BlinkRC™

802.11b/g WiFi Servo Controller with Analog Feedback

# BlinkRC User Manual

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Hardware Version 1.1

Manual Version 2.0

http://blinkgear.com

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## *Introduction*

Thank you for purchasing BlinkRC! BlinkRC is a RC vehicle WiFi receiver, that's not just a WiFi receiver. You see, BlinkRC has an open messaging protocol for interfacing its three PWM outputs and two analog inputs. That means, you can write your own code to control BlinkRC. Any scripting or programming language that supports UDP messaging will suffice!

## *Quick Start*

It’s as easy as B-G-1-2-3!

1. Remove the board from the packaging.

2. Take the cover off of your RC car. Remove all the PWM connectors from your Electronic Speed Control (ESC). Generally, there will be either two or three connections.

3. If one of the above connections is a dedicated power connection, plug that into the first slot on the board, with the black wire facing the outside. If neither are dedicated power, plug the wire coming from the motor into the first slot.

4. Plug the remaining wires (motor and/or steering) into the second and third slots. Always make sure the black wire faces the outside.

5. Turn on your iPhone

6. Go to Settings. Turn on Airplane Mode. This will prevent calls from interrupting your driving.

7. Go to Wi-Fi. Find your device's wireless network-- BlinkGearXX, where XX represent the two digits at the end of your device's MAC address. Configure the network to be Static. Give yourself an IP address between 192.168.1.2 ans 192.168.1.255, excluding 192.168.1.88 (the device's default IP). Give yourself a Netmask of 255.255.255.0

8. Exit to the main screen and start your app.

9. You're ready to drive!

10. If you're not driving, you might need to switch which channels control throttle and steering on the second screen.

## *iPhone Controller*

To obtain the iPhone controller, log into Apple's App Store and search for “BlinkRC”. The app is completely free.

## *Python Sample Code*

The following Python code causes all PWM output channels to move to either extreme (-100 to 100) for five iterations. It will simultaneously print out the incoming analog data from the board’s two analog inputs.

```
import sys, struct
from socket import *

#setup a listening UDP socket
udp_rx_sock  = socket(AF_INET, SOCK_DGRAM)
udp_rx_sock.bind(('', 8088))
udp_rx_sock.settimeout(0.02) #20 ms timeout

#setup a transmit UDP socket
host = '192.168.1.88'
port = 8088
addr = (host, port)
udp_tx_sock = socket(AF_INET, SOCK_DGRAM)
udp_tx_sock.connect(addr)

#setup version number and send a servo command message (id = 0x40)
version = 0x01
msgId = 0x40


for runs in range(5):
    for val in range(-100, 100):
        #valid range for servo positions include [-100, 100] w/ 0 at center
        ch1 = val
        ch2 = val
        ch3 = val

        #pack the data into a string with the BG magic word header
        data = 'BG%s' % struct.pack('>BBbbb', version, msgId, ch1, ch2, ch3)

        #send the data
        udp_tx_sock.sendto(data, addr)

        #wait for a2d reply
```

```
try:
   rxdata, addr = udp_rx_sock.recvfrom(16)
except:
   pass
else:
   print rxdata, addr, '\r',
```

## Android Controller

*Coming soon. Feel free to make your own and sell it in the Droid App Store!*

## Blackberry Controller

*Coming soon. Feel free to make your own and sell it in Balckberry App World!*

## Messaging Protocol

The BlinkRC is controlled via UDP messages. Each message begins with the characters “BG” followed by a single byte for the message version and a single byte for the message code. For example, the message code to control the servos is 0x40 and it has three bytes of data. Since the character “B” is 66 in ASCII (0x42 in hexadecimal) and the character “G” is 71 in ASCII (0x47 in hexadecimal) and the message version is one, the first four bytes of a servo control message would be 0x42 0x47 0x01 0x40. If the three bytes of data being sent in the servo are 0x7 0x8 0x9, then the total servo control message would be 0x42 0x47 0x01 0x40 0x07 0x08 0x09.

The BlinkRC will respond to any valid BlinkGear message listed below with an Analog-to-Digital (ADC) Message. The ADC Message follows the same format as the various control messages.

All messages are message version one unless otherwise stated.

### Servo Control Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x40 |
| 1 | char | channel 1 percent | [-100:100] |
| 1 | char | channel 2 percent | [-100:100] |
| 1 | char | channel 3 percent | [-100:100] |

### Description

This message controls the signal sent to the three servo control pins.

## Data Format

a. Signed byte ranging from -100 to 100. Determines the effort of the servo or speed controller connected to servo channel 1

b. Signed byte ranging from -100 to 100. Determines the effort of the servo or speed controller connected to servo channel 2

c. Signed byte ranging from -100 to 100. Determines the effort of the servo or speed controller connected o servo channel 3

## Example Message

0x42 0x47 0x01 0x40 0xCE 0x00 0x32

where a = -50 = 0xCE, b = 0 = 0x00, and c = 50 = 0x32

## Analog-to-Digital Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x06 |
| 1 | unsigned char | channel 1 analog | [1:255] |
| 1 | unsigned char | channel 2 analog | [1:255] |
| 1 | unsigned char | temperature | [1:255] |

## Description

This is message gives the values of the analog-to-digital input pins. The BlinkRC sends this message in response to any valid BlinkGear message it receives.

## Data Format

a. Unsigned byte ranging from 1 to 255. Describes the voltage measured on ADC pin 1

b. Unsigned byte ranging from 1 to 255. Describes the voltage measured on ADC pin 2

c. Unsigned byte ranging from 1 to 255. Describes the voltage measured on the on-board microcontroller's internal temperature sensor.

## Example Message

0x42 0x47 0x01 0x06 0x0A 0x14 0x28

where a = 10 = 0x0A, b = 20 = 0x14, and c = 40 = 0x28

## Antenna Mode Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x0D |
| 1 | unsigned char | use external | [0:1] (false:true) |

### Description

This message controls whether the BlinkRC uses its built in antenna or the external antenna connector. The BlinkRC may require being power cycled before this setting takes effect.

### Data Format

a. Unsigned byte that ranges from 0 to 1. 0 tells the BlinkRC to use its on-board antenna, 1 tells the BlinkRC to use the external antenna connector.

### Example Message

0x42 0x47 0x01 0x0D 0x00

where a = 0 = 0x00 to indicate that the BlinkRC should use its built-in antenna.

## Timeout Delay Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x35 |
| 1 | unsigned char | 50 per second delay | [0:250] |

### Description

If the BlinkRC has not received a Servo Control Message for a long enough period of time, it will set the servo outputs to a default value. This is to ensure that any device connected to the BlinkRC will enter a known state if wireless communications are lost. The Timeout Delay Message determines how long the BlinkRC will go without receiving a Servo Control before setting the servo outputs to their default values. Each time the BlinkRC is turned on the Timeout Delay is set to one second.

### Data Format

a. Unsigned byte that ranges from 0 to 250. Each tick is two hundredths of a second.

### Example Message

0x42 0x47 0x01 0x35 0x7D

where a = 125 = 0x7D = 2.5 seconds

## Timeout Default Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x34 |
| 1 | char | channel 1 | [-100:0] |
| 1 | char | channel 2 | [-100:0] |
| 1 | char | channel 3 | [-100:0] |

### Description

If the BlinkRC has not received a Servo Control Message for a long enough period of time, it will set the servo outputs to a default value. The Timeout Default Message sets the defaults that the servo ouputs will be set to. Each time the BlinkRC is turned on, the Timeout Defaults are set to all zeros. Be very careful when setting Timeout Defaults as loss of communication can result in unwanted behavior on the part of any device connected to the BlinkRC's servo outputs.

### Data Format

a. Signed byte that ranges from -100 to 100. This is the default timeout servo output for servo channel 1
b. Signed byte that ranges from -100 to 100. This is the default timeout servo output for servo channel 2
c. Signed byte that ranges from -100 to 100. This is the default timeout servo output for servo channel 3

### Example Message

0x42 0x47 0x01 0x34 0xEC 0x00 0x00

where a = -20 = 0xEC, b = 0 = 0x00, and c = 0 = 0x00

## Set SSID Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x0E |
| 32 | unsigned char* | ssid | [alphanumeric] |

### Description

The Set SSID Message changes the **S**ervice **S**et **ID**entifier that the BlinkRC uses to communicate wirelessly. The SSID can be thought of as the name of the wireless network. The BlinkRC may require a power cycle in order for this setting to take effect.

## Data Format

a. 32 single-byte character string that is the new SSID. All 32 bytes must be sent. Unused bytes should be set to zero.

## Example Message

0x42 0x47 0x01 0x0E 0x42 0x6C 0x69 0x6E 0x47 0x65 0x61 0x72 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

where a = “BlinkGear” = 0x42 0x6C 0x69 0x6E 0x47 0x65 0x61 0x72 and the remaining 23 bytes are 0x00

## Set Network Key Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x0F |
| 32 | unsigned char* | network key | [alphanumeric] |

## Description

The Set Network Key Message sets the security key or pass-phrase that the BlinkRC uses to connect to secured wireless networks. The BlinkRC is able to connect to networks that use 128-bit WEP encryption or WPA or WPA2 encryption. The BlinkRC may require a power cycle in order for this setting to take effect.

## Data Format

a. 32 single-byte character string that is the key or pass-phrase. All 32 bytes must be sent. Unused bytes should be set to zero.

## Example Message

0x42 0x47 0x01 0x0F 0x70 0x61 0x73 0x73 0x70 0x68 0x72 0x61 0x73 0x65 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

where a = “passphrase” = 0x70 0x61 0x73 0x73 0x70 0x68 0x72 0x61 0x73 0x65 and the remaining 22 bytes are 0x00

## Set IP Address Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x10 |
| 4 | unsigned char* | ip address | [1:255][1:255][1:255][1:255] |

## Description

The Set IP Address Message sets the IP address that the BlinkRC uses. The BlinkRC may require a power cycle in order for this setting to take effect.

## Data Format

a. Unsigned byte that ranges from 0 to 255. The first octet of the IP address.
b. Unsigned byte that ranges from 0 to 255. The second octet of the IP address.
c. Unsigned byte that ranges from 0 to 255. The third octet of the IP address.
d. Unsigned byte that ranges from 0 to 255. The fourth octet of the IP address.

## Example Message

0x42 0x47 0x01 0x10 0xC0 0xA8 0x01 0x58

where a = 192 = 0xC0, b = 168 = 0xA8, c = 1 = 0x01, and d = 88 = 0x58

## Set Netmask Message

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x11 |
| 4 | unsigned char* | netmask address | [1:255][1:255][1:255][1:255] |

## Description

The Set Netmask Message sets the netmask that the BlinkRC uses. The BlinkRC may require a power cycle in order for this setting to take effect.

## Data Format

a. Unsigned byte that ranges from 0 to 255. The first octet of the Netmask
b. Unsigned byte that ranges from 0 to 255. The second octet of the Netmask
c. Unsigned byte that ranges from 0 to 255. The third octet of the Netmask
d. Unsigned byte that ranges from 0 to 255. The fourth octet of the Netmask

## Example Message

0x42 0x47 0x01 0x11 0xFF 0xFF 0x00 0x00

where a = 255 = 0xFF, b = 255 = FF, c = 0 = 0x00, and d = 0 = 0x00

## *Set Gateway Message*

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x12 |
| 4 | unsigned char* | gateway address | [1:255][1:255][1:255][1:255] |

### *Description*

The Set Gateway Message sets the network gateway that the BlinkRC uses. The BlinkRC may require a power cycle in order for this setting to take effect.

### *Data Format*

a. Unsigned byte that ranges from 0 to 255. The first octet of the Gateway
b. Unsigned byte that ranges from 0 to 255. The second octet of the Gateway
c. Unsigned byte that ranges from 0 to 255. The third octet of the Gateway
d. Unsigned byte that ranges from 0 to 255. The fourth octet of the Gateway

### *Example Message*

0x42 0x47 0x01 0x12 0xC0 0xA8 0x01 0x01

where a = 192 = 0xC0, b = 168 = 0xA8, c = 1 = 0x01, and d = 1 = 0x01

## *Set Connection Mode*

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x13 |
| 1 | unsigned char | infrastructure/adhoc | [0:1] |

### *Description*

The Set Connection Mode message tells the BlinkRC to either create an Ad-Hoc wireless network with the SSID it has saved or to attempt to join an existing Infrastructure wireless network, using the SSID and security credentials it has saved. The BlinkRC may require a power cycle in order for this setting to take effect.

### *Data Format*

a. Unsigned byte ranging from 0 to 1. A value of 1 causes the BlinkRC to create an Ad-Hoc wireless network, a value of 0 causes the BlinkRC to attempt to join an existing Infrastructure wireless network.

### *Example Message*

0x42 0x47 0x01 0x13 0x01

where a = 1, indicating that the BlinkRC should create its own Ad-Hoc wireless network

## *Network Reset Message*

| BYTES | TYPE | DESCRIPTION | VALUE RANGE |
|---|---|---|---|
| 2 | unsigned char* | message start | "BG" |
| 1 | unsigned char | message version | 0x01 |
| 1 | unsigned char | command code | 0x0C |

### *Description*

The Network Reset Message causes the BlinkRC to power cycle its onboard wifi module.

### *Data Format*

None

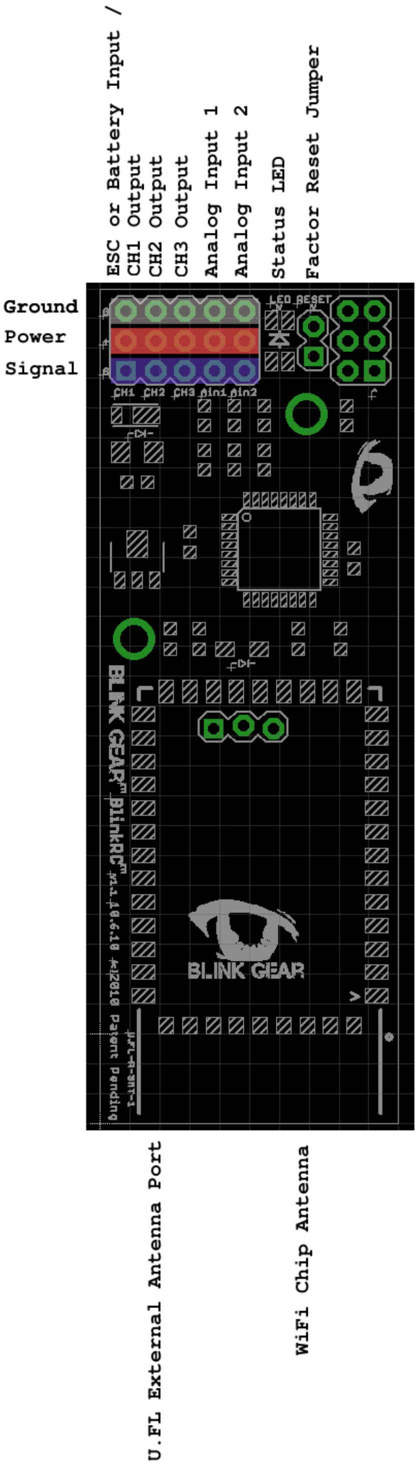
### *Example Message*

0x42 0x47 0x01 0x0C

## *Hardware Reset*

You can apply a hardware reset by shorting the reset jumper contacts together before applying power. Then keeping them shorted, apply power to the BlinkRC board and the LED will slowly flash red as it performs the necessary operations.  After approximately 6 seconds, the LED will turn green and all settings including WiFi SSID will be reset to the factory defaults.

## *Hardware Specification*


ESC or Battery Input /
CH1 Output
CH2 Output
CH3 Output
Analog Input 1
Analog Input 2
Status LED
Factor Reset Jumper
Ground
Power
Signal
LED
RESET
CH1
CH2
CH3
Ain1
Ain2
BLINK GEAR™ BlinkRC™
BLINK GEAR
Patent Pending
U.FL External Antenna Port
WiFi Chip Antenna