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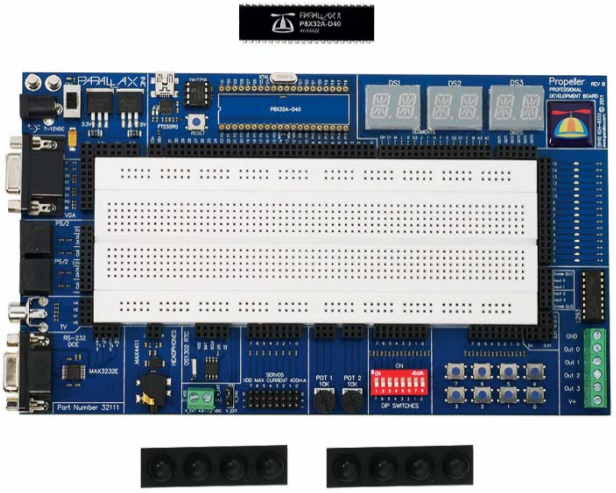
Propeller Professional Development Board (#32111)

The Propeller Professional Development Board is a high-quality, fully-integrated development platform for the Propeller P8X32A multicore microcontroller. A wide variety of peripheral connectors and typical I/O devices such as LEDs and buttons are built into the board, providing the developer with an ideal platform for rapid Propeller project development.

Features



- 40-pin DIP socket for P8X32A-D40 Propeller microcontroller
- P8X32A-D40 microcontroller included
- 24LC256 32 KB EEPROM included
- 5 MHz crystal included
- 5 V and 3.3 V regulators on board
- Built-in USB programming/communication interface
- Six blue 16-segment LED displays
- Sixteen blue discrete LEDs
- L293D high-current driver for motors, solenoids, etc.
- Eight active-low pushbuttons with 3.3 V pull-ups
- Eight active-low DIP switches with 3.3 V pull-ups
- Two 10 kΩ potentiometers
- Eight servo headers with selectable on-board/external power source
- DS1302 real-time clock with battery backup/charging capability
- MAX4411 headphone amplifier with 1/8" stereo audio jack
- MAX3232E RS-232 DCE interface
- RCA jack for broadcast TV or composite video
- Two PS/2 ports with 5 V power and 3.3 V pull-up resistors on clock/data lines
- 15-pin HD D-sub connector for VGA monitor
- Two ground terminals for logic analyzer/oscilloscope probe ground clips

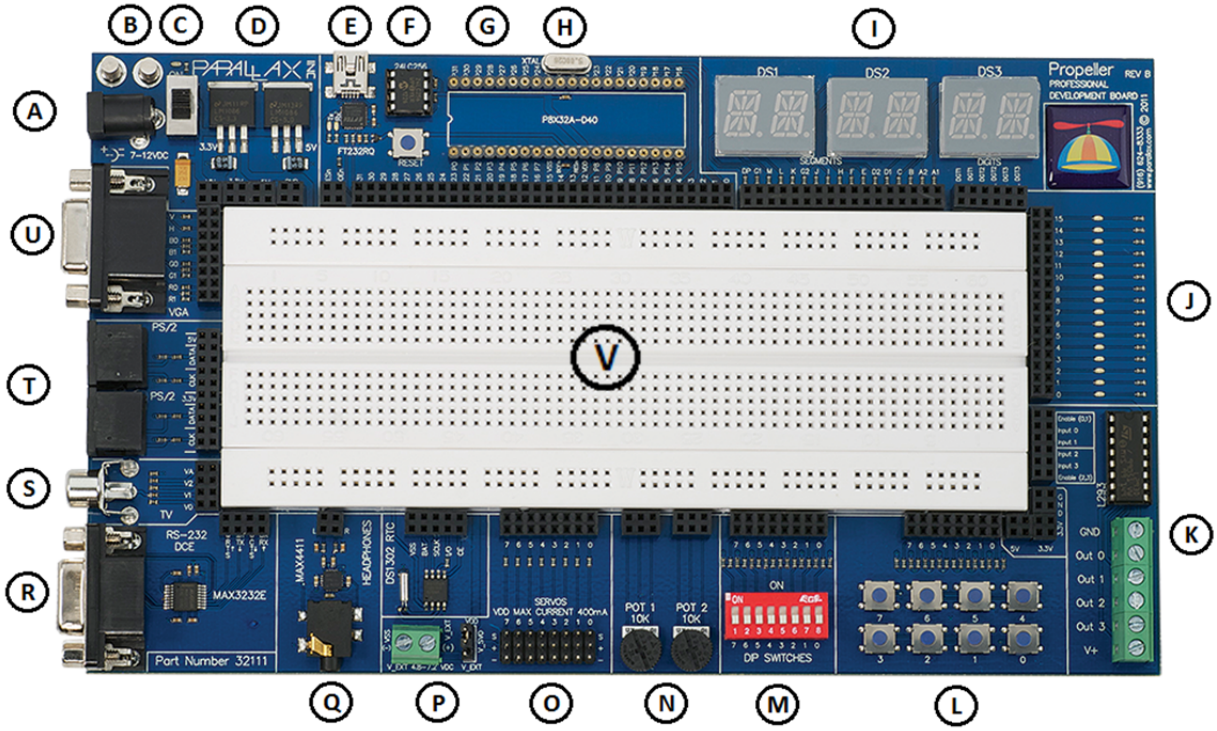
Key Specifications

- Power Requirements: 7–12 VDC (59 mA quiescent current @ 12 V)
- Communication Interface: USB serial programming interface (FT232R)
- Operating temperature: 32 to 158°F (0 to 70°C)
- Dimensions: 9 x 5.25 x 0.75 in (23 x 13.5 x 2 cm)

Product Change Notice

This product documentation is for the Propeller Professional Development Board Rev B. This revision added an extra ground terminal block to the top left of the board to make it easier to connect more than 2 scope probes. A VIN socket was added below the power switch, and additional 5 V and 3.3 V sockets were added to opposite corners of the board. The VGA connections were rearranged to make them consistent with the Propeller Demo Board wiring and pre-existing objects. The PCB color has changed from gray to blue. Schematics for both Rev A and Rev B boards are available from www.parallax.com.

Connections and Devices



A) Power connection, DC barrel jack, 7–12 VDC
B) Two ground terminals for ground probes
C) Power switch with LED power indicator
D) 5 V and 3.3 V on-board regulators
E) USB mini-B programming interface
F) 24LC256 EEPROM, 8-pin DIP included)
G) 40-pin socket for P8X32A-D40 included)
H) 5 MHz crystal (socketed)
I) Six-digit blue 16-segment LED displays
J) 16 blue discrete LEDs
K) L293D high-current quad half-H driver
L) Eight active-low pushbuttons
M) Eight active-low DIP switches
N) Two 10 kΩ potentiometers
O) Eight servo headers with selectable on-board/external power
P) DS1302 real-time clock with external backup battery/charging connection available
Q) MAX4411 headphone amplifier with 1/8" stereo phone jack
R) MAX3232E RS-232 DCE line driver with RX/TX and RTS/CTS handshaking signals.
S) RCA jack for NTSC/PAL composite/broadcast video/audio
T) Two PS/2 connectors
U) 15-pin HD D-sub connector for VGA
V) Solderless breadboard for connecting external components

(A) Power Connection

The DC Barrel Jack provides power to the Propeller Professional Development Board via a 2.1 mm barrel connector, center-tip positive. We recommend our 7.5 VDC 1 Amp power supply (#750-00009) for typical application development. Use our 12 Volt 1 Amp power supply (#750-00007) if you will be driving stepper motors, solenoids or other power devices via the L293D high-current driver.

(B) Ground Terminals

Two ground terminal posts provide plenty of secure connection room for logic analyzer and oscilloscope probe ground clips.

(C) Power Switch with LED

The power switch connects/disconnects power between the DC Barrel Jack Power Connector and the on-board voltage regulators.

Note: The VIN terminal block (top left, below the power switch) is intended to be used as a source of unregulated power for breadboard circuits while the board is being powered through the barrel jack. However, it is possible to apply an external power supply directly to the VIN terminal block as an alternate method of supplying power to the board. If you choose to do this, then power will be applied to the regulators regardless of the position of the switch.

(D) 5 V and 3.3 V Regulators

The PPDB contains both 5V and 3.3V circuitry so regulators for both voltages are included. 5V and 3.3V sockets are available at the top-left of the breadboard, bottom-right as well as near the push buttons.

Note: When V_{IN} = 12 V the Propeller Professional Development Board can source a maximum of 400 mA current. It is important to note that this total is from both regulators. Because the 3.3 V regulator is downstream from the 5 V regulator, the maximum current you can draw at 3.3 V is:

400 mA – (5 V current draw)

For example, if the 5 V circuitry is drawing 100 mA then you have 300 mA available on the 3.3 V regulator.

(E) USB Programming/Communication Interface

The Propeller Professional Development Board connects to a PC via a USB cable with a 5-pin mini-B connector (not included). This interface uses the FTDI USB to Serial chipset and requires the FTDI drivers to be installed on the host computer before connecting it. Power is not required for the USB circuitry to be active. The computer will recognize the USB COM Port even if the power switch is in the off position.

Note: The required USB drivers (for Windows) are typically installed automatically when you install the Propeller Tool software using the default options. Recommended USB cable is Parallax #805-00006.

(F) 24LC256 EEPROM

The EEPROM included on the Propeller Professional Development Board is capable of storing the entire 32 KB memory from the Propeller chip. For an additional 32 KB of non-volatile storage (64 KB total) you can optionally install a 24C512 EEPROM into this socket. This additional storage can be accessed using various Propeller objects.

(G) P8X32A-D40 Socket

A Propeller P8X32A-D40 multicore microcontroller is included with the Propeller Professional Development Board to get you started. This socket provides a convenient way to replace the Propeller 40-pin DIO chip should it be damaged during development. All 32 I/O pins of the P8X32A-D40 are available at the labeled connector socket block directly below the IC on the board.

(H) 5 MHz Crystal

The 5 MHz crystal is socketed allowing easy replacement if you should want to use a different frequency.

(I) 6-digit 16-segment LED Display

The 6-digit 16-segment LED display provides a flexible way to display data using the Propeller. They can display numbers, letters and even symbols. The displays are common-cathode and compatible with both 5 V and 3.3 V signals using 150 ohm series resistors. The decimal point and segment (anode) connections are located on the connector socket block directly below the displays. To the right of that connector are the common-cathode digit connections.

(J) 16 LEDs

16 LEDs are provided for visual indication of status, binary output of pins or variables, debugging or any other reason you may need LEDs in your project. The LEDs are compatible with both 5 V and 3.3 V signals and have a 470 ohm resistor in series. Connections are located on the connector socket block directly to the left of the displays (right side of breadboard).

(K) L293D High Current Quad Half-H Driver

The L293D is a 4-channel push-pull driver or quad half-h bridge. This driver chip could be used to control relays, solenoids, motors, high-current lights and both unipolar and bipolar stepper motors. The enable inputs are both 5 V and 3.3 V compatible. This circuit is designed to drive devices that have their own power supply. This power supply should be connected to the GND and V+ terminals on the terminal block on the bottom-right corner of the Propeller Professional Development Board. The control signals are accessible at the connector socket block directly to the left of the L293D IC, which is socketed for easy replacement. Note: VIN can be connected to V+ to provide 12 V when using a 12 V power supply.

(L) Pushbuttons

Eight pushbuttons are available to provide easy input signals for your Propeller project. These buttons are active-low and pulled to 3.3 V via 10 kΩ resistors. They also have 150 Ω series resistors for safety against short circuits. The pushbutton signals are accessible through the connector socket block directly above them, which is labeled 0 through 7 from right to left (binary).

(M) Active-low DIP Switches

Eight DIP switches are provided for easy input for signals such as configuration settings or other toggle switch type applications. These DIP switches are active-low and pulled to 3.3 V via 10 kΩ resistors. They also have 150 ohm resistors for safety against short circuits. The DIP switch signals are accessible through the connector socket block directly above them, which is labeled 0 through 7 from right to left (binary).

(N) 10 kΩ Potentiometers

Two 10 kΩ potentiometers provide analog signals, such as adjustable voltage reference or attenuation. The legs of each potentiometer are connected directly to the connector block above it.

(O) Servo Headers

Eight servo headers provide common ground, servo supply voltage, and signal inputs to each servo. The signal pins each have a 150 ohm series resistor. The servo signals are accessible at the connector socket block directly above the servo headers and are labeled 0 through 7 from right to left (binary). To the left of the servo headers is a 3-pin header with a shorting block on it. This block selects whether the servos get their voltage from the board's 5 V regulator or from an external voltage source. When the shorting block is in the top position, internal voltage is selected. In the bottom position, external voltage is selected.

Note: When using the on-board 5 V signal do not exceed 400 mA current! If you need more current or wish to use more than 4 servos you should select external voltage and connect this source to the 2-position terminal block to the left of the selection header. Be sure to observe proper polarity!

(P) DS1302 Real-Time Clock

The DS1302 is a real-time clock calendar IC with battery backup and charging circuitry. It also contains 31 bytes of RAM, which is also backed up when an external battery is connected to the BAT/VSS connections on the connector socket block for the DS1302, located above it. The DS1302 is powered internally from 3.3 V and the I/O line has a 150 ohm series resistor. The required 32.768 kHz crystal is permanently mounted.

(Q) Headphone Amplifier

The MAX4411 has been configured as a stereo headphone amplifier with a 1/8" stereo phone jack for connecting standard headphones. As there is no volume control, take care to assess the volume level of audio signals before placing the headphones directly on/in your ears. The L/R audio in signals are accessible from the connector socket block above the MAX4411.

(R) RS-232 Interface

An RS-232 DCE interface is provided via the MAX3232E line driver. This 3.3 V version of the popular MAX232 will make it easy to interface the Propeller to RS-232 level serial devices. RX, TX, RTS and CTS signals are available providing flow control for serial applications if needed. These signals are available on the connector socket block below the bottom-left corner of the breadboard.

(S) Video Out Jack

This RCA jack contains the resistors necessary for the Propeller chip to generate composite video signals (NTSC/PAL) as well as TV broadcast signals, including the audio subcarrier channel. The signals for this jack are located on the connector socket block just to the right of the RCA jack.

(T) PS/2 Connectors

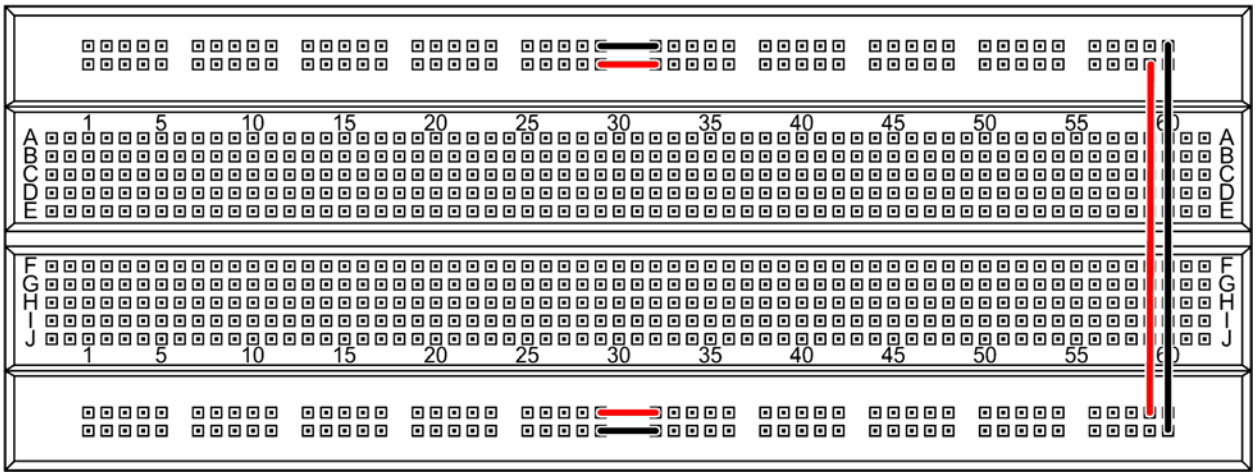
Two PS/2 connectors are provided to connect PS/2 keyboards and mice to the Propeller Professional Development Board. Each PS/2 port provides 5 V for power and 3.3 V 10 kΩ pull-ups on the clock and data lines. The clock and data lines have 150 ohm series resistors for protection against short circuits. The connector socket block for the PS/2 connectors is located to the right of the PS/2 connectors (left-center of the breadboard). These sockets and their functions are identical so it does not matter which is used for mouse/keyboard.

(U) VGA Connector

The 15-pin D-sub connector is used to connect a standard VGA monitor to the Propeller Professional Development Board. The appropriate resistors required to generate VGA video signals are included on the PPDB already. The connector socket block to the right of the VGA connector provides the Horizontal, Vertical and RGB signal interface.

(V) Solderless Breadboard

The large breadboard is provided for prototyping with custom circuitry. The power busses do not extend the length of the breadboard. To distribute power to all regions of the breadboard install jumpers using 22 gauge wire as shown below. These power busses can then be connected to the appropriate power supply (5 V or 3.3 V). If your circuit requires both 5 V and 3.3 V supplies, omit the red wire connecting the upper and lower busses and make the top power bus 5 V (available at top-left above the breadboard) and the bottom buss 3.3 V (available at bottom-right of the breadboard).



Note that the connector socket blocks for all the interfaces described above are arranged neatly around the breadboard, making connections between them nearly seamless. All connector socket blocks have two rows providing two connections to each signal, except power blocks, which provide 4 connections per block.

Resources and Downloads

Check for the latest version of this document, free software, and schematic diagram from the Propeller Professional Development Board product page. Go to www.parallax.com and search 32111.

Please refer to the product schematic for detailed information about each circuit on the board. For additional information on some of the integrated circuits included on the Propeller Professional Development Board, such as the L293D, DS1302, MAX4411 or MAX3232E, please download the manufacturer's datasheet or application notes from their respective websites.

Revision History

Version 1.1

Updates reflect changes made to product Rev B. See the Product Change Notice on page 2 for details.