RP2W Robot
Setup, Operation, Maintenance

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SuperDroid Robots
RP2W Robot

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Contents

1   Unpacking:

1. The robot is shipped in a wooden crate.

2. The marked screws along the side need to be removed and the lid removed and set to the side.

3. Remove all the cross bracing.

4. Remove the robot from the box.

5. Stand the robot upright.

6. All the support parts (chargers, gamepad controller, etc) are also in the box.

7. Unpack all the parts.

2   RP2W Preparation:

1. Place the robot on blocks so the wheels are free to spin and the bumper switch is free. This is important for the initial setup and operation.

2. Ensure the power switch on the side is in the off position. The switch is inside the caster wheel cavity on one side. The charger port is on the other side.

3. The battery should be fully charged. The laptop gets charged from the robot (the robot must be turned on for the laptop chargers to come on)

4. Charging is discussed in detail in a later section.

3   Setup Preparation:

1. There are a series of setup up and operation videos posted on YouTube that will assist in the setup and operation of the robot. These videos should be watched in conjunction with this manual. Go to www.youtube.com and search "RP2W Mobile Robot Video Conference"

   http://www.youtube.com/watch?v=zcmP57ibLYI
   http://www.youtube.com/watch?v=lGrxqegC1Ss
   http://www.youtube.com/watch?v=cyRgy2-9HKc
   http://www.youtube.com/watch?v=rEs261LnpMo

4   RP2W Server Setup:

1. The robot's network connection is handled through the laptop.

2. The embedded components and motors draw power from the robot's main batteries. Therefore, the robot should be turned on first.

3. Next power the laptop and let it boot up.

4. Connect the laptop to your wireless network. To make connection more consistent, it is recommended to set a static IP address. An example is shown below.
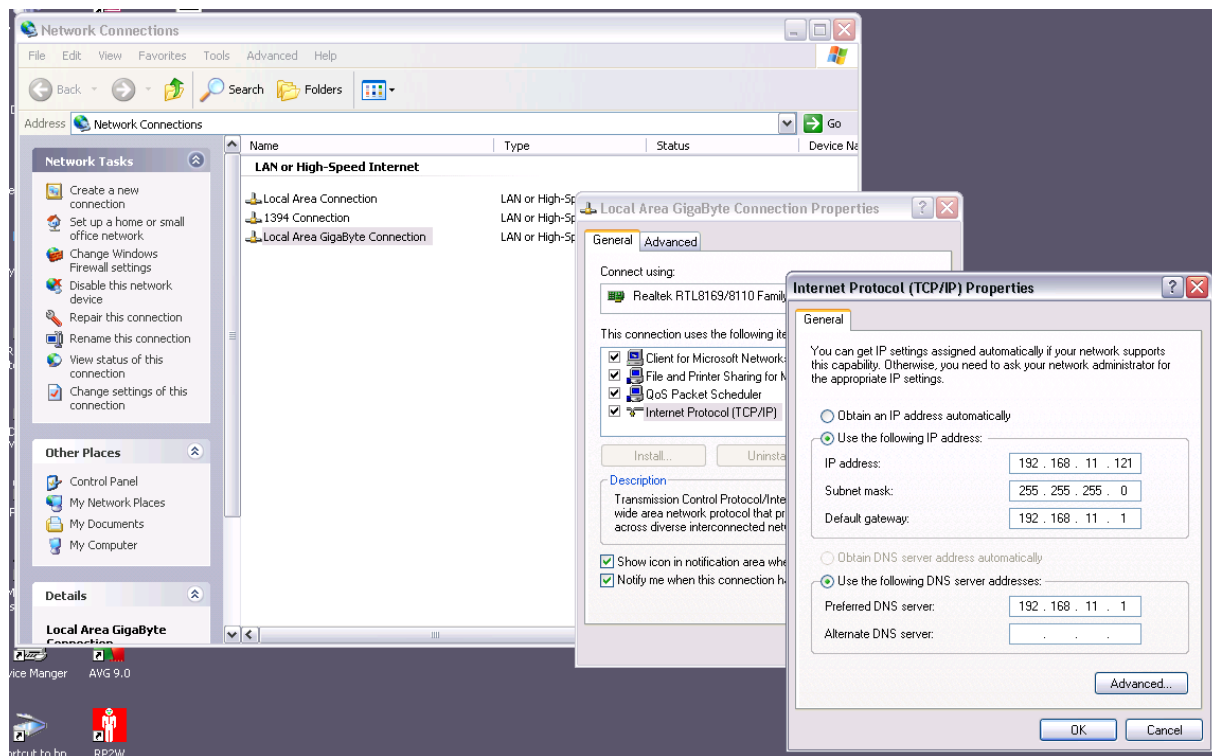
5. The robot comes with a laptop setup and configured with the necessary software and settings. So once it's configured to your router, its ready to run.

6. To test basic operation it is suggested to run the robot through its laptop to ensure proper operation before attempting to control it over a network. Doing so can simplify troubleshooting.

7. Start the RP2W software from the desktop icon. The program should be configured properly with the exception of the IP address port number. Go to the menu and select tools>Change Settings. Select communication tab. (If the robot is set up to wait for remote connection the form will be greyed out, you must uncheck this to get local control)

    a. None of the timer settings should be changed initially.
    b. The "Run As" setting should be "Server (Robot)"
    c. Change the remote connection port to correspond to your router configuration.
    d. As an option the checkbox for "Enable Remote Controlling after Startup" can be check if you wish the program to start right up and go to a standby mode waiting for a connection for the client. Further more you can put a shortcut icon for the RP2W program in the Windows startup menu, so when the computer boots up it starts the program and goes right to an enabled mode for a remote connection.
    e. Select the audio and video connection. There are multiple selections, make sure the USB camera on the mast is selected for audio and video.
    f. Select a low resolution format to begin with to ensure minimum latency. Since streaming video can be demanding on a network, it is suggested to incrementally increase the video resolution to the best possible setting while not compromising the data stream. An example screen shot is show below:
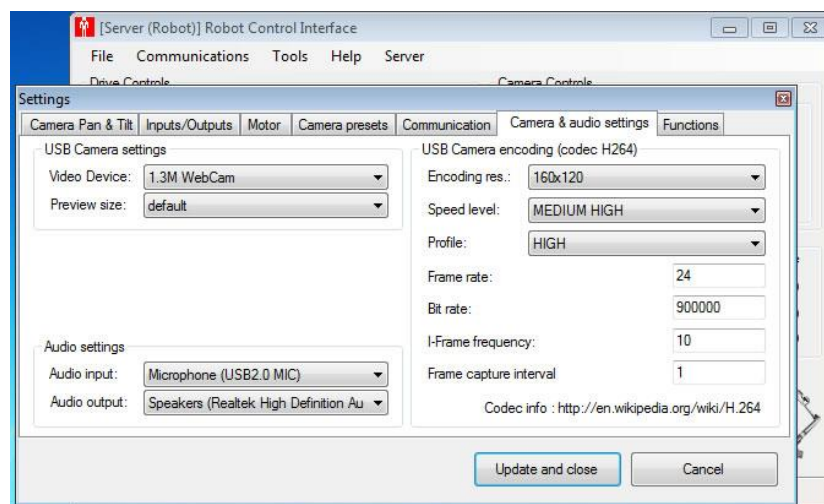
    g. The camera setting on the robot can be changed remotely from the client PC once connected.
    h. Select the COM port for the USB to serial cable that is used to control the robot.
    i. Select Update and Close to save the settings.

8. The robot is now waiting to run. To start communication between the robot and the laptop go to the communications menu and select "Data COM Enabled". (If the robot is set up to wait for remote connection the form will be greyed out, you must uncheck this to get local control)

9. The program should show actual values and the be linked to the robot.

10. The included Logitech Gamepad F310 is recommended for control of the robot.

11. If no gamepad controller is used you can simply use your mouse and move the controls to drive the robot. If using your mouse to drive, click on the drive pad to drive the robot (driven enabled must be checked). Right click on the touch pad to center the controls (stop driving)

12. The following are the functions of the gamepad controller:

	Drive Controls
Right Bumper (RB)	Hold to enable robot drive
Right Joystick	Robot drive
Back Button	Toggles half speed and full speed modes
	Camera Control
Left Bumper (LB)	Hold to enable camera pan and tilt movement
Left Joystick	Camera pan and tilt
D-Pan	Incrementally change the position of the cameras pan and tilt.
Left Shoulder + X, A, B or Y	Switches between the camera presets. These can be configured in the software client.
	Auxiliary Controls
X (Blue), A (Green)	Pan and tilt power. These will automatically turn on and off as you pan and tilt with the joystick. The timer settings for the pan and tilt power can be changed in the program options.
B (Red)	Toggles the lights on the camera assembly
Y (Yellow)	Toggles the laptop charger relay.
Right Shoulder	Mute Microphones
Start Button	Hold to override all limits

13. Once the robot has been tested, it can be put in standby mode waiting for the client to connect.

14. Once the gamepad is removed from the robot restart the program.

15. Start by going to the communications tab and ensuring the COM port is disabled. Then go to the Server menu and select Enable Remote Controlling. The program will now wait for a remote connection from the client.

5   Server (The Robot's) Router:

1. In order to provide a connection from the client to the robot from any internet connection, the network that the robot is connected to needs to be configured to forward a port to the robot.

2. The router needs to have an ISP (Internet Service Provider) connection to the WAN (Wide Area Network) port. A static IP address is recommended so the client does not need to keep track of a dynamic/changing IP address. Most ISP providers will provide a static IP address if requested.

3. If the robot is only going to be used on a local network (ie client and server on the same network), then the port forwarding router setup is not necessary.

4. The office/home router needs to be set up to port forward to the static IP address of the RP2W Robot. Six (6) ports must be set aside for the robot to properly connect to the client. An example screen shot of this is shown below. **The ports need to be open on both the robot's router and the client's router**
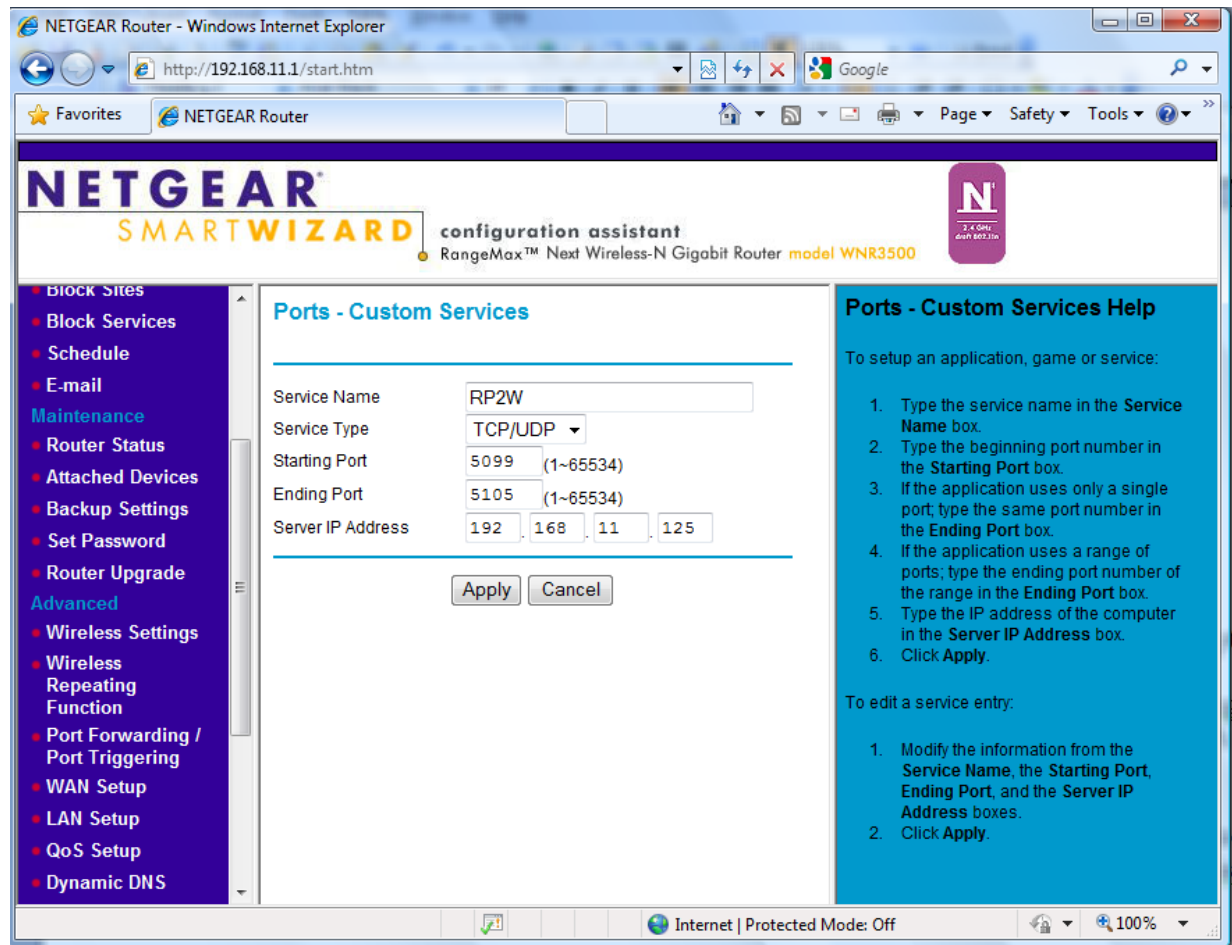
5. The client will then use the ISP address of the network router and the beginning port number to connect.

6   Client Setup:

1. A USB web camera needs to be installed on the client computer. The integrated webcam on most laptops works best. Third party USB webcams tend to have special features like facial tracking/zooming, etc. These will likely additional latency since they demand additional resources. The simplest USB webcam is suggested.

2. The Logitech USB gamepad should be connected. Windows 7 and 8 should automatically recognize the gamepad and install the appropriate drivers.

3. Run the setup program provided on the CD.

4. During the installation you will be prompted to install two programs. One is for installing DirectX and the other is for installing the .NET framework. These two components may or may not be already installed on your system. They are required for the program to function properly and links are provided during the installation process but they can also be found on Microsoft's website.

5. After the program and its dependencies are installed it will be ready to run.

6. Start the RP2W software by using the desktop icon or using Windows Search. The program will require configuration since it's a clean install. Go to the menu and select tools > Change Settings. Select communication tab.

   a. None of the timer settings should be changed initially.
   b. The "Run As" setting should be "Client (Remote)"
   c. In the "Remote Control Connection" section, the IP address and the port of the Server (Robot) should be input. If the robot is going to be run locally on the same network, then just the local IP address of laptop should be used. (Local use is recommended for initial testing and setup to eliminate port forwarding and router setup issues). If connecting remotely, then the ISP of the server (Robot) should be used. In either case the port number needs to be entered. It should be the starting port number and should be the same on the robot setup and router setup.
   d. Select the audio and video connection. There are multiple selections, make sure the USB camera on the mast is selected for audio and video.
   e. Select a low resolution format to begin with to ensure minimum latency, etc. An example screen shot is show below:
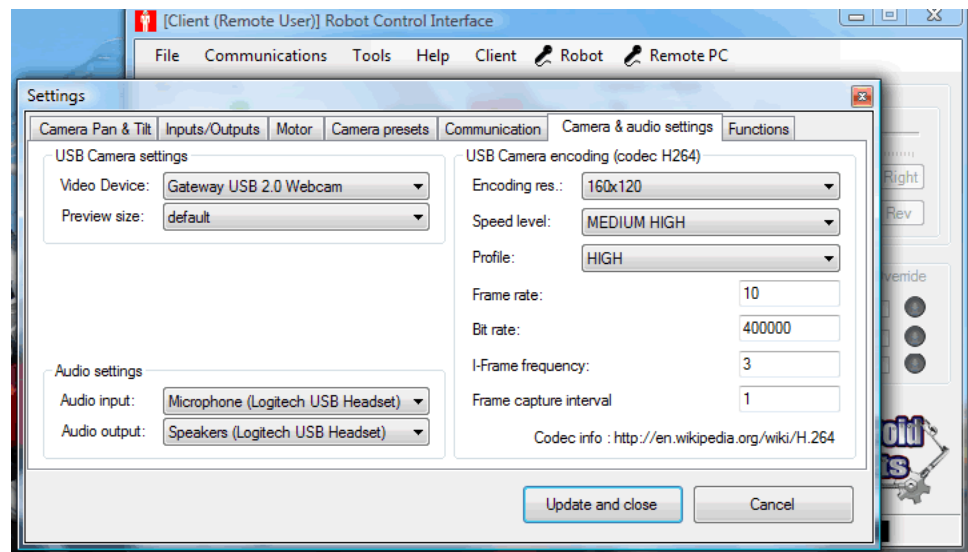
   f. Select Update and Close to save the settings.

7. The client should now be ready to connect to the robot. The robot needs to be ready for a remote connection described above.

8. Under the menu Client, Select "Connect to Remote Device" It will takes a few seconds for a connection to be established and latency will spike during setup. The latency should pop up a value, the Robot's WiFi signal strength and Laptop Battery Status should display on the Client Form.

9. After a connection is established to the robot, click on the Communications Menu and select "Data COM Enabled" to allow data to stream from the application to the robot. The controls of the robot are the same as described above when driving the robot in local mode.

10. Next to set up the camera, under the client tool menu, select enable local webcam Stream

11. To view the cameras go to menu Tools, show remote camera window. The image from the robot's web camera should appear. You can also select show local camera from the same tools menu and display the local camera (this is the camera view that will display on the robot). The local camera does not need to be displayed on the client, its just there for setting up the camera focus, etc.

12. To display the client's local camera view onto the robot, under the client tool menu, select "Switch Robot to Video Conference Mode". This will display a full screen shot of the clients camera view on the robots laptop screen.

13. When done. Turn off the COM port in the communication menu. Close the camera windows. Under the client tool menu, select "Close VideoConf Mode on the Robot", then select disconnect.

7   Troubleshooting:

1. If the robot will not run

   - From the client, make sure the robot will run locally.
   - Ensure the settings are correct for all the IP address and ports on the robot setup, router, and client.
   - Make sure the robot's form is not locked up, if it is, close the program and restart it.
   - Try repairing the network connections
   - Disconnect, wait about 30 seconds and try reconnecting from the client
   - Ensure the robot is within wireless range of the router.
   - Ensure the network connection is good from the robot. Open up Internet Explorer and make sure the web opens up. Repair network connections if not connected to the internet.
   - Under the client menu, there is an option to restart the server (robots) program. Please allow a couple minutes for the program to restart before trying to reconnect.

2. The robot will not run locally

   - Make sure the power to the robot is on and the batteries are charged
   - Make sure the USB cable is connected properly and the COM port has not changed.

3. The latency is high.

   - The client is best if connected via a LAN versus a WLAN especially if on the same network as the robot since wireless traffic may be colliding and causing delays
   - Make sure the web camera is not overloading the system. Change the camera settings to a lower frame rate and resolution and adjust the bit rate. A typical 802.11g wireless network cannot handle a continuous stream of two high resolution cameras (client and server), 2 way audio, and robot control with fast frame rates. So some of the settings need to be medium or low resolution.
   - Make sure the robot is not too far from a wireless access point
   - Make sure there is not excessive wireless traffic (other IP cameras, computers, etc.)
   - The timers can be slowed down under tools setup communication, the frequency the Tx and Rx timers respond, timeout constants, etc. Change these with caution and change only one at a time to not the changes.
   - Make sure the client computer is not getting overloaded, only run the necessary application
   - Close all applications on the server except the RP2W program.

8   Battery Charging: Never Charge batteries Unattended

Note: Review http://www.superdroidrobots.com/terms_batteries.htm

1. There are two batteries on the robot. The main batteries (two Seal Lead Acid batteries run in parallel). The laptop charger is run off on one of the batteries as a 12V load too.

2. The batteries are charged using the supplied docking station. The robot should be backed into the charger so the copper plates make contact with the copper plungers.

3. The 12V battery chargers have an LED light on them that will turn green when the battery is fully charged. Its is an automatic charger that will stop charging when the batteries are charged and provide a trickle charge.

4. If the robot is left on and the laptop is left one battery charger will never stop charging (ie the robot will be running off the charger) and the battery will take longer to charge since its being drained and charged at the same time.

5. The main drive batteries will last a very long time >8 hours if just left idle. Driving the robot, etc will drain the batteries.