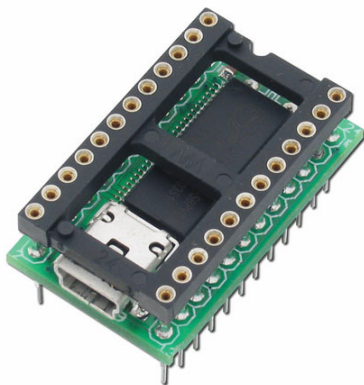# BASIC Stamp Logic Analyzer (#30010)

Introduction

The BASIC Stamp Logic Analyzer (BSLA) is a collaborative design between Parallax and CWAV, the developer of the popular USBee Pod logic analyzer series (www.usbee.com). The BSLA fits between all 24-pin BASIC Stamp and Javelin Stamp modules and their programming socket. The BSLA hardware connects directly to your PC's USB 2.0 port. The BSLA software runs on your PC and displays the digital value of all 16 BASIC Stamp I/O lines, Vdd, Res, Sout and Sin.

Technical Features

- USB 2.0 High-Speed connects the BSLA to your PC[1]
- BSLA power is from the USB port
- 2 Ms/s sample rates, fast enough for all Parallax 24-pin modules [2]
- 20 channels (16 for I/Os and 4 for Vdd, Res, Sout, Sin)
- Thresholds set at 1.4V and 0.8V, supporting TTL and CMOS
- Small size (3.25 L x 1.95 W x 1.67 T cm / 1.28" L x 0.77" W x 0.66" T)
- Free BSLA software compatible with Win2K, WinXP operating systems
  - Multiple triggering options on all channels
  - I2C, asynchronous serial, SPI bus decoder
  - Minimum sample depth of 1 million samples up to available PC RAM
  - Sample clock generated internally
  - Save, Open and Print captured data and settings
  - Movable cursors for easy measurements

[1] To determine if your PC has USB 2.0 support, go to the Windows / Device Manager and look under Universal Serial Bus Controller. If your device is shown as USB 2.0 Enhanced Controller then you have USB 2.0 support.

[2] USB 2.0 PC systems are commonly available in two types (a) USB 2.0 native on the motherboard which runs at speeds over 24MBytes/sec and (b) USB 2.0 PCI add-in cards and PCMCIA cards, along with some laptops which typically run at only up to 8MBytes/sec. The BSLA's 2 Ms/s BSLA sample rate with 16 channels is 4 Mbytes/sec, within the range of the slower USB 2.0 computers and fast enough for all Parallax 24-pin microcontrollers.

BASIC Stamp Logic Analyzer
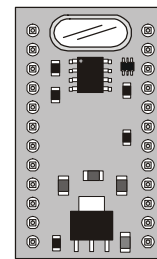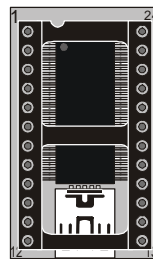
Top and bottom drawings

Packing List

Verify that your BSLA kit is complete in accordance with the list below:

- BASIC Stamp Logic Analyzer module
- USB A to Mini B cable

The BSLA PC software is available for download from our web site at http://www.parallax.com/detail.asp?product_id=30010 and is not included in the BSLA kit.

BSLA Software Installation

First, install the BSLA software before any hardware is connected. Download, unzip the files and run the "Setup.exe" program. The BSLA software is compatible with Windows 2000/XP. The software will also install the drivers for the Cypress USB chip used on the BSLA hardware and make the necessary addition to your Windows registry file.

BSLA Hardware Setup

Next, install the BSLA module. The BSLA module fits between any Parallax 24-pin microcontroller and the programming socket. To install the BSLA hardware on a Parallax board:

1. Disconnect power.
2. Remove your 24-pin Parallax module from the pcb socket.
3. Firmly insert the BSLA module noting the location of pin 1, denoted by the notch in the top of the BSLA's black socket. On the Board of Education, the BSLA's USB connector will be oriented opposite to the power jack as shown below.
4. Replace the 24-pin Parallax module in the BSLA's socket.
5. Connect the USB mini-B cable to the BSLA and to the USB 2.0 port on the PC.
6. Plug in power.

BASIC Stamp Logic Analyzer installed on a Parallax Board of Education.
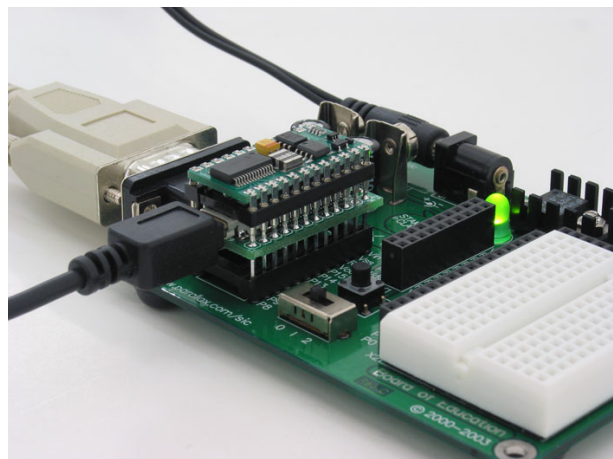
Using the BASIC Stamp Logic Analyzer Software

Run the BLSA software, which is located in the Programs/Parallax Inc/BASIC Stamp Logic Analyzer directory.
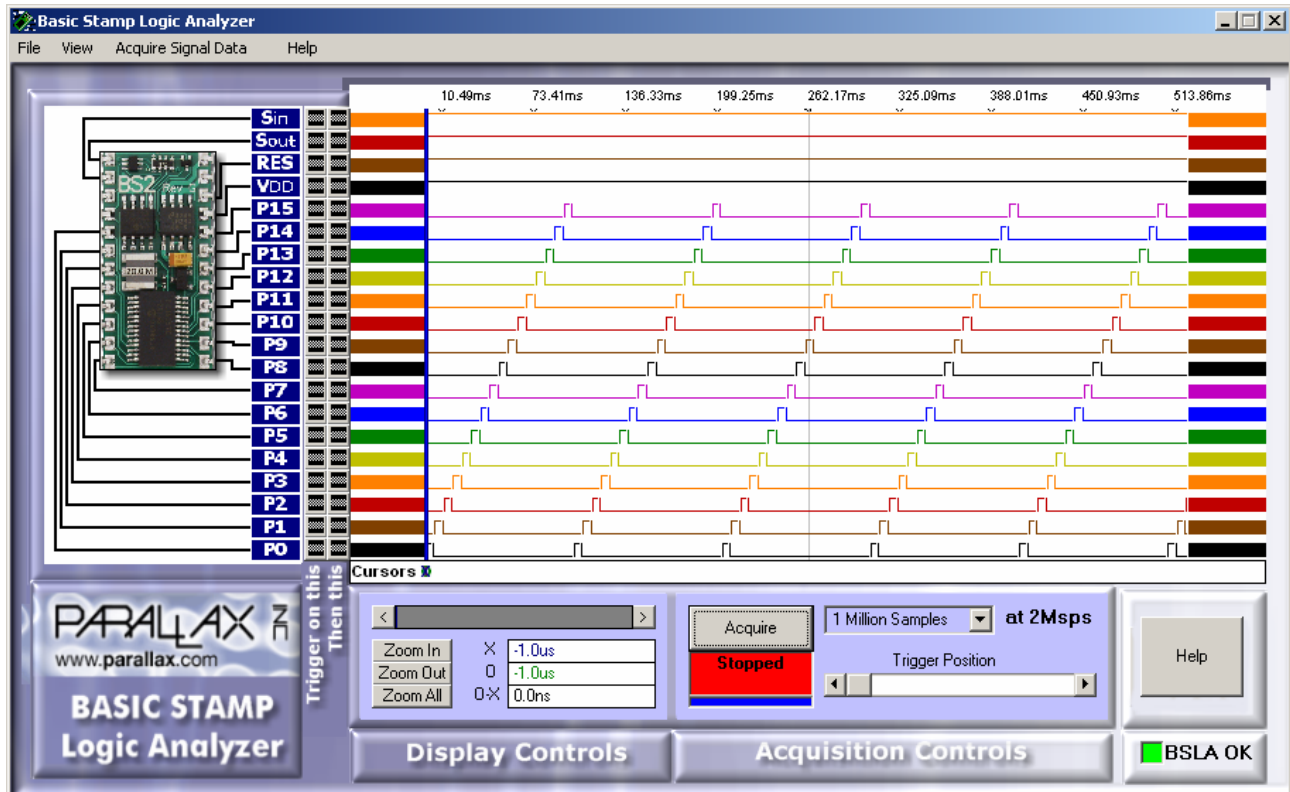

Replace image with some changes requested to Tim.

If BSLA device was recognized, then you will see a green button with "BSLA OK" in the lower, right-hand corner. Once you are successfully connected, try running the example BASIC Stamp / Javelin Stamp programs at the end of this document to test all of the BSLA's signals. These programs will display the I/O ripple pattern shown above.

Acquisition Controls

To acquire a signal, press the "Acquire" button. Use the pull-down menu to select the number of samples you would like to acquire, between one million and the maximum shown. The maximum sample buffer size will depend on the amount of available RAM in your PC. These samples will be stored in your PC's RAM as they are captured.
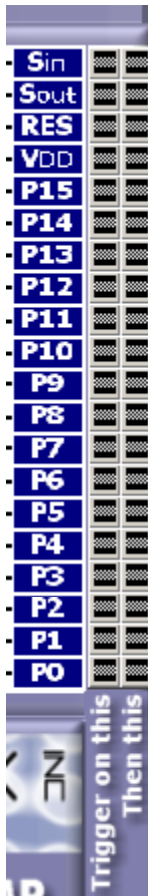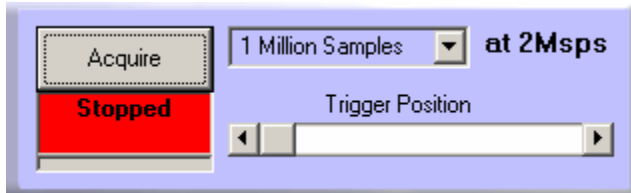
In the BSLA default state, it will start capturing data as soon as the "Acquire" button is pressed. However, sometimes it is desirable to wait until a certain event on a signal line occurs before the sampling begins. This can be done using the Trigger settings, which are just to the right of the signal names as shown below.

You can trigger on any level combination on any of the 20 signals. For example, if you want to trigger on the first time where P0 is sampled low, set the first position low following the P0 label by clicking the high label until it looks low (see graphic examples below). When you press "Acquire", the BSLA will wait until the P0 signal is low. Once it is low, it will trigger and store an entire buffer of samples. The buffer will display the Trigger cursor (red marked with a "T") showing the position that the trigger occurred. If you would like to trigger on a falling edge, not just the next low sample, then use the combination of high and low. If you would like to trigger on the next rising edge, select a low followed by a high level.

 No trigger

 Low symbol

 High and low combination triggers on a falling edge

The "Trigger Position" scrollbar lets you choose the relative location of the trigger within the sample buffer. To see what happens before the trigger, put the trigger position over to the right. Most of the captured samples will then be samples before the trigger occurs. To view samples that occur after the trigger position, place the Trigger Position at the left side (at the beginning of the buffer) and most of the samples will be samples taken after the trigger occurs.

Display Controls

The buttons labeled Zoom In and Zoom Out will zoom in or out on the signal in the middle of the BSLA's screen. The same function can be done by clicking the left and right mouse buttons in the colored display area. The Zoom All button displays all samples contained in the buffer on a single screen.
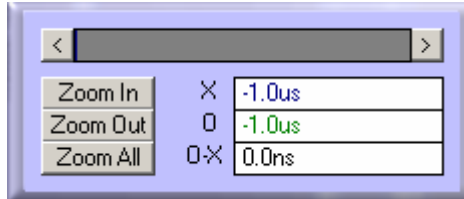
Signals are measured using two cursors. Place your mouse on the "Cursors" line and mark the begin and end points with your left and right mouse buttons, respectively. Zoom in as appropriate.
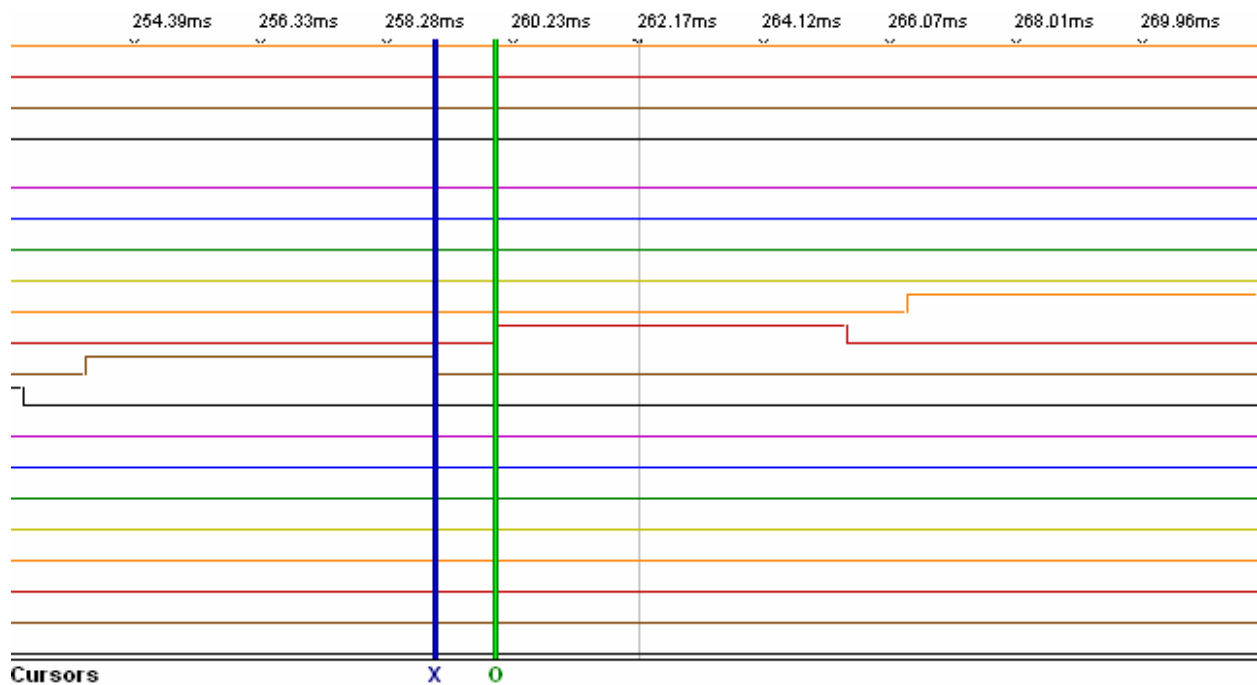
Measurements will be shown in your Display Controls box.

SPI Decoder

The View menu includes an SPI Decoder. This tool translates the synchronous serial data bits sent to and from peripherals like ADCs, DACs, clocks, memory devices, etc. The SPI Decoder requires that Slave Select (SS), Serial Clock (SCK) and Serial Data Out and Serial Data In (SO and SI) lines be identified. Next, select the Sampling Edge, Display Mode and Bit Order. ASCII or Hex values of the data lines will be displayed.

For example, the following BASIC Stamp 2 code sends a decimal 65 (ASCII letter "A"). In order to capture a short file, set the trigger.

```
'{$STAMP BS2}
SHIFTOUT 14, 15, LSBFIRST, [65]
```
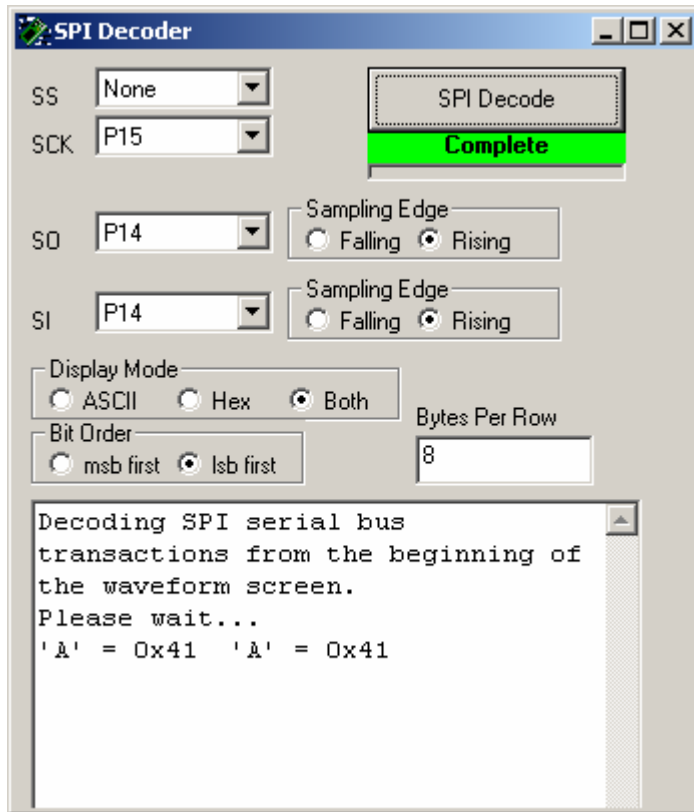
I2C Decoder

The I2C Decoder displays the data being sent or received by I2C-compatible devices (I2C command is supported only by the BS2p and BS2pe). To use this feature, you must first identify the BS2p24's I/O connections that are connected to the I2C-compatible chip's SCL and SDA pins.

For example, the following is an example of transmitting a "write" command to an I2C device connected to pins 0 and 1, followed by an address of "5" and a number of "100". It is important to have an I2C device connected to the BASIC Stamp in order to receive acknowledgement.

```
'{$STAMP BS2p}
'{$PBASIC 2.5}
I2COUT 8,$E0,[$32,$32]
```
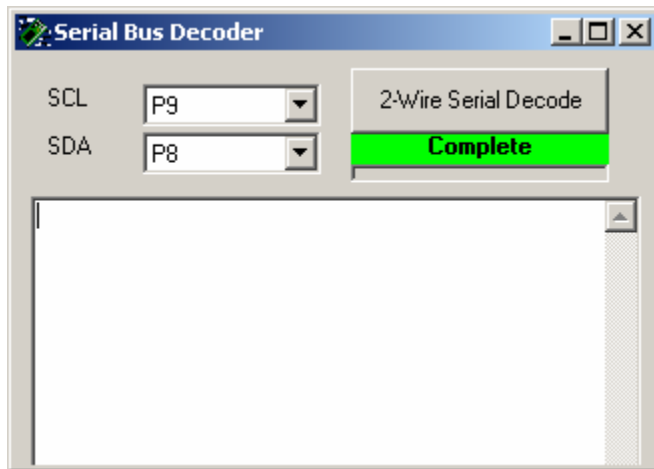
Asynchronous Serial Decoder

Serial data may also be decoded using the Asynchronous Serial Decoder, accessed from the View Menu. Choose any of the pins to monitor, configure the baud rate, parity and display mode.
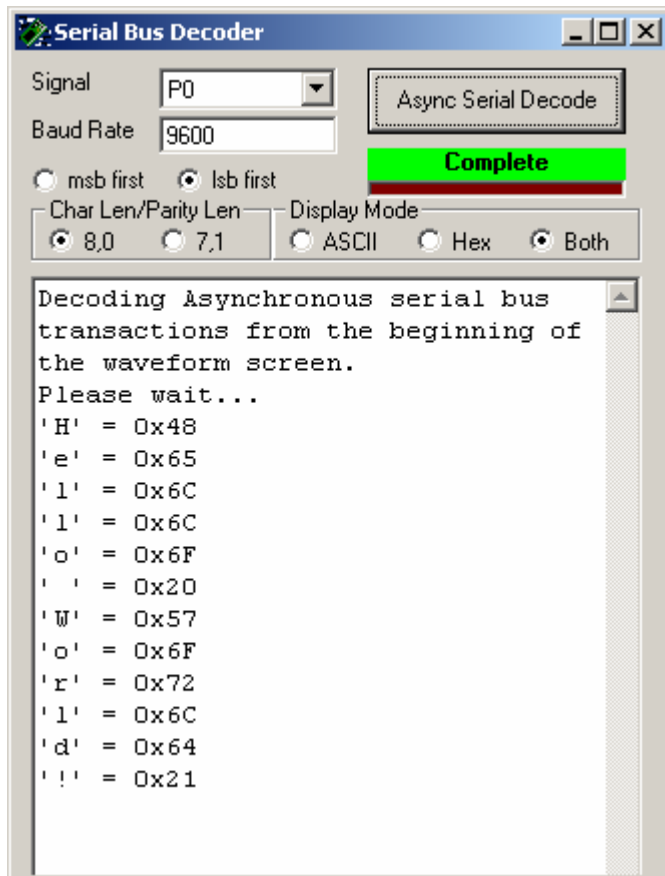
With the following BASIC Stamp 2 code, the BSLA decodes "Hello World!".

```
'{$STAMP BS2}
SEROUT 0, 84,["Hello World!"]
```

Frequently Asked Questions

(Q) I'm having trouble with the driver installation. The BSLA software isn't recognizing the BSLA hardware.

(A) Try the following, systematically:
    a) Plug in the BSLA hardware to the USB cable, and connect the cable to the PC
    b) Go to Windows Control Panel, System, Hardware, Hardware Device Manager
    c) In the Universal Serial Bus section, find the device that you have plugged in. It most likely will have a yellow symbol next to it.
    d) Right click and press Uninstall.
    e) Unplug the device.
    f) Reinstall the BSLA software.
    g) Plug in the BSLA hardware again.
    h) You will be prompted with the New Hardware Found wizard.
    i) Choose all the defaults.
    j) The device should be live and running now.

(Q) How do I know if my computer supports USB 2.0?

(A) Within the Windows Device Manager, expand the "Universal Serial Bus Controllers" list. If one of the ports listed is a "USB 2.0 Enhanced Host Controller" or similar then you have USB 2.0 support.

Example Code

The following BASIC Stamp 2 code will test all BSLA signals in a ripple fashion.

```
' =========================================================================
'
'   File....... Logic_Analyzer_Check.BS2
'   Purpose.... Tests IO Pins on Parallax USBee Logic Analyzer
'   Author..... Parallax, Inc.
'   E-mail..... support@parallax.com
'   Started....
'   Updated.... 02 FEB 2005
'
'   {$STAMP BS2}
'   {$PBASIC 2.5}
'
' =========================================================================


' -----[ Program Description ]---------------------------------------------


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


' -----[ I/O Definitions ]-------------------------------------------------


' -----[ Constants ]-------------------------------------------------------


' -----[ Variables ]-------------------------------------------------------

pinNum          VAR     Nib


' -----[ EEPROM Data ]-----------------------------------------------------


' -----[ Initialization ]--------------------------------------------------

Reset:


' -----[ Program Code ]----------------------------------------------------

Main:
  DO
    FOR pinNum = 0 TO 15                      ' cycle through all pins
      HIGH pinNum                            ' make this pin high
      PAUSE 5                                ' short delay for scope
      LOW pinNum                             ' make this pin low
    NEXT
  LOOP                                       ' repeat forever

  END


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

Example Javelin Stamp Code

The following Javelin Stamp code will test all BSLA signals in a ripple fashion.

```
// =======================================================================
// Logic_Analyzer_Check.java
//
// Updated: 07 FEB 2005
// =======================================================================

import stamp.core.*;

public class Logic_Analyzer_Check {

  static int pinNum;

  public static void main() {
    System.out.println("Cycling Pins");
    while (true) {
      for (pinNum = 0; pinNum <= 15; pinNum++) {      // test all pins
        CPU.writePin(CPU.pins[pinNum], true);         // make pin high
        CPU.delay(50);                                // wait 5 ms
        CPU.writePin(CPU.pins[pinNum], false);        // make pin low
      }
    }
  }
}
```