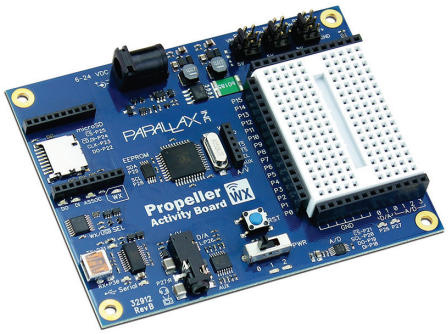
Web Site: www.parallax.com
Forums: forums.parallax.com
Sales: sales@parallax.com
Technical: support@parallax.com

Office: (916) 624-8333
Fax: (916) 624-8003
Sales: (888) 512-1024
Tech Support: (888) 997-8267

Propeller Activity Board WX (#32912)

The Propeller Activity Board WX features the 8-core Propeller microcontroller pre-wired to a host of popular peripherals for fast and fun experiments.



Learn or teach the basics of electronics, programming, and robotics with this versatile board. Explore our free web tutorials for graphical BlocklyProp code-building or text-based C-language programming at learn.parallax.com.

The WX version of the Propeller Activity Board expands upon the functionality of the original (#32910). There's more current for your projects with independent 1.8 amp 3.3 V and 5 V switching regulators, an upgrade from audio-out-only to a Mini TRRS audio/video (or audio/mic) jack, and selectable wireless socket/USB communication between host computer and the Propeller chip (RF module not included!)

Features

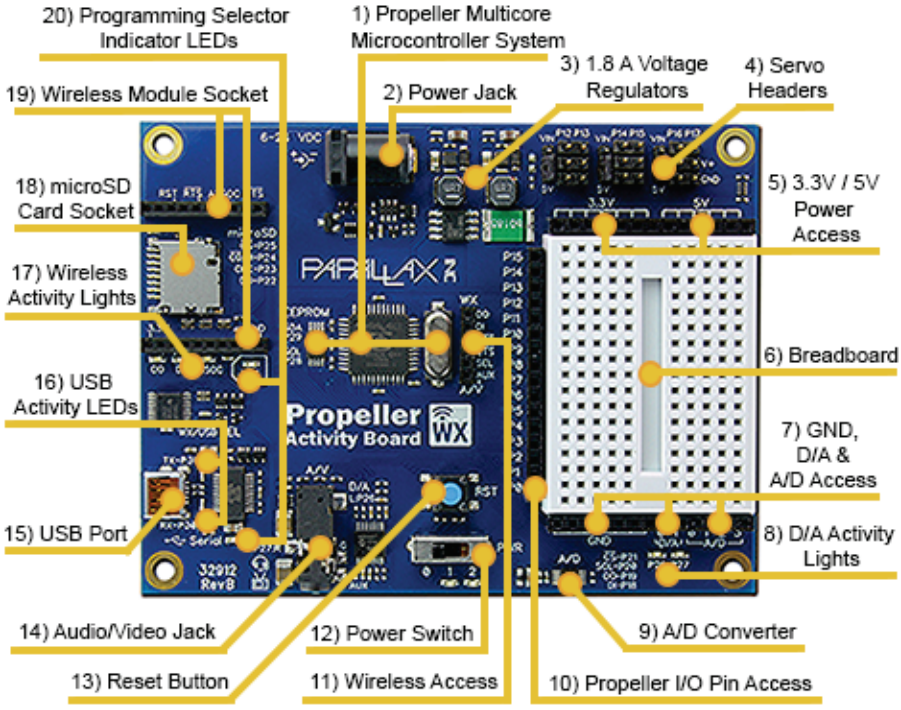
- Built-in 8-core Propeller P8X32A microcontroller, 64 KB EEPROM, and 5 MHz crystal oscillator
- Solder-free prototyping with breadboard and header sockets for power and I/O
- Six servo/sensor ports with power-select jumpers
- Automatically selects between USB and external power sources and provides USB over-current protection
- Center-positive 2.1 mm barrel jack for external power supplies
- Convenient reset button and 3-position power switch
- Onboard mini stereo-audio jack with microphone/video pass-through
- Built-in microSD card slot for data logging or storing WAV files
- Wireless Module socket accepts RF modules to simplify remote management
- Dedicated analog header sockets provide four A/D 12-bit inputs and two buffered variable-resolution D/A outputs
- Indicator lights show the status of system power, servo power, programming source, DAC output levels, wireless communication activity, and USB communication activity
- 3.3 V and 5 V switching voltage regulators with independent 1.8 amp outputs

Key Specifications

- Power requirements:
  - Rev A: 6–15 VDC from an external power supply, or 5 V from a USB port
  - Rev B/C: 6–24 VDC from an external power supply, or 5 V from a USB port
- Communication: USB mini-B (onboard serial over USB)
- Dimensions: 4.0 x 3.05 x 0.625 in (10.16 x 7.75 x 1.59 cm)
- Operating temp range: +32 to +158 °F (0 to +70 °C)

Board Features – Rev B/C

(See version 1.0 of this document for a labeled Rev A diagram and features.)



1) Propeller Multicore Microcontroller System

- 64 Kilobyte I2C EEPROM for program and data storage
- 8 core Propeller P8X32A microcontroller
- 5 MHz crystal oscillator

The P8X32A microcontroller has 8 cores, so it can do many different things at the same time. It uses I/O pins P28 and P29 to communicate with the I2C EEPROM for program and data storage. The crystal oscillator connected to the Propeller provides a clock signal for the system. The Propeller can multiply its 5 MHz oscillator signal by up to 16 for a system clock frequency of 80 MHz.

2) Power Jack

The 2.1 mm center-positive power jack is one of two power input options. The board accepts 6 to 24 VDC from this connector, although a maximum of 15 VDC is recommended. This option is useful for robots and other remote applications when the board is not powered from a computer's USB port. Parallax's 7.5 V, 1.6 A supply (#750-00009) and 12 V, 2 A supply (750-00003) work well with this board.

3) 1.8 A Voltage Regulators

The 5 and 3.3 V switching regulators can deliver up to 1.8 A each, with a 6 to 24 volt input, although a maximum of 15 VDC is recommended. Sockets along the breadboard provide power, from both regulators to circuits built on the breadboard. A jumper along each pair of servo ports optionally connects the regulated 5 V supply to the servo port. The 3.3 V regulator powers the Propeller microcontroller and accessories, including any modules connected to the wireless programming and communications socket.

4) Servo Headers

The servo ports connect servos and other 3-pin devices to Propeller I/O pins, labeled above each port. Labels indicating the GND (ground) and PWR (power) pins for each port are along the right.

Each pair of servo ports has a jumper on power-select pins to its immediate left. When the power switch is in the '0' or '1' position, or the port's power-select jumper is removed, the port will not provide power. If the jumper is inserted, the port will provide power while the power switch is in the '2' position.

Each jumper can set the power voltage of the port pair to 5 volts, by placing the jumper over the pair of pins closer to the 5V label, or to unregulated input voltage from the 2.1 mm barrel jack, by placing the jumper over the pair of pins closer to the VIN label.

If excessive power draw is present at any jumper position, the board may temporarily disconnect power and automatically reconnect it. Depending on the operating conditions, the Propeller Activity Board WX will disconnect VIN power when a load reaches a point between 1.5 and 3 amps for Rev A, and between 1.85 and 3 amps for Rev B/C.

CAUTION: For servos and other high-current devices, use VIN and an external power supply; see 2) Power Jack, p. 2 for details. The supply must not exceed the input voltage rating of your device.

CAUTION: Do not attempt to drive servos or other high-current devices from USB power. This may cause the Propeller Activity board WX to reset, and could be detrimental to some computer systems. See section 15) USB Port, p. 5, for details.

CAUTION: When using servo ports set to 5V, be sure the total current load does not exceed the 5 V regulator's maximum rated current. See section 3) 1.8 A Voltage Regulators, p. 2.

5) 3.3V / 5V Power Access

The positive 3.3 V and 5 V supply sockets are positioned along the top of the breadboard. Use jumper wires to connect these sockets to circuits you build on the breadboard. See 3) 1.8 A Voltage Regulators, p. 2, for information about how much current can be supplied through these sockets.

6) Breadboard

This breadboard has 34 5-socket rows arranged in 2 columns. The columns are separated by a valley in the middle. Any two wires plugged into the same 5-socket row become electrically connected. The socket spacing is 0.1".

7) GND, D/A, A/D Access

- GND access sockets — use jumper wires to connect these sockets to circuits on the breadboard.
- Digital to Analog access sockets — D/A 0, 1
    - Output voltage range: 0 to 3.3 V
    - D/A 0 is the digital to analog voltage from P26 after it has passed through a low-pass filter and buffer amplifier (but before it has passed through the coupling capacitor to the stereo output jack's right speaker channel).
    - D/A 1 is the same as D/A 0, but the duty modulated signal is provided by P27.
- Analog to Digital access sockets — A/D 0, 1, 2, 3
    - Input voltage range: 0 to 5 V. See 9) Analog/Digital Converter, p. 4, for details.

8) D/A Activity Lights

These yellow LEDs give a visual indicator of the output voltage at D/A sockets 0 and 1. They also indicate activity on the stereo output jack. The LEDs will vary in brightness with duty modulated digital to analog signals.

9) Analog/Digital Converter

Use the Analog to Digital Converter to monitor the voltage at analog inputs A/D 0, 1, 2, and 3. It will give a number from 0 to 4095, which tells what the voltage is in a range from 0 to 5 volts. The converter used here is a 12-bit, 200 ksps SPI ADC, with a 5-volt supply reference.

10) Propeller I/O Pin Access

Access to Propeller I/O pins P0...P15. Use jumper wires to connect these I/O pins to circuits on the breadboard, or to the WX wireless communication module access header.

NOTE: The accuracy of the 5 V supply will affect the accuracy of the D/A readings. 5 V power from a USB port may vary by as much as ten percent. For more accurate readings, power the Propeller Activity Board WX solely from the 2.1 mm barrel jack.

11) WX Wireless Access & Communication Header

The six-socket header labeled WX, to the left of the Propeller I/O pin access header, is the wireless access & communications header. Use jumper wires between the two headers to connect Propeller I/O pins to corresponding sockets on the wireless module socket:

- DO (data out)
- DI (data in)
- RTS (ready to send)
- CTS (clear to send)

The SEL socket makes it possible to override the Propeller Activity Board WX's automatic mode, and route serial communication for programming and default terminal communication through either the USB connection or the wireless communication module socket. Here are the three ways the SEL socket can be configured:

- SEL unconnected - Automatic
- SEL to 3.3V – Wireless Communication Socket
- SEL to GND – USB

The default mode when the SEL socket is left unconnected is automatic. For more info on automatic port selection, see 15) USB Port, p. 5, and 19) WX Wireless Communication Module Socket, p. 6. For information on the I/O pins the Propeller chip uses for programming and default terminal communication, see P31 and P30 in the Propeller I/O Pin Assignments table, p. 7.

NOTE: When Rev A of the Propeller Activity Board WX is not connected to a USB host or charger, and the Wireless Communication Socket is automatically selected, the automatic selection system may switch to the disconnected USB input. This may prevent successful programming or interrupt communications. When programming or communicating with Rev A, through the Wireless Communication Socket, when a USB host or charger is not present, connect the SEL socket to 3.3V, to override the automatic selection.

IMPORTANT: When SEL is set for the Wireless Communication Socket, do not try to send signals from an I/O pin to the DI socket because they will interfere with signals transmitted by the Propeller chip's P30 I/O pin to the wireless module's DI connection.

The AUX socket connects to the Audio/Video jack's sleeve connection. This connection can be monitored for mic output from common cell phone earbuds, or transmit composite video from the breadboard to a TRRS connector to an RCA adapter's video channel. See 14) Audio/Video Jack, p. 5 for more information.

12) Power Switch

The power switch has 3 settings:

- 0 — off
- 1 — power to the microcontroller system, including P0-P15 via the I/O pin access socket
- 2 — power to the microcontroller system and servo ports; see 4) Servo Headers. p. 3.

13) Reset Button

Use this button to restart the Propeller microcontroller's program. Press and hold to keep the microcontroller in reset. Press and release to reset, load and run the program in EEPROM.

Pressing the reset button also drives the DO pin low on the wireless programming and communications socket. This may be useful for configuring a Digi XBee S6B Wi-Fi module in certain applications.

14) Audio/Video Jack

The TRRS (tip, ring 1, ring 2, sleeve) A/V (audio/video) jack provides audio output to 1/8" stereo headphone or speaker plugs. Propeller I/O pins P26 (left channel = tip) and P27 (right channel = ring or ring 1) are hardwired to low-pass filters, amplifiers and coupling capacitors that can drive headphones, ear-buds, speakers, or line level inputs. It is compatible with the Veho 360 speaker from Parallax (item #900-00018).

A third signal (sleeve) connects to the AUX socket on the wireless access and communication header. This can be used to connect the microphone and controls on a CTIA-compatible headset (cell phone earbuds + mic for example) to the breadboard. It can also be used for connecting baseband video from the breadboard to a TRRS to RCA adapter's video channel.

15) USB Port

The USB port can perform the following functions:

- Load programs from a computer into the Propeller microcontroller.
- Support serial-over-USB communications to a terminal program on a computer.
- Supply 5 V power to the Propeller Activity Board WX from a computer's USB port. For power, the USB Port is input current limited to between 420 mA and 540 mA. When using the Propeller Activity Board WX with an external USB hub, be sure to use a powered hub when not providing power from the 2.1 mm power jack.

On connecting to a USB host, or programming via USB, the Propeller Activity Board WX automatically selects the USB port for serial communications on Propeller I/O pins P30 and P31. To override the selection, see 11) WX Wireless Access & Communication Header, p. 4.

NOTE: When overriding the selection, to select the Wireless Communication Module Socket, the override will disable programming and communications from the USB port.

16) USB Activity LEDs

When the USB host transmits data to the Propeller microcontroller, the blue TX→P31 LED lights to indicate activity. When the Propeller microcontroller transmits data to the USB host, the red RX←P31 LED lights to indicate activity.

When the Propeller microcontroller is transmitting data, but the USB host is not processing it, the red RX←P31 LED may remain unlit.

17) Wireless Activity Lights

These DO/DI/ASSOC Wireless Activity LEDs give a visual indicator the state of the module connected to the wireless programming and communications socket. The blue DO LED indicates the wireless module is outputting data, the red DI LED indicates the module is inputting data, and the blue ASSOC LED indicates that the wireless module is associated with a network. See 11) WX Wireless Access & Communication Header, p. 4, for more information.

18) microSD Card Socket

The socket allows applications to access files from a microSD card. Uses include:

- Accessing large lookup tables
- Playing audio files
- Data logging

This socket is hardwired to I/O pins: P22 - DO (data out); P23 - CLK (clock); P24 - DI/CD (data in and card detect); P25 - /CS (active low chip select).

19) WX Wireless Communication Module Socket

Use the Wireless Communication Module Socket for programming and communicating, using the Parallax WX ESP8266 WiFi Module - DIP, or for communicating only, with other wireless RF modules, such as the XBee S1 and SB6 Wi-Fi modules.

When programmed by the Parallax WX ESP8266 WiFi Module, the Propeller Activity Board WX automatically selects the Wireless Communication Module Socket for serial communications on Propeller I/O pins P30 and P31. To override the selection, see 11) WX Wireless Access & Communication Header, p. 4.

NOTE: When overriding the selection to select the USB port, the override will disable programming from the Parallax WX ESP8266 WiFi Module. Communications will still be possible, but only by connecting to the Wireless Access & Communication Header.

NOTE: When Rev A of the Propeller Activity Board WX is not connected to a USB host or charger, and the Wireless Communication Socket is automatically selected, the automatic selection system may switch to the disconnected USB input. This may prevent successful programming or interrupt communications. When programming or communicating through the Wireless Communication Socket with Rev A of the Propeller Activity Board WX when a USB host or charger is not present, connect the SEL socket to 3.3V, to override the automatic selection.

If this socket is selected for Propeller chip programming and communications, serial messages from a host computer or other device will be transmitted by the wireless module's DO pin, and received by Propeller I/O pin P31. Serial messages transmitted by Propeller I/O pin P30 will be routed to the wireless module's DI pin and then relayed to the host computer or other serial device.

NOTE: This socket does not support the older Digi XBee S6 Wi-Fi module; the S6B or later is required for operation with a Digi Wi-Fi module.

20) Programming Selector Indicator LEDs

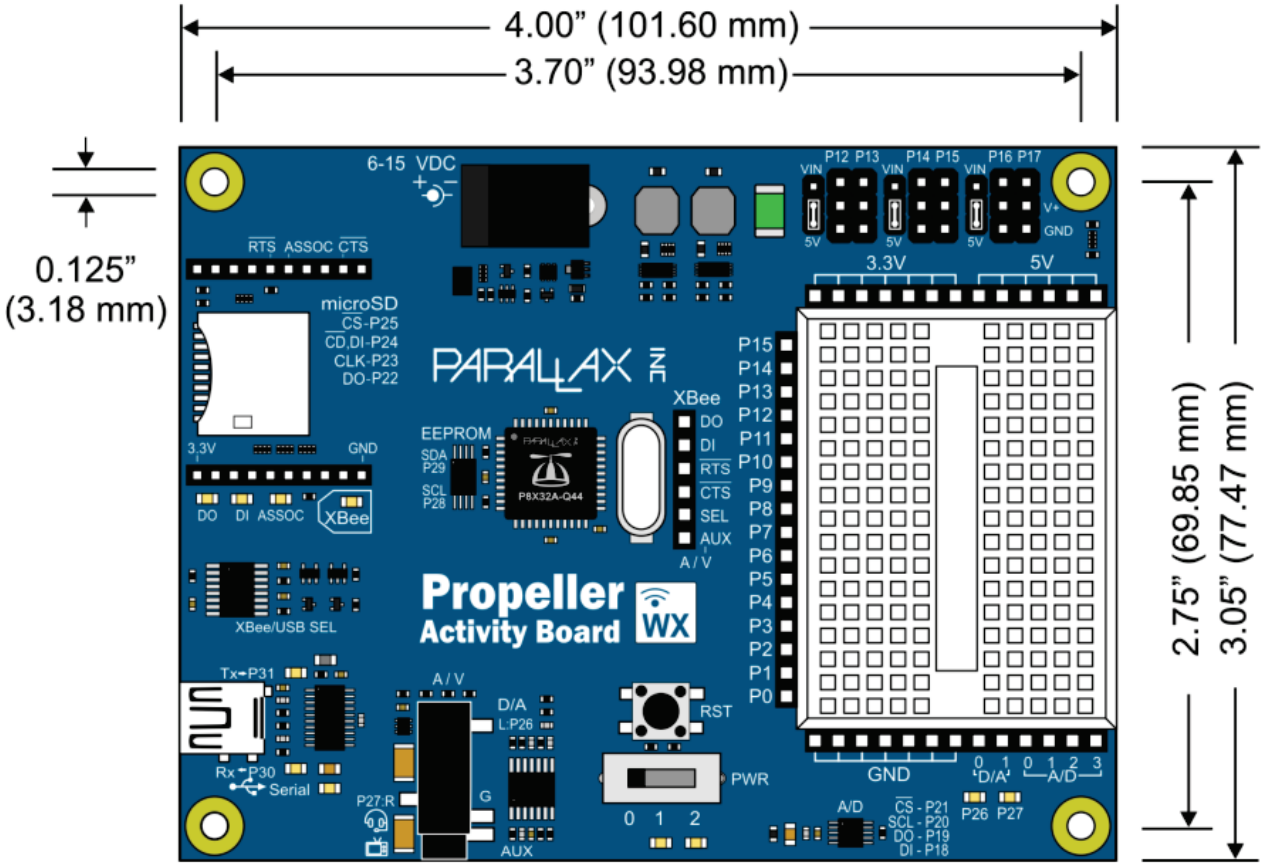
The Propeller Activity Board WX has two available programming sources: the USB port and the wireless communication module socket.

The programming selection indicator LEDs light to indicate which communication source has been selected for programming and bidirectional serial communication with the host computer (wireless or USB). For information about selecting the programming source, see 11) WX Wireless Access & Communication Header, p. 4, and 15) USB Port, p. 5.

Propeller I/O Pin Assignments

I/O Pin	Function
P0–P15	General-purpose I/O access alongside the breadboard
P12–P17	3-pin header signal pins — this is the servo port header above the breadboard
P18–P21	Analog to digital converter
P22	microSD card DO (data out)
P23	microSD card CLK (clock)
P24	microSD card DI (data in)
P25	microSD card /CS (active-low chip select)
P26–P27	P26–P27: Duty modulated D/A converter signals go to: • Logic buffered yellow LED circuits sockets for brightness control • Low-pass filter + op-amp buffer with outputs ranging from 0 to 3.3 V • To DA0 and DA1 analog outputs on the header below the breadboard • Through coupling capacitor to stereo outputs
P28–P29	64 KB I2C EEPROM for program and data storage. P28 = CLOCK, P29 = DATA
P30	Transmits from Propeller to host computer during programming and communication. When USB is the selected port, P30 transmits to the computer's RX connection through the USB-to-serial converter. When wireless is selected, P30 transmits to the wireless module's DI connection. See 20) Programming Selector Indicator LEDs, p. 7.
P31	Receives from host computer during programming and communication. When USB is the selected port, P31 receives from the computer's TX connection through the USB-to-serial converter. When wireless is selected, P31 receives from the wireless module's DO connection. See 20) Programming Selector Indicator LEDs, p. 7.

Dimensions



Resources and Downloads

Propeller Activity Board WX product page: go to www.parallax.com and search “32912”.

Online tutorials:

- C language: http://learn.parallax.com/propeller-c-tutorials
- BlocklyProp language: http://learn.parallax.com/tutorials/language/blocklyprop
- ActivityBot robot: http://learn.parallax.com/tutorials/activitybot

Revision History

2.0: Updated throughout for hardware Rev B (increased input voltage range and updated wireless communication and programming functionality. 2.1: changed references to Rev B to Rev B/C which are electrically identical. See version 1.0 for original Rev A documentation.