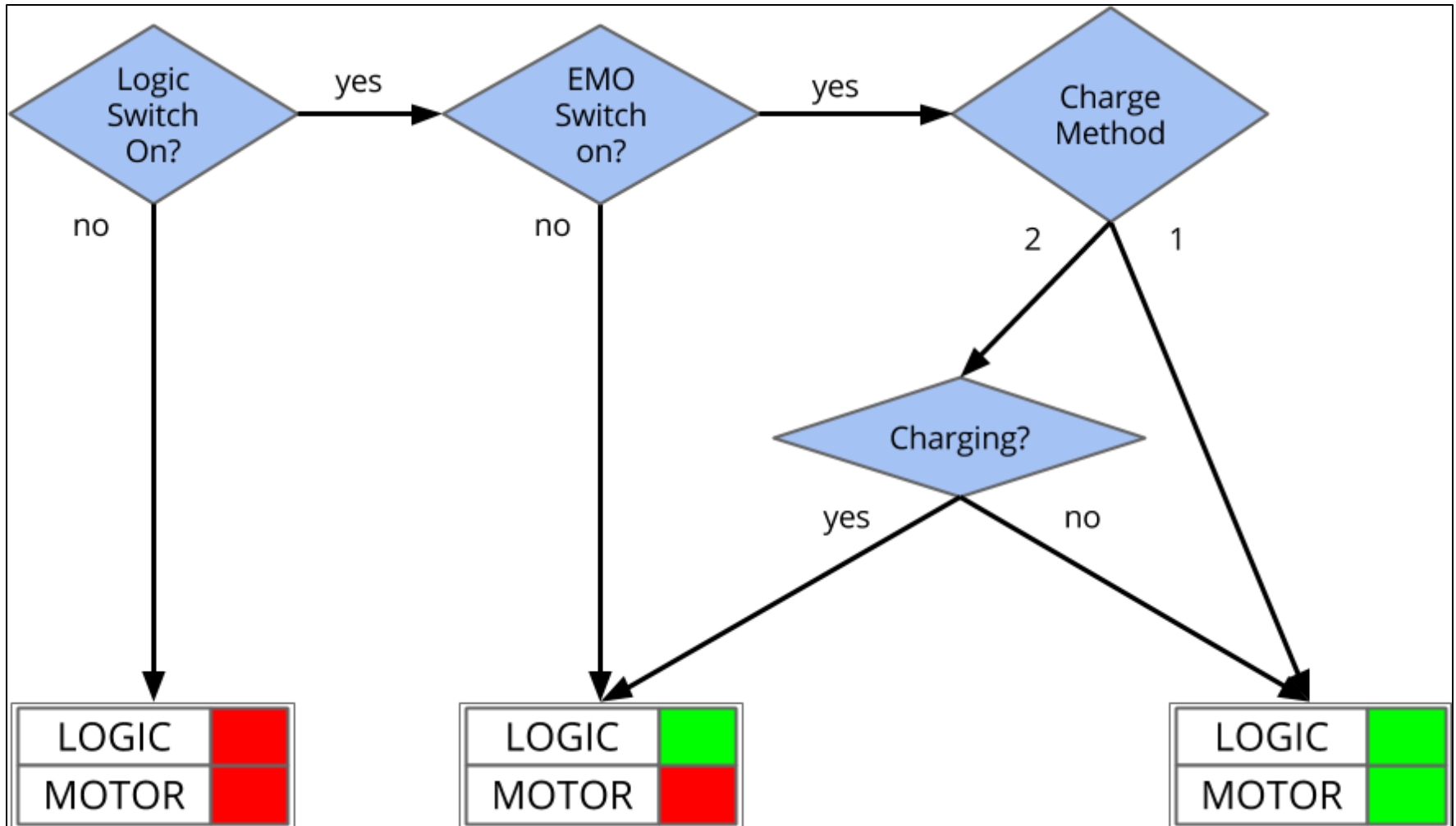


# Electrical System

## - Power Management Board



# Electrical Diagram

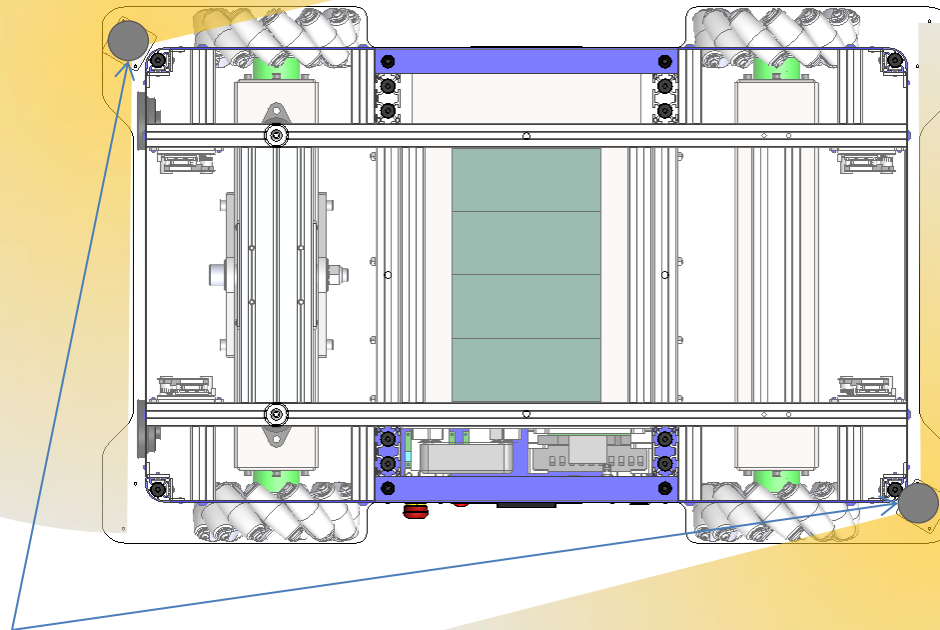


# Charging



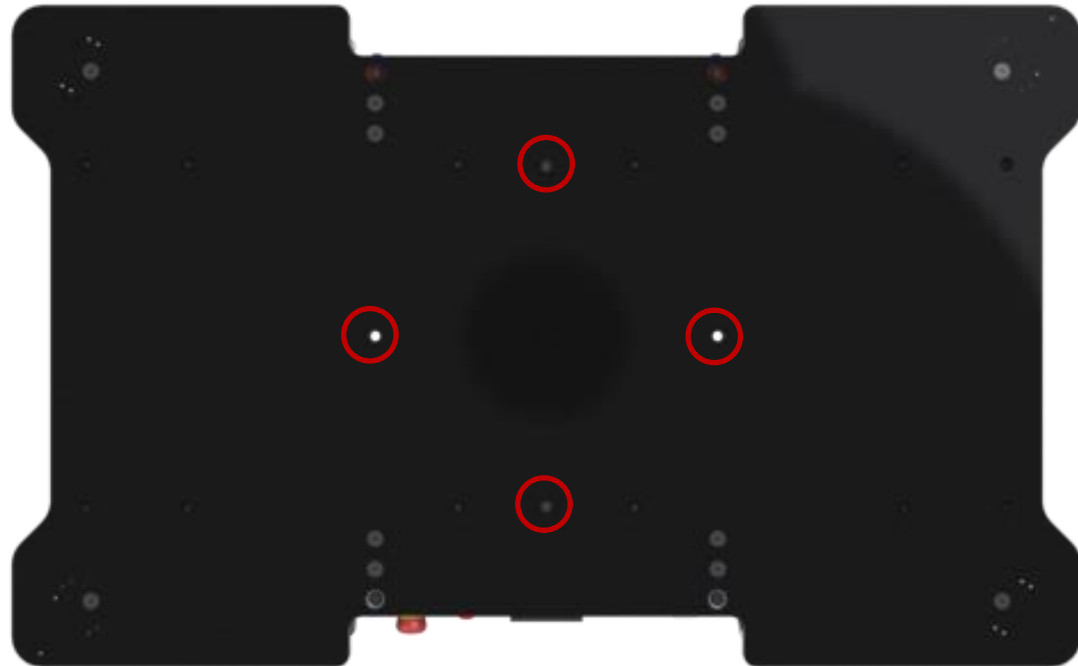
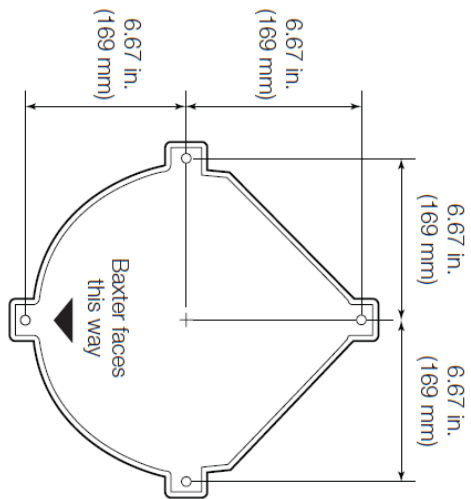
- Charge using a standard U.S. (120V AC) outlet only.
- Use the charger supplied by the manufacturer to charge this device.
- Do not use a charger with a damaged cord or plug.
- Charge indoors only.
- Never handle chargers with wet hands.

# Hokuyo for Auto Navigation



**Laser Sensor Locations**

# Baxter Mounting Holes (M10)





# Control

AMP -I mobile platform consists of four actuators in a mecanum wheel drive configuration. By the coordinated control of these four motor drives, a full holonomic motion control of the platform is possible.

All four motors may be independently controlled using the communications bus (serial port, CAN interface, etc). The drive motors are controlled by giving a speed command through an angular position command. An auxiliary “effort” command can also be given to all motors and is primarily used for coordinated kinematic control.

The details of the AMP-I Control Architecture can be found from [https://bitbucket.org/hstartechnologies/hstar\\_amp](https://bitbucket.org/hstartechnologies/hstar_amp).



# Control

## (Ubuntu 14/16.04)

- Install ROS if not already installed (<http://www.ros.org/install/>)
- Clone the AMP driver package  
git clone [https://bitbucket.org/hstartechnologies/hstar\\_amp.git](https://bitbucket.org/hstartechnologies/hstar_amp.git)
- Add that package to your ROS\_PACKAGE\_PATH, if you didn't clone it into a ROS working directory  
echo "export ROS\_PACKAGE\_PATH"=<path\_to\_amp\_package>:\$ROS\_PACKAGE\_PATH" >> ~/.bashrc  
source ~/.bashrc  
rospack profile
- Connect the robot to your network via the ethernet jack
- Assuming you're not already on the 10.1.10.0 subnet, create an interface on your machine in that subnet  
sudo ifconfig eth0:0 10.1.10.[pick a number 0-255, not 74]  
replace "eth0:0" with a different interface, if your computer is not using ethernet (ex. wlan0:0 if you're on wifi)
- Check if you can see the robot on the network  
ping 10.1.10.74
- (Optional) Add the robot's computer to your /etc/hosts file (robot's hostname is amp-wpi)
- Set your ROS\_MASTER\_URI to the robot's computer  
export ROS\_MASTER\_URI=<http://amp-wpi:11311>
- Open Rviz with the preset configuration file  
roscd hstar\_amp  
rviz -d robot\_description/amp.rviz

# Joystick Control

\*NOTE - XInput/DirectInput (❶)

Please check the console ports to be set on 'X'.

- **Left Analog Joystick (❶):** control x- & y- velocity of the AMP-1
- **Right Analog Joystick (❷):** controls the rotation (z-axis)

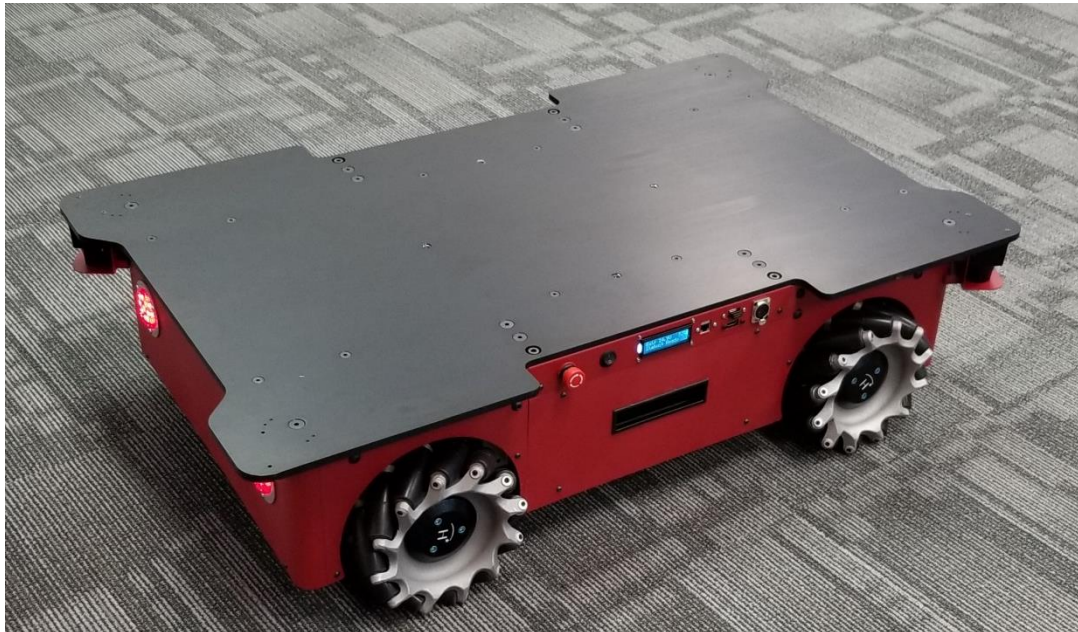
\*With no (❸ or ❹) buttons pressed, speed is limited to 1/3.

\* With either ❸ or ❹ pressed, speed is full.



# Transportation and Unpacking

- Use an appliance dolly when moving AMP™-I.
- Protect outside finish of AMP™-I during transport by wrapping shell in blankets or inserting padding between the AMP™-I and dolly.
- Secure AMP™-I to dolly firmly with straps or bungee cords.



# Please Note:

- **Turn off the Power Switch when the robot is not being used.**
- Temporary: The AMP-I contains a Raspberry PI 3 Model B installed with Ubuntu Mate 16.04.2 and ROS Kinetic. It is set with a default IP address at 10.1.10.74. Log in via SSH with username/password "user/user".