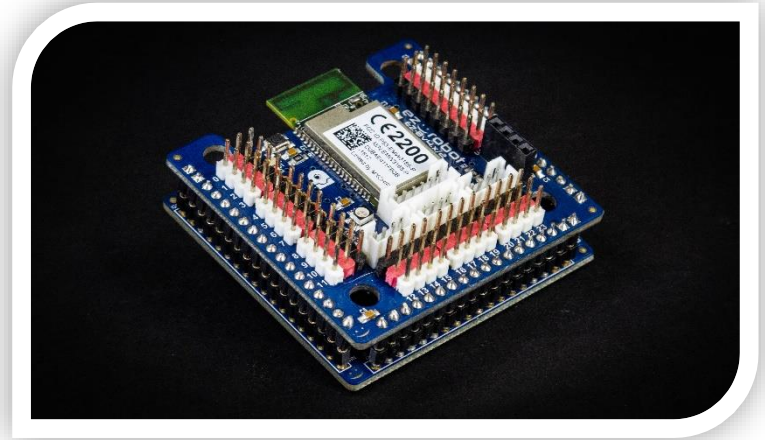


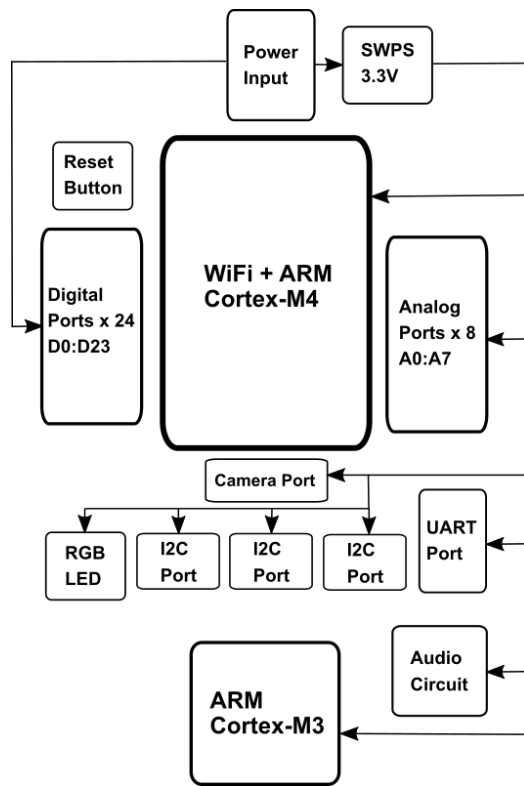
EZ-B v4 Datasheet

General Description

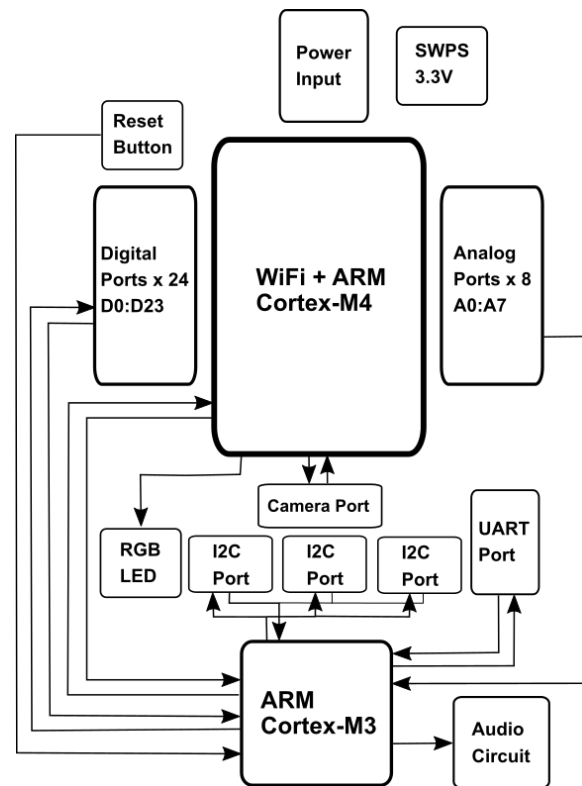
The EZ-B v4 takes robotics to the next level. It comes with Wi-Fi, Video, Audio capabilities, and all the standard features you've come to love from the previous generation EZ-B. The v4 allows your robot to track objects/motion/colors/faces, speak, stream audio, move servos, read sensors, control H-bridges and more. Connect your Laptop/PC or Mobile device to the EZ-B v4 through an AP mode or Client connection over Wi-Fi. Both options can be fully configured with the embedded Web Server. The v4 leverages the power and speed of two ARM 32-bit processors (120 MHz Cortex-M3 and 100 MHz Cortex-M4). It is also very expandable with 3 x I2C headers for additional sensors and displays, 24 x multi-use Digital I/O, and 8 x Analog-to-Digital ports.



Power Block Diagram



Communication Block Diagram



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EZ-B v4 Datasheet

Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Note
Voltage input (Vin)	4.5	7.4	16	VDC	Typ = 2 cell (2S) LiPo
Regulated voltage supply (Vcc)	3.2	3.3	3.4	VDC	
Vin Continuous Current Draw	0.008	1.3	5	A	Typ = 8 servos
Vin Current Spikes (when fuse protected)	0	5	20	A	Typ = 8 servos
Vcc Continuous Current Draw	0	0.18	1	A	Typ = EZ-Bv4 + camera
Vcc Current Spikes	0	0.4	3	A	Typ = EZ-Bv4 + camera
Vin Default Low Battery Warning	OFF	7	16	VDC	Default 7V for 2S LiPo
Current Draw with No Peripherals	70	80	90	mA	At 7.4V (connected)
Current Draw with Camera	140	150	160	mA	At 7.4V (enabled)
Digital I/O TTL Voltage Level (input high)	1.6	3.3	5	VDC	5V Tolerant, High sig >1.6V
Digital I/O TTL Voltage Level (input low)	0	0	1	VDC	Low sig < 1V
Digital I/O TTL Voltage Level (output)	0	3.3	3.3	VDC	Regulated to Vcc
Digital I/O Power Pin Voltage (output)	0	7.4	16	VDC	
ADC Voltage level (input)	0	3.3	3.6	VDC	5V tolerant
ADC Power Pin Voltage (output)	3.2	3.3	3.4	VDC	Regulated to Vcc
I2C TTL Voltage Level (input/output)	0	3.3	5	VDC	5V Tolerant
I2C Power Pin Voltage	3.2	3.3	3.4	VDC	Regulated to Vcc
Camera Voltage Level (input/output)	0	3.3	5	VDC	5V Tolerant
Camera Power Pin Voltage	3.2	3.3	3.4	VDC	Regulated to Vcc

Definitions

Vin	Battery or DC Power Supply voltage supplied to the board minus the diode's forward voltage drop (0.14 to 0.36V) which is current dependent
Vcc	Regulated 3.3VDC voltage from the on-board power efficient switching power supply
Digital I/O	Digital input/output pins – takes either an input logic level voltage of 0V (Low, 0, false) or 3.3V (High, 1, true) or outputs a logic level voltage of 0V or 3.3V
ADC	Analog to Digital convertor – takes an input analog voltage in the range of 0-3.3V and internally converts it into a digital signal for the controller to interpret
I2C	Inter-Integrated Circuit – is a communication bus that supports multiple slave devices running in parallel
Camera	EZ-Robot Camera (v2)

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EZ-B v4 Datasheet

Features

Wi-Fi

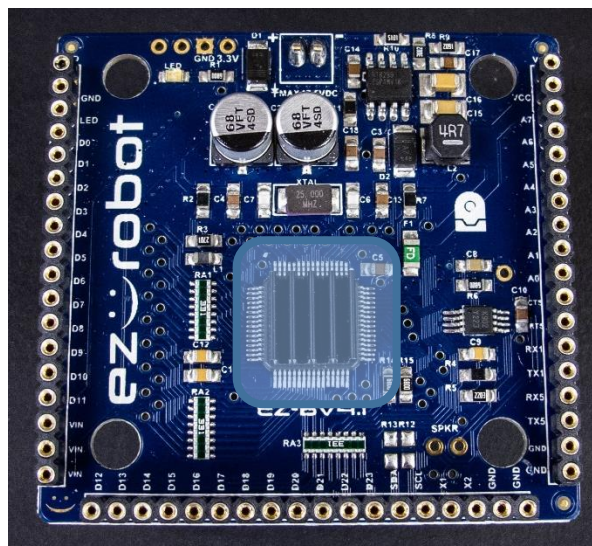
- IEEE 802.11 b/g/n 2.4GHz radio frequency
- Soft Access Point (AP) & Client modes supported
- Embedded Web Server
- WPA2, WPA and WEP encryption
- Transmit Power: 16.5dBm@11b,14.5dBm@11g, 13.5dBm@11n
- Receiver sensitivity: -87 dBm
- On board PCB Antenna
- Certifications: CE, FCC
- 1 x 3.33 Mbps Channel for Video
- Operating Temperature: -30°C to +85°C



EZ-B v4 Top board (E-15)

Main MCU

- 120MHz ARM 32-bit Cortex-M3 MCU
- 128K bytes of RAM1
- 1Mbytes of Flash
- 1 x 3.33 Mbps Channel for Communication
- 12-bit ADC (8 channels)
- 12-bit DAC
- 5V tolerant pins
- UART
- I2C
- 96-bit unique ID



EZ-B v4 Main board (E-01)

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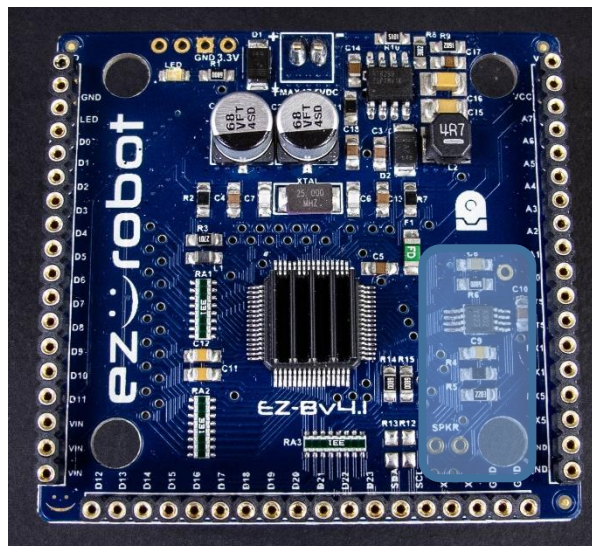
EZ-B v4 Datasheet

Audio (Amplified)

- Audio amplifier chip output rating: 0.3W max
- Amplifier in High Pass filter configuration
- Recommended Speaker: 8ohm 0.5W
- Speaker out (amplified audio) SPKR pins are left open for an external speaker
- Recommended speaker is included with the EZ-B v4 when purchasing from ezrobot
- Audio feedback automatically given for bootup, successful/unsuccessful network connection, and low battery

Audio (Non-Amplified)

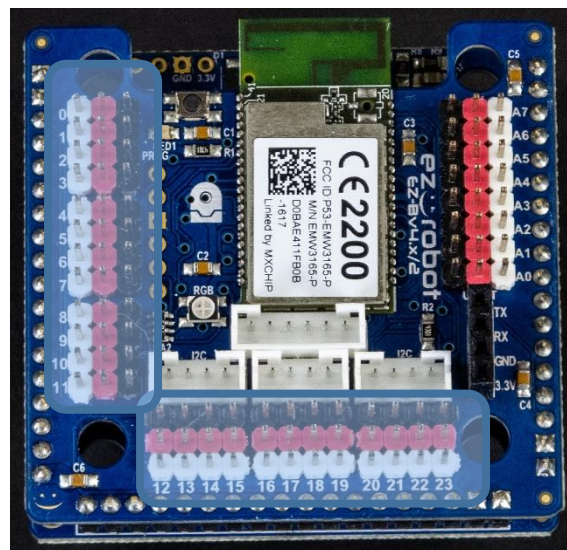
In the top right of the Audio circuit area there is an exposed pad that can be accessed from both sides of the board. The pad is directly connected to the DAC output of the main CPU and provides a breakout for non-amplified audio. Be extra cautious when connecting this pad, there is a risk of damaging the microcontroller.



EZ-B v4 Main board (E-01)

Digital I/O Ports

- 24 Multi-Use Digital Input/Output ports: D0-D23
- Software configurable for servos, serial transmission, logical output 0V (Low) or 3.3V (High) voltage levels or PWM (Pulse width modulation)
- Input Max 5 VDC TTL Logic (5V tolerant)
- Output Max 3.3 VDC TTL Logic
- 330ohm current limiting Resistor (~10mA) on each Digital I/O
- Left to Right pinout: SIG-3.3V-GND (GVS standard)
- **Please note** that the Digital I/O Red and Black power pins do not output regulated 3.3V voltage but rather the input voltage
- Special functions:
 - D5 can control Dynamixel servos
 - D5 (TX) and D6 (RX) can be used as UART1 with 5kB Receive buffer
 - D18 (TX) and D19 (RX) can be used as UART2 with 5kB Receive buffer

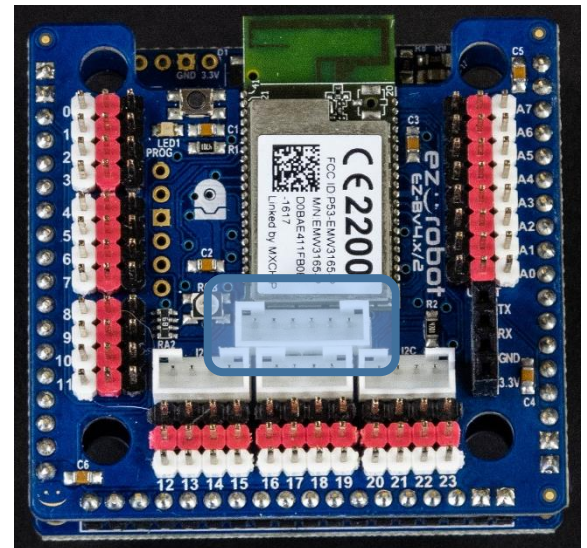


EZ-B v4 Top board (E-15)

EZ-B v4 Datasheet

Camera Port

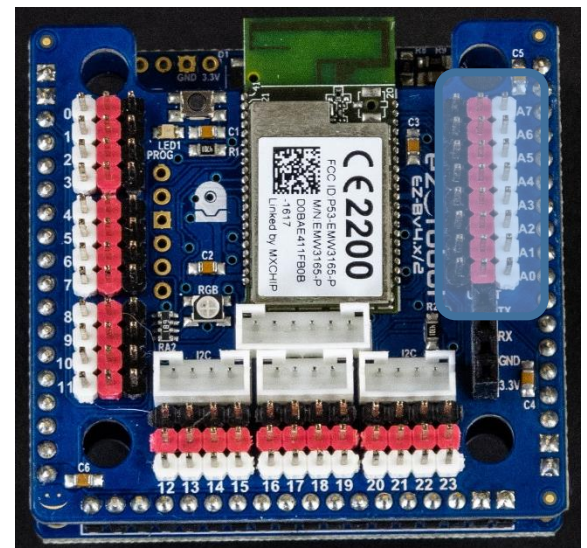
- 1 x 3.33 Mbps Channel for Video
- 6-pin 2mm pitch JST-PH header
- Left to Right pinout: CTS-RTS-TX-RX-GND-3.3V



EZ-B v4 Top board (E-15)

ADC Input Ports

- 8 ADC (Analog-to-Digital) ports: A0-A7
- 0-3.3VDC Range (5V Tolerant)
- Left to Right pinout: GND-3.3V-SIG (GVS standard)
- Configurable 8-bit (0-255) or 12-bit (0-4095) return values in software.



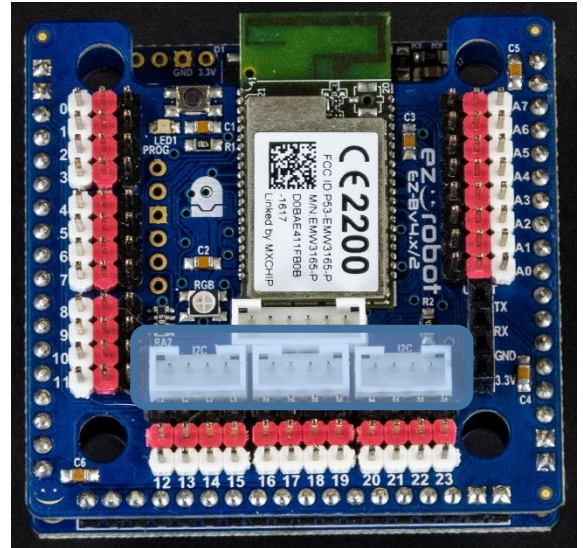
EZ-B v4 Top board (E-15)

EZ-B v4 Datasheet

I2C Ports

- 100kHz I2C default clock speed that is configurable in ez-builder up to 400kHz
- 4-pin 2mm pitch JST-PH header
- 3 x I2C ports
- Left to Right pinout: GND-3.3V-SDA-SCL

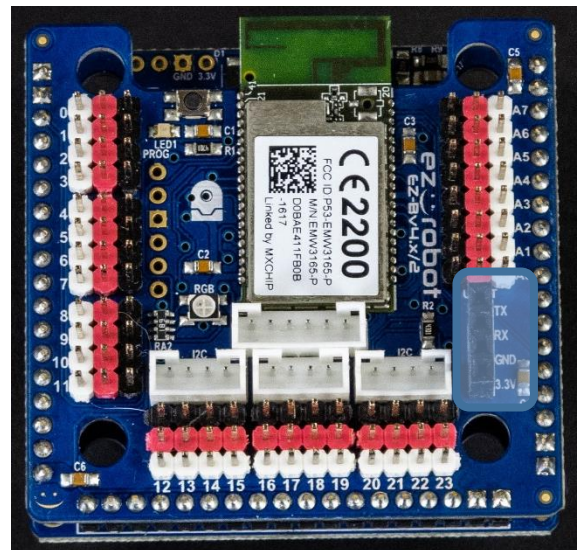
Note: Do not combine 5V and 3.3VDC powered devices as the 3.3VDC SDA and SCL lines may be pulled up to 5V and damage the lower voltage devices.



EZ-B v4 Top board (E-15)

UART Serial Expansion Port

- Asynchronous serial Communication up to 3.75 Mbaud
- Receive Buffer size: 5kB
- 2.54mm (0.1") Pitch Female header in bottom right corner on board
- Silk screen labels on the PCB
- Top Down pinout: TX-RX-GND-3.3V
- Denoted as UART0 in EZ-builder

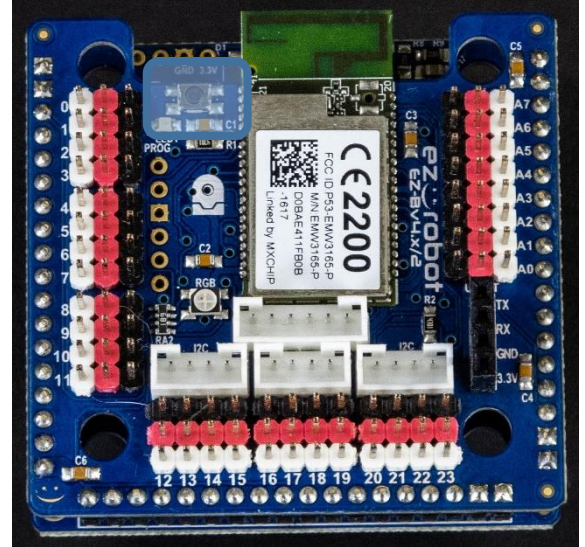


EZ-B v4 Top board (E-15)

EZ-B v4 Datasheet

Reset Button

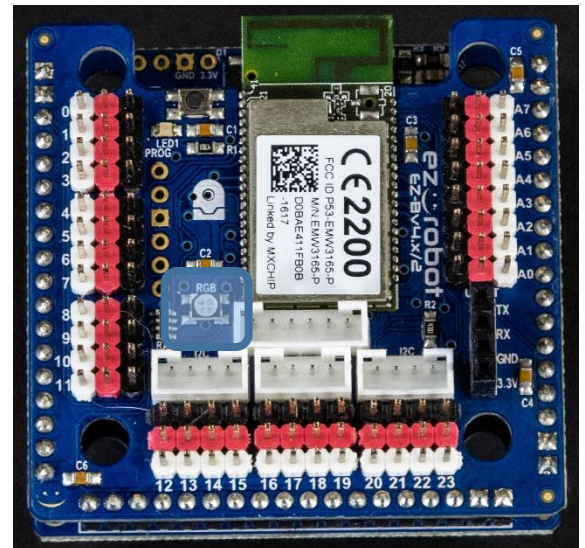
- Pressing the reset button will bring the EZ-B v4 back to it's default AP mode network settings
- Only needs a momentary press



EZ-B v4 Top board (E-15)

RGB Status LED

- AP mode Bootup – RGB LED flashes purple, green, white and then stays on flashing blue
- AP mode WiFi connection to EZ-builder – RGB LED is solid Blue
- Successful Client Mode WiFi connection – RGB LED Flashes blue, white, then Green. When a successful network connection is established then it continues to flash green
- Unsuccessful Client Mode WiFi connection – RGB LED Flashes blue, white, then Green until the network connection fails then it continues to flash red
- Successful Client mode connection to EZ-builder – RGB LED is solid green
- Using Firmware Updater – RGB LED flashes aqua blue while the firmware is updating
- While Resetting the RGB LED flashes yellow



EZ-B v4 Top board (E-15)

EZ-B v4 Datasheet

SPECIAL NOTES:

The EZ-B v4's Digital I/O power pins are unregulated due to the inefficiencies of regulating power for servo motors. Be aware that if you connect peripherals that operated at a certain regulated voltage to the EZ-B v4 Digital I/O power pins you risk damaging the peripherals. Inline voltage regulators are recommended when using third party peripherals that do not align with input voltage.

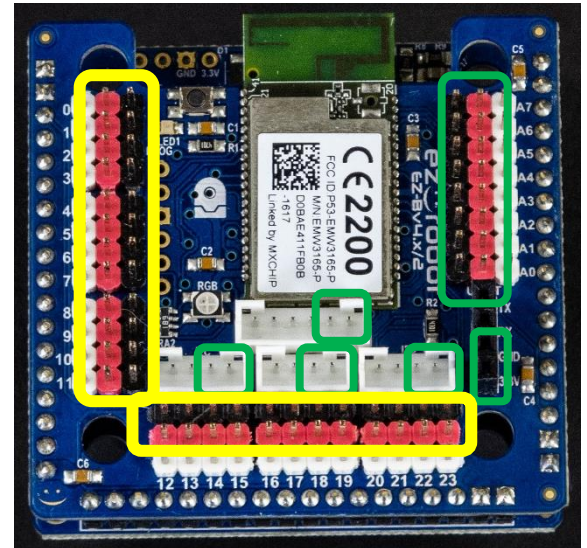
Reference the diagram to the right to see which power pins are regulated and unregulated.

3.3V Regulated Power Pins (Green):

- ADC
- I2C & Camera
- UART

Unregulated Power Pins (Yellow):

- Digital I/O



EZ-B v4 Top board (E-15)

Low Battery Monitor

The EZ-B v4 includes a low battery monitor designed for use with LiPo batteries. It is enabled by default. EZ-Robot recommends using 7.4V LiPo batteries at to power the EZ-B v4. The default Vin Low Battery Monitor threshold is set at a 7VDC. If the EZ-B v4 is powered on with less than 7 VDC, a verbal warning message will repeat that the battery is low. While the verbal message is repeating, the EZ-B v4 ports will be unresponsive. If using different batteries or a AC power adapter the battery warning can be permanently disabled via the integrated webserver or temporarily disabled in the EZ-builder software (Connection Settings).

*****WARNING***** the low battery Warning is a very important feature for LiPo batteries. Disabling the Low Battery Monitor is not recommended.

Recommendation

Since the digital I/O power pins are not protected we recommend you use a 20A (or lower) ATM automotive fuse between your battery and the EZ-B v4 to protect the EZ-B v4 and power source from any short circuit conditions on the Digital I/O power pins.

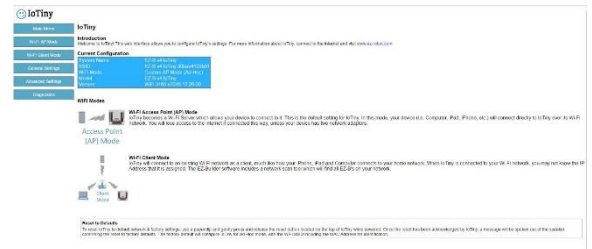


EZ-B v4 Datasheet

WiFi Settings

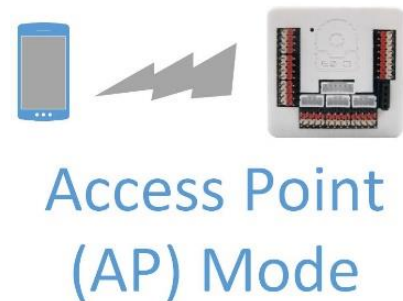
Webserver

The EZ-B v4's integrated Wi-Fi module has an embedded webserver built-in. It has many configurable options including connection modes. AP mode (default) or Client Mode can be selected. The Wi-Fi connection will use B/G/N modes with WPA, WPA2, and WEP security. The broadcasting channel can be changed from 1 to 11 (1, 6, or 11 are recommended). Be aware that when the Reset Button is pressed, all network settings will be reset to the default configuration. You can also Telnet into the module. To configure the Wi-Fi settings, the EZ-B v4 webserver can be accessed by your web browser. If the EZ-B v4 is connected via Access Point Mode, the default web address will be <http://192.168.1.1>. If the EZ-B is in Client Mode, you will use the IP Address that EZ-Builder has detected (i.e. <http://<ip address>>).



Connection Mode 1: Wi-Fi Access Point (AP) – Default

This is the default setting for the EZ-B v4, which becomes a Wi-Fi Server which allows your device to connect to it. In this mode, your device (i.e. Computer, iPad, iPhone, etc.) will connect directly to the EZ-B v4 over its Wi-Fi network. You will lose access to the internet if connected this way, unless your device has two network adapters.



Connection Mode 2: Wi-Fi Client

The EZ-B v4 will connect to your home or business Wi-Fi network as a client, much like your smart phone, tablet, or laptop. When the EZ-B v4 is connected to your Wi-Fi network, you may not know the IP Address that it is assigned. The EZ-Builder software includes a network scan tool which will find all EZ-B v4's on your network. You will have to set this mode up with the integrated Webserver (see above)



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EZ-B v4 Datasheet

Telnet

A user command interface to give remote access to some basic functionality and specification within the EZ-B v4. Access the Telnet interface can be found via the Windows command line tool (cmd).

To enable Telnet command line utilities in Windows:

1. Right Click the Windows Start Icon and select "Control Panel"
2. Click "Programs and Features"
3. On the left menu bar click "Turn Windows features on or off"
4. In the Windows Features dialog box, check the Telnet Client check box.
5. Click OK. The system will install the appropriate files. This will take a few seconds to a minute.

Default Command line entry (when connected via AP mode): telnet 192.168.1.1 8080

```

c:\> Telnet 192.168.1.1

Welcome to the EZ-B v4.x/2 CLI

-----

Product module: EZ-B v4 IoTiny
Hardware version: EZ_B_v4_IoTiny
Manufacture: EZ-Robot Inc.
SDK version: 31621002.044
Firmware version: v2016.05.16.00
Application information: EZ-Robot EZ-B v4 IoTiny
Bootloader version: EZ-B v4.x/2 v2.1 115200
WIFI version: wl0: Sep 10 2014 11:28:46 version 5.90.230.10 FWID 01-ffffff

Type 'help' for command list

#
  
```

List of Telnet Commands:

```

c:\> Telnet 192.168.1.1

#help

help: What you see now
version: Display hw/sw version
exit: CLI exit
scan: scan ap
wifistate: Show wifi state
ifconfig: Show IP address
arp: arp show/clean
ping: ping <ip>
dns: show/clean/<domain>
sockshow: Show all sockets
tasklist: List all thread name status
memshow: Print memory information
memdump: <addr> <length>
memset: <addr> <value 1> [<value 2> ... <value n>]
memp: Print memp list
wifidriver: Show wifi driver status
reboot: Reboot EZ-B
reset: Reset to default configuration
ugf: Start firmware upgrade
time: Show system time
flash: Flash memory map
identify: Identify EZ-B with flashing LED and Audio Beep
servo: Move a servo
servospeed: Set Servo Speed
set: Set digital port state
bs: Show Highest Buffer Sizes

#
  
```

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EZ-B v4 Datasheet

EZ-B v4 Dimensions

All measurements are in millimeters

