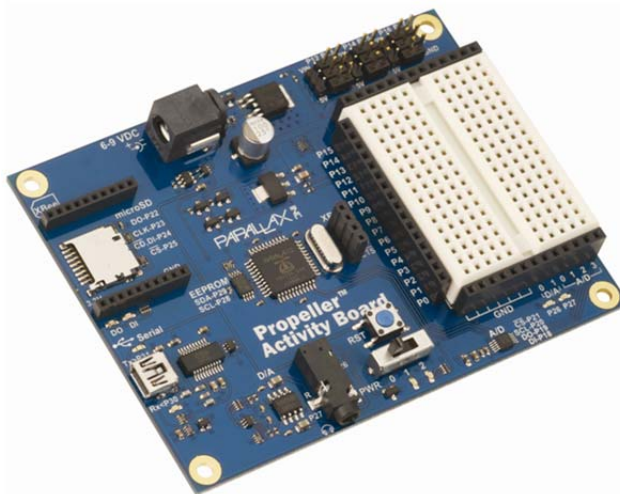


## Propeller Activity Board (#32910)

Do more with eight cores. Harnessing the power of the 8-core Propeller microcontroller is now easier than ever before!

With built-in sockets and pre-written C libraries, Parallax provides the resources for you to bring your project from idea to reality.

Learn or teach basics of electronics, programming and robotics with this board and our free C language web tutorials: [learn.parallax.com/PropellerAB](http://learn.parallax.com/PropellerAB).



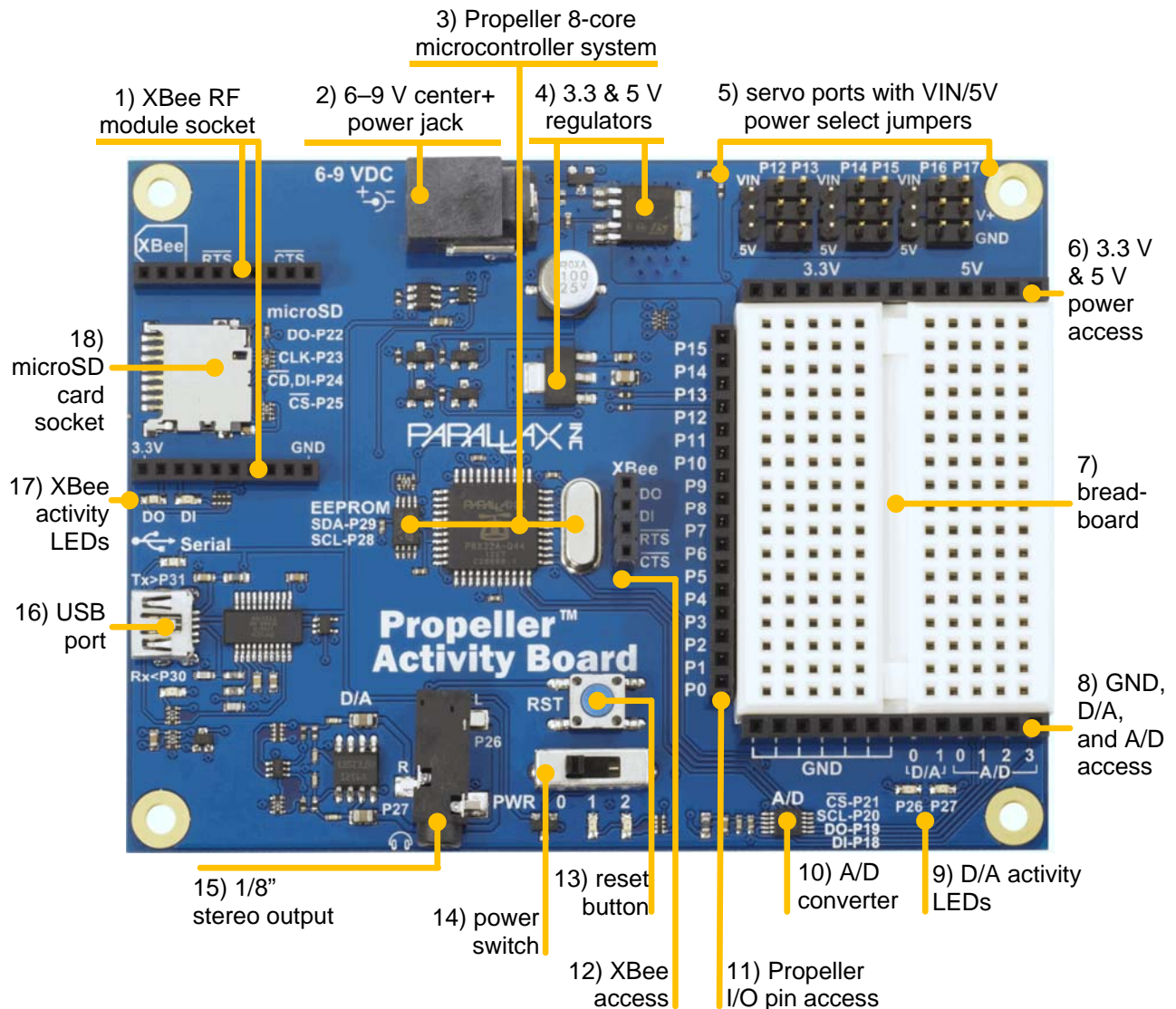
### Features

- Built-in 8-core Propeller P8X32A microcontroller, 64 KB EEPROM and 5 MHz crystal oscillator
- Breadboard, sockets for power and I/O access, and six servo ports with power-select jumpers for easy prototyping
- Automatically selects between USB and external power sources and provides USB over-current protection
- 6–9 V center-positive 2.1 mm barrel jack for external power supplies
- Convenient reset button and 3-position power switch
- Onboard mini stereo-audio jack
- Built-in microSD card slot for datalogging, WAV files, etc.
- XBee wireless module socket simplifies advanced applications
- Dedicated analog header sockets provide four A/D 12-bit inputs and two buffered variable-resolution D/A outputs
- 4-pin header for connecting I/O pins to the XBee RF socket
- Indicator lights show the status of system power, servo power, two analog output levels, XBee Tx/Rx, and USB Tx/Rx
- 3.3 V and 5 V linear voltage regulators

### Key Specifications

- Power requirements: 6–9 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



### 1) XBee RF Module Socket

This socket fits most XBee wireless modules and is useful when the Propeller Activity Board needs to be part of a wireless network. Use it for robot control and robot team sports, remote data logging, and wireless message exchange with computer connected to another XBee module or USB XStick.

NOTE: This socket does not support XBee Wi-Fi. See also 12) XBee Access, p. 4.

### 2) Power Jack

The 2.1 mm center-positive power jack is one of the two power input options. The board accepts 6–9 V from this connector. This option is useful for robots and other remote applications where the board is not powered from a computer's USB port. Parallax's 7.5 V, 1 A supply (#750-00009) works well with this board.

### 3) Propeller 8-core 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.

### 4) 3.3 V & 5 V Regulators

The linear 5 V regulator can deliver up to 1.5 A with a 6 V power supply, or 750 mA with a 9 V power supply, for circuits built on the breadboard and devices connected to the servo ports. The 3.3 V regulator can deliver up to 500 mA for breadboard circuits, and it also powers the Propeller microcontroller system.

### 5) Servo Ports

These ports are for connecting 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. Each pair can be set to 5 V by placing the jumper over the pair of pins closer to the 5V label, or to unregulated input voltage from an external power input by placing it over the pair of pins closer to the VIN label.

If the jumper for a pair of ports set to 5 V, they will receive regulated 5 V power whenever the power switch is set to 2. If the jumper for a pair of servo ports is set to VIN, they will receive unregulated power from the source connected to the 2.1 mm barrel jack, so long as the power switch is set to 2.

**CAUTION:** For servos and other high-current devices, use VIN and an external power supply; see 2) Power Jack on page 2 for details. Be sure to use a supply that does not exceed the input voltage rating of your device.

**CAUTION:** Attempting to drive servos or other high-current devices from USB power may cause your Propeller to reset. See 16) USB Port on page 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 4) 3.3 V & 5 V Regulators on page 3 for details.

### 6) 3.3 V & 5 V 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 4) 3.3 V & 5 V Regulators on page 3 for information about how much current can be supplied through these sockets.

### 7) 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".

## 8) GND, D/A, and 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 10) Analog to Digital Converter for details.

## 9) 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.

## 10) Analog to Digital Converter

Use the Analog to Digital Converter to monitor the voltage at analog inputs labeled 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 ksp/s SPI ADC, with a 5 V reference.

## 11) 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 XBee access header.

## 12) XBee Access

The XBee access header is to the left of the Propeller I/O pin access header. Use jumper wires between the two headers to connect Propeller I/O pins to XBee DO (data out), DI (data in), RTS (ready to send) and CTS (clear to send) pins.

## 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 and allow the Propeller to load the program in EEPROM.

## 14) Power Switch

The power switch has 3 settings:

- 0 — off
- 1 — power to the microcontroller system, including the P0-P15 via the I/O pin access socket
- 2 — power to the microcontroller system and servo ports; see 5) Servo Ports for details.

## 15) Stereo Output Jack

The audio output jack fits 1/8" headphone or speaker plugs. Propeller I/O pins P26 (right channel) and P27 (left channel) are hardwired to a low-pass filter, amplifier and coupling capacitor circuits that can drive headphones, ear-buds, speakers with built-in amplifiers, or line level inputs. It is compatible with the Veho 360 speaker from Parallax (item #900-00018).

## 16) USB Port

The USB port is used:

- to load programs from your computer into the Propeller microcontroller
- to provide serial-over-USB communication with a terminal program on your computer.
- to supply 5 V power to the Propeller Activity Board from your computer's USB port. For power, the USB Port is input current limited to between 450 mA and 500 mA. This prevents any unexpected responses from USB 2.0 ports to current draws from motors, wiring mistakes, etc. If you are using this board with an external USB hub, be sure to use a powered hub if you are not providing power from the power jack.

## 17) XBee DO/DI Activity Lights

These LEDs give a visual indicator of communication happening between the XBee module and the Propeller microcontroller. The XBee DO line activity is indicated with a blue LED. The XBee DI line activity is indicated with a red LED. See 12) XBee Access on page 4 for more information.

## 18) microSD Card Socket

This socket is useful for applications that need to access files from a microSD card. Examples include:

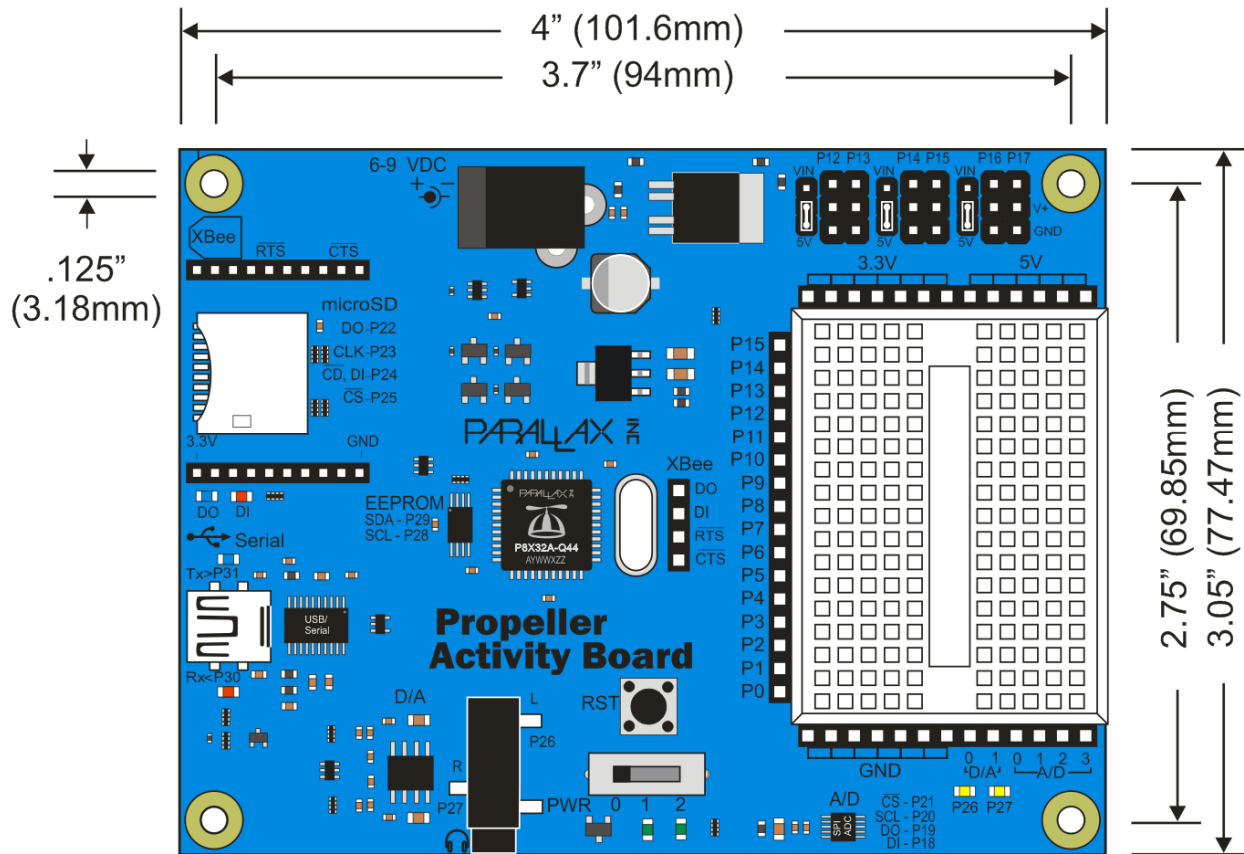
- Large lookup tables
- Play audio files
- C language programs using the extended memory model (XMM)
- Datalogging
- Multiple Spin program application images to be boot loaded

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).

## 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: <ul style="list-style-type: none"><li>– Logic buffered yellow LED circuits sockets for brightness control</li><li>– Low-pass filter + op amp buffer with outputs ranging from 0 to 3.3 V:<ul style="list-style-type: none"><li>o To DA0 and DA1 analog outputs on J1</li><li>o Through coupling capacitor to stereo outputs</li></ul></li></ul>
P28–P29	64 KB I2C EEPROM for program and data storage. P28 = CLOCK, P29 = DATA
P30	Propeller programming Rx (transmits signal received by USB-to-serial converter's Rx line)
P31	Propeller programming/debugging Tx (receives signal transmitted by USB-to-serial converter's Tx line)

## Dimensions



## Resources and Downloads

- Propeller Activity Board product page: go to [www.parallax.com](http://www.parallax.com) and search "32910".
- Online tutorials: [learn.parallax.com/PropellerAB](http://learn.parallax.com/PropellerAB)