

# Endurance R/C

## WiFi Servo Controller Instructions



The WiFi Servo Controller allows for the control of up to 8 hobby R/C servos via a wired LAN or wireless 802.11b/g WiFi connection. The controller can be configured for either wired or wireless operation at the flick of a switch. A secondary TTL level COM port is also available for bi-direction serial communication to devices such as a GPS module, JPEG camera, sonar and many other custom sensors making the WiFi Servo Controller a versatile tool for many different projects.

The WiFi Servo Controller features three connection methods for controlling connected devices. Control of the WiFi Servo Controller can be performed with the use of a PC side application via either serial or TCP/IP connections or over Java applet connections from the built in web server. Both custom user applications and the ServoCommander software can be used for control.

Please fully read this manual for setup and operation procedures before powering on your WiFi Servo Controller.

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## Requirements for Operation

- **Network**

Usage of the WiFi Servo Controller requires an 802.11 b or g wireless access point for wireless operation or LAN switch or hub for wired LAN operation. Many modern wireless access points will include a switch which is most commonly referred to as a router. A router can usually support both wired and wireless methods of control.

- **PC or Web Device**

A PC or device capable of executing the sample software is required for control.

- **Output Devices**

Any PWM controlled device can be controlled with the WiFi Servo Controller. Devices such as hobby servos, R/C switches, light controllers, and electronic speed controls can all be used.

- **Secondary Port (Port 2)**

Usage of the secondary COM port requires a TTL level serial device. Other RS232 devices can be used with the addition of a RS232 level converter such as the MAX232 Level Shifter board available from Endurance Robotics.

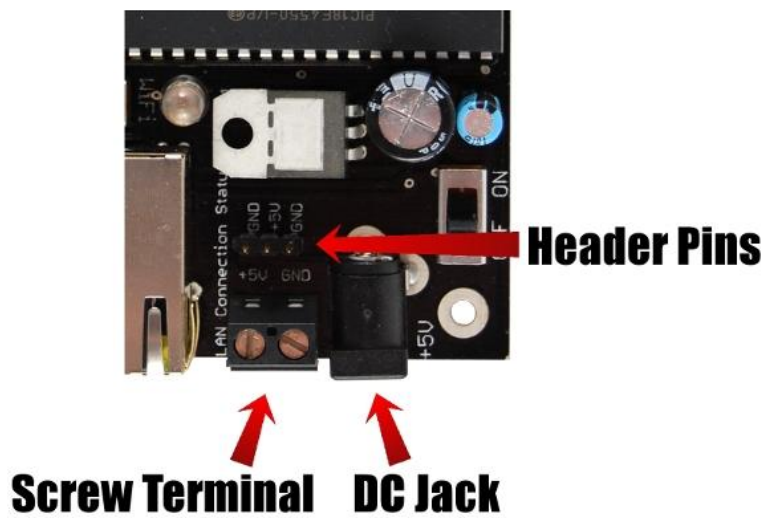
- **Power**

A +5V DC power source is required for operation of the WiFi Servo controller. A +5V DC 750mA power supply is included.

**Note:** Depending on the number of servos and their torque output as well as other output devices you choose to use, the supplied 750mA power supply may be inadequate for operation of all devices. Please check the output device power requirements in order to choose a power supply with enough amperage. If the WiFi Servo Controller suddenly disconnects from its connection upon power up, after a servo stalls out, or if many servos are moving at the same time this could be a sign that the power source used cannot supply enough voltage or amperage to the WiFi Servo Controller. Many high torque and robotics servos can draw in upwards of 1A or more when stalled.

Power can be connected to the WiFi Servo Controller via 3 methods:

1. Header pins
2. DC Jack – Positive center
3. Screw Terminals



*Figure 1. Close up of the three power connection methods*

**Note:** Take all necessary precautions when connecting your power supply. Always consult the manual when connecting power. Improper power connections can result in damage of servos and the WiFi Servo Controller. If you are running on battery power and you experience a sudden shutdown of the wired/wireless connection your battery charge may be too low to sufficiently power the WiFi Servo Controller. After shutdown the connection will attempt to reconnect and may obtain a connection only to briefly shut down again. Recharge or replace your battery pack if this occurs. See the above power section for more details.

**Package Contents**

1x - WiFi Servo Controller board  
1x - 7' CAT5 LAN cable  
1x - +5V AC adapter  
1x - 2.4GHz antenna

**Note:** Manuals, control programs, source code and any other files can be found at:

<http://www.endurance-rc.com/controllers.php#wifi>

## Network Setup

It is necessary to start with a wired LAN connection for initial setup. Many wireless access points will include security measures such as WEP and MAC address restrictions that will restrict connections by WiFi until certain parameters are set.

### Wired LAN Setup

During initial setup you must configure your network for DHCP (Dynamic Host Configuration Protocol). This will allow a unique IP address to be assigned to the WiFi Servo Controller automatically. Many networks will be setup for DHCP by default. If you are unsure how to configure your network hardware for DHCP please consult your hardware manuals or system administrator.

**Note:** Assigning a static IP address is possible but not recommended for the WiFi Servo Controller. If you happen to use an IP address that is already taken on your network you may be locked out of the WiFi Servo Controller. If you wish to configure the WiFi Servo Controller for a static IP proceed at your own risk.

Once DHCP is configured connect your WiFi Servo Controller to a free port on your router or switch with the supplied CAT5 cable. Make sure the network switch on the WiFi Servo Controller is set to LAN and the power switch is off. Next connect the power source and turn the WiFi Servo Controller on. You may notice the PGM indicator light up for several seconds after power on. This will indicate the programming of the wired functionality. Do not interrupt the programming process. Once the indicator goes off, the Link status and LAN Connection status indicators will flash.

### LAN Port Indicators

- The green LED on the RJ-45 socket labeled “Link Status” will indicate the correct insertion of a network cable. This indicator should always be on during operation so it is useful when troubleshooting physical network connection issues.
- The orange LED on the RJ-45 socket labeled “LAN Connection Status” will indicate data reception or transmission over the wired link. This indicator will blink when either data is being sent or received so it is useful when troubleshooting software configuration issues.

### Router Configuration

To connect to the WiFi Servo Controller it is first necessary to find what IP address has been assigned to it. This can be done by entering the admin page of your router. Please consult the manual for your networking hardware on how to do this. Usually a router will reside on the address 192.168.1.1. Open a web browser and enter <http://192.168.1.1> into the URL box and hit enter. You may be presented with a user name and password dialog. If so log in using your credentials.

The admin page should have a listing of all attached devices. From here you can begin to match up the MAC address of your WiFi Servo Controller to the IP address assigned in the table. Your MAC address can be found on the top of the WiFi module on the WiFi Servo Controller, see Figure 2 for details on MAC address location. Once you have matched up the MAC address with the IP assigned take note of the IP address for future reference.



Figure 2. WiFi Servo Controller MAC Address

You can verify that the IP address located is the correct one by attempting to connect to the WiFi Servo Controllers built in web page. Open your browser and type in <http://assignedip/test.html> and substitute “assignedip” with the IP address you located in the step above. For example: <http://192.168.1.5/test.html>.

If everything worked you should be presented with a page like Figure 3. Moving any of the 8 slider bars will control the corresponding servo port on the WiFi Servo Controller. If you have not already done so attach a servo now and move the slider bars to see how the servo responds to your input.

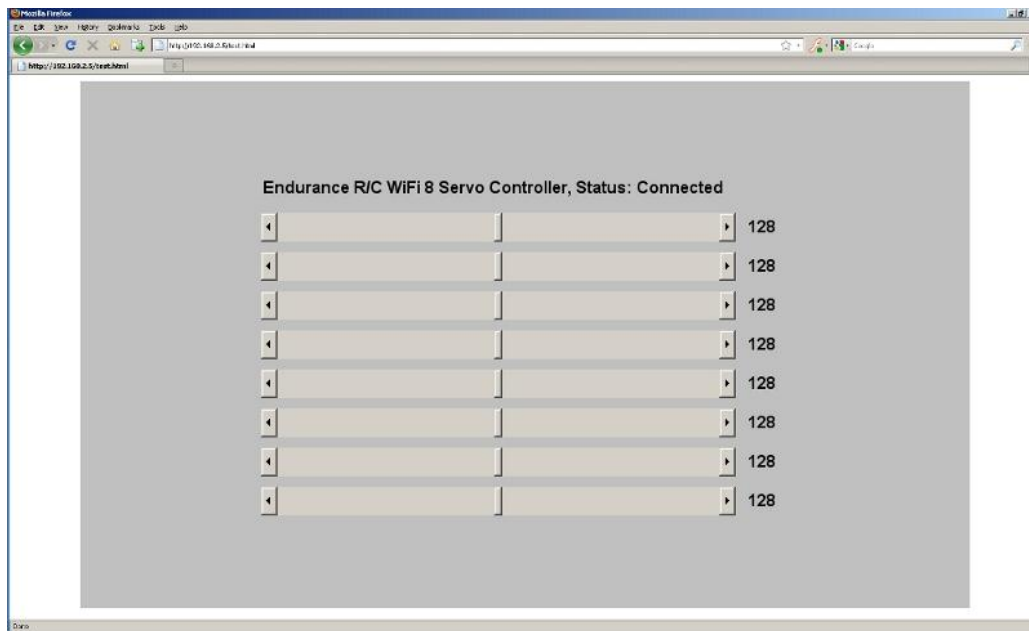


Figure 3. WiFi Servo Controller web access

## Wired LAN Troubleshooting

If you are instead presented with a “page not found” like in Figure 4 your IP address may be incorrect or you may have incorrectly typed in the URL. Please recheck your routers settings and try again.

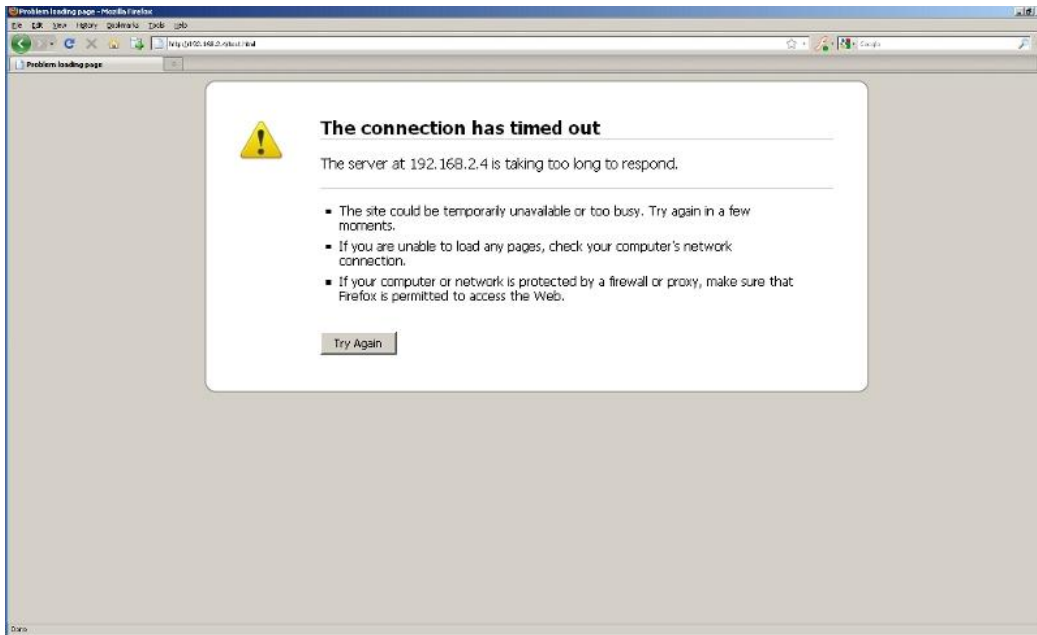


Figure 4. Page Not Found Error

If your page has been successfully found but you are unable to access the embedded controller program your PC may be missing the necessary Java Runtime files. In this case you will be presented with a page like the one in Figure 5. Go to <http://www.java.com> and download the latest version of Java. Install this and reboot your PC.

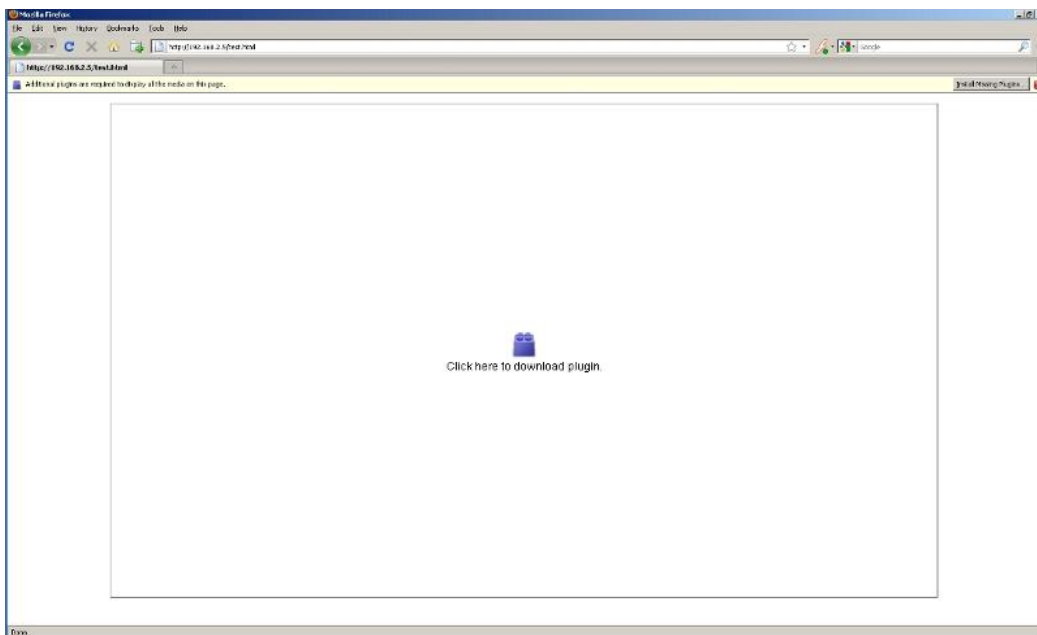


Figure 5. Java JRE missing

## Wireless Setup

Instructions for wireless setup may be slightly different for the brand of wireless access point being used however following these instructions will be fairly similar over many models. Please consult your router manual for further details on setup.

## MAC Address Restriction

If your access point (AP) restricts access by MAC address you must add the WiFi Servo Controllers MAC address to your access list. During initial setup it may be easier to disable controlled access. If your AP is already set to allow connections for any devices you can disregard this step. Refer to Figure 2 for the location of your MAC address. Once you have located your address add it to your list and save the settings.

## Wireless Encryption (WEP) Key

If your wireless access point is setup for encrypted transmissions it is necessary to add the WEP key of your network to the WiFi Servo Controller. If your network does not have WEP encryption you can skip this step. During initial setup it again may be easier to disable WEP.

To add your WEP key to the WiFi module follow the above instructions to connect to your network via the wired method. Ensure that a connection has been established by browsing to the web control page. Once connection you will need to use the Telnet program to configure settings.

To begin configuration go to Start->Run and type in CMD on a Windows PC connected to the same network as the WiFi Servo Controller. Again if you are using Linux or MacOS these instructions will be slightly different and are not covered in this manual. Consult your OS documentation for telnet application usage.

After typing in CMD a command line will be displayed. Type in the following command at the C: prompt. Replace the IP address 192.168.2.5 with the IP address you wrote down previously.

```
telnet 192.168.1.5 9999
```

This command will start the Telnet program and direct it to connect to IP address 192.168.2.5 on port 9999. Port 9999 is the default telnet connection port for the WiFi Servo Controller module. Once connected via telnet you will be presented with the following screen. Hit enter to continue on to the setup screen. Your MAC address and software version may be different.

```
c:\ Telnet 192.168.2.5
Min. notification interval: 1 s
Re-notification interval : 0 s

*** WLAN
WLAN: enabled
Topology: Infrastructure
Network name: wifi
Country: US
Security suite: none
TX Data rate: 11 Mbps auto fallback
Power management: disabled
Soft AP Roaming: disabled

Change Setup:
0 Server
1 Channel 1
2 Channel 2
3 E-mail
4 WLAN
5 Expert
6 Security
7 Defaults
8 Exit without save
9 Save and exit      Your choice ? _
```

Figure 6. WiFi Servo Controller Admin

Once you are presented with the screen above enter 4 for the WLAN Settings menu. There are many different options a user can configure however it is best to leave these settings alone unless you specifically know what you are changing. Press Enter two times and you will be presented with a Security type setting. Press the key corresponding to your encryption type. In this guide WEP is covered. Press 1 and hit Enter. Next enter your authentication type. Most commonly you would be using a shared WEP key. Press 1 and hit Enter. The next entry will define the WEP key length you use. If you are not sure of the length please refer to your AP or router settings. Once you have this press the correct entry and hit Enter. Press the Enter key five more times to return to the main menu. Save your settings by pressing 9 and then Enter.

### SSID Setup

In order to connect to your wireless AP you must configure the WiFi Servo Controller with the proper SSID (Service Set Identifier). To find your SSID consult your AP's manual. Most often you can find this via the setup web page for your AP. In most cases the default SSID value set in the WiFi Servo Controller will not work. To configure your WiFi Servo Controller you must first connect to it via the wired LAN method. Follow the steps above to connect via the wired LAN method.

Once you have verified that the WiFi Servo Controller is connected you can now begin to set the SSID using the telnet application. To begin configuration go to Start->Run and type in CMD. This will start a command line. Type in the following command at the C: prompt. Replace the IP address 192.168.2.5 with the IP address you wrote down previously

```
telnet 192.168.1.5 9999
```

Once connected via telnet you will be presented with the following screen. Hit enter to continue on to setup.

Next press 4 to enter the WLAN Settings setup page. Press the Enter key once, this will take you to the SSID configuration entry. Enter in the SSID of your network and press Enter until you are taken to the main menu. Press 9 to save your settings and exit.

Once the SSID and WEP key (if necessary), have been configured, turn the WiFi Servo Controller off. Change the network selector switch to WiFi and turn the WiFi Servo Controller back on. You will notice again that the PGM led light up for several seconds indicating the programming of the wireless mode. This indicator will go out in a few seconds indicating programming completion. Once programmed, the WiFi status indicator will start to flash indicating a wireless connection attempt. Once successfully connected the indicator will stop flashing and show blue.

## **Wireless LAN Troubleshooting**

If the WiFi status indicator does not start to flash once the programming mode has been set the controller may still be in wired LAN mode. It may be necessary to reset the WiFi Servo Controller again. Reset the controller by pressing the button labeled "reset" and try again.

If this does not solve the connection issues turn the WiFi Servo Controller off and reset it back to LAN mode and wait for the programming to stop. Turn the controller back off and switch again to WiFi mode and turn the controller back on.

If the WiFi indicator keeps flashing and does not go to solid either the WiFi WEP or SSID settings may be incorrect or an incorrect MAC address may be entered in your router configuration. Verify these settings and restart. If the issues persist turning off restriction by MAC and WEP may help diagnose the specific issue.

## Software

As mentioned earlier the WiFi Servo Controller can be operated via a built in web interface or virtual COM port on host PC. To use the sample software installed on the built in web server no installation is required. Most modern web browsers are capable of running the sample web interface however Java run time files may be required. If you are not able to see the web interface you will need to install Java. Go to <http://www.java.com> to download the latest Java JRE components.

### Com Port Redirector

To access the WiFi Servo Controller via a PC side application it is necessary to create a virtual COM port on the PC running the software. This software will create a virtual port that will redirect any traffic sent to this port over the LAN connection to the WiFi Servo Controller.

Begin by installing the Lantronix CPR software. Go to <http://www.lantronix.com/device-networking/utilities-tools/com-port-redirector.html> and browse to the Downloads link. Download the latest version of the GUI CPR software and proceed with the installation instructions.

Once installed, start the CPR Manager application. The CPR software works with either the wired or wireless LAN connection methods. Press the button labeled "Search For Devices". If no device was found make sure that your WiFi Servo Controller is connected to your network and operational.

You will notice a tree view section labeled "Com Ports". By default this is a listing of all physical COM ports on your system. You will not be able to create a virtual port with the same name as a physical port on your system.

In order to create a virtual port press the button labeled "Add/Remove". This will take you to a listing of available ports. Place a check box next to any free port name. It doesn't matter what port name you choose at this point however it is good practice to choose the smallest numbered port for ease of use. Once a port is selected, click the OK button. You will notice a new port appear in red under your Com Port listing. Click on this port name to reveal the settings in the right hand pane.

In order to map data from the virtual COM port to the WiFi Servo Controller it is necessary to relate this port to the IP address of the WiFi Servo Controller and one of the two available ports. In the right hand pane you will notice two boxes labeled "Host" and "TCP Port". Under "Host" enter in the IP address of your WiFi Servo Controller. Under "TCP Port" enter 10001. This will map the data sent to the virtual port you chose in the previous step to the built in servo controller of the WiFi Servo Controller.

**Note:** There are two serial ports available on the WiFi Servo Controller. These ports are numbered 10001 and 10002. Port 10001 is hard wired to the servo controller however port 10002 can be assigned for an alternate function. The output of this port can be found on the WiFi Servo Controller with the label "Port 2". If you wish you can map another virtual COM port to port 10002 now or you can leave it unused. Port 2 can be used to both transmit and receive data from a device connected to the Port 2 socket on the WiFi Servo Controller.

Once you have entered in the proper settings click the "Save" button. The CPR software will begin to install the necessary drivers for the virtual COM port. You may be prompted with a dialog Figure 7 asking you to verify the driver install. If so click the "Continue Anyway" button.



Figure 7. Driver Installation Dialog

Under the Windows Device Manager you will now notice a new COM port available. To open the Device Manager go to your desktop and right click on the My Computer or Computer icon, choose properties. Under Windows XP, go to the Hardware tab and then Device manager. Expand the Ports entry. Under Windows Vista go to the Device manager link and expand the Ports entry. Use this port name with your PC side applications to begin sending data to the WiFi Servo Controller's ports.

### Creating Custom Web Applications

The LAN module on the WiFi Servo Controller features a built in web server to store custom web pages and applications. Users can store plain web pages on the WiFi Servo Controller as well as pages with embedded Java applications to control the ports on the controller. Due to the complexity of creating custom web pages please refer to the following documentation from Lantronix:

[http://www.endurance-rc.com/media/Creating\\_Custom\\_Web\\_Pages.pdf](http://www.endurance-rc.com/media/Creating_Custom_Web_Pages.pdf)

The sample application preloaded on the WiFi Servo Controller was created using the above tutorial. The source code can be found at:

[http://www.endurance-rc.com/media/WiFi\\_Servo\\_Controller\\_Sample\\_Java\\_Applet.zip](http://www.endurance-rc.com/media/WiFi_Servo_Controller_Sample_Java_Applet.zip)

### Creating Custom PC Applications

A sample application and source code has been provided as a starting point for creating your own applications. The sample application was written using Visual C++ .NET. Since the WiFi Servo Controller operates with a standard COM port control via other languages can be achieved relatively easy. Use the following protocol information when creating custom applications in other languages.

## Port Settings

Serial ports should be set with the following data:

- Bits per second: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

## Protocol

To communicate with the WiFi Servo Controller 9 characters must be sent. The first character is defined as the frame start byte. The following eight bytes correspond to channels 1-8. The following is an example of a valid frame. Spaces have been inserted for readability.

```
0 150 150 150 150 150 150 150 150
```

Each channel value should be an ASCII value from 1 to 255.

