



Prop-2 Controller

PN: 31102

Document Version: 1.2 • 18 DEC 2007

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DESCRIPTION

The Prop-2 is a small-scale controller designed to meet the needs to prop builders, effects technicians, and others involved in light industrial control. The Prop-2 combines a Parallax BASIC Stamp[®] 2 microcontroller core with two high-current sink drivers (ULN2803A), allowing the user to connect devices like relays, solenoids, and lamps directly to the controller. Dual connections are provided for all I/O pins (3-pin header for TTL input/output connections; terminal block for high-current, open-collector outputs).

PRODUCT APPLICATIONS

- Holiday and museum displays
- Special FX and props
- Small-scale industrial control

FEATURES & BENEFITS

- Genuine Parallax BASIC Stamp 2 controller core
- 2.1 mm (center positive) power input (9 to 24 VDC)
- Three-position power switch (OFF, BS2 only, BS2 and V+ terminal)
 - separate LEDs are provided for +5v and V+ terminal
- 5v regulator provides up to 0.5 amps for TTL circuits
- ULN2803A high-current sink (open collector) drivers for outputs
 - can be used to drive solenoids, relays, lights, etc. – positive source is V+
- All I/O pins are protected with 220 Ω inline resistors
- Servo-style 3-pin header (Signal-Vdd-Vss) on all I/O pins
- Optional pull-up / pull-down setup resistors available on P12 through P15
 - simplifies connection of trigger devices
- Compact size: 3.2" x 4.15" (82.8mm x 50.8mm)

Power Connection / Power Switch

Power to the Prop-2 controller is provided through a 2.1 mm, center-positive barrel connector (commonly used with "wall-wart" power supplies). Use of a center negative supply will damage the controller.



CAUTION: Check the power supply carefully before connecting to the Prop-2; the use of a center-negative, AC, or unregulated supply that significantly exceeds 30 VDC *will damage the controller*.

Before connecting power to the Prop-2 controller, ensure that it is not resting on a metallic (conductive) surface; doing so could damage the Prop-SX circuitry and external power supply.

NOTE: Do not exceed 30 VDC at the input of the Prop-2 controller. Doing so will cause the onboard regulator to shut-down and prevent operation of the controller. When in doubt, use a regulated power supply.

A three-position switch controls power on the Prop-2. In position 0, all power is off. In position 1, power is supplied to the regulator and to the BASIC Stamp 2 (BS2); power is indicated by an LED near the power input connector. In position 1, the BS2 is active for programming and control via the 3-pin I/O headers. In position 2, the voltage supplied at the power connector is routed to the V+ terminals for use by external devices (relays, solenoids, lights, etc.). In position 2, a second power LED (near the topmost V+ terminal) will be lit.

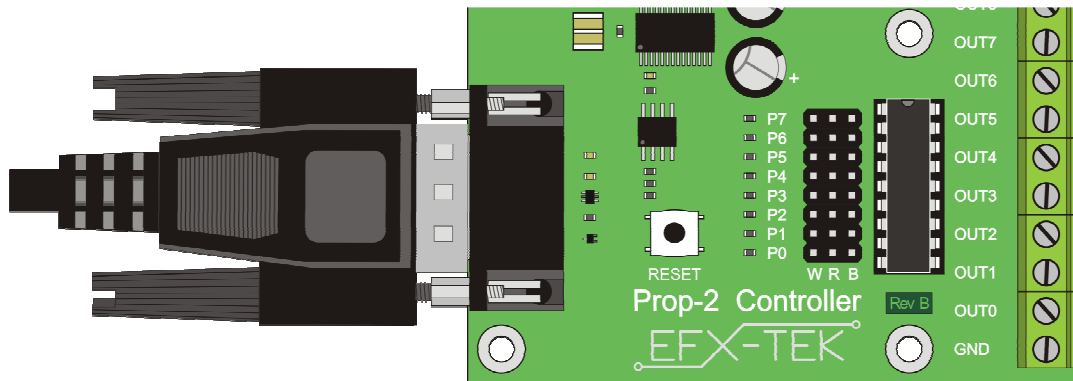
Programming the Prop-2 Controller



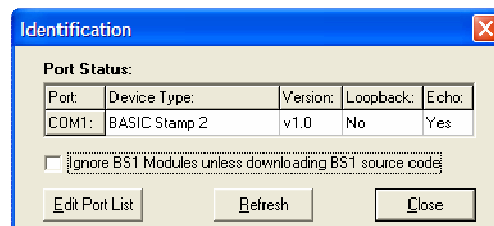
NOTE: EFX-TEK recommends using the Parallax BASIC Stamp Windows Editor which can be downloaded from this link:

www.parallax.com >> Downloads >> Basic Stamp Software

1. Start by making sure that you have the latest BASIC Stamp Editor; please download and install the latest update before proceeding. Start the BASIC Stamp Editor.
2. Connect a standard 9-pin serial cable (do not use a null modem cable) between an available serial port on your PC and the programming connection on the Prop-2. If you do not have an available serial port a USB-to-Serial adapter (#28030) may be used.
3. Connect a 9 to 24 VDC power supply to the Prop-2.
4. Move the power switch to position 1. An LED adjacent to the power connector will light; if it doesn't, check your power supply.



Once you've made the proper connections and verified that the power LED is lit, it's time to test the programming link between the BASIC Stamp Editor and the Prop-2 Controller. From the **Run** menu, select **Identify**. The following dialog should appear (Note: Your system will probably have different serial ports):



If the BASIC Stamp Editor is not able to locate the BASIC Stamp 2 (Prop-2), check the following items in order:

1. Is the power switch set to position 1 and the power LED lit?
2. Is the serial cable or USB adapter/cable connected to the Prop-2?

3. Are you using a true, straight-through, serial cable and not a null modem cable?
4. Is the serial port already in use by another program (like a PDA synch program)? If so, disable the program while programming the Prop-2 or select another serial port.
5. Has the serial port been excluded from the *Identify* dialog search? Click the *Edit Port List* button to verify that it can be searched, or add it to the port list.

Once you have a connection, the final step is to do a simple test of the board. Enter the following program into the editor, and then click the Run button on the toolbar.

```
' {$STAMP BS2}
' {$PBASIC 2.5}

Main:
  DEBUG "Hello, prop programmer!"
  END
```

The program will be compiled and downloaded to your Prop-2. Immediately thereafter you will be greeted by the Debug Terminal window with the "Hello, prop programmer!" message. Congratulations, the Prop-2 is up and running and ready to control your props, displays, and special FX devices.

Making Connections

There are two ways to make connections to the Prop-2 Controller:

1. Pin headers, P0..P15 (0.025" square pins on 0.1" (2.54mm) centers – compatible with hobby servo connectors)
2. Terminal block, OUT0..OUT15 (will accept up to 14-gauge wire) – *these are for outputs only*

The pin headers are compatible with 0.025" female crimp pin sockets (e.g., Molex 16-02-0103) that are available from a wide variety of electronics retailers (e.g., Jameco - #100766). Another good source of these connectors and a kit to build cables is Lynxmotion (www.lynxmotion.com). An easy way to connect to the 3-pin headers is by using the 12" extender cable (#805-00002); these can be cut in half to make two custom connections for your Prop-2 controller.

The terminal block provides connection for ground, V+ (when power switch is in position 2), and switched, low-side outputs for P0..P15; these terminals are outputs only and cannot be used for input connections. Note that the switched outputs connect to ground when active, and "float" (are disconnected) when not active.



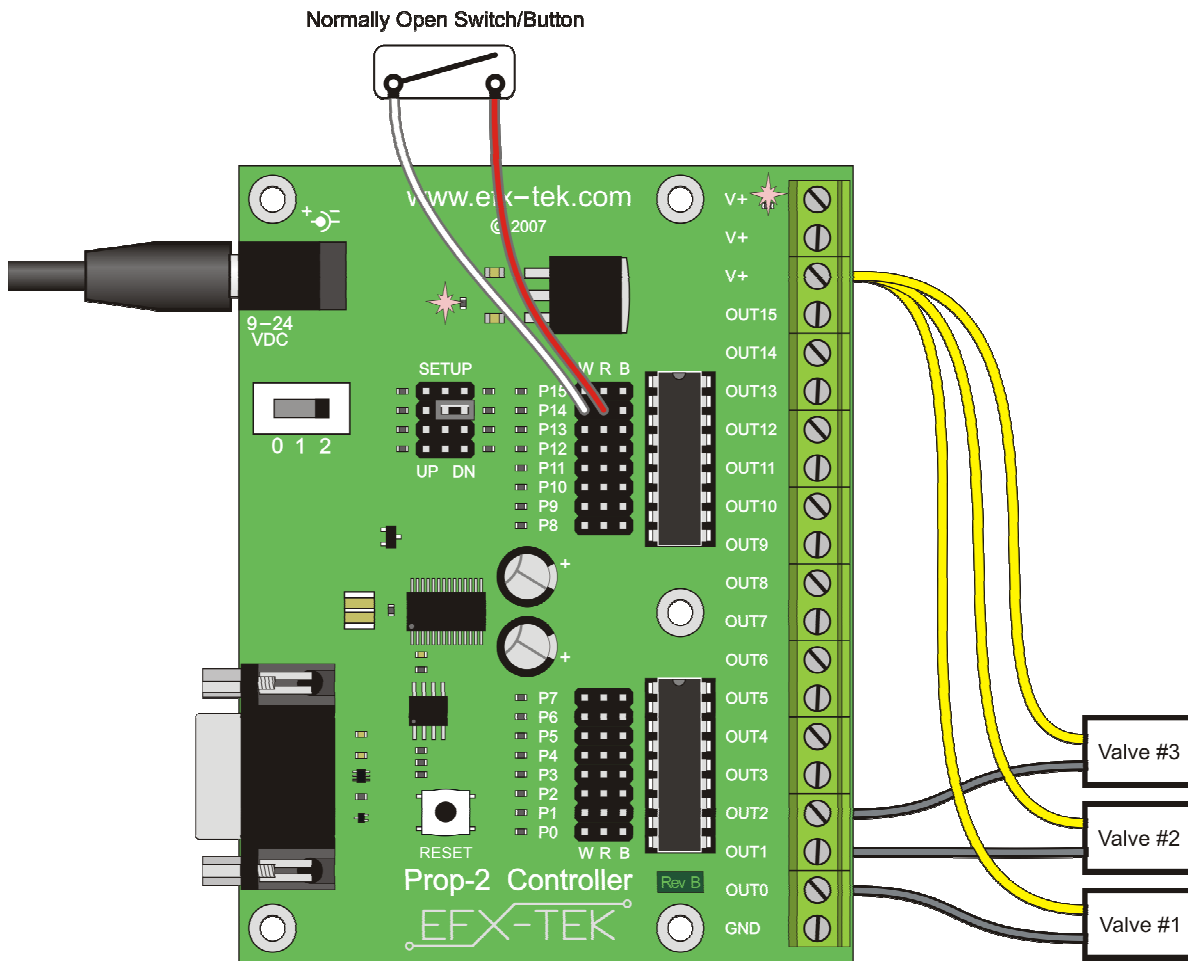
NOTE: When powering external devices from a voltage source other than that used to power the Prop-2 controller board, do not place the power switch in position 2. Doing so could cause damage to the Prop-2 and external circuitry.

Trigger Inputs

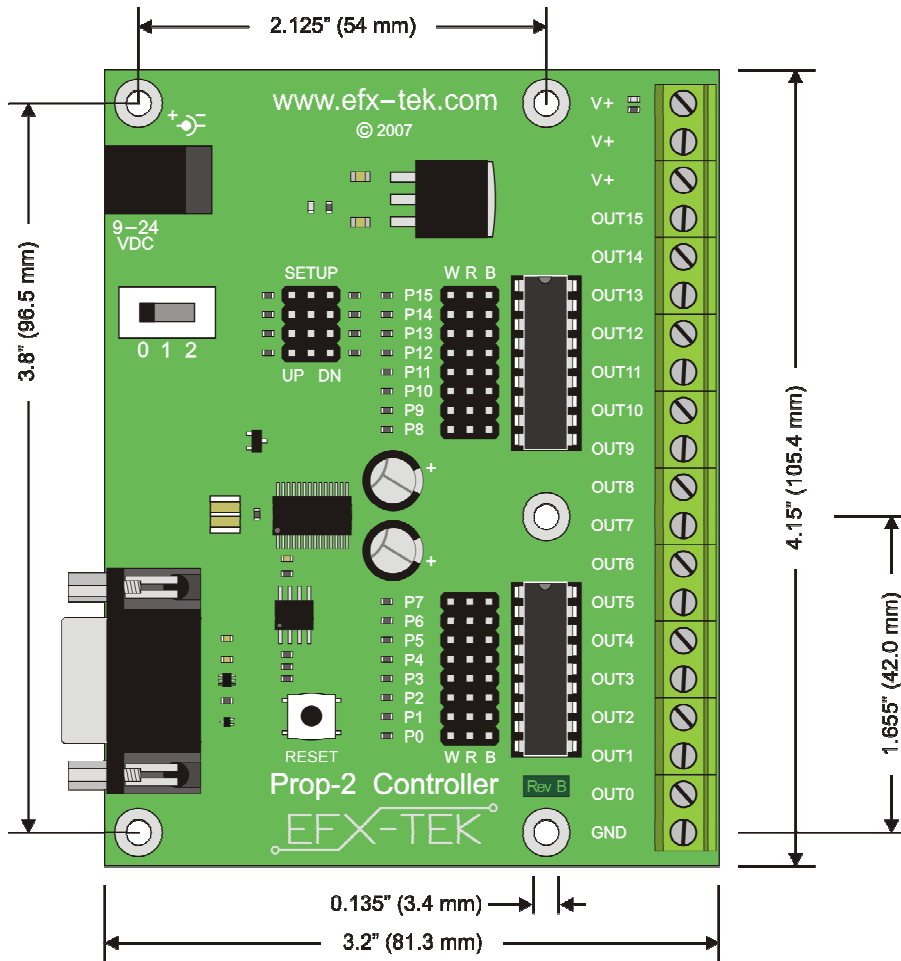
I/O pins P12..P15 have additional configuration (SETUP) jumpers that allow either of these pins to be set to a predetermined state when used as an input. When the jumper is placed in the “UP” position, the pin is pulled up to Vdd (+5v) through a 4.7 kΩ resistor – this is the setting to use for active-low trigger devices or configurations (i.e., a normally open switch placed between the trigger pin and Vss). When the jumper is placed in the “DN” position, the pin is pulled down to Vss (ground) through a 4.7 kΩ resistor; this is the setting to use for active-high trigger devices or configurations (i.e., the output from a PIR or sonic sensor).

Use of the SETUP jumper is optional, but should be used when either of these pins is used as an input as a “floating” input pin can cause false triggering. Note that if not needed as inputs, P12..P15 may be used as outputs (remove SETUP jumper when using either as an output).

The illustration below shows typical connections where P14 is used as the trigger input with OUT0, OUT1, and OUT2 are outputs. Note the P14 SETUP jumper (DN position) and that the power switch is set to position 2 so that power is available for the valves.



MECHANICAL SPECIFICATIONS



ELECTRICAL SPECIFICATIONS

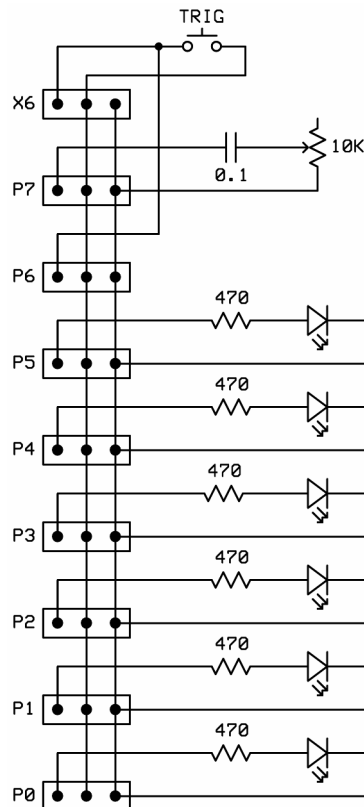
Parameter	Symbol	Specification			Unit
		Min.	Typical	Max.	
Supply Voltage	V_{IN}	9	12	30	VDC
Supply Current (no loads)	I_{IN}	25			mA
TTL input low	V_{IL}	0		0.8	VDC
TTL input high	V_{IH}	2		5	VDC
TTL output low	V_{OL}	0		0.6	VDC
TTL output high	V_{OH}	4.3		5	VDC
TTL output low current (sink) – per pin	I_{OL}			25	mA
TTL output high current (source) – per pin	I_{OH}			25	mA
TTL output low current (sink) – per group	I_{OLG}			50	mA
TTL output high current (source) – per group	I_{OHG}			50	mA
OUTx output low current (sink) – per pin	I_{OUT}		150	500	mA
OUTx output low current (sink) – per group	I_{OUT8}			1200	mA
Operating Temperature	T_{OP}	-40	25	85	C

Specifications subject to change without notice.

Demo Application: LED Strobe Controller

The following application demonstrates the use of a Prop-2 as a lighting controller, simulating the landing lights at an airport. A normally-open switch is used to trigger the controller; when this switch is active the light outputs will be sequenced using a simple loop.

The easiest way to see the program output is by attaching the Prop-1 Trainer (#31199) to the upper I/O group, P8..P15 (Note: You must replace the ULN2803A on this group with the ULN2003A that is provided with the Prop-1 Trainer, otherwise the ULN2803A will interfere with the potentiometer circuit). Remove the P12 and P13 SETUP jumpers, and move the P14 and P15 SETUP jumpers to the DN position before installing the Prop-1 Trainer. The Prop-1 Trainer schematic below shows the connections in the event you decide to build your own circuit. You may also wish to connect 12-volt lamps between V+ and the OUT8..OUT13 terminals (one lamp per terminal; 200 mA max each).



Source Code for Strobe Controller

```
' =====  
'  
' File..... Strobe_Controller.BS2  
' Purpose.... Linear strobe of six outputs  
' Author..... EFX-TEK (www.efx-tek.com)  
' E-mail..... teamefx@efx-tek.com  
' Started....  
' Updated.... 01 JUL 2007  
'  
' {$STAMP BS2}  
' {$PBASIC 2.5}  
'  
' =====  
'  
' -----[ Program Description ]-----
```

```

'
' Creates a linear strobe of six lamps/LEDs on P8..P13; much like airport
' landing lights. Strobing runs when button on P14 is pressed, and rate
' can be adjusted with pot circuit on P15.
'
' Replace the ULN2803A on P8..P15 with a ULN2003A to allow the pot circuit
' on P15 to operate correctly.

' -----[ Revision History ]-----

' -----[ I/O Definitions ]-----
Speed          PIN      15          ' remove ULN, SETUP = DN
Trigger        PIN      14          ' SETUP = DN

' -----[ Constants ]-----
IsOn           CON      1
IsOff          CON      0

' -----[ Variables ]-----
thePin         VAR      Byte        ' Lamp/LED pin pointer
delay         VAR      Word         ' for timing

' -----[ Initialization ]-----
Reset:

' -----[ Program Code ]-----
Main:
DO WHILE (Trigger = IsOn)          ' run when button pressed
  GOSUB Speed_Delay                ' read speed setting
  FOR thePin = 8 TO 13             ' loop through lamps/LEDs
    HIGH thePin                    ' LED on
    PAUSE delay                    ' hold
    LOW thePin                     ' LED off
  NEXT
LOOP
GOTO Main

' -----[ Subroutines ]-----

' Reads pot on Prop-1 Trainer, then sets delay to 50 to ~150 ms

Speed_Delay:
HIGH Speed                          ' charge RC circuit
PAUSE 1
RCTIME Speed, 1, delay              ' read raw delay
delay = delay / 3 + 50              ' set new range
PAUSE delay                          ' hold a bit
RETURN

```

Accessories

750-00007 12 VDC, 1 Amp power supply; *provides ample power for the Prop-2 and accessories*
31199 Prop-1 Trainer; *learn to program the Prop-2 without having to connect external devices*
805-00002 12-inch, 3-pin extension cable; *used to connect external devices to the TTL I/O pins*

Additional Applications

For additional ideas and application notes for the Prop-2 controller, be sure to visit us on the Internet at the following links:

www.efx-tek.com
forums.efx-tek.com

Errata

Rev A. and Rev B. boards do not have the loop-back feature enabled so the BASIC Stamp Editor may not find the Prop-2 in when *Default Com Port* is set to AUTO. Manually set the *Default Com Port* as required to connect to the Prop-2.

BASIC Stamp is a registered trademark of Parallax, Inc.