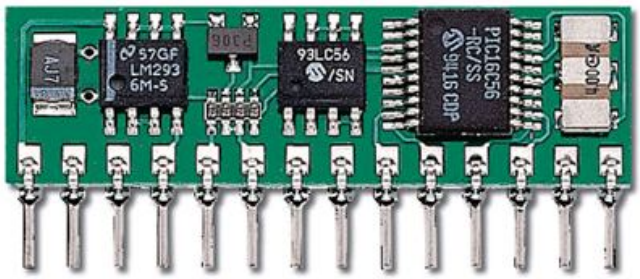
StampOne News!

Premier Issue 1
Spring 2009

"EVERYTHING ABOUT THE PARALLAX BS MICRO"



School & Home Projects with the Parallax Basic Stamp 1

By humanoido

Welcome to the first issue of StampOne News! – an exciting independent home-spun journal, solely designed by hobbyists for hobbyists. In particular, we want home experimenter enthusiasts and students to benefit from these project examples and be stimulated into creative thinking with the inspiration to build home circuits, science projects, and unique inventions. (You may utilize, copy and distribute StampOne News at the hobby level but not for sales, money gain or professional use.) We've stripped away most of the formatting so we can concentrate on the projects in minimal time presentations. Hand drawings will be shown to help save time over tedious computer drawings. Yes, we're on a shoestring budget. Yes, we're going to put a new twist on projects! We've got the handle on low cost and simplicity. If anyone can build it and make it work, you can do it!

In this issue, a 3D Three Dimension Stamp 1 Computer invention changes the way we think about using Basic One Stamps.

Build Your Own 21st Century 3D Stamp Computer !

A Novel Hobby Computer Invention
by Dr. Humanoido

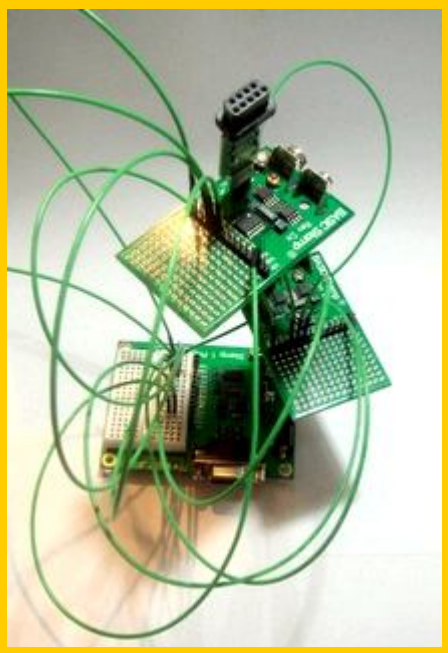


Fig. 1 – Is it science fiction art or working science fact? This strange looking computer is a three dimensional microcontroller with new applications.

The 3D Basic Stamp Computer is a tri-level board computer made up of Basic Stamp 1 boards. It's an exciting project that creates an aggregate cluster of 3 Stamps with a core in each dimension!

Back in the 60's, an amazing TV series called Star Trek, the brainchild of science fiction master Gene Roddenberry, was born. I remember being awed by the Vulcan, Spock, playing a game of 3D Chess. Nowadays, you can pick up 3D Chess at the local store. It has become

We'll be the first to admit it – we love Parallax products - microcontrollers and sensors, books and support. Face it; no other company ever had such innovative products and a wide range comprehensive information library for component support! This is a foremost consideration when building a microcontroller circuit and interfacing a sensor. You never want to find yourself "in over your head." That's why we'll guide you along the way with information and ideas.

One of the rare books from the original Tom Swift Sr. series was published in the year 1910. The text for this book and others are now in the public domain and available for download.

In the early 60s, a book adventure series by the name of *Tom Swift Jr.* was published. Authored by the pen name of Victor Appleton II, the books tell the continuing story of a young scientist inventor/boy genius who creates many amazing inventions (including a giant robot!). We believe the real Tom Swift of today would use Basic Stamp micro controllers and parallax products to accomplish his projects. For this reason, we encourage you to become the real *"Tom Swift"* of the 21st century, using Parallax parts as your cache of scientific components and the crux stimulus of unending creative inventions. Let's get started now!

Basic Stamp One Book?

We could write a book about Basic One Stamp projects – but that could take 2 years from beginning to final publication, *the average length of time to put out a quality book.* But look! Electronic magazines are much more efficient in getting to high resolution colorful epress. Here's the latest issue of **StampOne News!** In full color, it's here now. No delay. It holds the latest projects, mind melding info and ideas that you'll want to immediately put into good use.

science fact! Welcome to the 21st Century! 3D Chess has multiple player levels where components can move. It represents a higher order of thinking in three dimensions. How can this concept be applied to microcontrollers? Introducing the world's first 3D novel computer! Like 3D Chess, this fun new computer has multiple dimensional levels of processor boards.

Introducing Space-Time Computing!

The 3D Stamp Computer is a tri-level stage of Basic Stamp microcontroller boards interfaced on a Stamp party line.

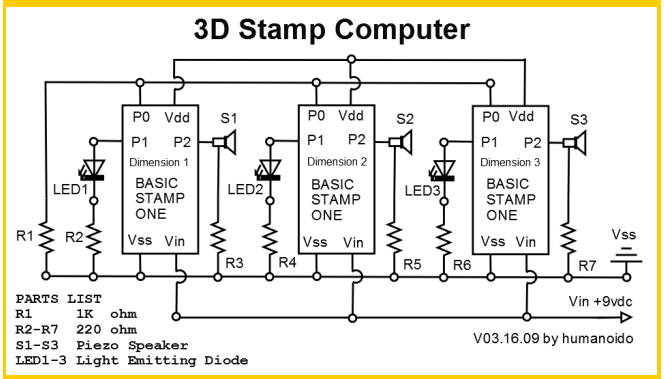


Fig. 2 – Schematic for the 3D Computer shows open source serial mode wiring for three Basic One Stamps (Dx boards shown) which are located at three dimensional places in space-time. Parts are minimal and only require LEDs, piezo speakers and resistors. Wiring includes capability for dimensional communications. When using a Stamp 1 Project Board, remember to adjust for the 220 ohm resistors already in place on the ports. All 3DSC photos and illustrations by humanoido. A larger schematic is posted at the Parallax Forum under Projects, in the Supercomputer thread.

Powerful Dimension Engines

The number of dimensions are up to you. This example uses three dimension engines. All three dimensions can operate at the same time or in part. The visual aspect is one of great clarity because of the stacking footprint. Now you can traverse the dimensions of space and time, literally. All three dimensions can be put in motion at the same time. The power of multidimensional computing is the ability to use time and space in various relationships with

hardware, calculation, computation, sound, light, sequence, phase, and sensors to develop new creative concepts.

3D Chess
In personifying the game of 3D chess play, the moves are now wires, with virtual space and software code that transcends from one level to the next. Thoughts and programming are now in three dimensions using both hardware and software.

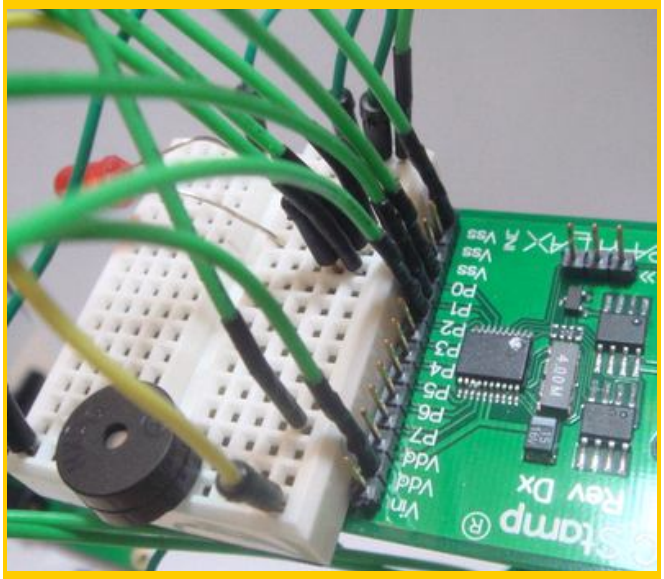


Fig. 3 A garden of green wires have male and female connectors on the ends for routing pins on Stamp Rev Dx boards directly to the bread-board. A solderless breadboard is added to support wires, a speaker and LED.

Overview To build the working model shown here, you'll need three Parallax boards and parts. This system is a Stamp 1 Project board, two Basic Stamp Rev. Dx boards and some green wires. Add in a resistor for the interface, some piezo speakers for sound, three LEDs for light, spacer hardware, and the device is complete. For more detail, refer to the schematics and wiring procedures.

Modify the Dx board
To modify each Dx board, simply affix one solder less breadboard to the free zone. The breadboard is self adhering.

Wiring Procedure
Serial Tx/Rx is on P0. On each board, connect the LED from Vss to P1, and Piezo speaker from Vss to P2. A 220 ohm dropping resistor connects the LED to port on the Rev Dx boards. The Project board already has the resistor built in. Connect a 1K resistor from P0 to Vss. Connect the Vss of each board together. Connect all P0's of each board together. On the Stamp 1 Project Board, lead small jumpers from both Vss locations, P0, P1 and Vdd to the breadboard as seen in the Figure.

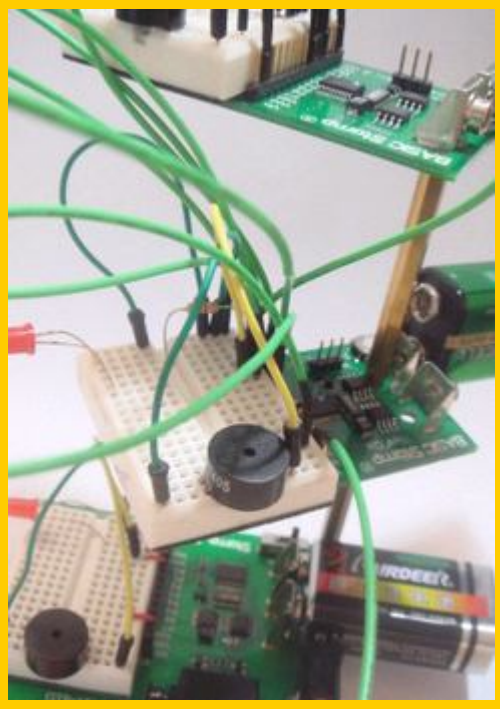


Fig. 4 Inter level programming (wire to wire) and multi-dimensional software (board to board) propels the 3D Computer. Batteries are $.39 carbon-zinc.

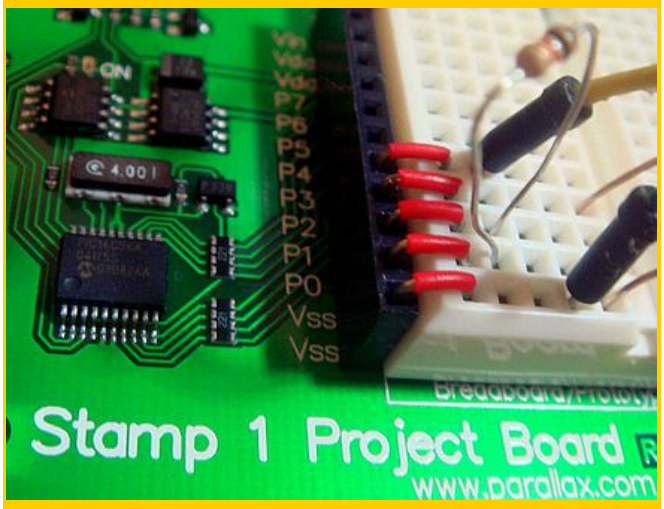


Fig. 5 Jumper both Vss and pins P0, P1, and P2 to the breadboard. Resistor is from Vss to P0.

Cost
Depending on your shopping savvy, cost can be as low as $50 or less if you already have some parts on hand. Purchasing everything new from stores at premium prices will still total well under $100.

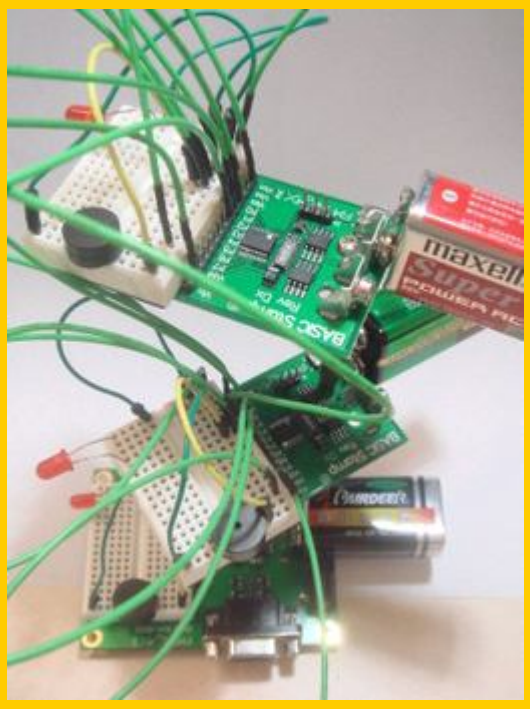


Fig. 6 Position boards with batteries at the balance point. The larger BS1 Project Board becomes the base. The upper two boards have solderless breadboards added for easy wiring.

Photos Note
All photos are shown during different stages of development and experimentation. Do not assume the wiring shows the completed unit unless otherwise indicated. Photos are shown to illustrate the points in the captions.

3D Computer Parts List
1 Parallax Stamp 1 Project Board
2 Basic Stamp Rev Dx Board
3 Nine Volt Battery
3 Red LED
1 Resistor 820 Ohms (on Stamp 1 Project Board)
4 Resistor 220K Ohms (when using 2 Dx Boards and a Stamp 1 Project Board)
3 Piezo Speakers 5 Volt
1 Pack Jumper Wires
1 Pack Male/Female Lead Wires
2 Brass Spacer 6cm Length, Female & Male Ends
1 Nut, 1 Screw for Above
2 Solderless Breadboard

PBASIC 3D Code
Being a 3D computer, the concept is to write three dimensions or levels of code that can interact all together. This can be syncing, phasing and coordinating of time, light, sound and data.

Let's Hold a Party - By the Rules
The Party Line design is so everyone can talk and everyone can listen, when abiding by a few rules. No two or more dimensions may talk at the same time. When one dimension is talking, the others must listen. Dimensions may "act" at the same time, i.e. perform various combinations of input and output. Commands and language are sent in ASCII serial format using English as noted.

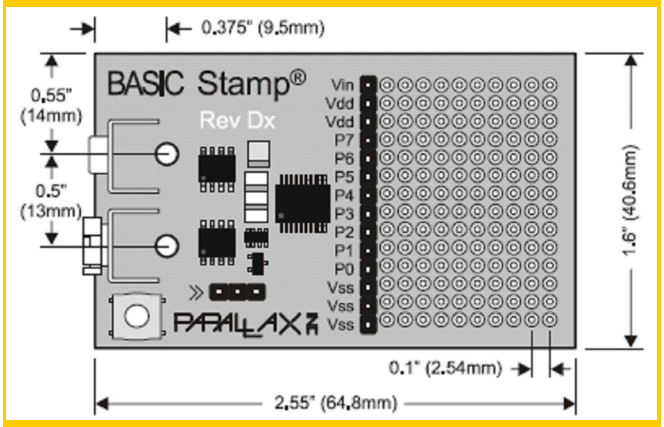


Fig. 7 Required are two Basic Stamp (1) Rev Dx boards for the 3D computer, placed at upper levels.

Multiple Dimensional Core Computing
How can we take full advantage of programming in more than one dimension? Advantage is gained through use of light, sound, computation, sensor information acquirement, output, input, synchronization, phasing, harmonizing, sequencing, and data talk in Binary, Hex, English or other languages.

Bells & Whistles
The advent of the microcomputer in the early 1970s was not inclusive of keyboards, fancy color displays, or operating systems. A microcomputer simply had switches and lights for program input and output. We're going to adopt this approach, with a one up improvement – the addition of sound.

Power Requirements
Nine volt battery clips have their positive leads connected together and routed to a bench lab power supply. The same routing is set up for the

ground leads. This saves on batteries during software development. The ammeter shows a current draw ranging from about 16ma to 39ma for all three computers running at the same time (as various combinations of LEDs and speakers are activated). That amounts to 6 to 13ma per board. These boards have extremely low power requirements, a great advantage when connecting multiple Stamps.

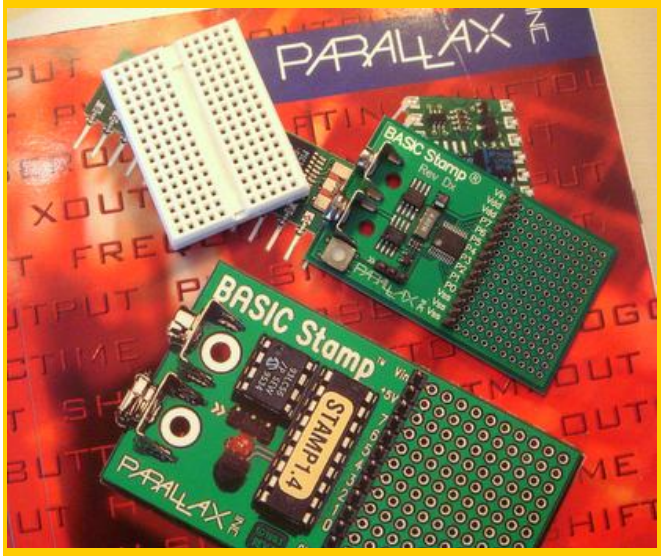


Fig. 8 These are your two friends – the tiny solderless breadboard and the new revised Basic Stamp Rev. Dx board (seen at top right, above the older Stamp 1.4 board). The new Dx board is now operating from all new SMT – Surface Mount Technology. The breadboard attaches with its sticky tape backing, and only slightly overhangs the north side. Be sure to match up the pins with the breadboard holes when attaching.

Tuning the Piezos

You'll need to do some speaker tuning to assure the same notes programmed will sound the same on each dimension. This is best accomplished by running a tone generating program and then listening to the note. Try exchanging a batch of speakers in the same circuit and listen for matching sounds. Then group all the same sounding speakers together for use, one with each Basic One Stamp.

```
' {$STAMP BS1}          ' Tone Tuner
Mains:                  ' Main Code
B0 = 100                ' Tone
SOUND 2, (B0,1000)      ' Sound Piezo speaker pin 2
GOTO Mains              ' Loop
```

Waveform Analysis

In the ideal case, a pure uniform sine wave would create a clean sound. For a low cost single piezo speaker circuit, we must consider the wave will be approximate and deviate from the ideal. Therefore, mixed results may be expected.

Discovery of the 3D Stamp Computer

By Dr. Humanoido

It was a strange and eerie accident, yet perhaps a favorable one, when the Master Offloader Machine (designed and built to assist the Basic Stamp Supercomputer) was running and two simultaneously operating piezoelectric speakers were sending out their tunes loudly. Suddenly it was realized the spatial separation (space) and the timing differences of the note frequency (time) was causing a beat effect to the ears, i.e. a new sound was being created. It was at this time my thinking began to include more elements such as sound phasing, light interference, distance adjustments, and time – especially space-time – the one which made Albert Einstein a little more famous.

Now I still don't know, or guarantee that the 3DSC will lead to such advanced projects as the version of space-time that Einstein made so popular in his equations of time travel and the curvature of space dimension through gravity - one never knows or can adequately predict the surprises the future may hold. This is only the first, and all the apps cannot be predicted that will develop in the future. But for now, the only intention is that of a fun new project for exploring a new way of computing and physics. So make this your project too, and explore the new undiscovered world of the 3D Stamp Computer!

Over time, various aspects were added, that can only be run on a 3D Stamp Computer. This made me think there could be some valuable uses for such a device, not only in teaching and conveying the concepts of physics, but to introduce a new and useful tool in the field of hobby computing. Already, this year, 2009, has ushered in new projects of supercomputing, offloading, and other designs which never existed in the past. So why not introduce a new 3D computer? The timing is perfect!

Demonstration Code

This project has demo codes. The first and most simple duplicates the action of light and sound in 3D. The LEDs appear to flicker in step with the sound which varies its rate. Below: load this same code into each dimension and turn on the boards at different times. The delay of light and sound will produce interesting combined effects.

```
' 3D COMPUTER BY HUMANOIDO 03.10.09 V1.0
' 3D COMPUTER LEVELS 1,2,3
' LOAD THIS CODE INTO EACH DIMENSION
' PIN 1 LED, PIN 2 PIEZO
' EXAMPLE OF SOUND, LIGHT, PHASE
' {$STAMP BS1}
Mains:          ' Main Code
FOR B0 = 1 TO 8 ' Variable B0 sound 20 iterations
FOR B1 = 100 TO 118 STEP 2 ' B1 duration
PAUSE 20        ' delay for sound and light
LOW 1           ' LED off
SOUND 2, (B1,B0)' Sound off the Piezo speaker
SOUND 2, (B1,B0)' Sound off the Piezo speaker
HIGH 1          ' LED on
NEXT B1         ' Next duration
NEXT B0         ' Next iteration
GOTO Mains      ' Loop
```

Three Dimension Channel Stereo

This code will create three dimensions of light and sound. This is a three channel stereo demo in all three dimensions. Each Stamp computer decides the timing for piezo speakers and LEDs. There are three programs. Load each program into its designated dimension to make a computer controlled sequence. Dimension one is the lowest level.

Load this into dimension one.

```
' {$STAMP BS1}  ' 3 Channel Stereo Level 1
Mains:          ' Main Code
B0=255          ' Max Delay
B1 = 100        ' Tone
LOW 1           ' LED off
SOUND 2, (B1,B0)' Sound off the Piezo speaker
HIGH 1          ' LED on
PAUSE 500       ' Light on duration
GOTO Mains      ' Loop
```

Load this into dimension two.

```
' {$STAMP BS1}  ' 3 Channel Stereo Level 2
Mains:          ' Main Code
B0=50           ' Delay
B1 = 90         ' Tone
LOW 1           ' LED off
SOUND 2, (B1,B0)' Sound off the Piezo speaker
HIGH 1          ' LED on
PAUSE 100       ' LED duration
GOTO Mains      ' Loop
```

Load this into dimension three.

```
' {$STAMP BS1}  ' 3 Channel Stereo Level 3
Mains:          ' Main Code
B0=10           ' Delay
B1 = 110        ' Tone
LOW 1           ' LED off
SOUND 2, (B1,B0)' Sound off the Piezo speaker
HIGH 1          ' LED on
PAUSE 100       ' LED duration
GOTO Mains      ' Loop
```

Harmonic Oscillator

Experiment to obtain sinusoidal sound waveform using an oscilloscope and create waves of harmonic oscillation.

Resonation

Combine sound waves to achieve specific resonating frequencies and record or observe with the use of an oscilloscope. A free PC sound oscilloscope will work fine for this experiment.

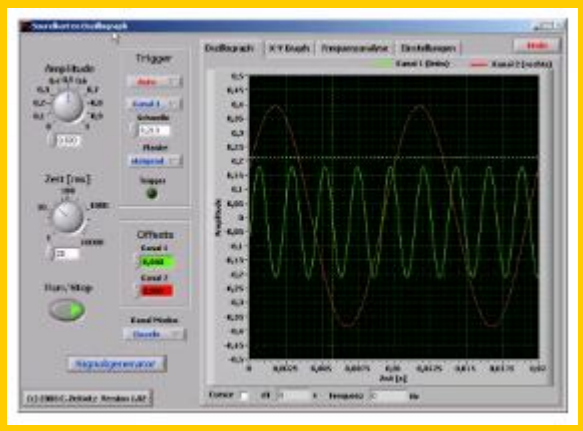


Fig. 9 A digital sound card oscilloscope is free from download sources and works well with sound waves and the 3DSC. For information on operating and isolating the input to assure safe and reliable input to the computer, refer to Parallax Forum discussions and other online sources.

Constructive and Destructive Interference

Try using code variations to product “constructive or destructive” wave forms. Each dimension is now in or out of phase with the preceding one. With serial statements, specific code placement, and timing delays, a realm of new three dimensional effects are possible. This includes softer sound or louder sound versus waveform timing and opening up various sound effects.

Beat Frequency 3D Program

When two sound waves of differing frequency are audible, the alternating constructive or destructive interference results in sound that is alternatively loud or soft - a phenomenon which is called "beating" or producing beats. The beat frequency is equal to the absolute value of the difference in frequency of the two waves.

$$F_{beat} = |f_2 - f_1|$$

Applications for Beat Frequency
If the beat frequency is in the mid-frequency region, the human ear will perceive it as a third tone, called a "subjective tone" or "difference tone". They can be made prominent by using two high, clear tones like the notes of a piezo speaker using SOUNDOUT. With two piezos you can produce a "trio for two piezos." One important role of subjective tones is the missing fundamental effect whereby a correct sense of pitch for a musical sound may be maintained even if the poor fidelity of the sound reproduction has filtered out some of its lower harmonics. This is one way to improve the quality of small piezo speakers driven by Basic Stamps. Adjust B1, the tone number, closer together to increase the length of time in between beats in these starter programs. The program is working when the LED is active.

Load this code into level 3.

```
' {$STAMP BS1}   ' Beat Frequency Level 3
HIGH 1           ' LED on
Mains:           ' Main Code
B0=10            ' Delay
B1 = 110         ' Tone
SOUND 2, (B1,B0)' Sound off the Piezo speaker
GOTO Mains       ' Loop
```

Load this code into level 2.

```
' {$STAMP BS1}   ' Beat Frequency Level 2
HIGH 1           ' LED on
Mains:           ' Main Code
B0=255           ' Delay
B1 = 100         ' Tone
SOUND 2, (B1,B0)' Sound off the Piezo speaker
GOTO Mains       ' Loop
```

Switching Off Dimensions
While working on developing code or just tuning the speakers with some dimensions and not others, the need may arise to turn off one of the dimensions. This program will do exactly that!

```
' 3D COMPUTER Turn Off the Dimension
' BY HUMANOIDO 03.15.09 V1.0
' {$STAMP BS1}
END
```

Creating a Standby Mode
It is also easy to create a standby mode where the speaker is silenced or the LED is off. Merely move the ground side jumper from the piezo or LED to an empty unused solderless breadboard hole. It's a bare bones standby switch cheaply made.

Harmonic Additive Synthesis
We can design more complex sounds, especially if we can modulate the parameters over time. One of the key features of natural sounds is that they have a dynamic frequency response that does not remain fixed. However, a popular approach to the additive synthesis system is to use frequencies that are integer multiples of the fundamental frequency, which is known as *harmonic additive synthesis*. For example, if the first oscillator's frequency, f_1 represents the fundamental frequency of the sound at 100 Hz, then the second oscillator's frequency would be $f2 = 2f_1$, and the third $f3 = 3f_1$ and so on.

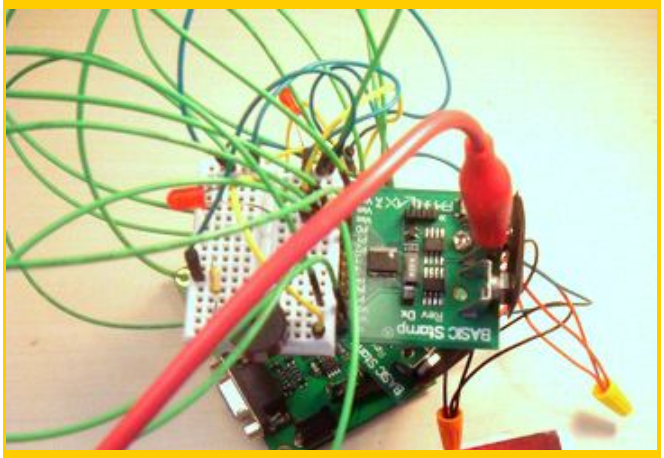


Fig. 10 Connecting a 9-volt DC Vin power supply to the 3DSC is shown here (+9v red lead). Use of the alligator is simple and connects to the battery clip. Be absolutely certain to observe correct polarity *before* attaching any power leads.

Light Effects
We've used sound to create several applications but light could be used in similar manners. Light can also behave in wave nature. Just as sound can constructively and destructively interfere, so can light. We leave it as an exercise and homework for the student and hobbyist to duplicate the effects of sound by using light. Coatings are used

on telescope mirrors to increase their light gathering power, a process of constructive interference. To reduce reflections on lenses, coatings can constructively interfere at specific wavelength. Develop new experiments with the 3D computer to demonstrate these effects with some add on hardware.

Sensors
Combining sensors in a 3D Computer can lead to new creative inventions. This is where the strength of the 3D computer arises.

3D Motion Mechanics
With servos on each dimension, an XYZ motion machine can be created. Such a machine, when combined with a camera, can freeze complicated motions such as ocean waves and wavelets, atmospheric dispersion for astronomical applications to clear up seeing in telescopes, ripples in an artificial space time continuum, a rapid tracker and guidance machine, a multiple visionary motion device for rapid artificial eye scanning, and numerous others.

Interdimensional Communications
To communicate from one dimension to another, serial commands, SERIN and SEROUT are used. The rule is any one stamp can talk while the others listen. However, sensors, input, output, light, sound and other processes may continue to run as programmed. The code that follows is an example of this type of communications. The dimensions are divided into bottom, middle, and top.

There is one program for each dimension. The hardware and software is compatible open-source mode with the ports resistor connected to ground. The ON designates 2400 BAUD. On the BS1, serial communication is set to: no-parity, 8-data bits and 1-stop bit at 2400 Baud (a choice of four different speeds: 300, 600, 1200 or 2400 Baud).

The new program shown is the network code in Token Ring style design for the first dimension, located at the highest physical level platform on the 3DSC. DIM1 starts the network by sending a message before receiving a cue. Thereafter, DIM1 only transmits when cued by DIM3, the bottom dimension.

A total of three Dimensions are on a network. The code illustrates how all three dimensions can talk to each other in Token Ring style. Included is a list of SERIN and SEROUT baud mode options for additional design work.

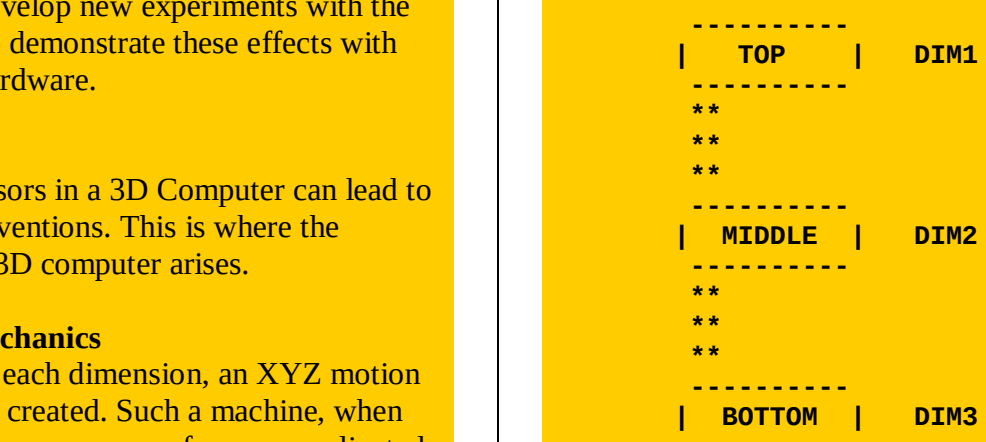


Fig. 11 This diagram illustrates the location of all three dimensions in the 3DSC's space-time configuration. Use this representation for loading codes into the correct dimensions.

```
SERIN Options
Baud mode       Baud
Value   Symbol Rate Polarity
0       T2400 2400  TRUE
1       T1200  1200 TRUE
2       T600   600  TRUE
3       T300   300  TRUE
4       N2400  2400 INVERTED ***
5       N1200  1200 INVERTED
6       N600   600  INVERTED
7       N300   300  INVERTED

SEROUT Options
Baud mode       Baud
Value   Symbol Rate Polarity
0       T2400  2400 TRUE     (always driven)
1       T1200  1200 TRUE     (always driven)
2       T600   600  TRUE     (always driven)
3       T300   300  TRUE     (always driven)
4       N2400  2400 INVERTED (always driven)
5       N1200  1200 INVERTED (always driven)
6       N600   600  INVERTED (always driven)
7       N300   300  INVERTED (always driven)
8     OT2400 2400 TRUE (open drain, driven HIGH)
9     OT1200 1200 TRUE (open drain, driven HIGH)
10    OT600  600  TRUE (open drain, driven HIGH
11    OT300  300  TRUE (open drain, driven HIGH)
12 ON2400 2400 INVERTED (open source,driven LOW)**
13 ON1200 1200 INVERTED (open source,driven LOW)
14 ON600  600  INVERTED (open source,driven LOW)
15 N300   300  INVERTED (open source,driven LOW)
```

Fig. 13 Baud mode options for the Basic One Stamp. Note the primary differences in sending and receiving. The 3DSC, when receiving, uses baud mode value 4, N2400, Inverted. When transmitting, ON2400, Inverted, Open Source, Driven Low is recommended.

Load the code below into the first level, DIM1.

```
' {$STAMP BS1}  ' DIM1.bs1   3DStamp Computer 3DSC
' {$PBASIC 1.0} ' This is DIM1 Top Level 1 Code
INPUT 0                        ' set pin 0 to input
PAUSE 1000      ' give other 2 time to wake up
GOSUB Snd                      ' subr sound/light
SEROUT 0,ON2400,("DIM2",10,13)' cue next
Loop:                          ' begin main loop
  SERIN  0,N2400,("DIM1",10,13)     ' wait for cue
  GOSUB Snd                         ' snd/light
  SEROUT 0,ON2400,("DIM2",10,13)    ' cue next
GOTO Loop                           ' again
Snd:                                ' sound/light
  B0 = 30                           ' Sound Delay
  B1 = 120                          ' Tone
  HIGH 1                            ' LED on
  SOUND 2, (B1,B0)                  ' Piezo speakr
  PAUSE 500                         ' LED duration
  LOW 1                             ' LED off
RETURN                              ' Back
```

Now load the code below into the second level, DIM2.

```
' {$STAMP BS1}  ' DIM2.bs1  3D Stamp Computer 3DSC
' {$PBASIC 1.0} ' DIM2 Level 2 Middle code
INPUT 0                          ' pin 0 to input
Loop:                            ' begin main loop
SERIN 0,N2400,("DIM2",10,13)     ' wait for cue
GOSUB Snd                        ' subr sound/light
SEROUT 0,ON2400,("DIM3",10,13)   ' cue next
GOTO Loop                        ' again
Snd:                             ' Make sound/light
B0=20                            ' Sound Delay
B1 = 110                         ' Tone
HIGH 1                           ' LED on
SOUND 2, (B1,B0)                 ' Sound Piezo spkr
PAUSE 500                        ' LED duration
LOW 1                            ' LED off
RETURN                           ' End of subr
```

Load this code into the third level, DIM3.

```
' {$STAMP BS1} ' DIM3.bs1  3D Stamp Computer 3DSC
' {$PBASIC 1.0}' DIM3 - Level 3 Bottom code
INPUT 0                           ' pin 0 to input
Loop:                             ' begin main loop
SERIN 0,N2400,("DIM3",10,13)      ' wait for cue
GOSUB Snd                         ' subr snd/light
SEROUT 0,ON2400,("DIM1",10,13)    ' cue next
GOTO Loop                         ' again
Snd:                              ' sound/light
B0=10                             ' Sound Delay
B1 = 100                          ' Tone
HIGH 1                            ' LED on
SOUND 2, (B1,B0)                  ' Piezo speaker
PAUSE 500                         ' LED duration
LOW 1                             ' LED off
RETURN                            ' End subroutine
```

Deploying the Network Code

With all three programs loaded, DIM1 into the top level, DIM2 into the middle level, and DIM3 into the bottom dimension, power on the 3DSC. Immediately, DIM1 will sound off and light its LED, and signal DIM2 to *speak* with lights and sound. DIM2 will, upon cue, sound off with lights and sound, then DIM3 will have a turn. The tone and the time are locally regulated by the clustered programming.

How to Use the 3D Stamp Computer

Admittedly, this is the first 3D computer concept developed so you won't see apps already available. Inexpensively, for simple demo purposes, the output includes sound and lights, which can be phased and synced from dimension to dimension. Another app is the development of a harmonic oscillator using two or three dimensions. Three dimensional motions can be achieved with light actuation and timing. Sound can also achieve this motion. It's stereo plus one added dimension.

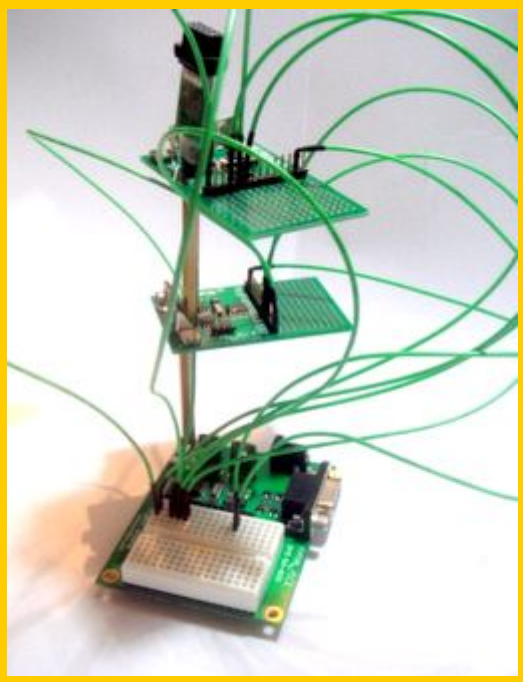


Fig. 14 Visual multiple dimensions give the 3D computer its advantage in processing. Note the top two Dx boards before modifications (no breadboards). At top-most is the 3-pin to serial converter for programming with Windows. Note that a USB-Serial Converter from Parallax will work to gain function for USB programming. Note: The pedestal is made up from two brass spacers, each exactly six centimeters long. One screws into the other at the structures midsection. At the top board, a screw holds the spacer in place, while at the bottom board, a nut fastener is used.

3DSC Tips

In working with the 3DSC, one recommended addition is an on/off switch for each Rev Dx

board. This will let you quickly test one Stamp computer over the other, and select combinations of the three for performance analysis. The Level One Stamp 1 Project Board already has a power switch. While the battery clips can be used as power switches, unplugging and plugging, it's a little inconvenient as the overall 3DSC is very lightweight. Otherwise these boards are perfect for dimensional stacking, with their tiny footprint.

Debug
For debugging code development, there's the output of the DEBUG statement, three LEDs, and three Piezo speakers.

Conclusion
This is just the beginning of a new era in hobby stamping. Microcontrollers are evolving to include more processors, more programs, and more power. Part of this evolution is with space-time and multiplicity of processors. The 3D Stamp Computer is a learning tool and teaching device that can effectively illustrate these concepts. The 3DSC is also a new entry level machine into a realm of new hobby computing.

Hobbyists unite! Whether we use sound or light, timing or phasing, syncing or processing, multi-phonics or spatial representation, or experiment with beat frequency, the 3D Computer is an amazing invention, can illustrate many advanced concepts, and will provide many hours of fascinating experiments.

Glossary of 3D Computer Terms

3D Chess – tri-dimensional Chess invented by Star Trek made popular in the Star Trek Star Fleet Technical Manual

3D Computer – a computer with three cores residing in three separate spatial dimensions or physical levels

3DSC – abbreviation for the new 3D Stamp Computer that operates in space-time

3D Sound – three channel stereo sound, example- three piezo speakers

Apps – applications, projects, programs

Beat Frequency slight off tuning of waveform creates the beat frequency effect, altered sound of variation

Cluster – 2 or more computers, CPUs, microcontrollers, connected together in unison, usually paralleled

Constructive Waveforms when two waveforms combine to create a stronger effect, it can create greater light reflected from mirrors, increased sound intensity

Core – the defining singular processing element of a computer cpu, or sectional processing power

Destructive Waveforms two waveforms out of phase by 180 degrees can annihilate each other. It can create anti-reflective coating, less sound or noise

Dimension – distinctive spatial property of an object in vector space or space-time

Dimension Engine – a core dimension that act as a driving force to accomplish specific tasks, a processing machine (i.e. Basic One Stamp) residing at a dimension level in space and time (1D, 2D, 3D…)

Elements – sound, light, computing, time, number, value, characteristic, cpu, computer

Harmonic Oscillator - A physical system in which some value oscillates above and below a mean value at one or more characteristic frequencies

Interdimensional Communications – the ability to communicate from one dimension to another, if 3D then 1D can talk to 2D or 3D, while 2D can talk to 1D or 3D. Likewise, 3D can speak to 1D or 2D.

Multidimensional Computing – is the ability to use time and space in various relationships with hardware, calculation, computation, sound, light, sequence, phase, sensors, etc. to develop new and various concepts

Phase – the combining of multiple elements, the relationship between the position of two elements such as sound waves or light waves. Waves can be in phase or out of phase

Sequence – a particular pattern of actuation and operation

Sync – when two or more elements match in cycle or period

Time Phase – the relationship of time that engages two or more elements such as sound, light, computation

TriD Actuator – a mechanism, code, mnemonic, to engage all three dimensions simultaneously, a TriD actuator may work with the phase of three different elements

DEBUG Talk Collection
The DEBUG statement uses the programming port for its serial communications. It's not general purpose serial communications. The data has a very specific format (described in a Nuts and Volts Column) and is BS1 to PC only. There are no provisions for PC to BS1 communications via the programming port. Any I/O pin can be used for bidirectional serial communications (with SERIN and SEROUT statements), just not the programming port.

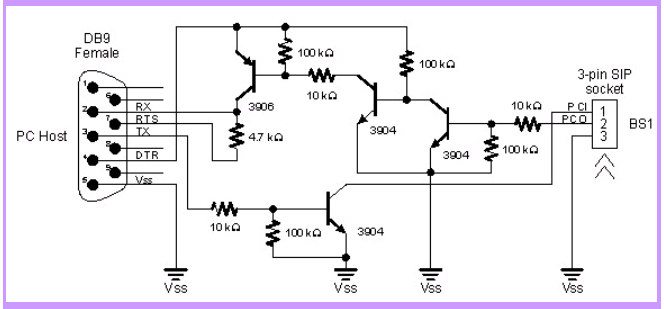
I think that one of the confusing factors is the evolution of the carrier boards for the BS1. The older boards used the PC's PARALLEL port for programming the BS1. The latest versions use the SERIAL port, changing the things that can be done with the connection. The following Nuts and Volts column has a short discussion of the changes as the product evolved.
http://www.parallax.com/Portals/0/Downloads/docs/cols/nv/vol4/col/nv104.pdf

If you are trying to use the programming port for input and output as you can on a BS-2, that won't work on a BS-1. See the following note from the PBASIC Help file, or PBASIC Reference manual, regarding SERIN and SEROUT:
"NOTE: ... The range of the Tpin argument on the BS1 is 0 - 7." You MUST use one of the regular pin ports (0-7) for I/O. You can use the programming port for DEBUG output, but please be aware that the format of the DEBUG output is also different between the BS-1 and BS-2. DEBUGIN is NOT supported for the BS-1.

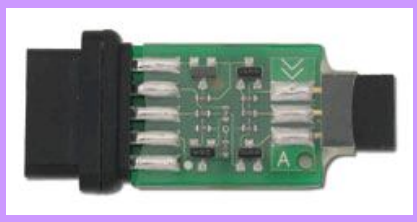
Which BS1 for Making Your Own Stamp Board?

This is the BS1 chip that can be fully socketed and used for making your own BS1 on-a-board. Why not put several on a board? The multiple density of Basic One Stamps opens up all new hobby computing possibilities.

Add a Serial Port to the Basic Stamp One



A homebuilt BS1 board can be adapted to a serial port by using this schematic. Plug this adapter between the BASIC Stamp Rev. D (or BS1 Carrier Board) and serial cable. The completed adapter product (see below) is available from Parallax.

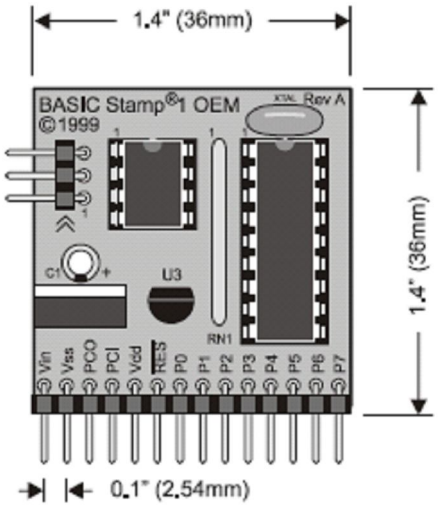


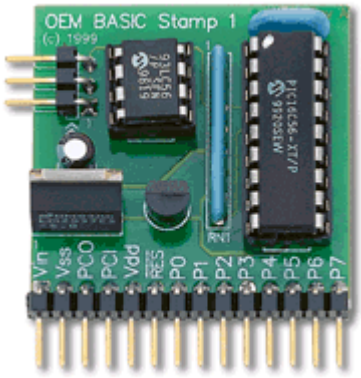
Stamp One Specs

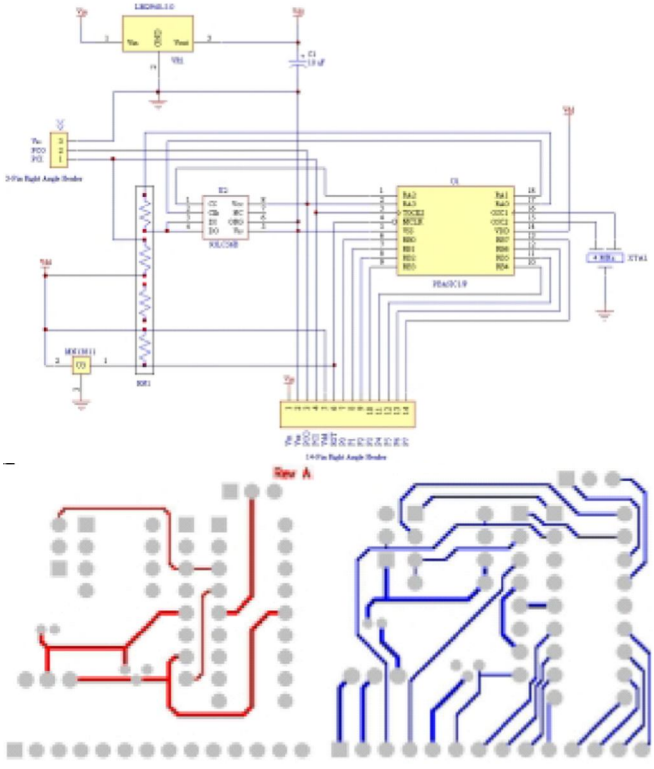
Released Products	Rev.D / BS1-IC
Package	PCB w/Proto / 14-pin SIP
Package Size (L x W x H)	2.5"x1.5"x.5 / 1.4"x.6"x.1"
Environment	0° - 70°C* (32° - 158° F)**
Processor Speed	4 MHz
Program Execution Speed	~2,000 instructions/sec.
RAM Size	16 Bytes (2 I/O, 14 Variable)
Scratch Pad RAM	N/A
EEPROM (Program) Size	256 Bytes, ~80 instructions
Number of I/O pins	8
Voltage Requirements	5 - 15 vdc
Current Draw @ 5V	1 mA Run / 25 µA Sleep
Source / Sink Current per I/O	20 mA / 25 mA
Source / Sink Current per unit	40 mA / 50 mA
PBASIC Commands	32
PC Programming Interface	Serial (w/BS1 Serial Adapter)
Windows Text Editor	Stampw.exe (v2.1 and up)

The Basic Stamp One has a lot of powerful features. Foremost, it has incredibly low power requirements. Even when placed in a board and driving several outputs, the current draw remains low. The advantage is great for battery powered apps.

The Search for the Smallest Stamp – OEM BS1 History



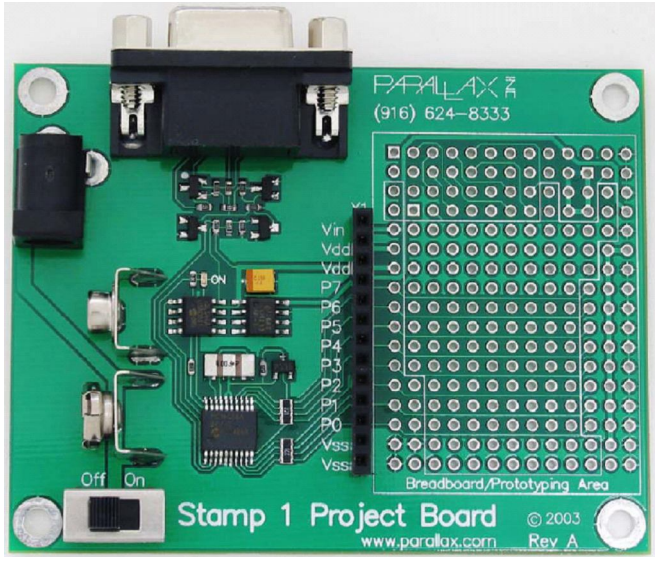




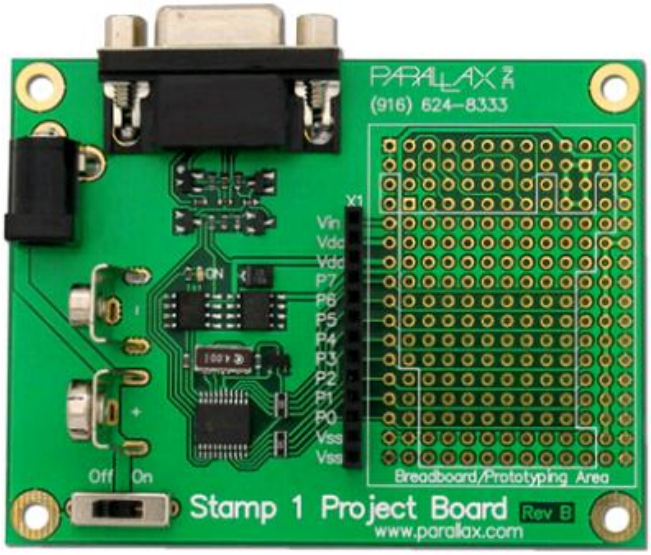
The Basic Stamp 1 OEM board (see Rev A tracing) was one of the smallest all-in-one Parallax boards made. The actual board spanned only 1.4 x 1.4-inches. The board was discontinued, only to be replaced with the even smaller USB Basic One Stamp! (seen below)

The USB BS1 is currently the smallest stamp on a board: Power Requirements are 5 VDC (Vdd) which is supplied by the USB host while connected. Communications is via serial through a USB port. Dimensions are 2.25 x 0.75 x 0.35 in (5.72 x 1.91 x 0.89 cm) and Operating Temperature range is 32 to 158 °F (0 to 70 °C). Specs and photos by Parallax.

Two Stamp 1 Project Boards Can you spot the difference?



Stamp1 Project Board Rev. A



Stamp1 Project Board Rev. B

The main difference between Rev A and Rev B boards is the power consumption and the power LED. Parallax quotes 7ma running no loads and 5ma in Sleep (Rev B), and reports that with Rev B boards, the power LED remains illuminated when the BASIC Stamp is in sleep mode.

Price Jumps

Shop around for pricing. We've seen a wide range from $14.99 now up to $29.99 - the latter represents the latest price increase by Parallax. Even at the higher price, the board is a great deal! Not shown above, each board comes with a small solderless breadboard that can be attached. Note the serial DBM connector which also works with the USB converter and the Parallax MS Windows Stamp Editor.

MULTI-TASK YOUR SOUND? They said you couldn't do it, but you can! The Sound command cannot be used in many situations because it will tie up your program while the sound is generated. Consider another approach - just toggle an output line in a loop while you do other things. If you want to increase the pitch, toggle it more than once in the loop. It does have some limitations, and pitch depends on the loop's timing, but it allows what appears as multitasking when performing another duty.

This Stamp board accepts the BS1 SIP package. Note the lack of an external voltage regular. It relies upon the internal Stamp Circuit. Features include a 3-pin programming port, 9-volt battery connector, and a reset button. Stamp pins are led to solder islands for direct soldering, and a male pin header.

Simple BS1 Robot Build Ideas Plus Links And Sources

What can you do with a BS1 and eight ports? A robot build is an ideal way to utilize the power of the BS1. Like Boe-Bot, connect two continuous motion servos. That will take two I/O pins. Another two pins can be used for an IR emitter driven by a 555 timer (use a pot to control the frequency). The detector takes only one pin and on/off for the emitter takes another pin. That leaves two spare pins for wireless communications, obstacle avoidance, etc. It only takes one port to connect a CaS photocell that can act as an eye in detecting light levels. Some ports can be programmed both input and output, essentially doubling up on possible functions. The BS2 has DEBUGIN while the BS1 uses other means of input. The work around is to input on pins using input, SERIN, keypad, or other code. If you *google* BS1 robot, you'll find many examples. For example, robot Cyclops run by a BS1 held the championship SUMO title at FRR.

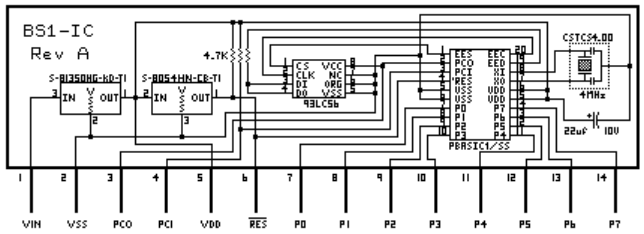
home.silverstar.com/~graben/Bots.htm

You may want to talk to David Buckley and visit his web site. He's created numerous

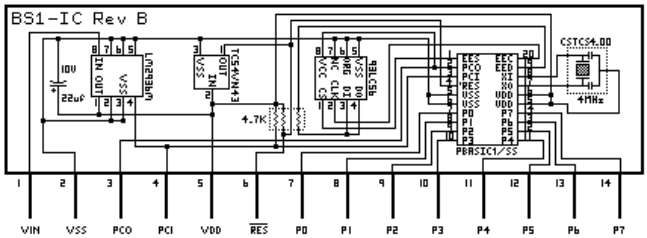
robots using the Basic Stamp 1, such as SimplHEX, Clarissa May, Snowdrop, Gargantua, Ranger Scout, The Imperial Drone Red - Nevik, The Imperial Drone Green - Gotan, and the famous BigFoot. Amazing, right?! His web site is at: davidbuckley.net/DB/RobotList.htm
View the BS1 robot car info here enel.ucalgary.ca/People/Turner/robotics/introtorobotics/SLIDES/s1-6.html
Take a look at the P.A.R.T.S. newsletter from the Portland Area Robotics Society. Though the projects are based on other microcontrollers, you can get a lot of good robotic ideas for circuits, sensors, projects, and robot building.
www.portlandrobotics.org/ancient.php?link_id=15

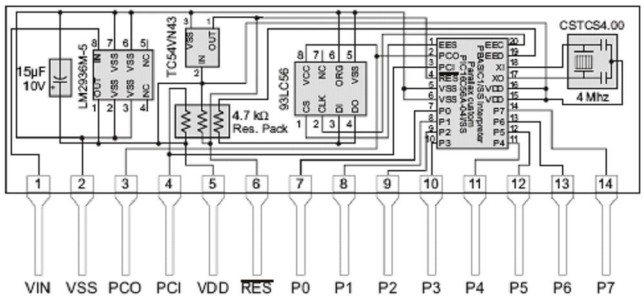
Try this link to Basic Stamp One robots.
http://www.abotics.com/NewCDbot_BS1_Assembly.doc

Above: note these component variances in appearance. The 4Mhz resonator is at right.



Pictorial drawing of the BS1 Rev A





Older and newer pictorials of Rev B

Why Go the BS1 Route?

Every Stamp has its own advantages and the BS1 has many strengths and features. In a nutshell, here are some things to look at.

- Very Small Footprint
- Extremely Light Weight
- Low Cost in the Stamp Lineup
- Unique Programming Statements
- Directly Reads Resistance
- Manages Button Input
- Has a Master Sound Command
- Stores Directly into EEPROM
- Has Many Completed Apps
- Abundantly Documented
- Reliable and Mature Product
- Flown into Space
- Used on Satellites for Telemetry
- Ideal for Robotics/Coprocessing

Does it Make You a Little Crazy?

The other chip companies release a chip, then a short time later it's taken off the market and the bugs are never corrected. The Parallax way is to keep the product, improve it, refine it, and make it available. From the time the Basic Stamp One was released in the 1990s until now, it has seen a mega fold of improvements, new boards, new features, new editor, developments and advancements. It's evolved from a chip programmed with a DOS machine to a modern Windows serial version and now works with USB. Other improvements include the Memory Map, Boards, interface and extended PBASIC instruction code.

Quick Reference Guide PBASIC 1 Instructions

BRANCH	Branch specified offset address
BUTTON	Monitor and manage button input; branch if button is in target state
DEBUG	Send variables/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 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	Short period low power mode
OUTPUT	Make pin an output
PAUSE	Suspend program for 1 to 65,535 milliseconds
POT	Read a 5 to 50 K Ohm 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 to 65,535 seconds
SOUND	Generate tone or white noise
TOGGLE	Make pin an output and toggle current state
WRITE	Write byte to EEPROM location

These Proposed Projects may appear in future issues of Stamp One News...

BS1 Project Board Reviewed, New BS1 Inventions, Over clocking the BS1, Low Cost Keyboard Magic, Add a Simple Serial Display, Stamp BS1 3D Computer, A Basic Stamp 1 Supercomputer!, Encoder/Decoder, Ultra Wiring, Interfacing Sensors, Programming Log, Making the Serial Command Do Stuff, PBASIC Differences, Robotic APPS, Interface a Servo, What's a Rev Dx?, Designing a computer around the BS1, Powerful Sensors All Interface, Make IR Obstacle Detector, Useful Projects, Robot Coprocessor for Boe-Bot, Tips & Tech, BS1 Ideas, Building BS1 Robots, Make Your Own Stamp 1 Project Boards, Master OffLoader Machine (MOM), Wiring the DX, Wireless Interface, Increase Stamp 1 Speed!, BS1 Program Magic, Clock the Beast!, Dx Modifications, BS1 Spatial Differentiator, Which Sensor to Choose?, LED Lights and Sound, School Projects for Everyone, Beyond Homework, Add-on Projects to What's a Microcontroller, Making the BS1 Immensely More Powerful, BS1 Balloon packages for Near Space Encounter, Your Own BS1 Kite Space Program, How to Build Stamp 1 Robots, How to Make the BS1 Go Invisible (Dimensional Interlude), Sensors and take a look at the oncoming slew of robots that utilize the BS1. There are main mother-boards in the tiniest package, coprocessors that will immediately go on your wish list, loads of ideas for connecting sensors and building code efficient bots. The eight ports can do an array of amazing things – these projects will be useful for your own ideas and developing new robots. Treasure and the BS1, Never Before Seen Projects, Latest BS1 News and Developments, Updates on Parts, Boards, Revisions, Products, Readers Comments. Let us know what you think. Your opinions matter – if we get good feedback, there's an increased chance you'll see the next issue of StampOne News!

Features of StampOne News!

Greater Page Potential
Easy to Read Format
Electronic Compressed
Standard PDF Reader Format
Manageable Email Size Files
Minimal Size Files Conducive to Archive

Full Color Articles
No Hidden Costs
Non Profit – No Hidden Agenda
Open Sourced Projects
Outstanding References
Anyone Can Contribute
Ideal for Home, School, Hobbyist
Educators Gold Mine of Projects
Cool Science Projects and Ideas
Article Text Size Larger than Most Printed Magazines
More summaries, in-depth Articles and Photos
Impetus for Spin-Off Technology
Readable, Blogable, Copyable

StampOne News!
Premier Issue #1 Spring 2009
Appearing Spring Summer Fall Winter or as time permits

StampOne News! is a concept by Dr. Humanoido and is an independent non-profit publication (although donations are accepted to help us continue) and has no appreciable timetable. Issues are released worldwide when interesting projects become available and documented. Material, ideas, concepts, and drawings may be used for your own personal projects for home and school use, unless otherwise noted. Although information is presented from working projects, it is considered "as is" and up to the user to determine suitability. The user assumes all risk and liability. Support is at the Parallax Forum. http://forums.parallax.com/forums/ StampOne News! and code posted - free downloads soon to be available at: http://www.robotinfo.net/penguin/
Input, manuscripts, projects, ideas and comments welcome. Contact: penguin.robot (at) yahoo.com.
Credits: Cover BS1 image, Stamp 1 Project Board photos, sourced BS1 commands instruction set – BS1 Project Board Documentation, courtesy Parallax Inc. Windows is a trademark of Microsoft Company. Basic Stamp is a trademark of Parallax Inc. The BS1 microcontroller, boards, sensors and components are available from Parallax Inc. http://www.parallax.com

Other Dr. Humanoido concepts include Penguin Tech Magazine, Penguin Robot Book, Toddler Robot Group, PRS Penguin Robot Society, PRS Web Site, Humanoid Toddler Robot, Master OffLoader Machine, the Stamp circuit with English/Chinese speaking ability using EMIC Text to Speech, and the invention of the Near – Near Space Program NNSP (using hobby kites and Basic Stamps).

Dr. Humanoido is an independent robotics and "Parallax Basic Stamps" enthusiast /hobbyist, the developer of one thousand Penguin Robot programs, and the creator of numerous new version Penguin robots, such as the Superhero Penguin, the Bat Penguin, Roller Skate Penguin, Happy Feet Dancing Penguin, the Humanizer Penguin, Pocket Penguin, Seeing Eye Penguin, Doctor Penguin M.D., and numerous others. His Basic Stamp inventions include the 3D Computer, the Basic Stamp Supercomputer, the Baby Supercomputer, the Master Off-loader Machine, the Black Box, and others. He can be contacted at the Parallax Forum or through the PRS.

Basic Stamp One Notes