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# BASIC Stamp 1 Project Board (#27112)

## Development / Education Platform for the BASIC Stamp 1

### Introduction

When the BASIC Stamp 1 was introduced – 10 years ago – nobody could foresee the impact this ingenious little controller would have on the electronics world; at both the hobbyist *and* professional levels. The original BASIC Stamp 1 (BS1) and its big brothers, the BASIC Stamp 2 family, have sold millions of units all over the world, and into every application and industry one can imagine.

The BASIC Stamp 1 has been used for years in award-winning Science Fair projects, in industry, in hobbyist and professional robotics, in television and motion picture props and special effects – the BS1 has a long and illustrious track record you're in very good company when you choose it.

The BS1 Project Board is a low-cost reintroduction of the original BASIC Stamp in a HomeWork Board type platform that has become a standard for students, hobbyists, and even professional engineers. The board includes everything you need to get started with microcontroller applications at minimal expense – just add your external circuits, code, and imagination.

### Features

- BASIC Stamp 1 microcontroller built right into the board
- I/O pin protection resistors (220  $\Omega$ ) makes the BS1 Project Board "student safe"
- Wall-pack (2.1 mm center-positive plug) or 9-volt battery power supply connections (mechanically interlocked to prevent dual connection)
- Voltage regulator delivers up to 40 mA of power for circuits
- DB9 connector for Stamp-IC programming and DEBUG communication during run-time (includes serial adapter circuit and requires Windows BASIC Stamp Editor, V2.1 or higher)
- 1<sup>3</sup>/<sub>8</sub>" x 2" solderless breadboard for external components
- PCB prototyping area configured for several convenient options
- Mounting holes for permanent installation into your projects

### Packing List

Verify that your BS1 Project Board kit is complete in accordance with the list below:

- BS1 Project Board #555-27112 (includes solderless breadboard)
- Solderless Breadboard #700-00012
- Bag of (10) Jumper Wires #800-00016
- Documentation

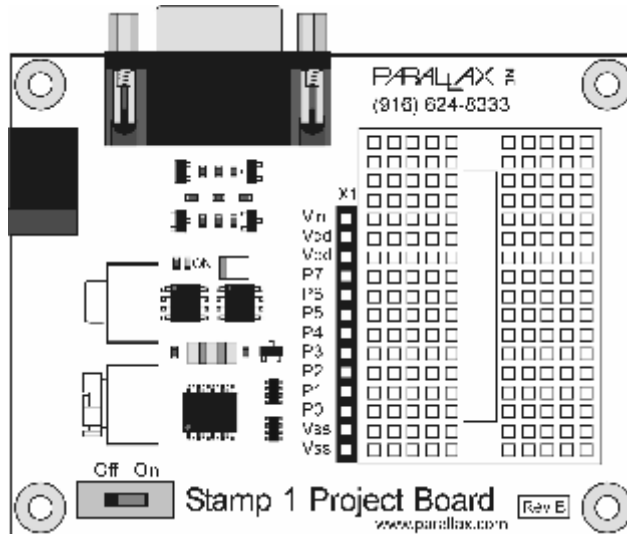
Several BASIC Stamp 1 demonstration programs are installed with the Windows BASIC Stamp Editor. Additional demonstration and application files may be downloaded from Parallax.

## Select Project Board Configuration

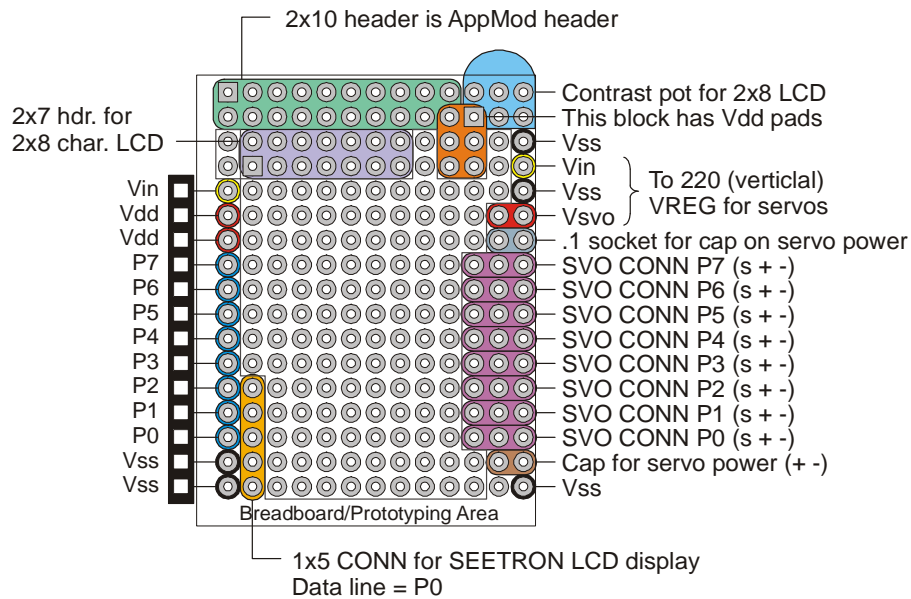
The BS1 Project Board may be setup for one of two configurations:

1. Experimenting by assembling circuits on the solderless breadboard.
2. Permanent project by soldering components or accessories to the PCB

To use the solderless breadboard, remove the paper backing and attach it to the PCB as shown below.



For permanent projects, you may leave off the breadboard and solder components directly to the PCB. Parallax offers a range of accessory component kits for the BS1 Project Board. The figure below shows the layout of the printed circuit board:



\*  Pad denotes Pin 1 where applicable.

## Getting Connected with the Breadboard Configuration

1. Start by making sure that you have the latest Windows BASIC Stamp Editor. The BS1 Project Board requires Editor version 2.1 or higher. If you have an earlier version, 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, this will not work) between an available serial port on your PC and the programming connector on the BS1 Project Board.
3. Connect a wall-pack (6 – 15 volts DC) power supply or 9-volt battery.
4. Move the power switch to the On position. You should see a red power LED illuminate. If not, check your power supply (must be center-positive) or battery (perhaps dead).

Once you have 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 BS1 Project Board. On the Editor toolbar, locate the *Identification* button:



After clicking the *Identification* button, the following dialog will appear (Note: Your system will probably have different serial ports):



If the Editor is not able to locate the BASIC Stamp 1, check the following items in order:

1. Is the power switch set to On and the red power LED lit?
2. Is the serial cable connected to the BS1 Project Board and to the PC?
3. Is the serial port already in use by another program (like a PDA synch program)? If so, disable the program while using the BS1 Project Board or select another serial port.
4. Has the serial port been excluded from the Identification search? Click the *Edit Port List* button to verify that it can be searched, or add it to the port list. You may also need to open the *Preferences* dialog and from the *Editor Operation* tab, set the *Default Com Port* to AUTO.

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.

```
' {$STAMP BS1}
' {$PBASIC 1.0}

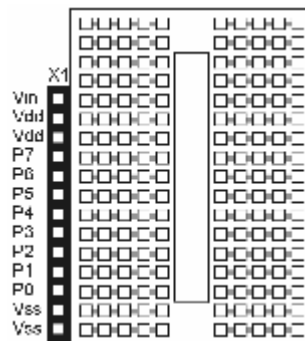
DEBUG "Hello, World!"
```

The program will be compiled and downloaded to your Stamp. Immediately thereafter you will be greeted by the **DEBUG** window with the "Hello, World!" message. Congratulations, the BS1 Project Board is up and running and ready for your experiments.

You may notice that after running the test program the power LED blinks very briefly about every two seconds. This is normal behavior. Refer to the **END** instruction in the manual or online help file for a complete explanation.

## Using the Breadboard

The breadboard has many strips of copper which run underneath the board in a horizontal fashion. These strips connect the sockets to each other. This makes it easy to connect components together to build circuits.

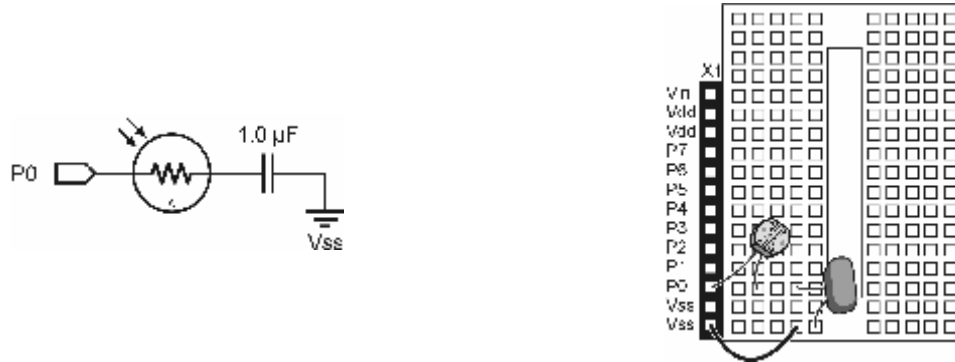


To use the breadboard, the legs of components or wires are placed in the sockets. The sockets are made so that they will hold the component in place. Each hole is connected to one of the metal strips running underneath the board. Each metal strip forms a node. A node is a point in a circuit where two components are connected. Connections between different components are formed by putting their legs in a common node. There are two columns of 17 nodes on the breadboard. Each node contains five holes.

For chips with many legs (ICs), place them in the middle of the board so that half of the legs are on the left side and half are on the right side. Nodes on the left side are not connected to nodes on the right side.

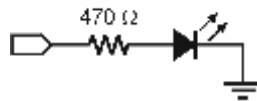
## Example Circuit

On the left is a simple circuit used to monitor light levels. The illustration on the right shows how this circuit can be constructed on the breadboard.

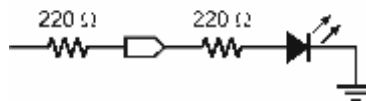


## Technical Notes About Pin Protection Resistors

The BS1 Project Board includes 220 Ω resistors inline with every I/O pin to protect the Stamp interpreter chip from inadvertent short circuits. In most cases these resistors will have no affect on your experiments. There may be times, however, when you chose to account for them. For example, if you have the following typical LED circuit:



To maintain about the same LED brightness you could change the resistor value from 470 Ω to 220 Ω, since it will be in series with the onboard 220 Ω resistor as shown below.



The total resistance is now 440 Ω, very close to the original circuit while using standard component values. When making resistor substitutions like this, be sure to consult the Technical Specifications table below to remain within the source and sink limitations of the BASIC Stamp 1.

## BASIC Stamp 1 Project Board Technical Specifications

Microcontroller.....	Microchip PIC16C56A
Speed.....	4 MHz
Program Execution Speed.....	~2,000 instructions per second
EEPROM Size.....	256 bytes (93LC56)
Program Length.....	~80 instructions
Inputs / Outputs.....	8
Source / Sink Current per I/O.....	20 mA / 25 mA
Source / Sink Current (device).....	40 mA / 50 mA
Power Consumption.....	7 mA running (no loads); 5 mA Sleep (Rev B) <sup>1</sup>
PC Interface.....	Serial, 4800 baud (programming and DEBUG)
Editor (Windows only).....	STAMPW.EXE (Version 2.1 or higher)
Power Supply.....	6 – 15 volts DC (2.1 mm, center-positive), or 9-volt battery
PCB Size.....	3 <sup>1</sup> / <sub>4</sub> " x 2 <sup>1</sup> / <sub>2</sub> " (with <sup>1</sup> / <sub>8</sub> " corner mounting holes)
Project Area.....	1 <sup>3</sup> / <sub>8</sub> " x 2" solderless breadboard or through-hole mounting pads <sup>2</sup>

1. On Rev B boards the power LED remains illuminated when the BASIC Stamp is in sleep mode.

2. Note that not all pads are available for general-purpose use; many are configured for option kits (AppMod connector, parallel and serial LCD connectors and servo connectors).

## Additional Resources

The following materials are available for download from [www.parallax.com](http://www.parallax.com):

- BASIC Stamp Programming Manual (Downloads → Documentation)
- BASIC Stamp 1 Applications Notes (Downloads → Documentation)
- Nuts & Volts "Stamp Applications" Reprints (Downloads → Nuts & Volts Columns)
- The Elements of PBASIC Style (Downloads → Documentation)

## Accessory Components

- Wall-pack power supply #750-00008
- AppMod socket kit #TBD (*advanced – requires soldering*)
- Parallel LCD connection kit #TBD (*advanced – requires soldering*)
- Serial LCD connection kit #TBD (*advanced – requires soldering*)
- Servo connection kit #TBD (*advanced – requires soldering*)

## Quick Guide to PBASIC 1 Instructions

- BRANCH Branch to address specified by offset
- BUTTON Monitor and manage button input; branch if button is in target state
- DEBUG Send variables and/or messages to PC for viewing
- EEPROM Store user data in available EEPROM space
- END Terminate program and enter low-power mode until reset
- FOR...NEXT Create numerically controlled loop
- GOSUB Unconditional branch to a subroutine
- GOTO Unconditional branch to program address
- HIGH Make pin an output high
- IF...THEN Compare and conditionally branch to program address
- INPUT Make pin an input
- LET Optional designator for assignments
- LOOKDOWN Search for target in table; if found set output variable to target location
- LOOKUP Set output variable to table data specified by offset
- LOW Make pin output low
- NAP Enter low-power mode for short period
- OUTPUT Make pin an output
- PAUSE Suspend program for 1 to 65,535 milliseconds
- POT Read a 5 – 50 K $\Omega$  variable resistance and scale result
- PULSIN Measure width of an input pulse
- PULSOUT Output timed pulse by inverting pin for some time
- PWM Output analog level (requires external RC network for filtering)
- RANDOM Generate a pseudo-random number
- READ Read byte from EEPROM location
- RETURN Return from a subroutine
- REVERSE Reverse pin state; make input if was output, output if was input
- SERIN Receive serial data, 300 – 2400 baud, N81 format
- SEROUT Transmit serial data, 300 – 2400 baud, N81 format
- SLEEP Enter low-power mode for 1 – 65,535 seconds
- SOUND Generate tone or white noise
- TOGGLE Make pin an output and toggle current state
- WRITE Write byte to EEPROM location

Consult the BASIC Stamp Programming Manual or the Editor's online Help file for a complete explanation of each PBASIC instruction.