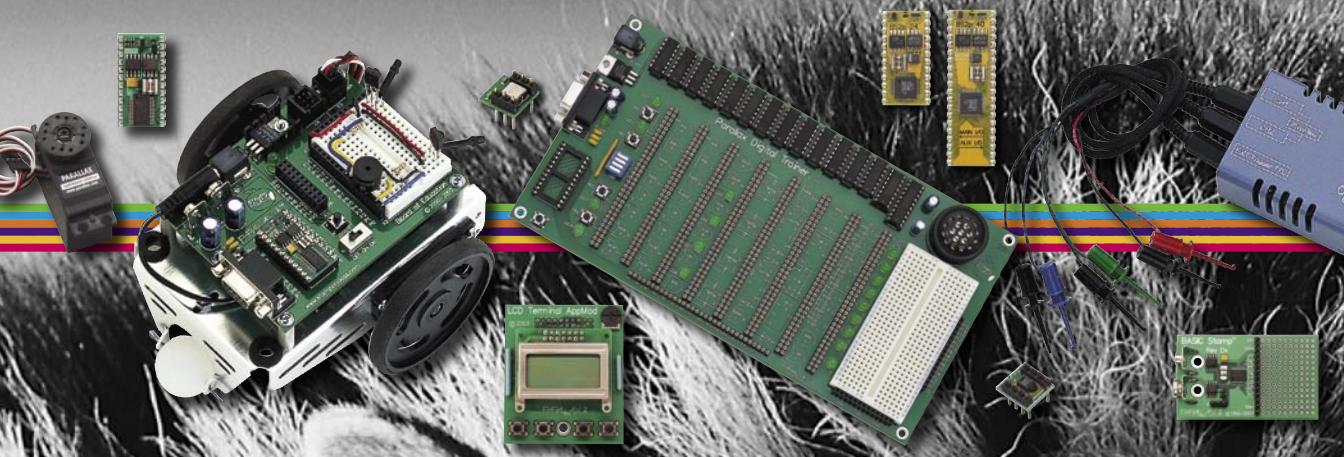


2 PRODUCT CATALOG 4



PARALLAX

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02

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Introduction

Welcome to the 2004 Parallax Catalog. Whether this is your first Parallax experience or if you've been a customer for several years, we hope you enjoy the applications, products, and extra information that is presented here. As with any printed information it is static once it's sent to print, so be sure to check out www.parallax.com for the latest details.

Our business is based on reliability, application support, customer service and creative engineering. Parallax started in 1988 making tools for the Apple computer and in 1990 for the PIC microcontroller. The introduction of the BASIC Stamp in 1992 created a tremendous customer base around the world. Today, we offer well-supported microcontroller solutions in BASIC, assembly language, Java and AHDL/Verilog. Whether you're an engineer developing your own ASIC or a 10 year old learning electronics, you have come to the right place.

Stamps in Class

Stamps in Class is our educational curriculum series with an accompanying family of products and kits. The focus is on middle school students through University, although the material is very well suited for the naturally curious individual. To illustrate the breadth of the scope and difficulty level of the Stamps in Class curriculum, we'll present you with 2 scenarios:

(1) Middle School students are working with the *Robotics* curriculum (Boe-Bot Robot Kit). They are able to follow the instructions to assemble the robots and connect the serial cables to their PC to begin programming. The students will enter the sample

programs that are presented in the book and will construct more advanced routines using the supplied code. They'll be able to wire the circuits by following the directions in the book, making the Boe-Bot detect or avoid objects. The advanced concepts presented in the book may not be fully understood, however, a good programming foundation has been forged.

(2) A 2nd year University student opened the Boe-Bot package and assembled the robot in very little time. After building the supplied wiring set ups and completing all of the activities and challenges, the student is able to construct her own circuits, programs, even navigate obstacle courses. She not only builds and programs the robot for infrared detection, she also comprehends and can explain such advanced concepts as frequency sweep, dead reckoning, infrared, and serial communication.



To capture the advancement of Stamps in Class in 2003, it could be described as a year of revisions and new releases. With the birth of the ParallaxEducators Yahoo! group, the communication channels between Parallax's Stamps in Class educational team and educators expanded even further. *What's a Microcontroller?* v2.0 was the primary beneficiary of this key feedback. It's a landmark improvement and considered one of the best hands-on introductions to the world of microcontrollers today. With entirely new material, WAM has doubled in page count and content to include over 40 activities in the standard kit, leaving

no doubt that this is the best starting point for new BASIC Stamp customers. It's excellent for first time programmers as well as being a refresher course for the more experienced.

In addition to the *What's a Microcontroller?* (WAM) re-invention, we added 2 new curricula to our line up; *Elements of Digital Logic* (EODL), and *Understanding Signals* (US). EODL includes free software to demonstrate and bring home the concepts of gates and logic theory to bring the student's electronics and logic background up to par. The *Understanding Signals* curriculum is based on a digital oscilloscope allowing you to read waveforms and capture data easily.

All SIC curriculum may be duplicated in an educational setting as long as there is no profit in the distribution of such material.

Whether your classroom consists of 1 student or if you have 4 periods of 35 students per class, we have the stocking solution for you. Visit www.parallax.com/sic for more information on the following kits.

Standard kits - are purchased in quantities of 1-9 and may include a 15% educational discount on select items.

Class Packs - Class Packs are offered in groups of 20 and include the hardware (Board of Education Full Kit) with the SIC curriculum kit of your choice.

10-Pack and 20-Pack - Quantity packs are simply a pack of 10 or 20 units of the same title at a reduced price.

Custom Kits - are usually combinations of Standard Kits reserved for groups of 25 or more.



BASIC Stamp Educator's Courses

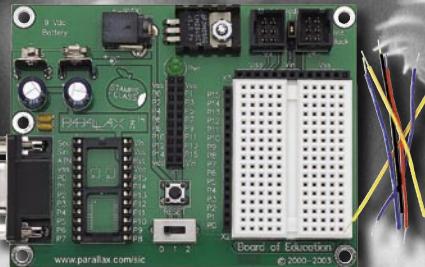
Our goal is to spread the word (and bits) of the BASIC Stamp to as many teachers as possible in a hands-on fashion, thus we have added additional field instructors to our staff. These courses train educators in the basics, so that they get a head start in teaching any of our curricula: *What's a Microcontroller?*, *Elements of Digital Logic*, and *Understanding Signals*, *Basic Analog and Digital*, *Applied Sensors*, *Robotics*, *Advanced Robotics* or *Process Control*. In 2004, we will add 2 new curricula to our line-up, Energy and Art!

The following BASIC Stamp Educator's Courses are scheduled for 2004, although the dates and course details are subject to change without notice. For a current listing of our courses, please visit www.parallax.com/sic and click on Educator's Course



Registration. The courses are designed for educators and have no prerequisites other than having the ability to navigate a PC/Windows environment, and to read schematics.

| 2004 BASIC Stamp Educator's Courses + Events | |
|--|----------------------|
| January 16-17 | Los Angeles, CA |
| January 20-21 | Bayside, NY |
| January 23-24 | Pennington, NJ |
| February 23-24 | Geel, Belgium |
| 2/26-27 and 3/1-2 | Utrecht, Netherlands |
| March 11-12 | Hopkinton, MA |
| March 19-20 | Horseheads, NY |
| April 16-17 | Fresno, CA |
| April 29-30 | Dobson, NC |
| May | Ottawa, Canada |
| June 21-22 | Rocklin, CA |
| June 29-30 | Carbondale, IL |
| July 17-18 | Tucson, AZ |
| July | Springfield, MO |
| August 2-3 | Rocklin, CA |



BASIC Stamp HomeWork Boards; #28158; 10-Pack \$400.00; or 20-Pack \$750.00

Key Features:

- **BASIC Stamp 2 is built into the board**
- **Very low cost of hardware**
- **Stamp I/O protection with built-in current limit resistors**

Designed to be a low cost BASIC Stamp 2/Board of Education for take home projects, it has now become a starting point for many new Parallax customers through last year's promotional kit or Radio Shack retail store purchase. Available in packs of 10 and 20 units, it's very economical hardware and close in functionality to a BS2/BOE set-up. The primary difference between the HomeWork Board and the Board of Education is that the HomeWork Board doesn't have servo connections or a power supply jack. On the other side of the coin, there is a built-in resistor network making it more difficult to damage the interpreter chip on the BASIC Stamp. Note: *What's a Microcontroller?*, *Basic Analog and Digital, Understanding Signals*, and *Applied Sensors* have been revised to support both Board of Education and HomeWork Board platforms.

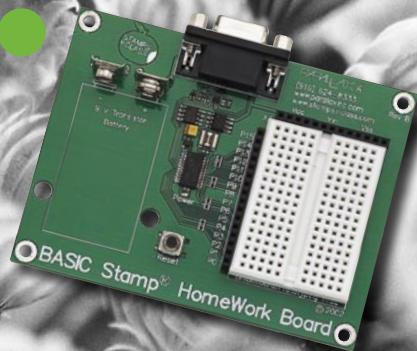
**Board of Education Full Kit; #28102; \$119.00
Board of Education Full Kit (no power supply);
#28103; \$119.00**

Key Features:

- **Lowest cost kit available with the BS2 module**
- **Stamps in Class hardware platform**
- **Small but effective breadboard sized for all Stamps in Class curriculum**

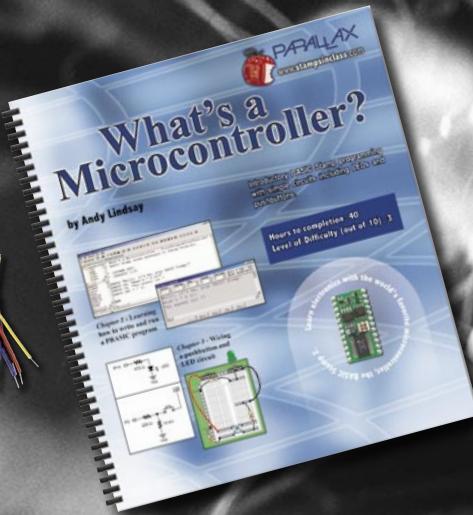
The Board of Education (BOE) Full Kit is the most popular educational kit. Referred to as the BOE Full Kit, it includes the necessary hardware and equipment for the Stamps in Class series. In addition to the Board of Education, it includes the BASIC Stamp 2 (#BS2-IC), serial cable, power supply, jumper wires, and CD-ROM with software and documentation.

This is a platform for the SIC curriculum or for your own experimentation, meaning that you need to purchase additional components and parts to "do something with the kit." By adding WAM v2.0 (#28152, page 05) to the BOE Full Kit, you'll have a working kit that is a great starting point to get you immersed in learning how the BASIC Stamp functions.



05

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What's a Microcontroller?
Parts and Text; #28152;
\$65.00; WAM Parts only;
#28122; \$39.00; WAM Text
only; #28123; \$29.00

WAM Class Packs (qty. 20) are available at savings of over \$25 per kit! See parallax.com/sic for details.

Key Features:

- Great starting point for all
- Program circuits for light, sound and motor control
- Over 40 hands-on activities with complete PBASIC 2.5 support

As titled, *What's a Microcontroller?* (WAM) answers the question of how to design customized, intelligent inventions using the BASIC Stamp 2. The activities incorporate a variety of fun and engaging experiments that appeal to one's imagination using motion, light, sound, and tactile feedback to introduce new concepts. These activities are designed to introduce the user to many basic principles in the fields of computer programming, electricity

and electronics, mathematics and physics. Many of the activities facilitate a hands-on presentation of design practices used by engineers and technicians in the creation of modern machines and appliances, using inexpensive and easy to obtain parts. This text is designed to accommodate a wide range of ages and skill levels.

The *What's a Microcontroller?* (v2.0) activity highlights include the following which are all intended to enhance multisensory involvement:

- Reaction timer game
- Potentiometer-controlled servo
- 7-segment LED light meter
- Nokia Cell Phone ringtone player

The last activity in each chapter typically involves an example project that makes the concepts that were introduced up to that point more tangible. The first activity in a given chapter is hands-on so that students can discover how the electrical/electronic component works before controlling/sensing it with the BASIC Stamp and a program. The intermediary activities introduce techniques that either support the

project in the previous activity or one of the projects from the aptly titled "Projects" section at the end of the chapter.

Throughout the text, you are writing and downloading PBASIC code to a BASIC Stamp, building circuits on a breadboard, and implementing them with components which include: LEDs (light emitting diodes), a 7-segment display, pushbuttons, and a servo. Upon completion of WAM, you will have a solid understanding of writing your own PBASIC programs and building custom circuits to get the results you want.

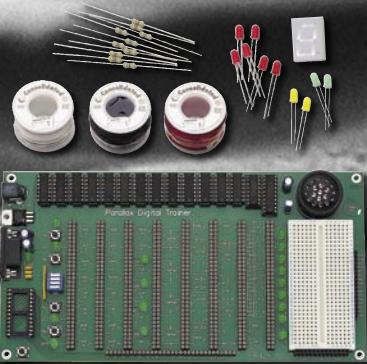
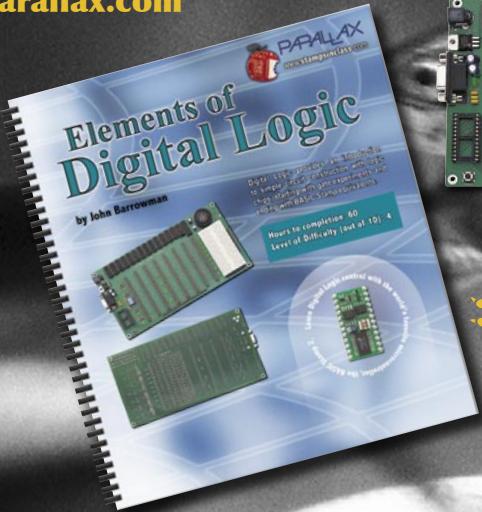
WAM is the primary starting point for new BASIC Stamp users, students and hobbyists alike.

**Hours needed to complete: 40
Level of Difficulty (1-10): 3**

Note: the Board of Education Full Kit (#28102) or the HomeWork Board is required to use this product.

06

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**Elements
of Digital
Logic Parts and
Text; #28201;
\$99.00; EODL Parts;
#28159; \$79.00; EODL
Text; #70008; \$24.00**

**EODL Class Packs (qty. 20) are
available at a savings of over \$25
per kit, see parallax.com/sic for more
details.**

Key Features:

- Suitable for High School/College Logic Classes
- Digital Logic Trainer Board provides hands-on experience
- Logic Simulator software brings concepts to life

Elements of Digital Logic is a hands-on introductory logic course relevant for today's student. The course covers: basic, combinational, sequential logic, problem solving methods and solution design. The student is exposed to: simple DC circuit theory, schematic

symbols, number systems, and simple BS2 programs.

Chapters 1-4 are based on the Parallax Logic Simulator software. Using this free software, students gain an understanding of logic concepts, gate operation, type of signals, and truth tables.

Chapters 5-9 are based upon the Digital Trainer Board and expose the students to more complex logic elements and concepts. The derivations of logic elements and design solutions of simple logical problems are covered using Boolean Algebra as a tool.

Chapter 9 utilizes the BASIC Stamp 2 (not included). Each project is implemented 3 times: in hardware, software, and as a hybrid. After critiquing the hardware and software approaches, the hybrid is designed to exploit the strong points of each previous solution.

**Hours needed to complete: 60
Level of Difficulty (1-10): 5**

Successful completion of this course gives you two possible methods of solving real-world problems. Also, you will possess the skills necessary to derive the most correct solution for the problem. It's absolutely clear that the hands-on approach of EODL produces a confident user with practical problem solving skills. This course is designed for a lab-style environment, lending itself well to a class where students work in pairs. Appendices are provided as reference material so that this book may "stand alone" for individual instruction.

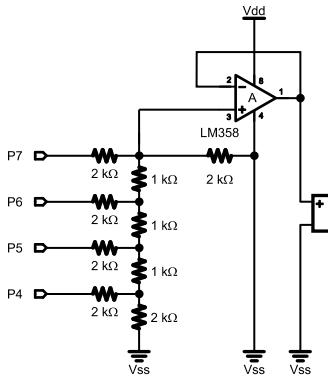
The Digital Trainer Board is included in the EODL parts kit. In addition to the *Elements of Digital Logic* parts kit, you will need a power supply, and serial cable (both sold separately). For Chapter 9, you will also need a BASIC Stamp 2 (#BS2-IC, sold separately).

Basic Analog and Digital Parts and Text; #28155; \$45.00; Basic Analog and Digital Parts only; #28128; \$29.00; Basic Analog and Digital Text only; #28129; \$24.00

BAAD Class Packs (qty. 20) are available at savings of over \$16 per kit! See parallax.com/sic for details.

Key Features:

- **Digitally measure voltage, resistance, capacitance, and frequency with simple circuits and the BASIC Stamp 2**
- **Digitally synthesize DC and time-varying voltage signals**
- **Updated in 2003 for PBASIC 2.5**



Basic Analog and Digital is a 162-page student guide with lots of simple, hands-on BASIC Stamp programming and circuit activities. Common analog to digital (A/D) and digital to analog (D/A) circuits and conversion techniques are introduced. They provide the fundamentals for a host of sensor and control applications as well as a first look inside devices like digital multimeters, function generators, and oscilloscopes.

Application examples include a comparator, voltmeter, digital oscilloscope, DC supply and function generator, resistance/capacitance meter, and frequency synthesis and measurement. A/D circuits include direct I/O pin connections, ADC0831, and resistor-capacitor (RC). D/A circuits

include a resistor ladder, PWM across RC, and an op-amp buffer. Circuits for frequency synthesis and measurement include a 555 multivibrator and piezospeaker.

Revised in 2003 to include PBASIC 2.5 and improved figures and schematics, this text can be studied concurrently with other Stamps in Class texts and it is suitable for any student who has the skills presented in WAM (Page 05).

The text was written by Andrew Lindsay of Parallax, and is available for purchase or free download. This kit requires a BS2 module and Board of Education (BOE Full Kit #28150), sold separately.

Hours needed to complete: 25

Level of Difficulty (1-10): 5



07
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Understanding Signals Parts and Text; #28119; \$189.00

Understanding Signals Class Packs (qty. 20) are available at savings of over \$19 per kit! See parallax.com/sic for details.

Key Features:

- Compact, USB oscilloscope is ideal for laboratories
- 144-page *Understanding Signals* curriculum
- OPTAscope demonstrated with common Stamps in Class signals

The OPTAscope is a USB-based oscilloscope, perfect for education, hobby and for portable applications.

The OPTAscope electronics are enclosed in a powder-coated case and require no external power supply.

OPTAscope Software for Windows supports common scope features including rising/falling trigger settings, waveform measurements (MIN, MAX, frequency, period). BMP screen captures, and the ability to save setups are all standard in the software. Parallax recently added the *Understanding Signals* Text and Parts Kit to the OPTAscope at no additional cost to the customer, a \$45 value.

Note: The OPTAscope oscilloscope is not available for individual purchase.

OPTAscope Technical Specifications

- 2 channels and an external trigger (auto and normal modes)
- 1 Ms/s maximum sample rate on one channel; 500 Ks/s sample rate with two channels
- 20 Vpp Maximum Input for Channel 1 and Channel 2
- 200 kHz Bandwidth
- 8-Bit Vertical Resolution
- 1 M Ohm Input Impedance
- FFT measurement

The *Understanding Signals* Student Guide is an excellent kit to accompany the *Robotics and What's a Microcontroller?* texts and may be completed concurrently or alone. The experiments demonstrate the following signals: analog inputs from photoresistors, synchronous and asynchronous serial communication; single and dual sine waves; servo pulse signals over

an entire range of motion; pulse width modulation with infrared; decoding of handheld infrared remote control signals and op-amp signals used in amplifier circuits.

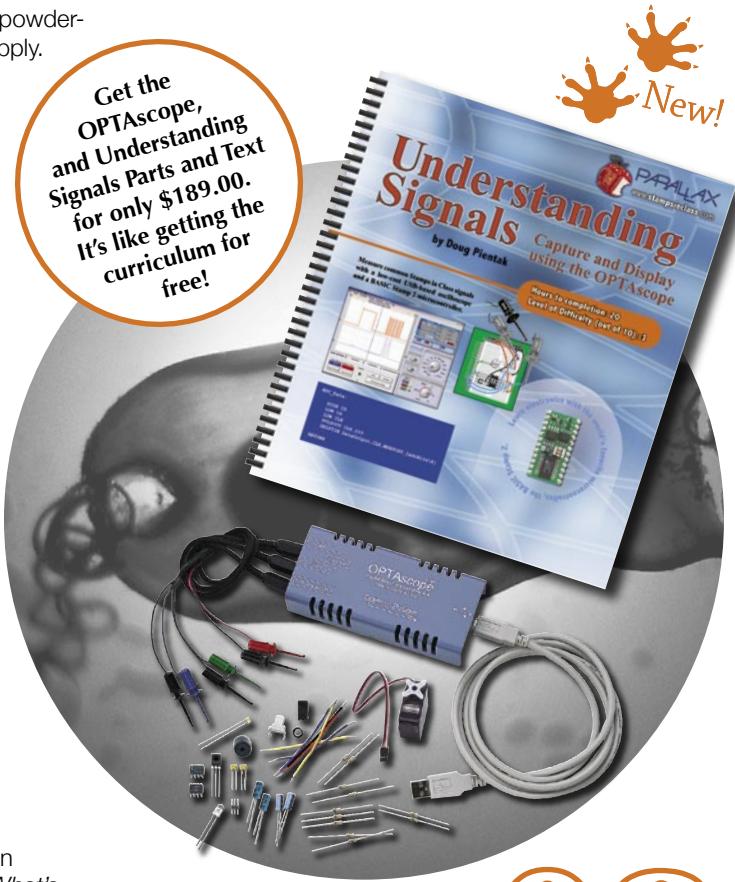
Hours needed to complete: 20

Level of Difficulty (1-10): 3

The Understanding Signals Kit Includes the Following:

- OPTAscope (oscilloscope, USB cable, CD-ROM, 3 pairs probes)
- *Understanding Signals* Student Guide
- *Understanding Signals* Parts Kit

Note: This kit requires a BS2 module and Board of Education (BOE Full Kit #28102), sold separately.



Robotics: with the Boe-Bot Parts and Text; #28154; \$129.00; Robotics: with the Boe-Bot Parts only; #28124; \$119.00; Robotics: with the Boe-Bot Text only; #28125; \$29.00

ROBO Class Packs (qty. 20) are available at savings of over \$40 per kit! See parallax.com/sic for details.

Key Features:

- Explore autonomous robotics
- Multiple sensors allow you to detect objects with infrared, follow or avoid light, and navigate with bumper wires
- Text provides detailed assembly and programming instructions

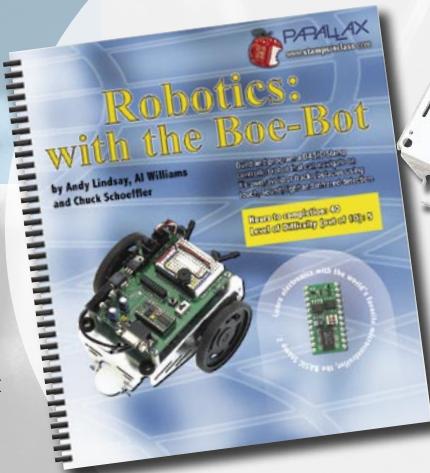
The Boe-Bot is Parallax's most popular robotics kit because it appeals to beginners and the more experienced roboticist. The multifaceted Board of Education (BOE) programming board with the BS2 module (both sold separately) is mounted on top of a sturdy chassis, providing you with an excellent base for wiring circuits. The breadboard mounted on the BOE makes it easy for you to experiment with different wiring configurations, allowing you to switch your Boe-Bot very easily from a light follower to an object avoider. Should you happen to make a mistake, there's no soldering involved which saves you valuable time.

The programming of the Boe-Bot is covered in complete detail, beginning with the explanation of servo motors. You'll learn how to use PBASIC commands that will give you complete control of this robot. The first activities start with controlling the robot by sending commands to the servos for traveling predetermined distances and making turns with no concern for the robot's environment. As you proceed through the *Robotics* book, you'll become familiar with advanced programming techniques to use with sensors for ultimate control and feedback. Frequency sweep programming will allow you to even make one Boe-Bot follow another, or as a solo activity you can make the robot follow the edge of a table without falling off!

**Hours needed to complete: 40
Level of Difficulty (1-10): 5**

Throughout your Boe-Bot explorations with the *Robotics* text, you'll discover an abundance of helpful

information, terminology, and pointers from the pros at Parallax. Each of the chapters includes an introduction discussing the forthcoming concepts, multiple activities, applications, chapter summary, questions, and challenge projects. Once you have completed *Robotics: with the Boe-Bot*, you will be confident with programming, building circuits, reading schematics, and solving problems with a microcontroller.



Note: To purchase the Boe-Bot parts along with the BASIC Stamp and Board of Education order the Boe-Bot Robot Kit (#28132, page 27). If you are ordering only the parts kit you will also need to order a Board of Education Full Kit (#28102, page 04).

Educator's Note: The *Robotics* curriculum is a very popular launching point in the Stamps in Class curriculum, second only to *What's a Microcontroller? (WAM)*. Contact us at stampsinclass@parallax.com if you need guidance with your educational approach.



Using the key components of the Parallax Boe-Bot Robot Kit, Mark Devine's students at the Singapore American School designed their own chassis to create unique robots with the BASIC Stamp 2 and the Board of Education.



Applied Sensors Parts and Text; #28153; \$79.00; Applied Sensors Parts only; #28126; \$59.00; Applied Sensors Text only; #28127; \$29.00

AS Class Packs (qty. 20) are available at savings of over \$30 per kit! See parallax.com/sic for details.

Key Features:

- Build a multi-sensor data logger as you progress through the text
- Improved in 2003 with PBASIC 2.5 and technical drawings
- Excellent for engineering and environmental science courses

Applied Sensors (formerly *Earth Measurements*) is written by Dr. Tracy Allen of Electronically Monitored Ecosystems in Berkeley, California. The 200+ page text is the most complete primer on BASIC Stamp program structuring, sensor calibration, and serial communication in the Stamps in Class series. Dr. Allen continues to be a valuable contributor to

the BASIC_Stamps Yahoo! Groups online forum and implements BASIC Stamps in his OWL2C data logging product line.

The concepts are taught using an earth science theme with emphasis on resistor/capacitor networks, serial communication, and data logging. The first experiment walks you through the steps of measuring temperature with the DS1620 and a handful of parts. The text builds in complexity as you build more challenging circuits, programs, and concepts related to sensors.

The final *Applied Sensors* experiment consists of an environmental data logger that measures air temperature, water temperature, light levels, and electrical conductivity of water. Two stainless steel screws are used to determine the water level in a cup, and the pump is controlled to maintain the water level. A speaker provides Morse code sound feedback of each sensor parameter as it is logged to the BASIC Stamp's EEPROM. The BASIC Stamp's DEBUG command is used to display all of the data on a PC where it may be cut and pasted into a

spreadsheet or other program for analysis.

The 6 chapters consist of the following topics: Piezo and Temperature Transducer, Data Logging, Temperature Probe for Micro-Environments, Light on Earth and Data Logging, The Liquid Environment, Measurement and Control.

This curriculum is highly recommended for the student that has already completed the introductory WAM Curriculum. *Applied Sensors* is excellent for any engineering and science courses with an environmental or data collecting facet. Weather monitoring enthusiasts and those that want to learn more about serial communication will also find this text to be very valuable and engaging.

**Hours needed to complete: 50
Level of Difficulty (1-10): 7**

Process Control Parts and Text, v1.1; #28156; \$59.00; PC Parts only; #27340; \$39.00; PC Text only; #27341; \$29.00

PC Class Pack: includes 20 PC Parts and Text Kits and 20 BOE Full Kits; #28170; \$2795.00 A savings of over \$38 per kit!

Key Features:

- Closed-loop control engineering concepts with a simple incubator circuit
- Complete visual integration with StampPlot Pro
- Control concepts (proportional, integral, derivative) developed one step at a time

Learn Process Control on Your Desktop

Learning the basics of industrial process control is practical and educational with our *Process Control* (formerly Industrial Control) Parts Kit and Text. You don't need to have a wastewater treatment plant to learn the essentials of on-off, differential gap and PID control (proportional, integral, derivative).

Our 200+ page *Process Control* Student Guide instructs the methods of process control in detail using a simple desktop heater system consisting of a film canister with a temperature sensor (LM34 probe) and a heat source (1/2 watt 47 ohm resistor). The heating drive is altered to demonstrate each concept. A fan provides an external disturbance to the closed-loop system. The projects are built in a step-wise fashion.

StampPlot Pro Provides Visual Feedback

A key benefit of the text is that it uses StampPlot Pro as a graphic and datalogging utility for each experiment. By building the projects on a BASIC Stamp Board of Education and leaving it connected to your PC, you will use the SEROUT command to send data back to the PC. The data sent by your PBASIC code will configure the graph and plot temperature, time and heater status. StampPlot Pro was a \$49 utility, but this year Parallax formed an agreement with the developers to distribute this software free with the *Process Control* kit.

Progressive Document

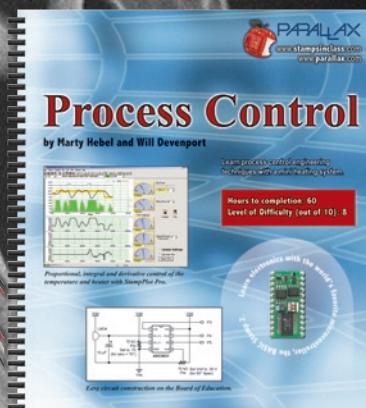
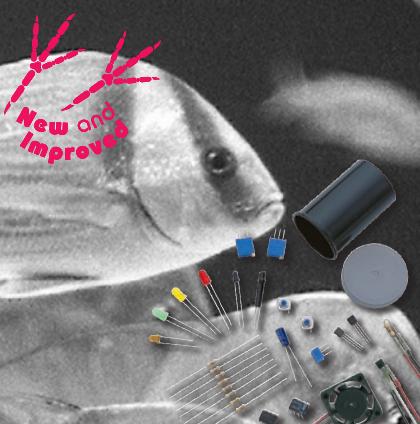
Process Control, formerly *Industrial Control*, is now in its third revision, and expected to be released early this year. Written by Marty Hebel and Will Devenport, two instructors from Southern Illinois University and the Parallax educational team, *Process Control* has been improved through significant customer feedback. *Process Control* is in use at universities across the US.

**Hours needed to complete: 60
Level of Difficulty (1-10): 8**

Note: Download Process Control text and BASIC Stamp software from our website.



StampPlot Pro screenshot



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Toddler Robot Kit - Gold; #27310; \$249.00; Toddler Robot Kit - Blue; #27311; \$249.00; Advanced Robotics Text only; #122-00001; \$29.00

Key Features:

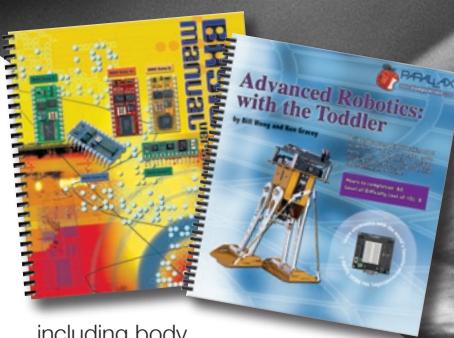
- Excellent example of software and mechanical interdependences
- Real-time process control example with feedback from infrared, bumpers and incline
- Advanced programming techniques used throughout the text

As seen on Fox TV's *John Doe* program to reenact a crime scene with two vagrants running through a neighborhood, our Toddler robot is a true entertainer. The Toddler shifts its center of gravity to walk and turns by sliding its feet in opposite directions. The Toddler is well supported with customer-created discussion groups, video downloads, sensor accessories and our well-written 200+ page *Advanced Robotics: with the Toddler* Student Guide.

The Toddler hardware includes CNC-punched and cast/polished aluminum and brass parts. The kit includes all the hardware you need



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including body parts, legs, ankles, control linkages, screws/nuts/standoffs, BASIC Stamp electronics, etc. The Toddler requires 2-3 hours to assemble and tune. The aluminum parts have holes, slots and configurable mounting angles for your own customization.

The Toddler is controlled by a surface mounted BASIC Stamp 2 module. Four infrared sensors and receivers, LEDs, servos for tilt and stride, resistors/capacitors, speaker, and photoresistors complete the electronics package.

The real experimentation happens when you get into our 200+ page *Advanced Robotics: with the Toddler* text, written in Stamps in Class style.

Walking robots have mechanical and software interdependences that require in-depth examples and explanation. The text starts with detailed examples of the Toddler's basic movements but advances to closed-loop control with state-machine programming with infrared and light sensors. Customers using the Toddler will learn advanced embedded programming with PBASIC, efficient code development, sensor feedback, and general control principles.

Because of the number of possible movements (34) we consider the Toddler to be appropriate for those aged 14 and above. Advanced



Robotics: with the Toddler could be done subsequent to the *Robotics with the Boe-Bot* (page 9) curriculum.

**Hours needed to complete: 80
Level of Difficulty (1-10): 9**

Note: Download Advanced Robotics text and BASIC Stamp software for free from our website.

Toddler Accessories

To keep the cost of the Toddler kit reasonable, Chapters 8 and 9 use additional hardware that is sold separately. The **Bumper Sensors (#27312)** provide physical sensor feedback and the Memsic 2125 Dual-axis Accelerometer (#28017, page 34) is used for incline measurement.



Experiments with Renewable Energy - Coming Soon!

Parallax will be releasing the *Experiments with Renewable Energy* curriculum in early 2004. Stay tuned to the website for the announcement and release date.

EWRE Parts and Text; #28145; EWRE Parts only; #28144; EWRE Text only; #70011

This *Experiments with Renewable Energy* curriculum focuses on electricity. In this course you will learn about the fundamentals of direct current (DC) and alternating current (AC) and how they both apply to our everyday use of electricity. By studying electrical energy as the primary theme, you will also learn simple, yet elegant, programming techniques using the BASIC Stamp.

And to add a dramatic

visual dimension to your learning activities, we have also integrated StampPlot Pro software. StampPlot Pro software provides you with the ability to graph the real-time voltage measurements that make up the basis for each of the five experiments that comprise this course.

This series of five experiments will introduce you to DC and AC electrical concepts using the Board of Education and the BS2-IC. To produce DC and AC power, these experiments use rechargeable batteries, miniature solar cells, and a 3-phase wind-driven AC alternator that, taken together, will help you learn about two forms of renewable energy as well.

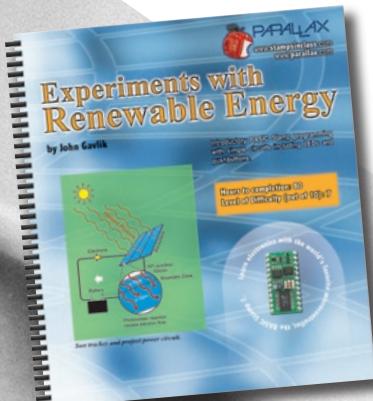
The underlying goal of this course is to whet your intellectual appetite to learn more about the various forms of electrical energy and how best to apply them in a technical sense.

The purpose of this course is to introduce students to careers in the energy and power electronics fields. Our country's dependence on electrical power and the electronic components that control and process this power still remains a sleeping giant. While computers and telecommunications were the technology bellwethers of the 1980s and

1990s, power technologies will dominate at least the first part of the 21st Century electronics industry, largely due to our reliance on these computer-based technologies. This is why students should seriously consider careers in the energy and power electronics fields, because they will shortly represent the new-growth industries that will cry out for technical talent. Hopefully, this *Experiments with Renewable Energy* course will help to inspire participation in this new technology revolution.

This *Experiments with Renewable Energy* curriculum was created for ages 15 and above as a subsequent text to the *What's a Microcontroller?* and *Basic Analog and Digital* guides. Therefore, it is assumed that both students and teachers are already familiar with PBASIC commands and understand their functions in a normal programming environment.

Authored by LearnOnLine's John Gavlik, recipient of the 2002 Power Sources Manufacturers Association (PSMA) Power Electronics Educational Award for his REEL Power Renewable Energy Education Lab project.

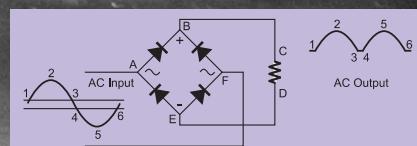
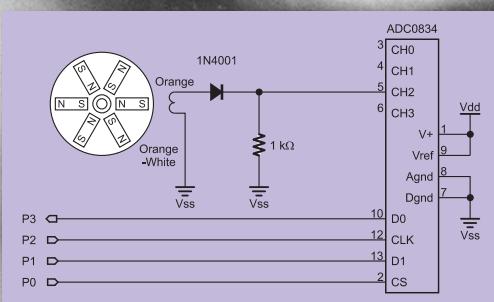


Wind turbine power generator

Voltage rectifier circuit

Generate
3-phase AC
power with this
kit, just like real
power plants!

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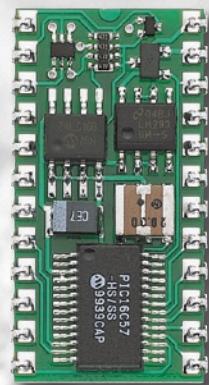


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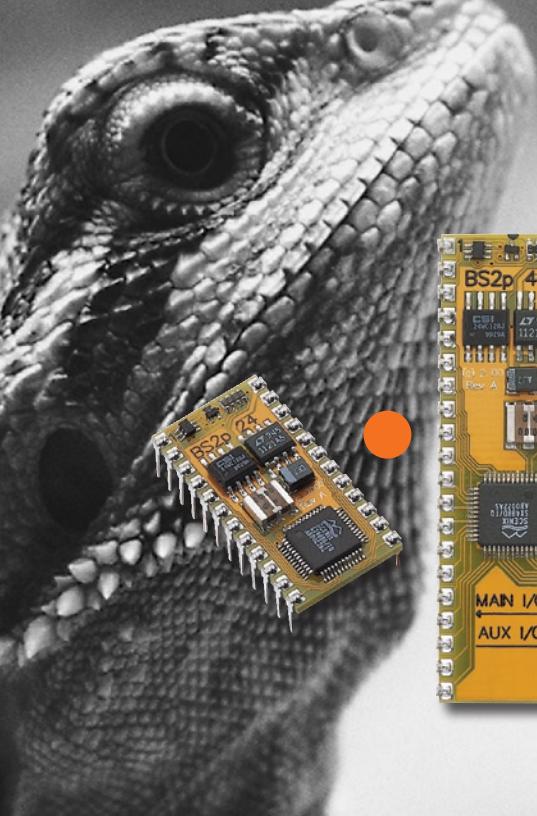
BASIC Stamps continue to provide engineers, educators, and hobbyists with microcontrollers that are easy-to-use, have proven track records, and are ideal for project development. For first-time customers, we highly recommend that you start with the BASIC Stamp 2 (BS2-IC). The BS2-IC has the most detailed documentation and educational support, making it the ideal choice for understanding the world of the BASIC Stamp. If you're an advanced programmer with previous microcontroller experience, opting for the BASIC Stamp 2p (BS2P24) will be the best choice since its PBASIC command set has 19 additional commands including those for I²C, 1-Wire, and

parallel LCDs. After exploring the capabilities of one of the aforementioned BASIC Stamps, you may then focus your approach by selecting a BASIC Stamp with the following characteristics: more I/O pins, additional memory, or faster programming execution speed. Perhaps you'll even find out that you can do everything necessary with the BASIC Stamp 1 (#BS1-IC, page 25) with 8 I/O pins and now with the ability to be programmed in a Windows environment! Visit our web site to download the BASIC Stamp Manual, applications, articles, books, and educational curriculum for free to guide your journey of engineering with the BASIC Stamp.



Visit our web site to download the programming software for Windows, DOS, Linux and Mac.

| Name | #BS2-IC; #BS1-IC | #BS2E-IC | #BS2SX-IC | #BS2PE | #BS2P24; #BS2P40 |
|-------------------------------------|-------------------------------|-----------------------------------|-----------------------------------|---|-----------------------------------|
| Processor Speed | 20 MHz | 20 MHz | 50 MHz | 8 MHz Turbo | 20 MHz Turbo |
| Program Execution Speed | ~4,000 instructions/second | ~4,000 instructions/second | ~10,000 instructions/second | ~6,000 instructions/second | ~12,000 instructions/second |
| RAM Size | 32 Bytes (6 I/O, 26 Variable) | 32 Bytes (6 I/O, 26 Variable) | 32 Bytes (6 I/O, 26 Variable) | 38 Bytes (12 I/O, 26 Variable) | 38 Bytes (12 I/O, 26 Variable) |
| Scratch Pad RAM | N/A | 64 Bytes | 64 Bytes | 128 Bytes | 128 Bytes |
| EEPROM (Program) Size | 2K Bytes, ~500 instructions | 8 x 2K Bytes, ~4,000 instructions | 8 x 2K Bytes, ~4,000 instructions | 16 x 2K Bytes (16K for source), ~4,000 instructions | 8 x 2K Bytes, ~4,000 instructions |
| Voltage Requirements | 5–15 VDC | 5–12 VDC | 5–12 VDC | 5–12 VDC | 5–12 VDC |
| Current Draw @ 5V | 8 mA Run/100 µA Sleep | 20 mA Run/100 µA Sleep | 60 mA Run/200 µA Sleep | 15mA Run/60 µA Sleep | 40 mA Run/400 µA Sleep |
| Source/Sink Current per I/O | 20 mA/25 mA | 30 mA/30 mA | 30 mA/30 mA | 30 mA/30 mA | 30 mA/30 mA |
| Source/Sink Current per Unit | 40 mA/50 mA per 8 I/O Pins | 60 mA/60 mA per 8 I/O Pins | 60 mA/60 mA per 8 I/O Pins | 60 mA/60 mA per 8 I/O Pins | 60 mA/60 mA per 8 I/O Pins |
| PBASIC Commands | 36 | 39 | 39 | 55 | 55 |



BASIC Stamp 2; #BS2-IC; \$49.00;
BASIC Stamp 2i; #BS2I-IC; \$54.00



Key Features:

- Easy to program with proven track record
- 16 I/O pins for hardware connectivity
- Excellent support and documentation

Widely used in industrial, education, and hobbyist applications, the BS2-IC is the most popular BASIC Stamp. The BS2-IC has adequate I/O pins, processing speed, and program space for most designs. No compiler is required, and a serial interface provides enhanced debug features.

The BASIC Stamp 2 can control systems in a wastewater treatment plant or it can control the direction of your robot. Presented in the friendly form factor of a 24-pin DIP module, it's very practical for developing projects on a Parallax programming board or your own breadboard set-up. The succinct and easy-to-use PBASIC language makes hardware interfacing very understandable. This has allowed students, hobbyists, and inventors to develop ideas at the same level as an engineer.

BASIC Stamp 2p 24-Pin; #BS2P24; \$79.00
BASIC Stamp 2p 40-Pin; #BS2P40; \$89.00

Key Features:

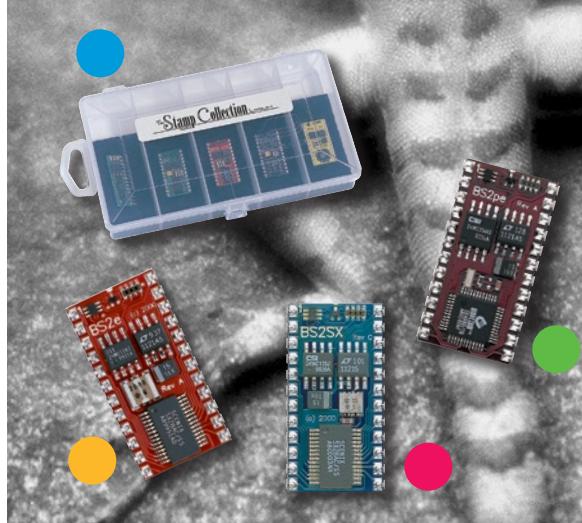
- BASIC Stamp with highest speed
- Ideal for proof of concept designs
- Interfaces to I²C, 1-Wire, and Parallel LCDs

The BASIC Stamp 2p is available in a 24-pin and a 40-pin (16 extra I/O pins) module. Each module has commands for interfacing with parallel LCDs, I²C devices and Dallas Semiconductor 1-Wire parts along with a polled interrupt capability. The BS2p24 may be interfaced with any Parallax programming board with a 24-pin socket.

BASIC Stamp 2pe; #BS2PE; \$75.00
BASIC Stamp 2sx; #BS2SX-IC; \$59.00
BASIC Stamp 2e; #BS2E-IC; \$54.00

The Stamp Collection; #020-78267; \$199.00

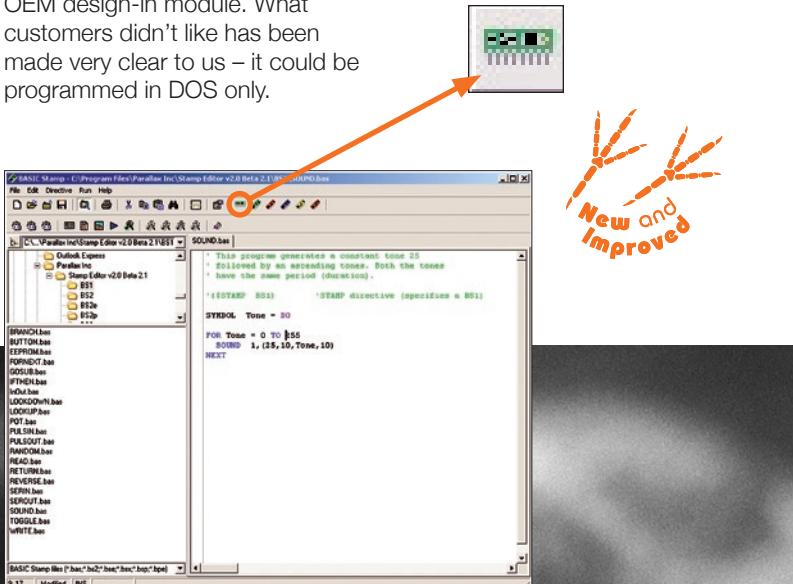
Meet every engineering need with this selection of BASIC Stamp modules. Consists of the BS1 (#BS1-IC, page 25), BS2, BS2e, BS2sx, and the BS2p24.



Parallax Proudly Announces BASIC Stamp 1 Windows Programming

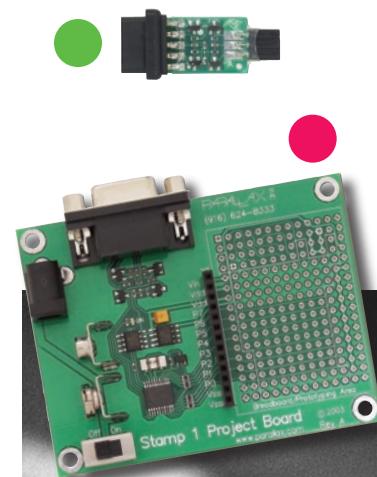
It was 1993 when the original BASIC Stamp 1 (BS1) was released. There is something about this ground breaking module that our customers really like: easy language, small form factor and low cost. Even today, teachers may hand them out to students for dedicated projects, they appear on competition Sumo robots and are our most popular OEM design-in module. What customers didn't like has been made very clear to us – it could be programmed in DOS only.

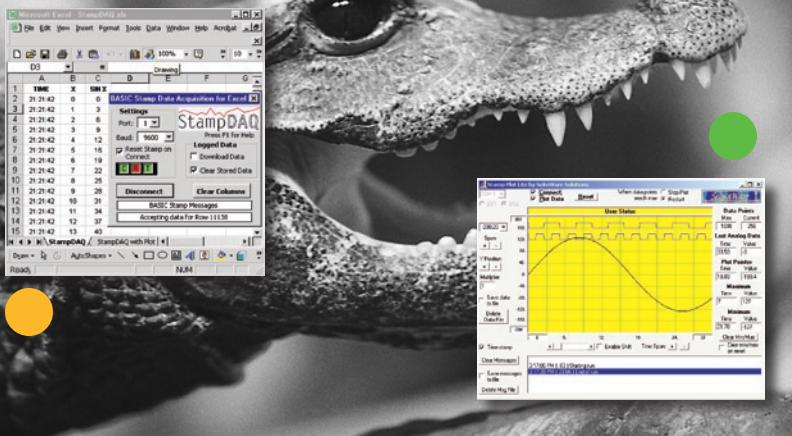
In November 2003, Parallax released a new BASIC Stamp Windows Editor with BS1 support. The new software provides a Memory Map of the BS1, syntax highlighting and additional code formatting features. Now you can develop code in the same environment as other BASIC Stamps. No more DOS!



Technical Details Resolved and Two New BS1s are Introduced

We've developed two hardware solutions for BASIC Stamp 1 users, both involving a level-shifting adapter ([#27111, page 25](#)). For existing users of the BS1, simply plug the adapter between your parallel port and your BS1 circuit. New customers can buy the **BS1 Project Board (#27112, page 25)**, which already has the adapter circuit, as well as the BS1 components built onto the PCB.





Free software and downloads



If you have been to our website lately, you already know that Parallax prides itself in providing customers with the latest software, manuals, and other resources for free downloading. We believe that information isn't a commodity, and you probably agree.

All resources authored and printed by Parallax are presented to you online, with the primary exception being books written by third party authors. The bottom line is that Parallax wants to give customers all the necessary information to develop a project completely or to assist you with making the best purchasing decision. Downloading and printing a 400 page text may not be a practical option, so you can download it to review prior to purchasing.

In addition to the printed material support, we offer online resources such as the Customer Applications section which provides you with over 40 finished projects based on Parallax products. To visit these

online treasures, just go to our web site and select the Resources or Downloads sections to begin your exploration. In addition to the items presented above, we also have the following online categories containing helpful information: Getting Started, Video Library, Catalog Applications, and Nuts & Volts columns.

Software

The BASIC Stamp Windows Editor is one of the most popular downloads on our web site. Jumping to the BASIC Stamp Windows Editor v2.0 and beyond is a huge improvement over previous versions. Most importantly, all upgrades and new platform versions for the BASIC Stamp are presented at no cost to you and that's guaranteed. Here is a listing of the new key features, with a complete list available online:

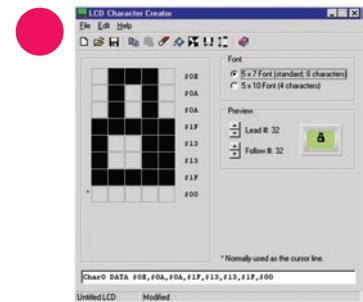
- Syntax Highlighting
- Integrated File Explorer
- Split Screen Capability
- Optional automatic line numbering
- IF...THEN...ELSE
- SELECT...CASE
- DO...LOOP
- READ and WRITE work with Words and lists of data

Other free downloads include BASIC

Stamp software for Mac, Linux, and DOS. Additional software is also provided for such products as the OPTAscope (page 08), StampDAQ, and Stamp Plot Lite.

GUI-BOT. This Graphical User Interface Robot allows you to program a Parallax Boe-Bot with a drag-and-drop icon-based interface. The beginner mode provides an output-only mode and the advanced mode allows for integration of whiskers and infrared sensors.

LCD Character Creator. A Windows-based program that makes it easy to create custom characters for parallel LCDs. Includes complete on-line integrated help.



Parallax Logic Simulator.

Accompanies the new *Elements of Digital Logic* curriculum (page 06) and trainer board to teach you basic logic concepts.



BASIC Stamp 2 OEM Module (Kit Form); #27291; \$45.00

Key Features:

- Build a BASIC Stamp on your board to save costs
- Enjoy the reprogrammability and ease of use
- Save time developing with a robust and proven solution

One of the main purposes behind the BASIC Stamp OEM modules is to make it easier to embed a BASIC Stamp into an OEM (Original Equipment Manufacturer) design. This approach of making your own board to house a BASIC Stamp will save you considerable costs as opposed to using a 24-pin module, but still offers the same desirable features including reprogrammability. BASIC Stamp Interpreter chips are available in a number of packages; the pinouts may be different so be sure to specify the correct package and use the correct pinout. Prior to embarking on your own OEM design, we recommend contacting Parallax technical support if you have any questions. The BASIC Stamp OEM Manuals will provide you with complete details. When designing a BASIC Stamp 2 into your product, this is an overview of considerations:

Power Supply. The BASIC Interpreter (also known as the PBASIC interpreter chip) requires a 'clean' 5 VDC supply. The LM2940 was selected because of its wide operating range, built-in protection features, and ability to deliver up to 1 Amp of current. Be sure to consult the manufacturer's recommendations for input and output capacitance for the regulator that you will be using in your design.

Resonator Location. When laying out your board, please choose a location for the resonator that is as close as possible to the BASIC Interpreter, and has

the shortest circuit traces possible to ensure reliable operation.

FCC Considerations. If you intend to seek FCC approval for your BASIC Stamp-inclusive OEM product, be advised that while the BASIC Stamp does not qualify for testing in and of itself, preliminary studies indicate that the BASIC Stamp alone operates within FCC stated tolerances for both radiation emission and flux sensitivity.

Parallax uses a minimum complement of components to effect an interface between the high levels of

RS-232 and the relatively low levels of

TTL. Regardless of how the line

levels are interfaced, there are

two important things to

note: the idle state of the

serial input line (Sin)

at the interpreter,

(RA.2), is high, so

you should place a

pull-up resistor on

the RA.2 pin, also,

there must exist

some form of loop

back from Sin

to Sout so that

the Stampw.exe

software can

communicate with

the BASIC stamp.

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Powering up your OEM BS2.

There are two mutually exclusive

ways in which you can

power your OEMBS2:

- You may apply 6-24 VDC to the Vin pin (and ground to the Vss pin)

- You may apply 5 VDC to the Vdd pin (and ground to the Vss pin)

BASIC Stamp 2 OEM Module (Assembled);

#27290; \$59.00

BASIC Stamp 1 OEM (Kit

Form); #27296; \$39.00

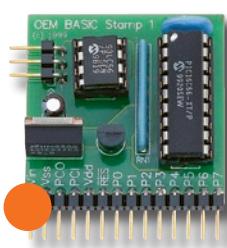
BASIC Stamp 1 OEM

(Assembled); #27295; \$45.00

BASIC Stamp 2SX OEM

Module (Assembled only);

#27294; \$59.00



It's Not a PlayStation Game Controller – It's a Boe-Bot Controller!

Just Ask an Educator What Students Like

Our Stamps in Class focus is driven by educators. They always tell us that robots compete for student interests really well, but students are still attached to their video games. Here is one way to combine the best of both worlds and make a normally autonomous Boe-Bot remote controlled – complete with joystick rumble feedback for sensor detections!

The toughest part of this project is building the mechanical/electrical interface. You can solve the connector problem by buying a \$10 PlayStation extension cable and carefully cutting the socket from one end of it. With a few resistors and a transistor the circuit will be complete and will protect the BASIC Stamp from any dangerous game controller induced electrical noise.

The Coding is Simple

The example PBASIC programs available for download use a BS2-IC. The program consists of a **Main: DO...LOOP** which runs the **Get_PSX_Buttons** routine to capture the button states and returns to a **CASE-SELECT** statement which manages the Boe-Bot servos for control.

```
Get_PSX_Buttons:  
    LOW PsxAtt  
    SHIFTOUT PsxCmd, PsxClk, LSBFIRST, [$01, $42]  
    SHIFTIN PsxDat, PsxClk, LSBPOST, [psxThumbL, psxThumbL, psxThumbR]  
    psxId = $41  
    HIGH PsxAtt  
    RETURN
```

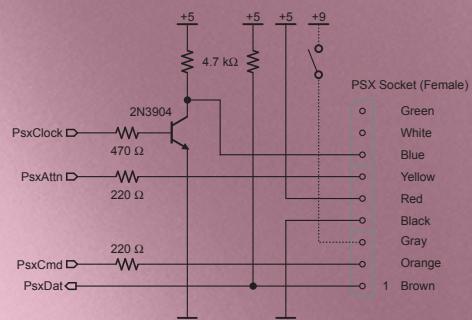
The first **psxThumbL** byte is thrown away and, through some aliasing, the two **psxThumbL** and **psxThumbR** variables are assigned to four bits of another variable which is used to branch to nine different driving routines.

Entire Application Available for Download

You can download a detailed article on interfacing a PlayStation game controller to a BASIC Stamp from our Downloads/Nuts & Volts menu on our web site. The complete BASIC Stamp code and explanation are in column #101 from September 2003, named "PlayStation Redux".

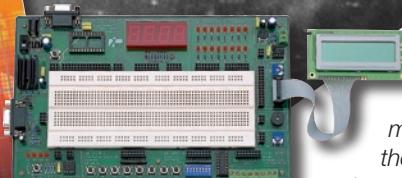
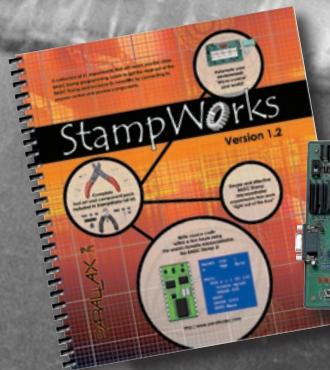


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StampWorks Experiment Kit; #27297; \$349.00

Key Features:

- Includes NX-1000 Board, BS2, full set of tools, and multimeter
- Recommended for advanced programmers
- 32 Experiments with source code and support

The StampWorks Experiment Kit includes the most tools compared to any other offerings in our inventory of kits. Take a look at the comprehensive listing of included parts and components on this page and you'll be amazed with the possibilities. The style of the book and the complexity of the code makes it perfect for advanced programmers that are able to grasp high level PBASIC coding. Most of the code explanation lies within the comments in the source code listing. The experiments are generally completed with the following progression of steps: Discussion of new PBASIC elements/commands, Building the Circuit, Source Code presented, Behind the Scenes, and occasionally a Challenge.

If you want to become a "Stamp Guru" and exchange advice on the "basicstamps" YahooGroups Discussion list, then you should tackle the StampWorks experiments. After all, one of the most prolific contributors is Jon Williams, Parallax Engineer and author of the extremely popular Nuts & Volts Stamp

Applications columns and the StampWorks manual itself. The core of the StampWorks book is 200+ pages, with an additional 300+ pages in the appendix due to the inclusion of the BASIC Stamp Manual.

Note: The kit includes BASIC Stamp 2 module and source code, but if you prefer to use the other BASIC Stamps (2e, 2sx, 2p) then you can download code for them online.

StampWorks Experiment Kit includes:

- StampWorks Manual
- NX-1000 BASIC Stamp Experiment Board
- BASIC Stamp 2 module (BS2-IC)
- 2 x 16 Hitachi-compatible parallel LCD with cable
- Digital multimeter with two probes
- Wire cutter / wire stripper / pliers
- Three 100' rolls of 22 AWG wire (red, white, & black)
- Screwdriver kit (two standard and two phillips)
- Photoresistor
- 555 timer
- 8-bit serial to parallel and 8-bit parallel chips
- Dallas Semiconductor 1620 Digital Thermometer and 1302 Real Time Clock with 32.768 kHz crystal
- National Semiconductor 8-bit A/D converter
- Maxim 7219 8-digit LED display driver
- National Semiconductor LM358 op-amp
- 12 volt unipolar stepper motor
- Parallax standard servo
- 12 VDC / 1 Amp wall-pack power supply
- Resistors (220 Ω, 1 kΩ, 10 kΩ, 100 kΩ)
- Capacitors (0.1 μF, 1 μF, 10 μF)
- Serial cable
- Parallax CD-ROM
- Technical support by phone and email

NX-1000 Board; #28135; \$179.00

The package includes printed documentation, schematics, and source code examples for the BS2-IC. A parallel LCD with cable and a power supply is also included.

**BASIC
Stamp 2
Educational
Starter Kit;
#27207; \$159.00**

Key Features:

- Complete "Getting Started" kit
- Enhanced to include the *What's a Microcontroller? (WAM)* curriculum and parts kit at no additional cost
- Includes all of the BASIC Stamp hardware needed to complete WAM

Our most popular BASIC Stamp is the BS2-IC module. Widely used in education, hobby, and industry, this module has enough program space, execution speed, and I/O pins for most applications. Now featured with WAM, this Starter Kit has our highest recommendation. An incredible value at only \$159.00.

With the latest edition of this kit, you will receive the *What's a Microcontroller?* parts and text making this combination a bona fide "Getting Started" kit. With the WAM kit you'll get your feet wet through a series of over 40 activities designed to provide you with the best possible introduction to the world of BASIC Stamps.

If you're starting from scratch and need a printed manual, this is the most cost-effective approach. The BASIC Stamp 2 Starter Kit includes a BASIC Stamp 2 module, Board of Education Programming Board, BASIC Stamp Manual, CD-ROM (software and documentation), jumper wires, and a serial cable.

Board of Education (alone); #28150; \$65.00

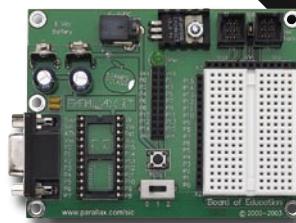
Key Features:

- Programming Board of choice for SIC and educational customers
- Excellent board for robotics (used in Boe-Bot)
- Breadboard is suited for multiple projects

The Board of Education Rev. C received two major improvements in 2003, resulting in better control of your



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projects. Power to the servos: The jumper near the servo connectors will select either Vdd (5 V) or Vin (unregulated input voltage) to power the servos. 3-position power switch options: off (0), power to everything but servo connectors (1), or power to everything (2).

The Board of Education is available as a separate programming board or you may purchase the "BOE" Full Kit (#28102) or the BS2 Educational Starter Kit (#27207). The BOE was designed in coordination with our educational customers to teach microcontroller programming and interfacing.

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BASIC Stamp 2p24 Professional Starter Kit; #27235; \$209.00; BASIC Stamp 2p40 Professional Starter Kit; #27238; \$219.00

The BS2p24 and BS2p40 are the fastest and most advanced of the BASIC Stamp 2 series. Both have a program execution speed of ~12,000 instructions per second and have 128 bytes of scratch pad RAM.

Each of the BS2p24 and BS2p40 Professional Starter Kits are presented to engineers with a sampling of components such as a DS1822 thermometer and RTC w/RAM to test and get an immediate hands-on feel for the capabilities of the BS2p modules. This is especially handy when referring to the Philips I²C components and Dallas Semiconductor 1-Wire components since the BS2p has special PBASIC commands to make interfacing very straightforward (ex. OWIN, OWOUT). A polled interrupt capability is also a key feature of the BS2p series. If you purchase a parallel LCD separately or in the Plus Pack, you'll also appreciate the ability of the BS2p to communicate directly with this device.

The BS2p24 has 24-pins (16 I/Os) and is supported by the BS2p24 Demo Board. For a list of BASIC Stamp technical specifications, see pages 14 and 15. The BS2p40 has a total of 32 I/O pins and is accompanied

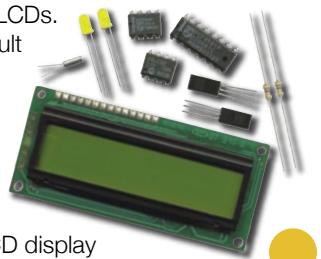
by the BS2p40 Demo Board with a larger repluggable breadboard and connections for the included parts.

Please note that both BS2p Starter Kits are designed for intermediate to advanced users. The schematics and source codes are available online. A 7.5 V power supply (not included, #750-00009) is required to use these kits.

BS2p Plus Pack; #45184; \$69.00

The BS2p Plus Pack is a collection of parts designed to show off the abilities of the BS2p modules. The accompanying demonstration projects focus on interfacing to I²C and parallel LCDs.

Use Parallax engineering default source code to get started and customize it for your application. This kit is ideal for engineers wanting to prototype very quickly with one of the BS2p Professional Starter Kits. Includes 2x16 LCD display w/cable, DS1822, DS2890-000, DS2405, 8 bit I/O Expander PCF8574P, 8 bit A/D & D/A PCF8591P, and RTC w/RAM PCF8583PN, and more.

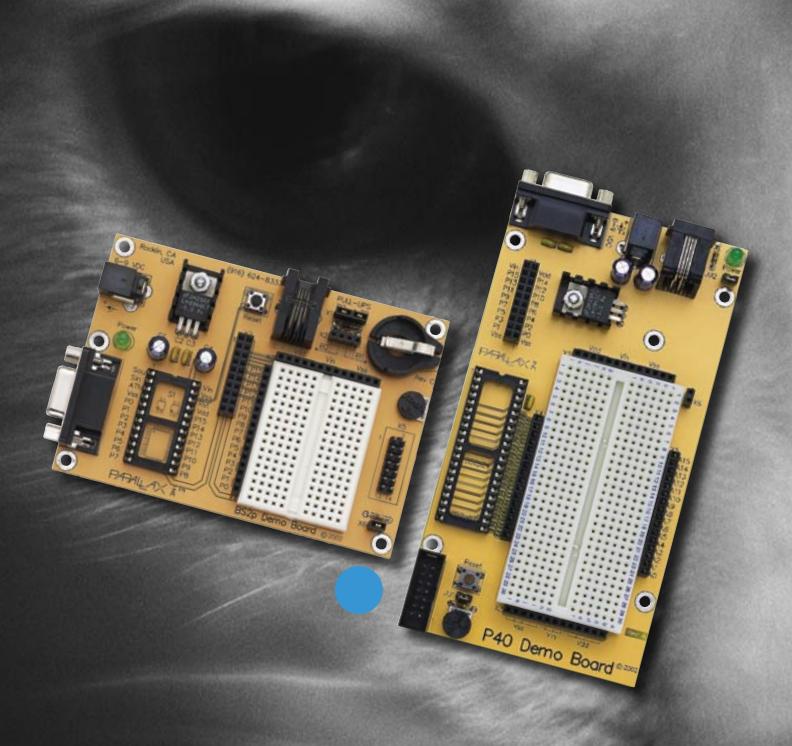
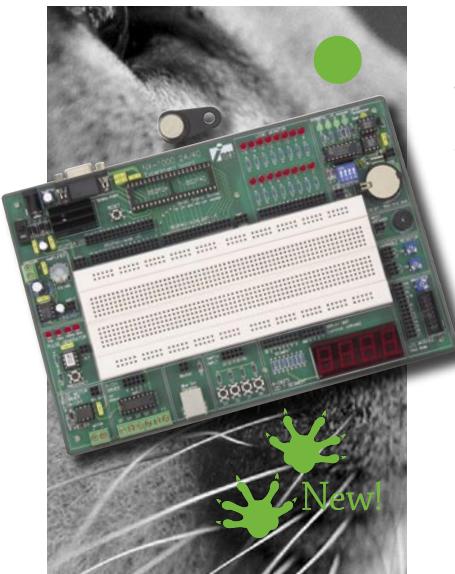
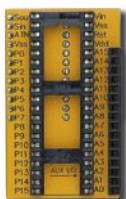


**BS2p24 Demo Board; #45183;
\$89.00; BS2p40 Demo Board;
#45186; \$89.00**

The BS2p Demo Boards are a valuable learning tool and time-saving prototyping aid for the Parallax BS2p modules. The Demo Boards provide very useful connections to Dallas Semiconductor 1-Wire, Philips I²C communications components, standard parallel LCDs (with Hitachi HD44780 or compatible chipset) as well as a breadboard prototype space. Either Demo Board will work with 24-pin BS2-series BASIC Stamps. A 7.5 V 1 amp power supply is recommended for this board.

**40 to 24-pin Adapter Board;
#45185; \$29.00**

BS2p40 module is now compatible with any BASIC Stamp Programming board with a 24-pin socket except for the BASIC Stamp 2 Carrier Board (#27120).



**NX-1000 24/40 Board; #28137;
\$199.00**

Key Features:

- Excellent prototyping board for BS2p series (24- and 40-pin) and Javelin Stamp
- Connection for an iButton interface
- Excellent for professional and educational engineering labs

The NX-1000 Experiment board's popularity has spawned a new breed titled the "NX-1000 24/40." The 24/40 designation is appropriate since any 24-pin BASIC Stamp, 40-pin BASIC Stamp, or Javelin Stamp may be plugged into the socket. Recommended as a development and prototyping platform for customers with a strong programming and electronics background. Due to the I²C components, and a connection for a 1-Wire interface, the 24/40 is the ideal choice for BS2p series and the BS2p40. In addition to the board,

you will receive the following:
12 volt, 1 amp power supply,
documentation, 2x16 Parallel
LCD, and a DS1990A-F3 iButton
sample in plastic fob.

Features include:

- Accepts 24-pin and 40-pin BASIC Stamps, and the Javelin Stamp module
- Socketed components:
 - PCF8574
 - DS1621
 - DS1307
 - L272M DC Motor Driver
 - RJ-11(for iButton Connectors)

The original NX-1000 board (page 20) is well documented by the StampWorks manual (page 54) and would make a practical resource for this board. See our website for a full comparison of the two NX-1000 boards we offer.

Super Carrier Board; #27130; \$49.00

Key Features:

- Programming board; soldering required
- Great for permanent applications
- Sockets support BS1-IC and all 24-pin Stamps

Who is ready for some soldering? The Super Carrier programming board provides Parallax customers with a solder pad prototyping space and holes placed to accommodate DIP ICs. The Super Carrier is unique because it is one of the few boards that provides support for both the BS1-IC and the complete series of 24-pin BASIC Stamps (including the Javelin Stamp).

BASIC Stamp Activity Board; #27905; \$89.00

Key Features:

- Includes 4 pushbuttons to stimulate inputs
- Excellent for X-10 projects with the BS2
- (2) 8 pin DIP IC sockets

The Activity Board is a programming board solution that is perfect for BASIC Stamp experimentation. This board is able to accept the BS1-IC and 24-pin BASIC Stamp modules (including the Javelin Stamp). Built-in components and pushbutton control are the primary assets of this board.

Specifically, the 4 pushbuttons are provided to stimulate the input pins of the Stamp. Four LEDs indicate the status of the I/O pins and connect to the same I/O pins as the four pushbuttons. Above each LED/Pushbutton combination there is a legend that shows which I/O pin it is connected to.

Additional features include:

- 32 Ohm speaker outputs frequencies of 500-8 KHz
- Potentiometer for analog input
- RC network for changing PWM into analog output
- RJ-11 socket for X10 output
- (2) sockets for 8-pin DIP ICs
- 9V power supply

BASIC Stamp 2 Carrier Board; #27120; \$24.00

Our lowest cost programming board is suitable for small projects. The BS2 Carrier Board has 24-pin DIP socket for all 24-pin BASIC Stamp modules. The board also contains through-hole prototype area, battery clip, and reset button. 9V battery is required (not included).

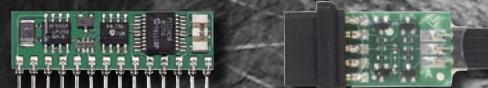
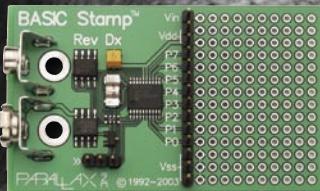
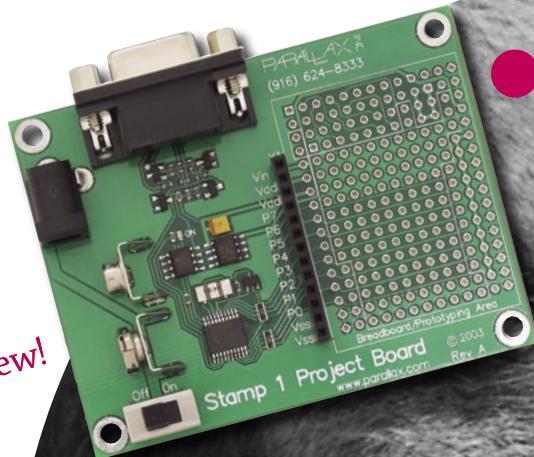
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The BASIC Stamp 1 is now programmable in the Windows environment. We have created a low cost BS1 Project Board for only \$34 and are lowering the price of the BASIC Stamp 1 (#BS1-IC) to only \$29!

BASIC Stamp 1 Project Board; #27112; \$39.00

The BS1 Project Board is similar in concept to the popular HomeWork Board. With the BASIC Stamp 1 surface mounted on the board, you save money and gain ease of use. The serial adapter is already included on the board. Now programmed in Windows, you'll be able to take advantage of the original BASIC Stamp, the workhorse of your projects for over 10 years. The benefits are clear - everything you need for low cost applications is included. This board also fits nicely on a Boe-Bot chassis, so why not try a BASIC Stamp 1 robot?



BASIC Stamp Rev. Dx; #27100; \$34.00

The original BASIC Stamp, operating in many custom projects since its introduction in 1992. For projects with a few inputs, a logical decision path and some control outputs, the Rev. Dx remains a practical tool.

BASIC Stamp 1 (BS1); #BS1-IC; \$29.00

Key Features:

- May be programmed in Windows!
- Lowest Cost BASIC Stamp
- Excellent for projects that don't require BS2

The BS1-IC is equivalent to the Rev Dx except it is packaged in a 14-pin SIP module. The BS1 is often an ideal fit for volume applications with tight space limitations. The BS1's interpreter chip format is the most popular OEM solution we provide. Get the BS1 Serial Adapter to add Windows programming capabilities.

BS1 Serial Adapter; #27111; \$4.95

For under \$5 you can add Windows programming to the BASIC Stamp 1! One end plugs into your serial cable and the other into a 3-pin header.

BASIC Stamp 1 Carrier Board; #27110; \$15.00

Simple programming board, a favorite for the BS1-IC. Note: board does not have a serial interface (the BS1 Serial Adapter must be purchased separately).

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Robotics and Accessories

Robots are more popular than ever, and there's no doubt about it. They are in everything from TV's Robot Rivals to the movie adaptation of Isaac Asimov's "I, Robot" (Fox) starring Will Smith in July 2004. Some robots are 5 dollars and operate at the push of one button and move in straight lines whereas others are on Mars performing complicated instructions sent from an unimaginable distance and cost millions of dollars. Parallax robots fit in the "easy to acquire" part of this spectrum based on their cost and ease of use. Designed with the BASIC Stamp, an industrial microcontroller at its core, you'll learn to enjoy its benefits in your robot just as engineers value its features in factory control.

If you have ever attended a robotics competition, chances are that you've seen the BASIC Stamp in action. The BASIC Stamp is easy and quick to program, and since it doesn't require a compiler it's very easy to alter the code on your laptop and download the necessary code to your competition robot right on the spot! Often times, the BASIC Stamp brain may not be visible and the customized robot chassis doesn't look like a Parallax item, but you can be assured that the BASIC Stamp is a popular choice among robotics competitors. Be sure to check the events section of our web site to learn about Parallax appearances at robot competitions.

Our most popular robot in terms of deployment numbers is the Boe-Bot Full Kit. Rounding out the robot lineup are the SumoBot, Toddler, and HexCrawler robots



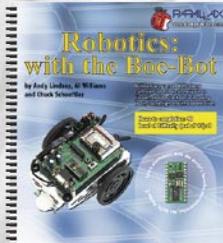
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(listed in order of difficulty from beginning to most advanced).

Pushing, walking, crawling, and rolling is very possible so no matter what direction or surface you want to conquer, we've got you covered. You can program these robots to be intelligent machines, to be autonomous and think on their own without any human interaction. The following is all possible with one or more of our robots: Sense and avoid objects, enter a Sumo Robot or maze competition, control walking routines using advanced programming skills, and tackle rough terrain.

The Boe-Bot and HexCrawler use the BASIC Stamp 2 and Board of Education while the SumoBot and Toddler use a mini board version with a surface-mounted BASIC Stamp 2. This means that programming each of the robots is handled with the same microcontroller, allowing you to build upon your experience from one robot to the next. Along the way, you'll discover tricks on how to control sensors, manage servos, and write the best code possible no matter what the goal. Don't forget to have fun along the way...Robot On!





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Boe-Bot Robot Kit; #28132; \$229.00

For an additional description of the Boe-Bot Robot Kit see page 09.

The 200+ page *Robotics* text provides you with complete assembly and programming instructions. Projects are detailed in pictorial and schematic formats.

The Boe-Bot Robot Kit includes all hardware, body parts, and electronic components you will need to assemble and program the Boe-Bot pictured to the right. The Boe-Bot is basically a Board of Education with wheels, which allows you to build all I/O projects on the breadboard. The Board of Education (and BS2-IC) may be removed to be used as your platform for the other Stamps in Class curriculum. Please note: The Boe-Bot requires 4 AA batteries (not included).

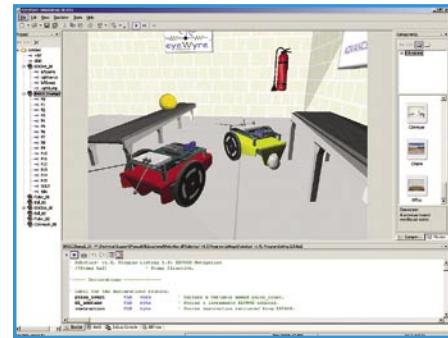
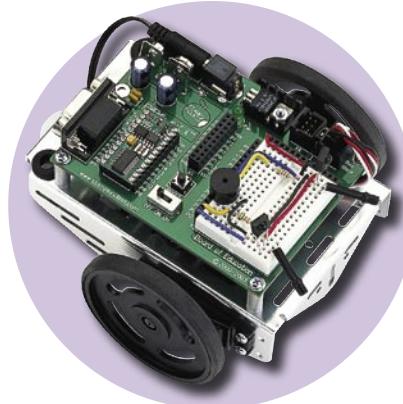
The Boe-Bot is among the world's most popular programmable robots in education. It's the flexibility of the Boe-Bot chassis with many mounting locations, the wide variety of add-on hardware and our complete *Robotics* curriculum that have made this product well known all over the

world. A search on Google for "Boe-Bot" will result in many customer applications.

Students using the Robotics text stay after Class

Educators tell us they have to kick the students out of their classrooms when they're immersed in the Boe-Bot projects. Robotics becomes easy because we've made the activities simple, the projects rewarding and the explanations well-written.

With over 50,000 units in the field and a core group of educators on our ParallaxEducators YahooGroup providing input, we continually refine and improve our *Robotics* presentation.

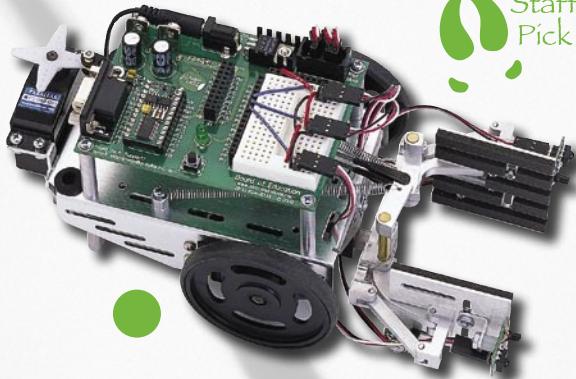


eyeWyre Boe-Bot Simulator

Note: This software simulator will be sold separately early 2004. It is not included with the Boe-Bot Robot Kit.

Through a computer simulated environment that provides real physics, a BASIC Stamp programming interface and Boe-Bots that run all of the code in our *Robotics* text, eyeWyre will prove to be a popular learning tool in 2004.

It's simple. Drag a Boe-Bot into the environment, load it with your code and watch it run! Adding objects such as pylons, balls or changing scenery is simple. Following light, avoiding objects with whiskers or infrared works just like it does in the real world.



The Gripper Kit; #28200; \$149.00

Key Features:

- Quality CNC machined aluminum parts with tight tolerances
- Infrared sensors for object location and depth in grip determination
- Single-servo design closes and picks up objects

The Gripper is an incredible mix of mechanical, electronic and software interdependencies. This product is pure fun to assemble and entirely rewarding to program. A very creative mechanical design means a single servo actuates the Gripper closure and pickup of an object the size of a ping pong ball. There is no need to pulse the servo when the Gripper is closed or open and no current feedback is required to determine when the grip is tight on the object.

With the parts, tools and information in the Gripper Kit you can turn any ordinary Boe-Bot into a pick-up machine. A 60-page manual provides complete assembly instructions and BASIC Stamp 2 programming examples with handheld infrared remote control, autonomous pickup and keychain RF control.

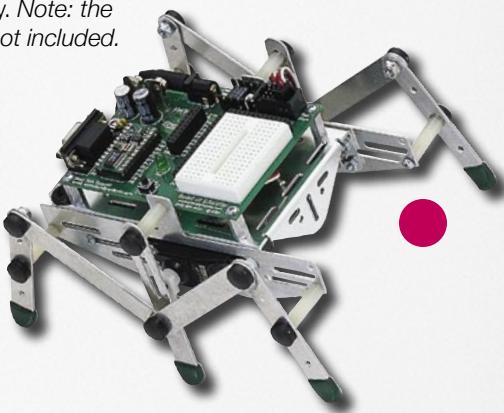


The Crawler Kit; #30055; \$39.00

Key Features:

- Converts the rolling Boe-Bot to a Crawler
- Easy to switch between rolling and crawling Boe-Bot
- Works with standard Boe-Bot source code

Make your Boe-Bot a Crawler by adding this accessory kit for only \$39. Includes printed documentation with detailed assembly instructions. The Crawler runs on standard Boe-Bot source code and includes one sample PBASIC code in the documentation. Plus, it's easy to convert the Boe-Bot back and forth between roller and crawler. To fully capture the way in which the Boe-Bot transforms into a Crawler, check out the video (Crawler Kit in Action (.gif)) in the online Boe-Bot Video Gallery. Note: the Boe-Bot is not included.



GazBot Infrared Distance Sensor; #28013; \$59.95

Key Features:

- Responsive sensor and bumper is perfect for wall and object detection
- Sample code to get you running and bumping
- Made with durable plastic, hardware included

Solve mazes using infrared and a bumper with the Gazbot Infrared Distance Sensor (GIDS)! This device uses an analog distance finder to notify your BASIC Stamp that an object lies ahead. Should the object be outside of the view of the distance sensor, the bumper system takes over with dual switches to detect left, right, and head-on contact with obstacles. The GIDS will provide BASIC Stamp compatible robots with increased maneuverability. A Gazbot program is included, written in PBASIC, specifically designed for the BOE-Bot (not included).



Boe-Bot CMUcam; #30051; \$129.00

Key Features:

- Ability to track color blobs
- Collects color and variance data
- Includes hardware to mount on Boe-Bot

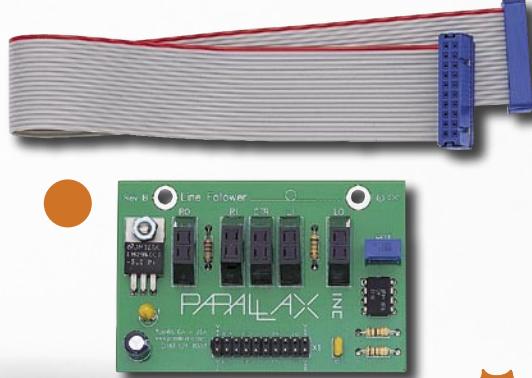
Track images with the Boe-Bot CMUcam! This CMUcam is designed specifically for the Parallax Boe-Bot. The CMUcam ships with printed documentation, CD-ROM with demo programs, and a pre-installed custom mounting bracket with two screws. The board communicates using a TTL level serial port. Download the complete manual and video from our website for more detailed information.

**QV356 Boe-Bot Speech Board; #27975; \$119.00
Speech Diphone Chipset (optional); #30050;
\$29.00**

Key Features:

- Gives the Boe-Bot the ability to talk
- Includes 220 preprogrammed robotics words
- Speech may be enabled by sensors contact, etc.

The QV356 Boe-Bot Speech Board ships with 220 professionally pre-recorded robotic words including distances, units of measurement, nouns, objects, etc. Words are replayed under BASIC Stamp serial control through the on-board audio amplifier. The speaker circuit can be used with the BASIC Stamp's FREQOUT command for amplified sound effects playback. No programming tools are required. The QV356 ships with a 2x10 header to mate with the Board of Education (required - sold separately) and all required standoffs and screws to mount the board on top of the Boe-Bot. Replace the two chips on the QV356 board with the optional Speech Diphone Chipset to playback an unlimited vocabulary of synthesized serial speech using allophone based sentences.



**Line Follower Application Module;
#29115; \$69.00**

Customer Favorite

Key Features:

- Accurate array with 5 sensors
- Great for line following and maze contests
- Includes beginning and advanced line following algorithms

Line following and table edge detection are not a problem for this popular add-on. The Line Follower Module uses a multi-sensor array over which you have complete programmatic control. This level of control allows you to develop line following algorithms that range from simple to advanced. Since the module uses reflective sensors, it contains a threshold adjustment that can tune the sensor array to the ambient light conditions.

The Line Follower Module consists of: printed documentation, pre-assembled Line Follower module, ribbon cable assembly, 2x10 dual-row header, (2) 1" female-female hex standoffs (4) 4/40 x 3/8" screw, (2) nylon washer. The module connects to the 2x10 Application Module socket on Board of Education via the simple ribbon cable and male-male header.



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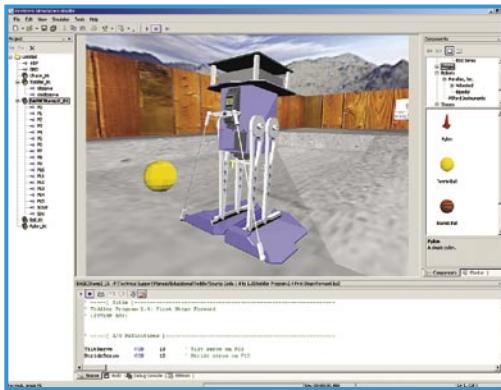
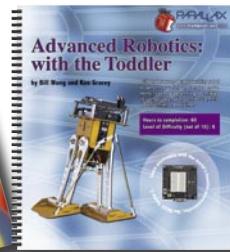


The Toddler Robot Kit (gold); #27310; \$249.00; The Toddler Robot Kit (blue); #27311; \$249.00

For a full description of the Toddler Robot Kit see page 12.

The Toddler hardware includes aluminum and brass parts. The kit includes all the hardware you need to assemble the Toddler pictured above. The Toddler is controlled by a surface mounted BASIC Stamp 2 module. Complete electronic component package also included. Our 245-page *Advanced Robotics: with the Toddler* text starts with detailed examples of basic movements and advances to closed-loop control with state-machine programming with infrared and light sensors.

For ages 14 and above. The Toddler will take approximately 3 hours to assemble and tune.

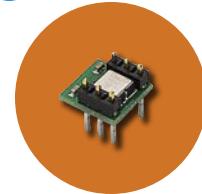


The Toddler has created interesting partnerships. With a software simulator, a partnership with an accelerometer manufacturer and a web discussion group the support base has grown significantly.

eyeWyre Toddler Simulator

Michigan based eyeWyre has released a beta version of eyeWyre for the Toddler robot. This software simulator provides a virtual physical environment in which to program and debug the Toddler.

The tool provides PBASIC source code single-step debugging, downloading and a series of landscapes and props which can be used in the simulation. Similar to the real hardware, the simulated version accurately supports whiskers, infrared sensors, photoresistors and the Memsic 2125 accelerometer. *To be sold separately early 2004.*

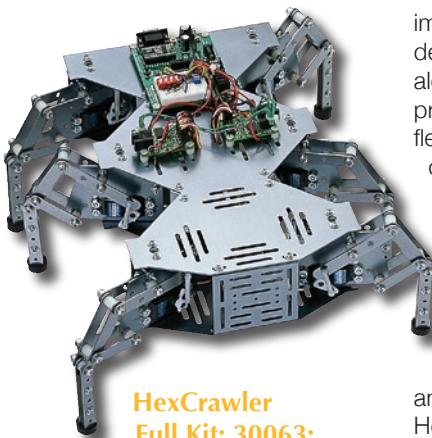


Memsic Accelerometer Partnership

In 2003 Parallax established a partnership with Memsic, enabling us to serve as a prototype portal for their 2125 accelerometers and providing them with a robotic demonstration of their sensor.

With the Memsic 2125 accelerometer in the final Toddler project, the BASIC Stamp handles a myriad of tasks such as:

- Control of two servos for tilt/stride (2 I/Os)
- Single-axis accelerometer feedback for incline (1 I/O)
- Infrared emitter/detector circuits for object detection (4 I/Os)
- Toddler Bumper Sensors (#27312; \$29.00) for object detection (4 I/Os)
- Speaker for low battery indicator (1 I/O)



**HexCrawler
Full Kit; 30063;
\$695.00**

Key Features:

- Ample platform is easily equipped with accessories
- Walking algorithms are highly entertaining
- Accessories include camera pan/tilt fixture, 3rd degree of freedom leg, and sensors

Parallax and CrustCrawler (www.crustcrawler.com) have formed a partnership to develop a hexapod robot with the highest quality and value in mind for the serious roboticist. If you think this robot is amazing from the photographs, download the many videos from our web site to see it in action. The HexCrawler kit may be appropriate for mechanical engineering classes, programming courses or the hobby roboticist.

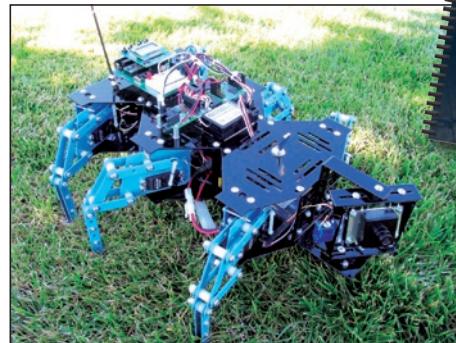
Construction. Building and programming a HexCrawler takes 12 hours, so we recommend reviewing our downloadable resources prior to making a purchase decision. The assembly requires the use of common hand tools (not included), and attention to detail, like other hobby kits.

Documentation. The instruction manual details the complete assembly process with 3D

images. Our code examples demonstrate all six robot gaits, along with tips for making the final product quite precise. Due to the flexibility of this robot and variety of customer applications, Parallax documentation focuses on properly configuring the walking routines and understanding the software and mechanical interaction. The Parallax robotics team is frequently developing new source code and application examples for the HexCrawler, including our recent radio-controlled video transmitter circuit on our HexCrawler web page.

Hardware. The HexCrawler robot chassis is a high-quality CNC-machined aluminum that provides a sleek platform for the 12 servo motors and control system. The leg design provides a precise two-axis range of motion. Mounting holes and slots are easily used to add custom robotics equipment. The kit includes everything you need except for an R/C car battery and charger. Be sure to read the docs and have a battery ready so you're prepared when the HexCrawler arrives at your door.

Parallax wireless-controlled HexCrawler with video transmission and custom paint.



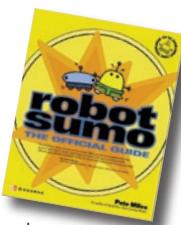
HexCrawler Full Kit includes:

- (1) HexCrawler Hardware Kit
- (1) HexCrawler Manual
- (1) BASIC Stamp Manual
- (12) Standard Servos
- (2) Servo Controllers
- (1) BASIC Stamp 2 Module
- (1) Board of Education
- (1) 7-segment LED
- (7) 1 kΩ resistors
- (2) 10 kΩ ohm resistors
- (2) Pushbutton
- (2) 220 Ω resistors
- (10) 3" Jumper Wires
- (1) Serial cable
- (1) Parallax CD-ROM

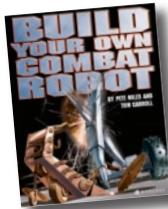


Robot Sumo: The Official Guide Book; #70005; \$24.95

Everything you need to know about Robot Sumo competitions is covered in this 400-page book by Pete Miles, well-known robotics author and mechanical engineer. Pete also authored the *Build Your Own Combat Robot Book*. Features the BASIC Stamp and source code. The book includes helpful information on building your own Sumo robot. It also provides all of the rules, schematics, and construction plans.



Build Your Own Combat Robot Book; #28011; \$9.97 (limited quantities)



Miles and Carroll's 350-page book, *Build Your Own Combat Robot* is a well-written topical overview about building your own combat robot. The book describes the various competitions one can enter including Robot Wars, Battlebots, RoboCup and FIRST.

Even if you aren't going to enter a competition you'll learn how these robots are built for your own pursuits. The BASIC Stamp is featured throughout the book as an example of a controller.

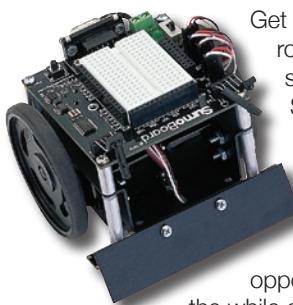


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SumoBot; #27400; \$149.00

Key Features:

- Meets official Northwest Mini Sumo Requirements
- Powered by a surface mounted BASIC Stamp 2
- High quality chassis is rugged for competitions



Get started in autonomous robotics and compete in sumo competitions. The SumoBot is a competition-ready robot designed within the Northwest Robot Mini-Sumo Tournament rules. This little pusher will locate and knock its opponent right out of the ring, all the while detecting the outside circle should an escape move be necessary.

The electronics consists of a surface-mounted BASIC Stamp 2, and infrared sensors to detect your opponent and the edge of the Sumo Ring. The hardware package includes the black anodized aluminum chassis and scoop, servo motors, wheels, 4AA power pack (batteries not included) mounting standoffs and screws. The documentation takes you from basic moves to one-on-one combat.

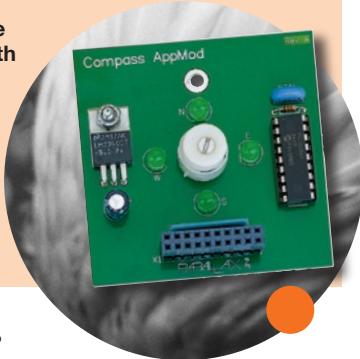
SumoBot contents:

- (1) SumoBot Board with surface-mounted BS2
- (2) QTI Sensor
- (1) Parallax Screwdriver
- (1) Chassis
- (1) Front Scoop
- (2) Plastic Wheels, 2.58 Dia, .3 W
- (4) Rubber Band Tires
- (1) Battery holder, 4cell, AA, leads
- (1) SumoBot Manual
- (2) Resistors, CF, 5%, 1/4W, 470 Ω
- (1) Parallax Data on CD-ROM
- (1) Green LED
- (2) Infrared LEDs
- (1) Red LED
- (2) IR Receivers
- (2) LED Standoffs
- (2) LED Light Shields
- (1) Serial Cable
- (10) 3" Jumper Wires
- (2) 10" Servo Extension Cables
- (1) Piezo Sound Generator
- (2) Continuous Rotation Servos
- Assortment of screws, washers, and standoffs

Compass Application Module; #29113; \$79.00

Key Features:

- Based on Dinsmore digital compass with eight directions
- Single I/O communication thanks to an on-board serial co-processor
- Ideal robot navigation tool



Don't know where to take your project next?

The Compass Module can give your application direction. Thanks to this handy little sensor from Dinsmore Instruments, our Compass AppMod provides a low cost, direct interface, direction sensor that is perfect for many applications, particularly Boe-Bots. Additionally, we added a co-processor to make the module as useful and as easy to use as it can be. Eight directions are depicted with 4 LEDs, and a simple serial interface with the BASIC Stamp provides directional feedback. Requires a BS2 and a programming board.

Devantech SRF04 Ultrasonic Range Finder; #28015; \$36.00

Key Features:

- Popular robotic add-on
- Detects objects that infrared may miss due to color
- Determine object distance (3cm-3m)

The Devantech SRF04 works by transmitting an ultrasonic pulse and measuring the time it takes to "hear" the pulse echo. Output from the SRF04 is in the form of a variable-width pulse that corresponds to the distance to the target. From a BASIC Stamp's perspective it's a snap to interface with this device. Code is supplied online for all 24-pin BS2 modules.

NOTE: The user is required to solder four (4) wires (not included) to the SRF04 module. Please use caution with soldering and connecting the wires since improper soldering may burn holes through the solder pads and damage the sensor.

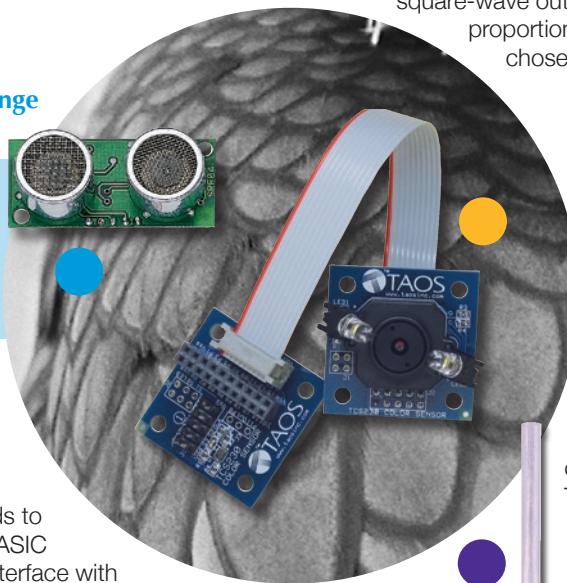
TCS230 Color Sensor Evaluation Kit; #30054; \$79.00

Key Features:

- RGB color sensor provides complete on-board circuitry
- Applications include color matching, robotics and sorting M&M's
- Designed in partnership with TAOS

The TCS230 sensor module set is comprised of a complete color detector, including a TAOS TCS230 RGB sensor chip, white LEDs, collimator lens, AppMod adapter board, and connecting cable. It interfaces easily to any BASIC Stamp, either through an AppMod socket or connected directly, and can detect and measure a wide range of visible colors. Applications include color edge-following robots, sorting by color, and color matching, to name just a few.

The TCS230 has an array of photodetectors, each with either a red, green, or blue filter, or no filter (clear). The filters of each color are distributed evenly throughout the array to eliminate location bias among the colors. Internal to the device is an oscillator which produces a square-wave output whose frequency is proportional to the intensity of the chosen color.



M Sorter Kit; #30067; \$89.00

The M Sorter Kit includes a Futaba servo and materials to build your own M&M's candy sorter. Additional hardware is required in addition to the M Sorter Kit, such as a BS2, Board of Education, and TAOS TCS230 Color Sensor.



Memsic 2125 Dual-axis Accelerometer; #28017; \$29.00

Key Features:

- Dual-axis incline and acceleration measurement
- Low current operation - less than 4 mA at 5 VDC
- Our most popular sensor

The Memsic 2125 is a low cost, dual-axis thermal accelerometer capable of measuring dynamic acceleration and static acceleration with a range of ± 2 g. It is completely temperature compensated over 0° to 70° C range, with simple, pulse output of g-force for X and Y axis.

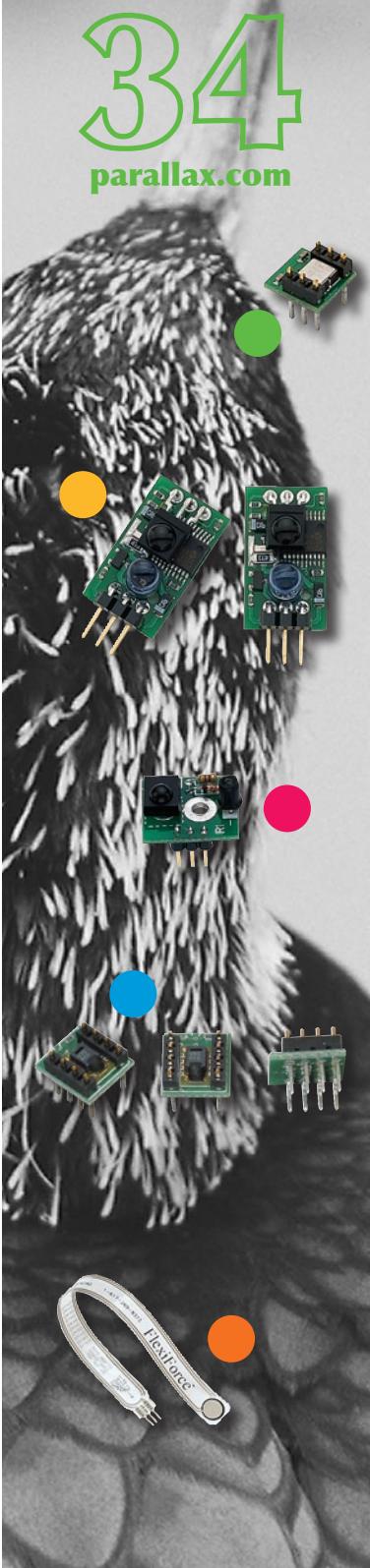
Sensirion Temperature/Humidity Sensor; #28018; \$29.00

Key Features:

- Measures temperature and humidity
- Friendly 8 pin DIP package
- 0.01° C and 0.03% RH accuracy

Humidity is notoriously difficult to measure. Some of the scientific and electronic considerations to measuring humidity include: analog to digital interface and external circuitry which might require op-amps or oscillator circuitry; temperature compensation adjustments to calculate dew point; calibration against a known humidity source; mounting, protection and response time in the real world.

The Sensirion SHT1x addresses many of these issues head on. It is a smart sensor for both humidity and temperature, and it comes from the factory in a tiny package that incorporates the analog to



digital interface. All that the BASIC Stamp has to do is read out the humidity and temperature values through the two-wire digital serial interface. The only math required is a simple scale and offset.

IR Buddy Pair; #28016; \$59.00

Key Features:

- For sending and receiving data packets
- Single-wire connection
- Great for wireless data exchange between BASIC Stamps

The Infrared Buddy is a handy communication companion for your BASIC Stamp projects. The IR Buddy lets you send and receive data and remote control commands from a single BASIC Stamp pin. The IR Buddy's on-chip 8-byte buffer holds data and remote control commands so your program doesn't have to wait around for them to arrive.

SSIR Detector; #28019; \$14.95

This infrared emitter/detector consists of an infrared LED and 38 kHz modulated receiver. Using example code from the *Robotics with the Boe-Bot* text, this part is easily used for object detection up to a foot away.

Flexiforce Sensor Demo Kit; #30056; \$25.00

The Flexiforce has an ideal output for A/D conversion - 0 V is no force and 4.2 V is 100 lbs. The active sensing area is a .375" diameter circle at the end of the sensor. The kit includes a 220 Ω resistor, 0.1 μ F and 0.01 μ F capacitors, Flexiforce sensor, and printed documentation.

Toddler Troupe – Doing the Hokey Pokey “Robot Style”

Wireless communication for robotics is becoming a fundamental aspect for dispersed task-oriented projects in space, remote surveillance, firefighting, hospital and elderly care. While we don't believe it is practical to send a Toddler or Boe-Bot out to administer medicine, our experimentation with networked Toddlers proved to gather quite a bit of interest on discussion groups and at different Parallax presentations. Our project was quite simplistic, operating in an open-loop command mode.

We used eight Toddler robots, seven painted black and one painted blue. The blue Toddler was the commander chief and responsible for sending control packets to the team of students, controlled by a human with a BS2, Board of Education and radio transmitter.

Based on the character sent, the blue Toddler would synchronize all of the Toddlers to perform the different commands. This loop of example code was intermittently polled by each black Toddler robot:

```
Main:  
DO  
    command = ""  
    GOSUB Wait_Command  
    IF (command <> " ") THEN  
        GOSUB Blink_LEDs_One_Sec  
        SELECT command  
            CASE "I"           ' Initialize  
                GOSUB Reset_CC  
            CASE "F"           ' Forward  
                GOSUB Forward_March  
            CASE "D"           ' Dance  
                GOSUB Hokey_Pokey  
            CASE "S"           ' Seek Light  
                GOSUB Follow_Light  
            CASE "C"           ' Light Compass  
                GOSUB Light_Compass  
            CASE "H"           ' Halt  
                GOSUB Halt  
        ENDSELECT  
    ENDIF  
LOOP
```



The result of this fascinating experiment was a collection of complex robots that danced, marched and followed light in unison. At the RoboMaxx 2003 event in Grant's Pass, Oregon, the Dancing Toddlers performed twice to a large cheering crowd between the mini sumo events. Download videos, pictures and technical details of this project from www.parallax.com.



The photos on this page were taken at the 2003 RoboMaxx event. The Toddler robots are demonstrating synchronization through wireless communication.



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**2 x 16 Serial LCD; #27910;
\$49.00; 2 x 16 Backlit Serial
LCD; #27923; \$59.00**

Key Features:

- Easy serial interface
- Display text and data of your projects
- Customer's favorite LCD

This very popular LCD consists of a Supertwist 2x16 LCD with the original LCD Serial Backpack interface factory installed. This display is the right choice if you require a small footprint and low current draw (2-3 mA without backlight). Commands allow scrolling, cursor positioning, and ASCII character support. Display has a 2400/9600 baud serial input and posts for connecting to +5 V, ground, and I/O. Manufactured by Scott Edwards Electronics.



New!

**120 x 32 Graphic LCD; #27936;
\$109.00**

Key Features:

- Graphic display for plotting, charts, etc.
- Displays text in four sizes
- Serial LCD is easy to program

This Scott Edwards Electronics LCD allows you to format the screen as 4 lines of 20 small characters or 2 lines of 10 large characters, or mix font sizes freely to achieve special effects. The real treat, however, is the graphic capabilities. Plotting points, drawing lines, and displaying full-screen pictures is easy with a 4 KB non-volatile EEPROM. The package includes a 3.5" disk with an extensive HTML manual, a graphics conversion/downloading utility program, and examples using the BS2-IC.

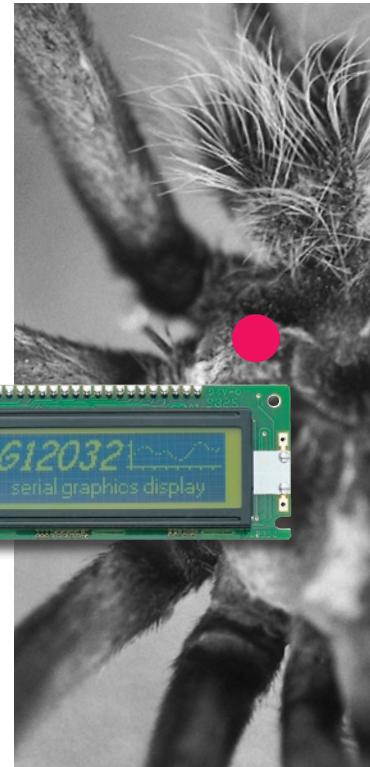
LCD Terminal Application Module; #29121; \$39.00

Key Features:

- HD44780-compatible parallel display
- Contrast control pot
- 4 buttons for user input

This low-cost 2x8 display is excellent for your smaller projects. Connects to any Parallax board that has a 2x10 AppMod header. Extensive documentation on the Parallax site guides you through the programming interface.

This handy device is a very popular add-on for your robot projects. At parallax, we added it to our HexCrawler (page 31) to display the program number currently running, and to take advantage of the pushbutton control.





2x16 Parallel LCD; #603-00006; \$29.00

This Hitachi-compatible parallel LCD goes well with the BS2p24 module and the BS2p24 Demo Board.

2x20 Serial LCD with Keypad Interface; #30057; \$79.95

Key features:

- Interface with up to 25-key keypad (5x5)
- Six general purpose outputs for a variety of applications
- May draw bar graphs and use up to 8 special characters

This new Matrix Orbital 20 character by 2 line serial LCD (TTL) has a keypad interface and a white backlight. This LCD allows you to draw bar graphs (either horizontal or vertical) and define up to eight special characters. The keypad interface is a valuable feature which processes the keypad row/column matrix into a serial (RS-232 or I²C) data byte stream. Pre-modified for BASIC Stamp compatibility (TTL level).

4x20 Serial LCD with Keypad Interface; #30058; \$109.95

Key Features:

- Interface with up to 25-key keypad (5x5)
- Use 6 General Purpose Outputs
- Communicate over RS-232 or I²C

Display text, horizontal & vertical bar graphs and large digits with this Matrix Orbital 20 character by 4 line serial LCD. It also allows for line wrapping, scrolling, contrast, backlight and time-out setting (up to 180 min). Display is sharp inverse blue with white backlight. This version is pre-modified for BASIC Stamp compatibility (TTL level).

4x20 Parallel LCD; #603-00004; \$39.00

The 4x20 Parallel LCD includes a cable that connects into a 2x10 header which is found on the BS2p24 Demo Board, BS2p40 Demo Board, and NX-1000 Board. If you have other programming boards, you will need to make your own connection on the breadboard using a header pin and jumper wire (not included).



320 x 240 Graphic Amulet Easy GUI 5.7 Starter Kit with Bezel; #30053; \$399.00

Key Features:

- Touch screen display for industrial and home applications
- Includes all the necessary software, serial cable, and power supply
- Comes with standard configuration or you may customize



Creating a feature-rich graphical user interface is easier than you can imagine. Use the included HTML authoring software to create and edit quickly using the drag-and-drop tool to construct the user interface layout. Compile the user interface pages using the Amulet compiler which converts from HTML, JPEG, and GIF into small, quickly-executable Amulet µHTML pages. Program the flash using the dedicated GUI chip which manages the GUI, interacts with the user, and controls the LCD—which in turn frees up your BASIC Stamp.

The GUI Starter Kit includes a 1/4 VGA, 5.7" diagonal monochrome display with a CCFL backlight, a fully-integrated analog touch panel, and the Amulet Controller Board all mounted in a high quality bezel. In addition, you will receive a serial cable, development software CD, stylus touchpen, and an AC power adapter. Easy GUI comes pre-programmed from the factory with sample pages stored in the onboard flash.

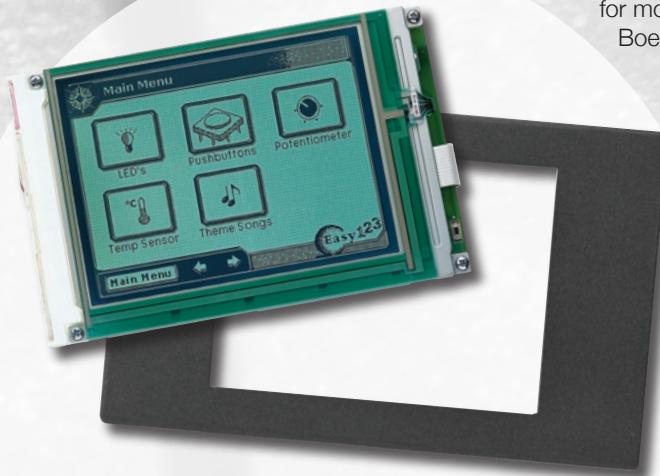
The Easy GUI controller board comes equipped with a 2.5 mm external power connector (J3). The power requirement is 9 to 14 VDC @250 mA.

CAUTION: Do not reverse the polarity on the power input. Doing so will permanently damage the module and invalidate your warranty.

Note: To operate this kit with the standard GUI, you must have a BS2-IC or higher and a BASIC Stamp programming board. The Amulet device connects to your programming board with a cable.

GUI Interface for the Boe-Bot

In addition to the standard GUI interface that is geared toward the BASIC Stamp Activity Board, Amulet has created a GUI for the Boe-Bot. You can remotely control a Boe-Bot via RF using icons on the Amulet display screen. In order to utilize the interface, you will need to have a Boe-Bot, RF Transmitter/Receiver, and an additional BS2 and Board of Education. Visit our website for more information on the Boe-Bot GUI.

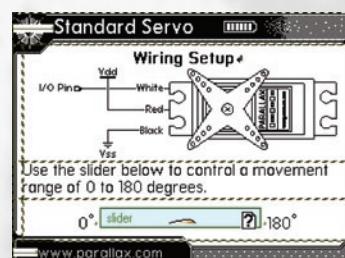


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Pair your Amulet GUI with a Stamp PLC

The Amulet GUI makes for an excellent companion with the Stamp PLC. GUI control in an industrial environment application is beneficial since it allows for a non-engineer to maintain the primary system operations with a touch screen interface.

Check out the Amulet GUI Project Page on our website to discover additional Amulet GUI programs such as the Activity Board GUI, Stepper Motor GUI and Servo GUI.



Screen shot from the Servo GUI.



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Audio Amplifier Application Module; #29143; \$29.00

Key Features:

- Adjustable volume control and built-in speaker
- 125 milliwatt amplifier
- Inexpensive way to add sound to your Boe-Bot or Toddler

To make the most of the BASIC Stamp's DTMFOUT and FREQOUT commands, an audio amplifier circuit should be used. The Audio Amplifier AppMod employs an industry-standard LM386 audio amplifier. Raw audio output is taken from BASIC Stamp pin 10 and filtered prior to amplification; this converts the pulse-width modulation output of the BASIC Stamp to sinusoidal waves for the best audio quality. The amplified signal is fed to an onboard 8 Ω speaker.

ISD Sound Application Module; #29111; \$89.00

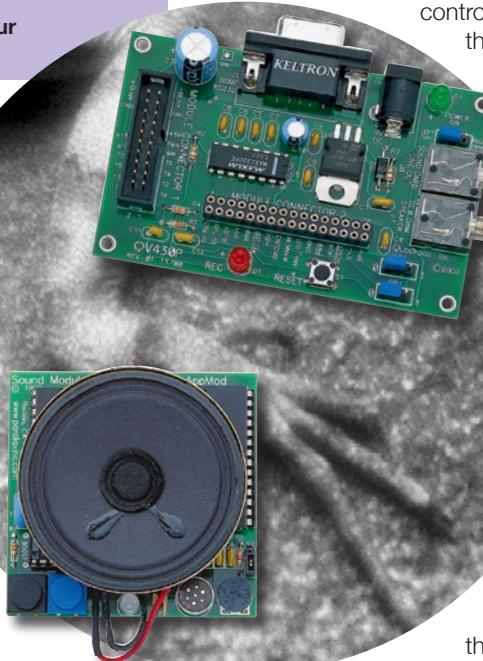
The Sound Module is a small recording and playback studio. With an 8 kHz bandwidth, both voice and music are handled with good quality. There is a small microphone on board the Sound Module for recording, or you can use the line-in connection for a direct recording. Similarly, the sound produced can be heard using the on-board speaker, or can be directed to the line-out jack. Up to 60 seconds of sound may be recorded on this device, either as one message or up to eight discrete messages. Messages can be recorded and played back using a BASIC Stamp, Javelin Stamp, or any other intelligent device capable of RS-232 communication.

Quadravox QV306M4P Playback Module; #27967; \$69.00

The QV306M4P is a small PCB that holds an ISD4003-04, an audio amplifier and a serial controller that makes interfacing the device to a BASIC

Stamp a snap! The device is pre-programmed with 240 sound files: numbers, measurements, days and technical terms. Playing any of these "files" is as simple as sending the file number from your BASIC Stamp serially. You'll need a speaker (not included).

The on-board amplifier can deliver 300 mW so pick up a reasonable speaker from Radio Shack. Otherwise, the QV306M4P works with a BASIC Stamp right out of the box.



Quadravox QV430P Sound Programmer; #27968; \$79.00

If you're ready to play some Windows *.wav files from your QV306M4P, or if you want to put some additional words or files (Quadravox has over 1,000 available for download) into the QV306M4P module you'll need the QV430P programmer. Note that you will need a mini-jack cable to connect the QV430P to your PC's sound card headphone jack or speaker out jack as well as a mini-jack for your speaker. A 12 V 1 A power supply is sold separately (#750-00007).



Don't Forget A Power Supply

Choosing an RF Module

Radio frequency (RF) modules provide an easy-to-use method of wireless communication for the BASIC Stamp. Parallax modules operate in the 418-433 MHz frequency band. The devices are considered low-power and have transmission distances up to 250 ft., depending on the field environment and product choice. Our most popular RF combination is the keychain transmitter and receiver. Choose an RF module based on the following characteristics:

Antenna Style. Loop antennas are built into the printed circuit board using a copper trace. Wire antennas are shipped with a 7-inch (~18 cm) length and may be cut to a shorter size to reduce reception distance. Solid style antennas are 2-inch (~10 cm) and can be attached using a machine screw.

Package Type. The Keychain style is a 5-button pushbutton package. The accompanying receiver

single-in-line package (SIP) format, plugs into breadboards or through-hole prototype areas.

Software Interface. The RF modules utilize three communication concepts. The keychain transmitter operates in switch mode. When a button is pressed on the keychain transmitter, the corresponding pin on the receiver outputs +5 V. Data transmitted as raw means that the BASIC Stamp uses the SEROUT command to send and SERIN to receive, however your PBASIC code must be structured for error correction to verify that what was sent was properly received. Finally, encoded data means that the error correction is taken care of by an on-board coprocessor and a simple SEROUT command will do the trick -- one line of code to send and one line of code to receive.

Transmission Distance. While the simple keychain transmitter and receiver work up to 50 feet, the more complex modules may function up to 250 feet.

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| Stock #; Price | #27986; \$59.00 | #27987; \$89.00 | #27988; \$119.00 | #27995; \$59.00 | #27996; \$39.00 | #27997; \$95.00 | #28004; \$69.00 | #28005; \$20.00 |
|-------------------|---------------------------------|--------------------|---------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| Package | SIP | | | SIP | | | SIP | keychain |
| TX/RX/TRX | TRX | RX | TX | RX | TX | TRX | RX | TX |
| Antenna | loop | | | fixed | | | wire | loop |
| Transmit Range | 250 feet (~76 m) | | | 150 feet (~46 m) | | | 75 feet (~22m) | 75 feet (~22m) |
| Data Transmission | encoded/switch mode; 9600/N/8/1 | | | raw data; 9600/N/8/1 | | | switch mode | switch mode |

433.92 MHz SIP/Dual-Mode Modules

These wireless RF Modules have a range up to 250 feet. Modules include built-in antennas, encoders, decoders and RF data processors for serial strings or switch on/off functions. Very simple to use, just plug it in then apply +5 V and your project is wireless, instantly. Single direction communication requires one of the three combinations: (1) Transmitter and Receiver; (2) Transmitter and Transceiver; or (3) Transceiver and Receiver. Bi-directional communication requires at least two Transceivers.

418 MHz Receiver and Keychain Transmitter

The 418 MHz Receiver is a 7-pin module that plugs into your Parallax programming Board (ex. Board of Education, NX-1000 Board). Transmission range is 75 feet. The pair is used to send and receive up to five remote control commands. The keychain transmitter operates in switch mode - press a button on the keychain transmitter and the receiver pin goes "high".

433.92 MHz SIP/Solid Antenna Modules

Low profile solid Antenna is only 2 inches long. Receiver transmission range is 150 feet. Use SERIN/SEROUT 2400 baud max. data rate. Single direction communication requires one of the three combinations: (1) Transmitter and Receiver; (2) Transmitter and Transceiver; or (3) Transceiver and Receiver. Bi-directional communication requires at least two Transceivers.





MEMKey; #27963; \$39.00

Key Features:

- Eases keypad control with a serial interface
- Supports Serial and PC/AT communication
- 64 bytes of user-accessible EEPROM

Use this Matrix keypad decoder to add user input to your BASIC Stamp. The MEMKey is a programmable keypad encoder which supports both a simple serial communication protocol and the standard PC/AT communication protocol using a matrix keypad as large as 4x5. The MEMKey has 64 bytes of EEPROM and will retain features even with power removed.

4x4 Matrix Keypad; #27944; \$19.00; 4x4 Matrix Keypad Cable; #27943; \$9.00

Recommended keypad for the MEMKey. This 4x4 Grayhill keypad has an operational life of 3 million cycles. Custom Cable (#27943) sold separately.

Stamp Modem Application Module; #29116; \$99.00

Key Features:

- Provides convenient modem interface for BASIC Stamp
- Calls PC modem to transmit/receive data
- BASIC Stamps may communicate via the modem

The Stamp Modem provides a functional and easy-to-use modem interface to a BASIC Stamp. The Stamp Modem is based on the Cermetek CH1786, an FCC part 68 pre-approved modem with a CCITT v.22 bis full AT command set.

Stamp Modem is connected to Parallax boards on the 2x10 Application Module connector and secured with a screw and standoff. Power, ground, and BASIC Stamp I/O connections are conveniently connected to the BASIC Stamp through this header.

This product takes care of all of the connections you need to use a modem reliably, and it's small, too.

EmbeddedBlue Transceiver AppMod; #30068; \$99.00;

Key Features:

- Easy integration with the BASIC Stamp
- Seamless connectivity with standard Bluetooth devices
- Perfect for wireless cable replacement

The EmbeddedBlue Transceiver AppMod provides standard Bluetooth connectivity for BASIC Stamp applications without the need for detailed Bluetooth knowledge. Engineers, educators, hobbyists, and OEMs can take advantage of advanced wireless connectivity with this easy to use module. It is designed and manufactured by A7 Engineering based on specifications provided by Parallax, the exclusive distributor of the EmbeddedBlue Application Module.



The communication potential with Bluetooth is rather amazing when compared to proprietary RF, especially with the proliferation of Bluetooth enabled hardware devices. The documentation includes a detailed overview and sample source code for EmbeddedBlue projects with the BASIC Stamp, including interfacing to standard Bluetooth devices.

Technical Specifications include:

- **Frequency:** 2.4 GHz FHSS (Frequency Hopping Spread Spectrum)
- **Transmit Power:** 4dBm (max) class 2 operation
- **Open field range:** 300 feet
- **Bluetooth:** Compliant with the v1.1 standard
- **Receiver Sensitivity at 0.1% BER:** -85dBm

EmbeddedBlue Serial Connector (not pictured); #30069; \$99.00

The EmbeddedBlue RS-232 Adapter provides a standard RS-232 interface for the EmbeddedBlue Transceiver AppMod. The adapter can be used for a simple PC connection allowing testing, prototyping, and two-way communications with a BASIC Stamp. Additionally, the adapter provides an interface for Transceiver AppMod firmware updates.

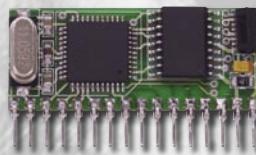


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FlexiPanel Module; #30070; \$99.00

Key Features:

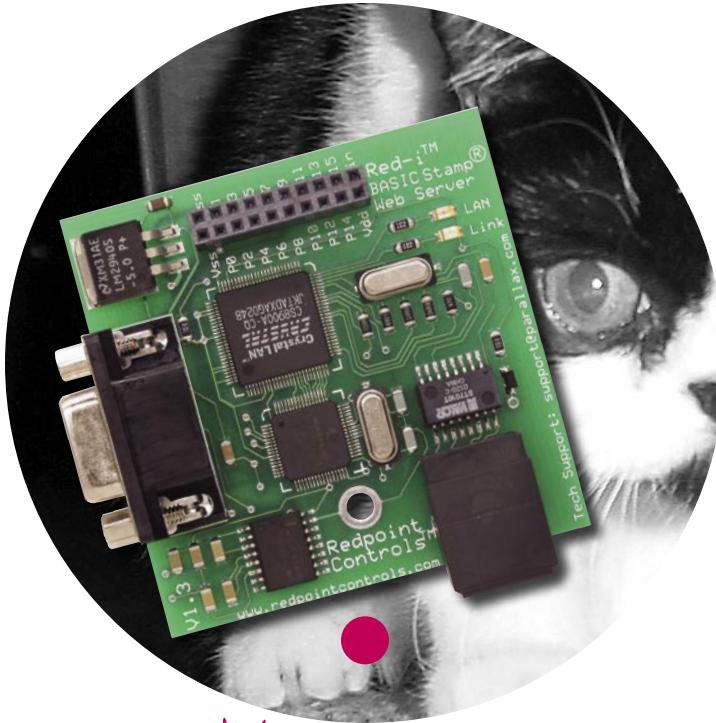
- Operates via the IrDA link
- Creates control interfaces on remote devices such as Windows CE
- Great option as a low or high volume solution



The FlexiPanel allows electronic products to create an operator interface on a range of remote devices including handhelds, mobile phones and other computers via an IrDA infrared link. The key to FlexiPanel technology is the standardized communication link (patents pending). The FlexiPanel software on remote device is free and does not need to be customized for your device. FlexiPanel modules, processors and licenses allow electronic devices to communicate with all remote devices running FlexiPanel software. The FlexiPanel Module manages the user interface features for you.

The FlexiPanel module acts like a memory device which stores all the controls that appear on the remote FlexiPanel operator interface. The host controller communicates via I²C and can read or write values as desired. If a remote device comes in range, the FlexiPanel module transmits the control information to it and the controls are displayed. If the controls are modifiable, the user may make adjustments and transmit these back to the FlexiPanel module.

The FlexiPanel is manufactured and designed by Societe Hoptron (www.hoptron.com) of Paris, France. For applications of 1,000 or more units, please contact Hoptron to learn about reducing your costs. Parallax is proud to be the worldwide exclusive distributor of the FlexiPanel module. Check our web site for sample applications to see how the BASIC Stamp communicates to the FlexiPanel.



Red-i BASIC Stamp Web Server; #30005; \$199.00



Key Features:

- Connect the BASIC Stamp to the internet with ease
- Serve up to 100 K bytes of web files
(ex. htm, txt, zip, jpg)
- Includes hardware for easy connection to Parallax 2x10 Application Module header

The Red-i (say “red-eye”) BASIC Stamp Web Server is a fully functional microcontroller based web server and email client. This product is designed and manufactured by Redpoint Controls, with Parallax playing a significant role in the design process. Ethernet connectivity has been a long standing request from our customers, so we are very pleased to deliver with this product. The Red-i BASIC Stamp Web Server is very easy to interface to your current applications since it connects to any Parallax Board with a 2x10 Application Module header. This hardware solution is only available from Parallax and our network of distributors.

Our website contains a downloadable 14-page instructional manual and a 1-page Quick Start Guide to make it easy for you to get your BASIC Stamp projects connected to the web! The manual covers the following

topics: Configuration Software, Downloading Files, Web Interface, Sending Email, Stamp-to-Stamp Messaging, Registers, Examples, and Electrical Specifications.

Here is a list of the features:

- 10 Mbps 10-BaseT Ethernet connection
- Serve up to 100 K bytes of web files
(ex. htm, txt, zip, jpg)
- Update the contents of any web page
- Receive data from HTML Form POST messages
- 1200 bytes of accessible RAM to store web variables
- Send email messages
- Stamp-to-Stamp Communication over the internet via UDP

Important note: In addition to the Red-i BASIC Stamp Web Server, you will need the following:

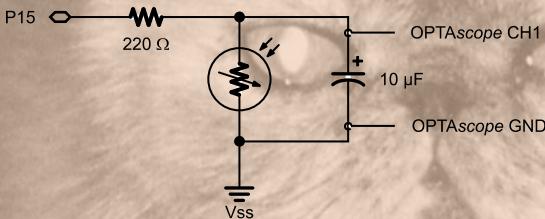
- BASIC Stamp 2 or higher
- BASIC Stamp programming board with 2x10 Application Module header
- RJ-45 Ethernet cable
- DB9F-DB9M COM cable

OPTAscope Tips

RCTIME Example Validates BASIC Stamp Measurements

To read more about the OPTAscope and the accompanying Understanding Signals curriculum, see page 08.

The BASIC Stamp's RCTIME command is a low-cost and very useful way to measure analog inputs. The OPTAscope software can validate the BASIC Stamp's results. As the BASIC Stamp Debug Terminal shows 68 ms measurements, the OPTAscope "cursors" box demonstrated the same. It is quite easy to compare each line of PBASIC code to the OPTAscope's display. Substitute larger capacitors and adjust the variable resistor to demonstrate different results.

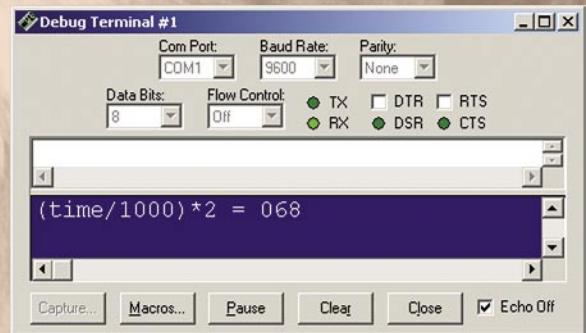
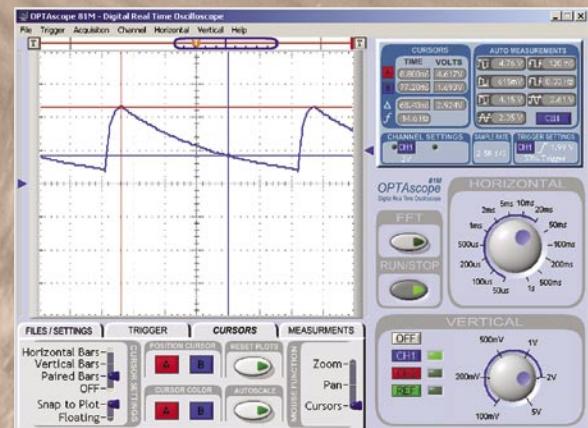


OPTAscope "cursors" measurement shows a value of 68 mS from 5.0 V to 1.4 V (BASIC Stamp's logic threshold)

```
' Understanding Signals - RCTimeConstantWith
' Photoresistor.bs2. Read photoresistor in RC-time
' circuit using RCTIME command.
'{$STAMP BS2}
'{$PBASIC 2.5}

time VAR Word

DO
  HIGH 15          ' 5 V to capacitor for charge
  PAUSE 10         ' capacitor fully charges
  RCTIME 15, 1, time
  DEBUG HOME, "(time/1000)*2 = ", DEC3 (time/1000)*2
  LOW 15
LOOP
```



RCTime Command works in 2 mS units. Converting these values to mS showed an RCTime value of 68 mS.

Motor Control

Make motor control for hobby or commercial applications easy with our variety of control options. We can help you control servo motors, DC motors, and Unipolar Stepper motors. In early 2004, be ready for a servo controller from Parallax that can operate up to 16 servos at a time!

12 Volt / 90 Ohm Unipolar Stepper Motor; #27964; \$12.00

Stepper motors are ideal for precision control, and may be easily operated in forward and reverse directions at varying speeds. This four-phase motor has a step angle of 3.6 degrees and requires 12 VDC for operation.



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Parallax Servos

Key Features:

- Servos are manufactured by Futaba for Parallax
- Your choice: continuous (360°) or standard (180°) rotation
- Low current draw, precise and quiet motor/gears



Standard Servo; #900-00005; \$12.00

The Parallax Standard Servo is now made exclusively by Futaba. Servos may be controlled directly from a BASIC Stamp I/O pin by using the PULSOUT command. Servos may be easily modified for continuous rotation.

Continuous Rotation Servo; #900-00008; \$13.00

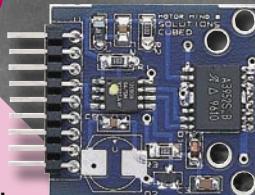
The Parallax Continuous Rotation Servo is now a Futaba S148 servo. It's recommended for robotics projects and includes an adjustable potentiometer to center the servo. Servos may be controlled directly from a BASIC Stamp I/O pin by using the PULSOUT command. The servo has been modified for continuous rotation.



Motor Mind B; #27961; \$29.00

Key Features:

- Controls speed and direction of DC motor (up to 30 VDC)
- 2400 baud serial interface
- Our most popular motor controller



The Motor Mind B provides DC motor speed and directional control (up to 30 VDC). Works with a one or two-wire, 2400 baud serial interface. Optional tachometer reads inputs up to 65,528 Hz. The module supports peak currents as large as 3.5 A and continuous currents of 2 A, and has an external emergency override input brake that shuts down motor. The Motor Mind B's small size and connection scheme allows the device to be inserted directly into circuit boards for production runs, or into breadboards for easy prototyping. The Motor Mind B has additional uses other than just motor control. One example is to use an external voltage to frequency converter and the tachometer function to provide a regulated charge voltage for a battery. Includes heat sink.



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Motor Mind C; #30001; \$59.00

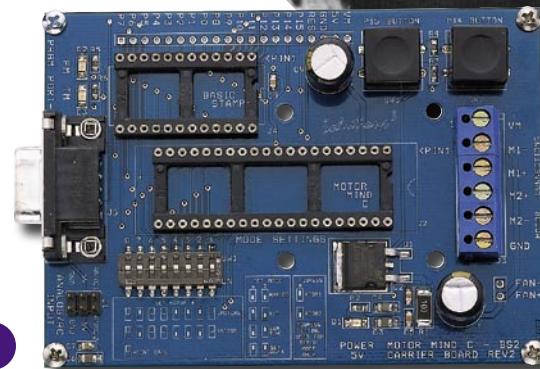
Key Features:

- Improved version based on the successful Motor Mind B
- Ability to control 1 or 2 motors (6-24 vdc)
- 3 modes of operation offer flexibility for users



The Solutions Cubed Motor Mind C answers many customer requests for improvements to their popular Motor Mind B. The Motor Mind C has been designed to function as a versatile DC motor control system for controlling one or two motors. The Motor Mind C is ideal for use in small robotics projects for controlling two-wheel axles.

In Serial and Analog Mode you have direct control over the motor speed and direction. When configured for 2 motors the motor speed and direction for each motor can be controlled independently with separate control voltages.



Motor Mind C BASIC Stamp 2 Carrier Board; #30002; \$45.00

The Motor Mind C Carrier Board was designed to simplify connectivity to and ease control of the Motor Mind C. It's the easiest way to implement application notes published by Solutions³ using the Parallax BASIC Stamp modules. Includes one socket for any 24-pin BASIC Stamp module and one socket for the Motor Mind C.

BiStep Motor Controller A06; #30004; \$99.00

The BiStep version A06 board is a complete Unipolar/Bipolar dual stepper motor controller system. It includes the capability of driving one or two stepper motors, each of which being either unipolar (4-pole) or bipolar (2-pole).

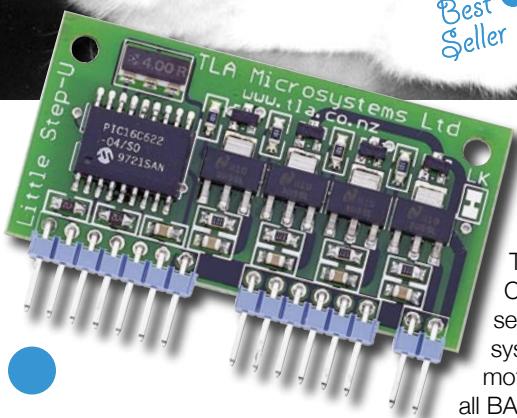
The board is specified as allowing up to 1 amp per winding, with 7.5 to 15 volt motors supported when in single power supply mode. It also supports a dual power supply feature, wherein the motors use a separate supply from the logic

circuits. In addition, the GenStepper firmware allows you to run one motor at double the rated current of the board!

Key capabilities include:

- Up to two stepper motors may be independently controlled at one time.
- Each motor may be either 4-pole Unipolar or 2-pole Bipolar.
- Each motor may draw up to 1.0 amps per winding.
- If only a single motor is being used, you can configure the board and wire the motor for double current mode.
- Limit switches may be used to automatically request motion stop of either motor in either direction.

- Rates of 1 to 62,500 microsteps per second are supported.
- Step rates are changed by linearly ramping the rates, and the rate of change is independently programmed for each motor.
- Motor coordinates are maintained as 32 bit signed values.
- Complete control of the motors is available through the 2400 or 9600 baud serial connection.
- Runs off of a single user-provided 7.5 to 15 VDC power supply.



Little Step-U Motor Controller; #27938; \$69.00

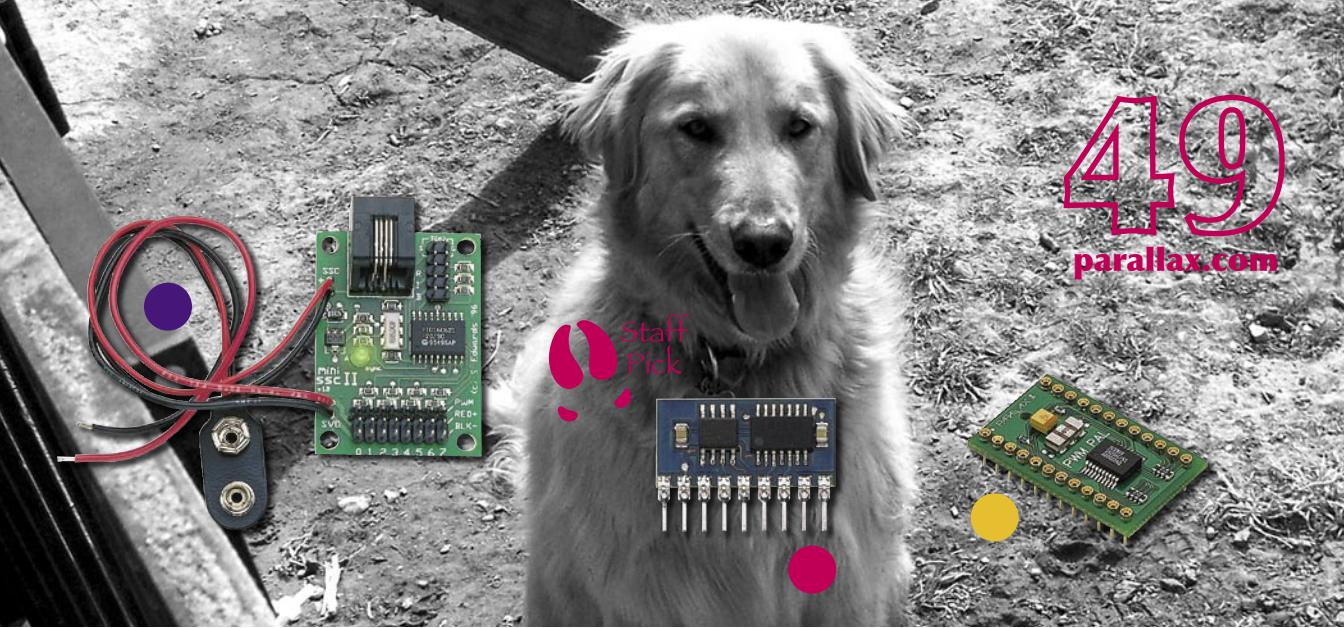
The Little Step-U Motor Controller is a complete, serially controlled, drive system for unipolar stepper motors and is compatible with all BASIC Stamps (1 and 2).

Using an intelligent module allows the host system to concentrate on the task at hand while the Little Step-U performs all calculations and operation of the motor. The desired operating speed, ramp time and drive mode can be configured once and then a single command used as required, to move to fixed or

relative positions. While the motor is in motion, a BUSY output is active and the movement can be optionally interrupted by one of the two external inputs.

Key Capabilities Include:

- Unipolar motors to 35 V, 3.0 A
- Full step, half step and wave drive modes
- 1-5,000 steps per second
- Inbuilt speed ramp (.1-10.0 seconds)
- Easy serial commands with TTL interface
- Absolute and relative movement commands
- Separate power input for motor and logic



Mini SSC 2; #27912; \$49.00

Key Features:

- Control up to 8 servos
- Requires only 1 I/O line
- Connector accepts standard 3 conductor servo plugs

The Scott Edwards Mini SSC 2 is a fully assembled module that includes a phone-style jack for serial hookup to a BASIC Stamp, servo output headers, a sync LED to indicate when valid data is received, and switchable servo range/resolution (90° range with 0.36° resolution, or up to 180° motion with 0.72° resolution. One Mini SSC controls up to eight servos, but move the jumper and attach a second Mini SSC and you can control sixteen using one serial line.

Check out our
website in early 2004
for a controller that
can handle up to
16 servos!

Pololu Micro Dual Serial Motor Controller; #30052; \$23.00

Key Features:

- Very low cost controller with high reliability
- Easy to program, includes sample code
- Pre-assembled and excellent for tight applications

Using one serial output from the BASIC Stamp, this motor controller can independently set each motor to go forward or backward at any of 127 speeds. To control additional motors, you can connect multiple motor controllers to the same serial line. The Pololu controller supports a low range of voltages and comes pre-assembled. It measures only 0.9 x 0.45 inches and is compatible with all BASIC Stamps.

PWMPAL; #28020; \$29.00

Key Features:

- For motor or process control
- May be configured in software or hardware
- Fits any 24-pin BASIC Stamp

The PWMPAL is an intelligent peripheral that adds up to four PWM output channels and up to four control/counter input channels to the BASIC Stamp. The BASIC Stamp (which plugs directly in to the PWMPAL) is required for use and is sold separately.

The PWM channels can be configured to operate under software control, or under hardware control through the corresponding counter input channel. In addition to PWM waveform generation, the PWMPAL has four 16-bit counters that operate at all times, even when the counter pin is used for hardware PWM control. Communication with the PWMPAL is handled through a bi-directional serial connection on pin P0 of the BASIC Stamp. The Parallax AppMod communications protocol is used, allowing baud rates of 9600, 19,200 and 38,400 baud.

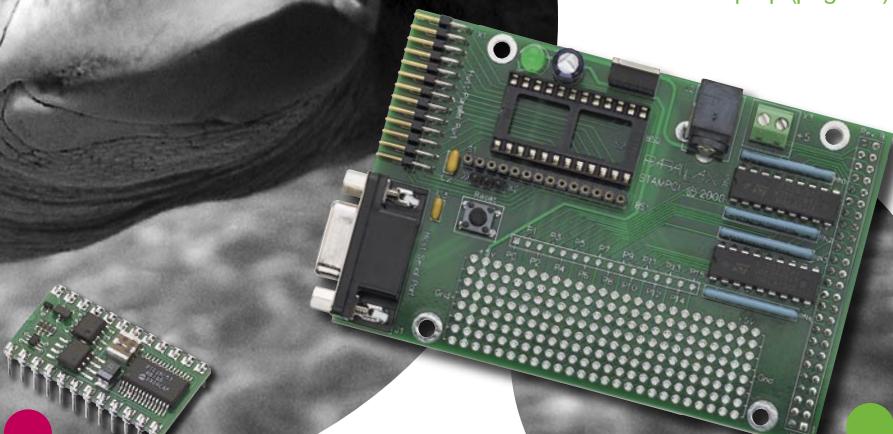


Industrial Products

In addition to our selection of Industrial Products, consider the feasibility of the following products for your next high-voltage / extreme temperature / high-vibration or closed-loop systems project:

- Amulet GUI (page 38)
- PWMPAL (page 49)
- BASIC Stamp 2p (page 15)

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BASIC Stamp 2i (Industrial) module; #BS2I-IC; \$54.00

This industrial version of the BS2 and has the same specifications except for the extended temperature range of -40 C° to +85 C° (-40 F° to +185 F°). See page 14 for more BS2-IC specifications.

The BS2i can withstand harsh environments and will keep on performing at peak performance in your industrial system. The following attributes make the BASIC Stamp a preferred choice over other controllers: high reliability, no compiler required, powerful yet easy to use PBASIC command set and reprogrammability.

Stamp Controller Interface Board; #27945; \$69.00

Key Features:

- Connects directly to an I/O control board
- Accepts all 24-pin BASIC Stamp modules
- Mix and match 16 inputs and outputs in any configuration

The Stamp Controller Interface allows the BASIC Stamp to connect directly to industrial type digital I/O control boards produced by Opto 22, Grayhill, Allen-Bradley, and others that accept 0-5 VDC voltage control levels. These optically isolated modules are ideal for interfacing microcontrollers to the real world, and are more reliable by providing proper isolation. The Stamp Controller Interface accepts

all BASIC Stamp modules and has a parallel port connection for monitoring status of I/O pins. A 9-12 VDC, 2.1 mm jack is included for external power supply (sold separately). A clever driver/resistor configuration allows the user to mix and match up to 16 inputs and outputs in any configuration.

Do you need a primer before embarking on your next industrial project? Check out our Stamps In Class "Process Control" curriculum on page 11.

BS2 16-relay Industrial I/O Board; #27965; \$329.00

Key Features:

- Designed to control machinery
- Accepts all 24-pin Stamps
- Includes LCD port

The BS2 16-relay Industrial I/O Board was designed for use in industrial machinery as a main controller, or as a controller to add features to a machine. Standard 24 VDC power is used both for input sensor and output load devices. This board will support all 24-pin Basic Stamp modules and the Javelin Stamp. This board may be used to control industrial processes, or equipment functions, without having to learn ladder logic.

BS2p40 32-relay Industrial I/O Board; #27966; \$399.00

Key Features:

- Designed for the BS2p40
- 16 high speed opto-isolated inputs
- Configurable inputs

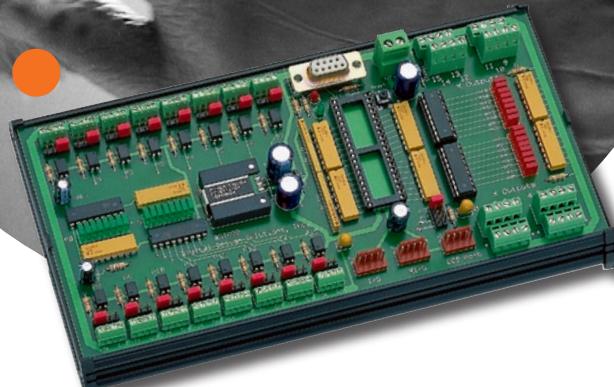
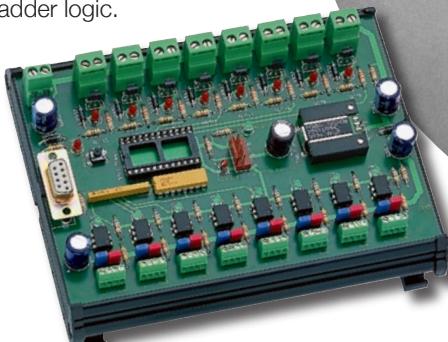
The 32-relay Industrial I/O Board will support only the BS2p40 module (sold separately). Similar to the preceding board, this board may be used to control industrial processes, or equipment functions, without having to learn ladder logic.

Opto 22 8-Channel I/O Module Rack; #27320; \$59.00

The Stamp Controller Interface Board (#27945) connects directly to the Opto 22 8-channel I/O mounting rack (pictured below) for an easy high-current switching solution. The Opto 22 I/O board accommodates up to eight I/O modules. The board uses a 5 VDC power supply from the StampCI for control power. When connected to the Stamp CI Board the BASIC Stamp can control all 8 relays simultaneously.



The Stamp CI Board connects securely to the Opto 22 8-channel I/O module rack header. Each I/O module is attached to the Opto 22 board with a screw.

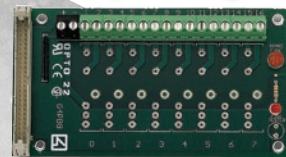


Output 60 VDC Module; #27321 (red); \$19.00

Output 120 VAC Module; #27322 (black); \$19.00

Input 120 VAC Module; #27323 (yellow); \$19.00

Input 10-32 VDC Module; #27324 (white); \$19.00



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Stamp PLC; #30064; \$199.00

Key Features:

- DIN rail mounting
- 10 digital inputs; 8 digital outputs; 4 analog inputs
- Complete Javelin and BASIC Stamp code support

The Stamp PLC (Program Logic Controller) is sized for automating small machines. Specified by Parallax, Inc. and designed by Lawicel HB of Sweden, this product represents our combined expertise to answer a frequent request from our customers. A 24-pin BASIC Stamp or Javelin Stamp is required and sold separately.

PLCs are microcontrollers that are packaged to withstand the hazards of an industrial environment. Stamp PLC inputs and outputs are optically isolated, fully protected, and the electronics are electrically tough and rather immune to noise typically present in industrial environments. Stamp PLC is housed by a strong and sleek enclosure that offers an integral DIN rail mount.



Here are the technical features:

- **10 Digital Inputs.** Eight of these inputs are grouped together courtesy of an on-board shift register. BASIC Stamps and the Javelin Stamp have built-in commands to read these with ease. The remaining two inputs are read directly by the Stamp. All inputs are optically isolated.
- **8 Digital Outputs** are optically isolated, electrically and thermally protected.
- **4 Analog Inputs (OPTIONAL).** Installing an optional A/D converter (#604-00026, \$29.95) into its socket adds four analog input channels. Each channel can be independently configured as 4-20 mA, 0-5 VDC, -5 to +5 VDC, -10 to +10 VDC, and has 12-bits of resolution.
- Front Panel LEDs indicate the status of all ten inputs and all eight outputs via a light-pipe array.
- Heavy-duty power supply has built-in noise protection.
- RS-232 Serial Port. Once programming is completed, the on-board serial port can be used to send and receive data at any baud rate between 300-50K Baud, when used with the BASIC Stamp.
- **24-pin socket** accommodates any 24-pin BASIC Stamp or Javelin Stamp. This means that this PLC can do virtually anything that your chosen Stamp can perform: logic functions, numerical computation, conditional branching, even non-volatile memory for data-logging.

Automating a Model Railroad with BASIC Stamps

Don Buczynski of San Diego, California has built a garage-sized HO layout called the D & B railroad. Some of his design goals were to have train holdover track routing, blocking detectors and signals, automated grade crossings and lighting control. Of course, it had to be a fun project and fit within established family budgetary guidelines. The BASIC Stamp 2 is used in four key aspects of the railroad.

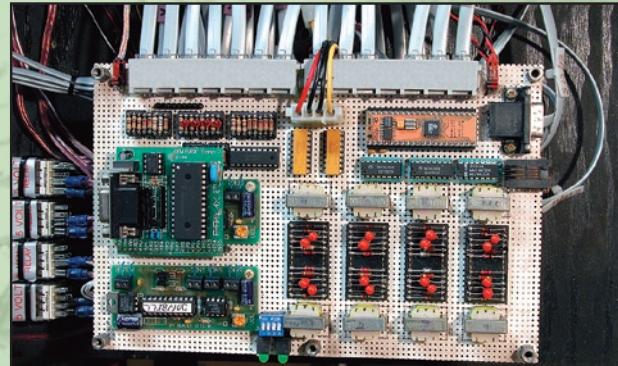
Automatic Reverse Loop Control

This is accomplished with infrared emitters and detectors for train detection, a block detector circuit to measure power consumption of passing trains and a speaker to provide warning signals. This circuit solves a common electrical polarity problem for model railroad enthusiasts. This system operates in conjunction with digital command control (DCC) equipped trains.



Yard Track Routing and Turnout Control

Through a keypad, the train operator selects a series of switches to send a locomotive to its final branched destination. The circuit uses a multiplexer for keypad decoding. The code provides warning tones for incorrectly entered destinations, an LED for user feedback, and the ability to make decisions based on the direction of train travel.



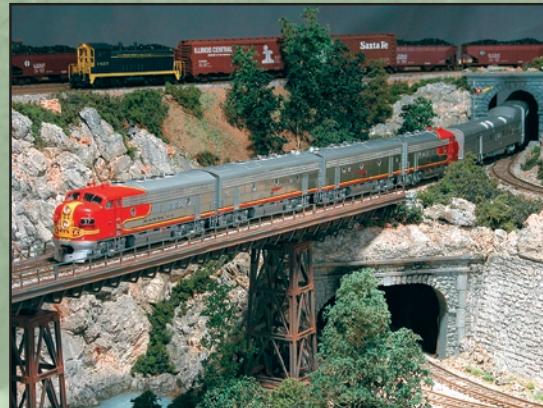
Grade Crossing

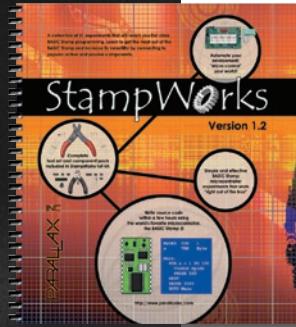
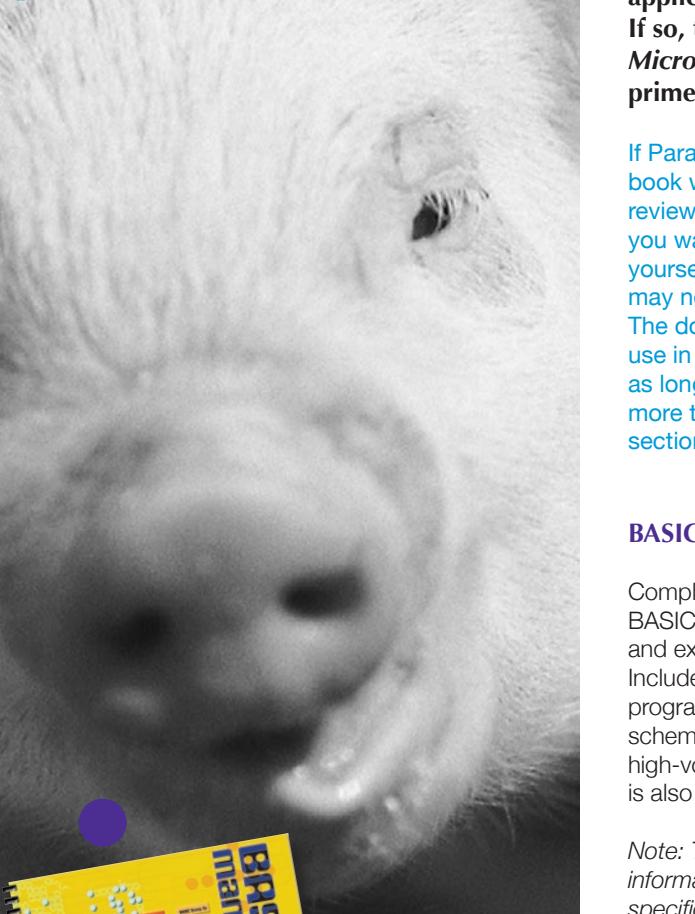
Grade crossings have automatic servo-actuated gates. An infrared emitter/detector pair detects the presence of the train so the BASIC Stamp can control the servo, sound module, and signal lamps accordingly.

Block Signal

The entire D & B railroad is equipped with three color searchlight and semaphore block signals. The lights are off for unoccupied blocks; green for approaching an unoccupied block, red for approaching an occupied block and yellow for approaching an unoccupied block with a subsequent occupied block. The circuit uses a BS2p40 due to the number of lighting circuits, combined with a pair of 74HC151s to address the block detector inputs.

Visit Don's web site at www.geocities.com/donbuczynski/DnB_rr/DnB_Frame.html. A search on Google for the words "BASIC Stamp model railroad" will provide many more examples.





The *BASIC Stamp Manual* is an essential programming guide and a recommended book for all customers. If you're a beginner, Scott Edward's *Programming and Customizing the BASIC Stamp* is a good choice. Do you need application ideas, code, or sample projects? If so, then the Nuts & Volts series and the *Microcontroller Application Cookbooks* are prime materials for your explorations.

If Parallax is the primary author of the text, then the book will be presented as a free download for your review on our web site. So, if you're unsure that you want to make the purchase just check it out for yourself online. Some books are 300+ pages so they may not be ideal for printing on your personal printer. The downloads may be printed and distributed for use in a classroom setting with Parallax products, as long as the recipients receive the materials for no more than the cost of printing. Visit the "Downloads" section of our website for more information.

BASIC Stamp Manual; #27218; \$34.95

Complete PBASIC reference guide for programming BASIC Stamps. This manual details command syntax and examples with circuits you can easily build. Includes instructions for using the editor, downloading programs, memory organization, PBASIC math, and schematics for implementing the BASIC Stamp in a high-volume OEM application. This 300+ page manual is also available from our website as a free download.

Note: The BASIC Stamp Manual does not yet include information relating to PBASIC 2.5. If you would like specific information, please see the help file of your BASIC Stamp Editor v.2.0.

StampWorks Manual; #27220; \$49.00

A well-written collection of 31 experiments that will teach you first class BASIC Stamp programming. Written by popular Nuts & Volts "Stamp Applications" columnist Jon Williams - 180 pages. Plus, the appendix includes the BASIC Stamp Manual. Based on the BS2-IC and NX-1000 programming board. The StampWorks Manual is included in the StampWorks Experiment Kit (#27297).

The Nuts & Volts of BASIC Stamps Books

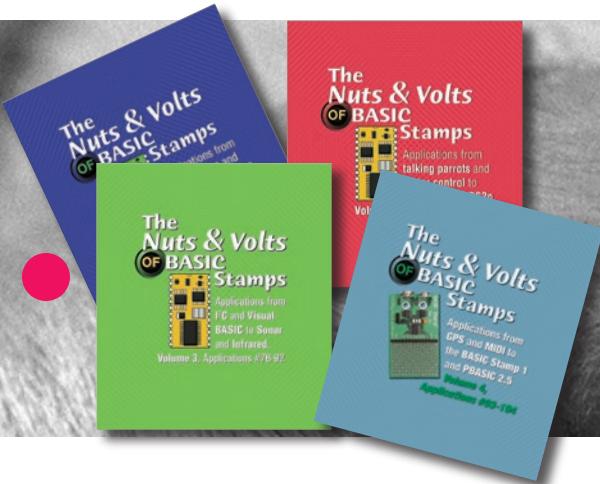
Volumes 1 - 4; #28169; \$79.00

Volume 3; #28168; \$19.95

Volume 4; #70010; \$19.95



In 1995 Nuts & Volts Magazine began publication of the monthly "Stamp Applications" column. *Nuts & Volts of BASIC Stamps Volume 1* includes the first 45 articles written by Scott Edwards and Jon Williams. Highlights include the popular "Beginner's Corner" columns, an assortment of math and general command syntax examples to help you squeeze the most from your BASIC Stamp 1 module. The book focuses on such applications as measuring water level, measuring temperature and time, controlling DC motors, communication (using modems, RS-485, to the PC, etc.), using keypads, controlling large loads with



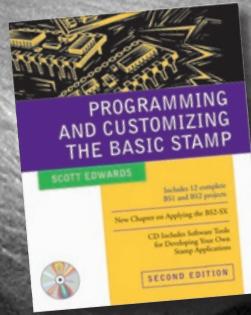
solid state relays, interfacing serial LCD modules and controlling Hitachi-compatible LCDs. Published by Parallax, Inc. Press. (515 pages)

Volume 2 includes applications 46-75 ranging from motor control to LCDs and the BS2p, while providing an assortment of engineering and hobby applications. The authors of *Nuts & Volts Volume 2* include Jon Williams and Lon Glazner. Highlights of this volume include a multi-drop BASIC Stamp network, examples with the BS2SX-IC, D/A and A/D converters, menu-based programs and examples with sound, speech and Dallas Semiconductor 1-Wire protocol. The BS2p24 is featured throughout the later columns. Published by Parallax, Inc. Press. (467 pages)

Volume 3 covers applications 76-92 ranging from Visual BASIC and networking to angles and acceleration, providing well-written examples from Jon Williams.

Highlights of the third installment include infrared decoding, expanding I/O with I²C, a 1-Wire weather station, environmental sensing, ultrasonic object detection and use of inclinometers. Published by Parallax, Inc. Press. (268 pages)

Volume 4 covers applications 93-104, thus including all material presented through the end of 2003. The first article "PBASIC Gets a Make-Over" covers the improvements and new features of the recently released BASIC Stamp Windows Editor v2.0. It's very appropriate as the front runner in Volume 4. The remaining articles cover such topics as: music with MIDI, project development and PBASIC variable manipulation, keyboard entry and display with an LCD, color sensors, and more! For only \$19.95 this is a BASIC Stamp resource that you shouldn't pass on.



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Programming and Customizing the BASIC Stamp Computer - 2nd edition; #27956; \$34.95

Programming and Customizing the BASIC Stamp Computer is a friendly introduction to working with the BASIC Stamp. Covers a few fundamentals of circuitry and electronics including Ohm's law. The book presents ten complete projects ranging from a simple dial-up timer to a sophisticated network terminal with display and keypad. Each project is a learning experience, with common-sense explanations of the whys and hows of the circuits and techniques used. The book is a great start if you have no programming or electronic skills. Scott Edwards also authored the original *Nuts & Volts* (<http://www.nutsvolts.com>) Stamp Applications column. Includes CD-ROM with software. (380 pages)

Microcontroller Application Cookbook

Volumes 1 & 2; #28113; \$54.00

Volume 1; #28111; \$29.95

Volume 2; #28112; \$29.95

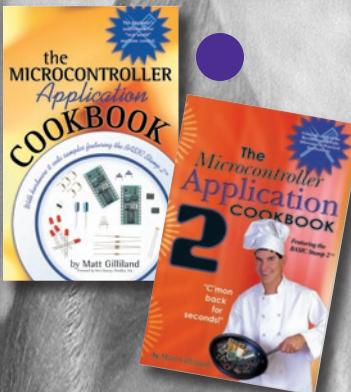
Microcontroller Application Cookbook Volume 1, authored by Matt Gilliland, is a wide-ranging collection of 113 interface circuits designed around the BASIC Stamp 2. For somebody getting started with microcontrollers, designing the circuit can be the most challenging part of building a project. Sifting through timing diagrams trying to figure out how to interface an A/D converter or control a high-voltage circuit with a solid state relay can be a challenge.

With this book you'll be able to assemble a circuit casserole from a collection of ingredients. Suppose you wanted to automate your greenhouse. The book includes examples of controlling solenoid valves with solid state relays (water distribution), simple DC-motor control with H-bridge circuits (roof vents), linear temperature sensors, humidity sensors and photocells. Cook up an application that waters the plants in the morning, opens the greenhouse vents when it's too hot or humid and powers the microcontroller from solar energy!

Matt Gilliland's *Microcontroller Application Cookbook Volume 2*, builds on the success from the first culinary book with a new collection of 154 interface circuits designed around the BASIC Stamp 2. Many of our customers have all of the necessary BASIC Stamp hardware but need more project ideas and circuits. Well, Matt has delivered a sequel that won't leave you disappointed! Both books are published by Woodglen Press and are each 248 pages.

Microcontroller Projects with BASIC Stamps-Second Edition; #27952; \$44.95

Due to the range of topics covered - including a section devoted to the BS2p, this book is recommended for beginners and advanced users alike. Al Williams' definitive guide will assist you with building your own electronic game, a robot, or an automated manufacturing process. All you need to get started is a PC, BASIC Stamp, a cable, and programming board. Each chapter includes exercises and source code.



BS2p Commands, Features, and Projects Book; #70001; \$19.95

Kühnel and Zahnert's *BS2p Commands, Features and Projects* book provides a detailed overview of the Parallax BASIC Stamp 2p module. This 295-page book includes a complete command reference with short examples and BS2p-specific projects. The code examples in the book include 11 for the BS2p and 17 for the BS2. Projects demonstrate how to interface the BS2p to Dallas Semiconductor 1-Wire sensors, GPS receivers, I²C enabled circuits, serial networks and LCDs.

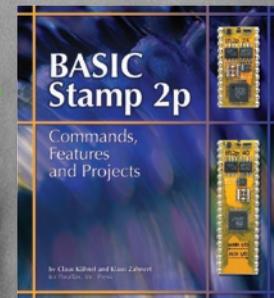
The key strength of the text lies in Kühnel and Zahnert's ability to provide simple and concise examples that appeal to a BASIC Stamp newcomer and a seasoned Stamper looking for some tips on how to use the latest BASIC Stamp. Excerpts from the actual book and source code listings featured in this book are available for download on our website.

BASIC Stamp Second Edition; #27222; \$35.00

Claus Kühnel and Klaus Zahnert's *BASIC Stamp Book Second Edition* is an overview of the BASIC Stamp software, PBASIC programming language, and getting started information. This book is a second release of the popular First Edition, updated to include the BS2SX-IC. The benefit of this book is that it includes a complete set of 21 applications. A sampling of the applications include motion detection with radar sensors, distance measurement with IR triangulation, serial reading from a phone card, tilt control with servos, and simple optical data transmission. (295 pages)

Stamp 2 Communications and Control Projects Book; #70004; \$24.95

This book on the BASIC Stamp 2 shows you how to incorporate the Stamp into your ham radio, communications, and control projects. Features 20 projects from simple serial communication to complex 12 channel web-based alarm reporting. Teaches building and programming with a special emphasis on customizing for your own needs. The CD includes all the software, photos, and schematics needed to build the projects in the book.





Javelin Stamp Module; #JS1-IC; \$89.00

Key Features:

- **Plenty of EEPROM and RAM**
- **Capable of background tasks**
- **Programmed in subset of Java**

The Javelin Stamp is a 24-pin DIP module programmed in a subset of the Sun Microsystems Java language.

What makes Java unique?

Java is both structured and object oriented. A structured programming language is one where the commands you write make decisions that control the sequence and repetitions of events. Object oriented means

you can create, name, and even duplicate objects (segments of reusable code) in your main program. The reusable

code is written and stored in separate files called class files.

If you have a pair of temperature sensors and an LCD display, you can create objects from the temperature and LCD class files, and make use of the reusable code within these class files in your main program.

Advanced capabilities and specs for demanding applications

The Java programming language is not the only thing that makes the Javelin Stamp uniquely different from BASIC Stamps: 32 k bytes of RAM/program space (leftover space can be used for variables, arrays, and serial buffers); 32 k bytes of non-volatile EEPROM; buffered serial communication in the background; up to seven UART objects that can communicate independently of each other and the main program; pulse width modulation in the background; 8000 instructions/second execution speed (not including background processes which run independently of foreground tasks). The Javelin Stamp is compatible with any BASIC Stamp programming board with a 24-pin DIP socket.

Javelin Stamp Starter Kit; #27237; \$239.00

Everything that you need to begin your quest for Java programming success is included in this Starter Kit: the Javelin Stamp, a demo board, software, manual, serial cable and some electronic components. The Javelin Stamp Demo Board is only available with the kit and it has a second, configurable RS-232 port and 2 servo port connections.



Javelin Application Notes

Applications with source code are available on our website for a host of sensors and components. Each of the applications contain appnotes, documentation, and class files.

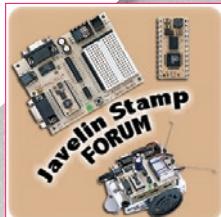
- Getting Started with 1-Wire
- DS1302 Real-Time Clock
- I²C Primer
- LED Terminal
- Using the Microchip 24LC256 EEPROM
- Using the Analog To Digital Abstract Class
- Using the ADC0831 8-bit Serial I/O A/D Converter
- Using the LTC1298 12-bit A/D Converter
- Using The BPI-216 Serial LCD Module
- Using a Serial Mouse with the Javelin
- 32-bit Integer Math for the Javelin
- The Text Format Library
- The FloatLite6 Library

Javelin Discussion Group

Exchange questions, answers, program files and schematics pertaining to the Parallax Javelin Stamp.

While occasional discussion of other products are acceptable, postings intended to advertise other products are moderated.

The list is moderated - your messages will not be sent to all other list members without review.



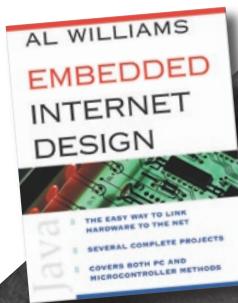
Regardless, we ask that you please be courteous to the people who will know you only by the words you type.

Join this discussion group and others hosted by Parallax by visiting our website and navigating to Support/Discussion Groups.

Embedded Internet Designs Book; #70007; \$34.95

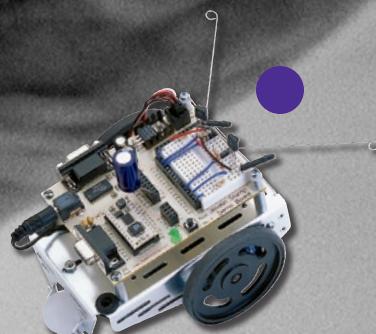
Great for conquering convergence—the buzzword for the meeting of consumer electronics and the Internet. Al Williams's guide takes you beyond Internet-integrated phones and TV set-top boxes to the Internet-connected future of all kinds of appliances, entire homes, factories, and even automobiles.

- Under-the-hood net explanations
- Complete coverage of the Javelin Stamp and TINI microcontroller
- Dozens of source code listings
- The best short course there is in hooking devices to the Net



Customized JavelinBot

Please note that the material in the JavelinBot manuscript is much more advanced than the content in the *Robotics with the Boe-Bot* text. The JavelinBot application material is not supported by Parallax Technical Support. If you need assistance with the material in the manuscript, you can post questions to the Javelin Stamp Discussion Group. To see a list of existing posts regarding the JavelinBot, use the search term "JavelinBot" in the Javelin Stamp Discussion Group's Search Archive field.





SX Tech Tool Kit; #45180; \$229.00; SX Tech Tool Kit (no power supply); #45181; \$229.00

Key Features:

- Complete development kit for programming and debugging SX chips
- Program SX chips within an hour
- Includes new manual v2.0 with Daubach book

Our SX Tech ToolKit is a complete assembly language programmer and debugger kit. The SX-Key DB-9 serial connector on one side of the tool connects to the RS-232 port of your PC using a serial cable; the 4-pin connector on the other side of the tool plugs into the SX's Vss, Vdd, OSC1 and OSC2 pins. For purposes of debugging, the SX-Key has a programmable oscillator for 400 kHz and 100 MHz (remove the oscillator from your circuit during debug). On the SX Tech board the connections from the tool to the chip are made for you.

This kit is the most complete starting point to get you programming SX chips with Parallax's SX-Key. The Günther Daubach tutorial makes use of the latest SX software improvements to get your project off the ground faster. Upon receiving the kit, you will be able to program SX chips within the hour.

The SX Tech Tool Kit includes:

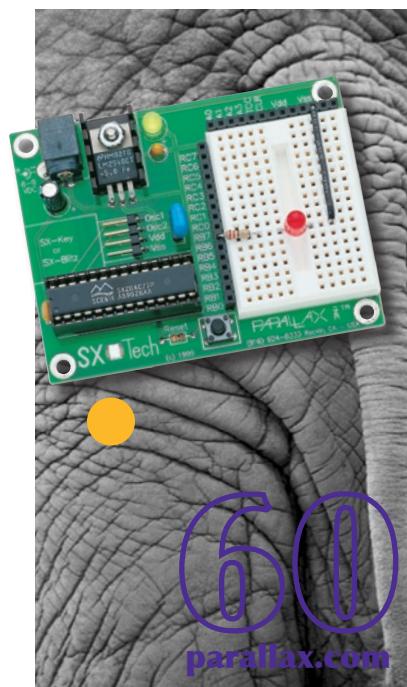
- Programming the SX Microcontroller book by Günther Daubach
- SX-Key Rev. F
- SX Tech Board
- (2) SX 28AC/DP 50 MIPS chips
- (1) Murata 50 MHz resonator
- (1) Murata 4 MHz resonator
- 4-pin header
- 7.5 VDC Power supply and serial cable
- SX-Key Manual v2.0
- Software on CD-ROM

SX Tech Board; #45205; \$39.00

The SX Tech board is our project area for the SX microcontroller. Simply plug in the SX-Key, power, and build a project on the breadboard. SX I/O ports and control lines are brought to the SIP headers on the side of the board and accessed by jumper wires. The SX Chip is NOT included.

Programming the SX Microcontroller - Tutorial; #70002; \$29.95

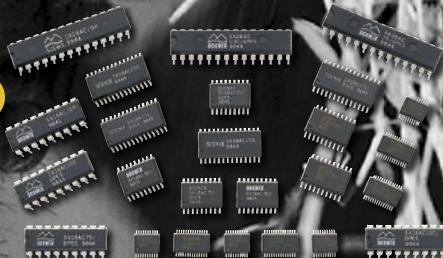
Do you want to understand how a microcontroller is programmed in the lowest level? This text is a tutorial-based set of projects and explanations using the Parallax SX-Key to program SX chips in assembly language. The step by step approach ensures an understanding of the bit-level operations necessary to program the SX.



SX-Key Rev. F (alone); #552-00007; \$179.00

The SX-Key is Parallax's primary development tool for the SX line of microcontrollers from Ubicom, supporting every chip that is commercially available. Supported by the SX-Key software, the SX-Key can program SX chips in-system and perform in-circuit source-level debugging. Also at the user's fingertips is an on-board programmable clock. The frequency output of this clock is adjusted from the software with a slider bar between 400 kHz and 100 MHz. The software operates on a Windows platform and is compatible with Windows 95/98/NT/2000/XP.





Byte Craft SX/C Compiler Windows 95/98/ NT4.0; #45201; \$1495.00; Byte Craft SX/C Compiler Educational Version; #45206; \$295.00

Byte Craft's SX/C Code Development Systems is targeted to each Ubicom part. SX/C includes a highly optimized C compiler, the Byte Craft Limited Integrated Development Environment (BCLIDE), and a built-in macro assembler. The compiler supports the following data types: 8, 16, 24, and 32 bit signed and unsigned integers; 16:8 and 16:16 fixed point; IEEE-754; 24-bit and 32 bit floats, and single bit types. Project managers will appreciate C for its ease of use and maintenance with multiple developers. SX/C has full source level debug support with the SX-Key. Files generated by the compiler may be launched with the SX-Key software for debug by pressing on the SX-Key button. Note: *Proof of educational status is required to purchase the educational version.*

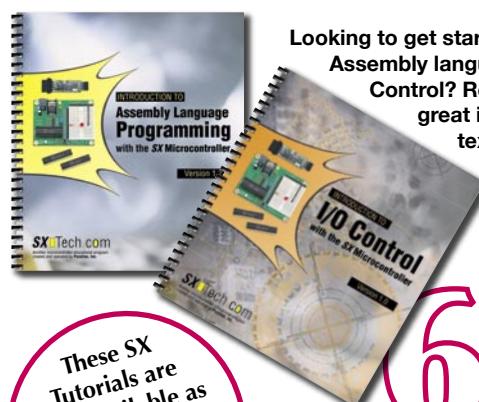
SX52 conCarne; #45207; \$59.00

The SX52 conCarne module (48-pin DIP package) is a development board for the SX48/52 microcontrollers for use with the Parallax SX-Key development tools. This makes prototyping with TQFP and PQFP package styles of the SX48/52 easier. Since the SX48BD is simply a subset of the SX52BD, developers can use the SX52 conCarne to develop SX48 code with ease.

SX Chips from Ubicom

Parallax is an authorized Ubicom distributor. Parallax stocks the SX20/28AC silicon version (complete data sheets are available from Ubicom). See our website for complete details and pricing. Some of the key features of the SX20/28AC silicon:

- Quick programming time (48 seconds for a full part)
- Wide operating voltage range (2.5 to 5.5 VDC)
- Enhanced oscillator design with programmable gain
- Internal 4 MHz oscillator can be divided down to 4 MHz, 1 MHz, 128 kHz and 32 kHz



These SX
Tutorials are
only available as
free downloads
online.

Parallax is leading the way with low cost, powerful development tools for Altera Stratix and Cyclone devices.



Stratix SmartPack with EP1S10 (not pictured); #60002; \$395.00; Stratix SmartPack with EP1S25; #60001; \$495.00*

The Stratix SmartPacks provide you with an awesome FPGA that is loaded with RAMs, DSP Blocks, and PLLs – all at a price comparable to a single Stratix chip. The Stratix SmartPacks provide all necessary support circuitry and a proven connection to the 672-pin Stratix device, saving you valuable engineering time. The SmartPack with EP1S10 comes with Altera's Quartus II Web Edition software.

| Stratix Device Overview | EP1S10 | EP1S25* |
|-------------------------|--------|---------|
| Logic Elements | 10,570 | 25,660 |
| M512 RAM Blocks | 94 | 224 |
| M4K RAM Blocks | 60 | 138 |
| M512K RAM Blocks | 1 | 2 |
| DSP Blocks | 6 | 10 |
| PLLs | 6 | 6 |

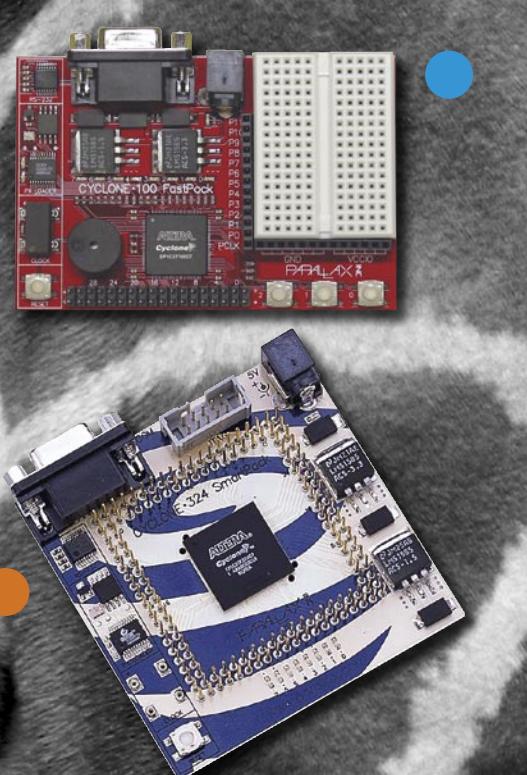
*The SmartPack with EP1S25 requires the purchase of Quartus II Full Edition software from Altera.

Cyclone FastPack with EP1C3; #60004; \$195.00; Cyclone SmartPack with EP1C20; #60003; \$295.00

Altera Cyclone FPGAs are the lowest-cost FPGAs available in the market today. Cyclone FPGAs include an optimal feature set for high-volume, price-sensitive applications in the consumer, industrial, automotive, computing, and communications markets. Both Packs provide everything you need to start developing with the Cyclone family.

The SmartPack and FastPack both neatly present the Cyclone device with all required support circuitry, plus a serial port loader. These products come with Altera's Quartus II Web Edition software on CD-ROM.

| Cyclone FPGA Overview | EP1C3 | EP1C20 |
|-----------------------|--------|---------|
| Logic Elements | 2,910 | 20,060 |
| M4K RAM Blocks | 13 | 64 |
| Total RAM Bits | 59,904 | 294,912 |
| PLLs | 1 | 2 |
| Maximum User I/O Pins | 104 | 301 |



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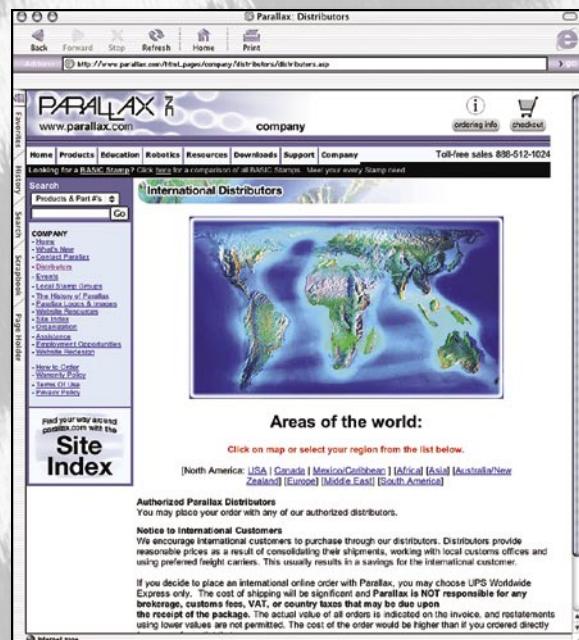
Mail - Purchase orders, pre-paid orders with a personal check or money order may be submitted to:

Parallax, Inc.
Attn: Accounting Dept.
599 Menlo Drive, #100
Rocklin, CA 95765, USA

Note: Please write "Order Enclosed" on the envelope.

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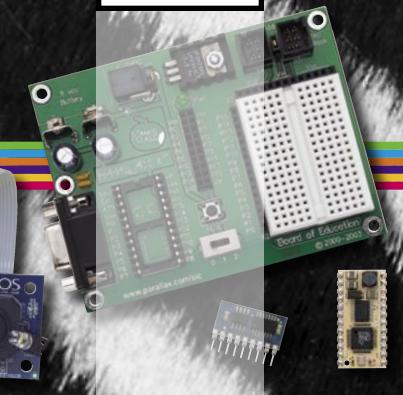


International Customers

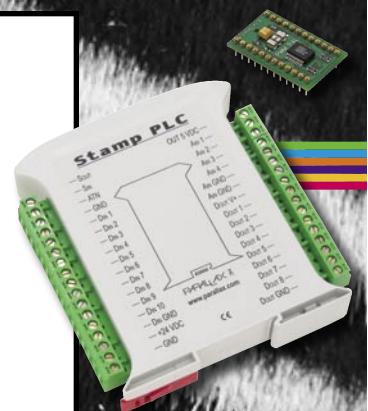
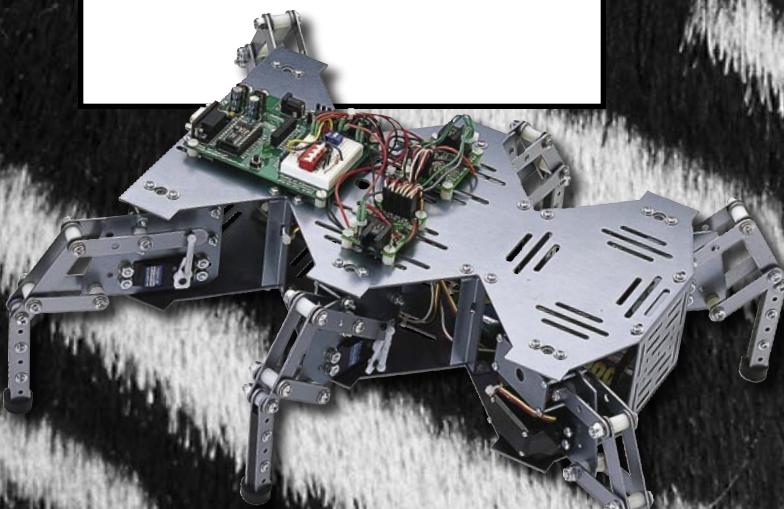
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