

Accessories

Propeller BASIC Stamp SX 2008 Robots

Sensors *motor control*

PARALLAX

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Parallax Celebrates 20 Years of Excellence

September 4, 2007 marked Parallax's 20th year in business. Over the years our company has evolved in many ways. We are proud to be given the opportunity to continue to serve our customers. One of our longest tenured employees, Chantal Woods-Jones, recently stated in our Parallaxian E-mail Newsletter:



The first shipment of the original BSI-IC (now known as the Rev.Dx) was in March of 1993. When the product finally came in we had so many orders to fill it took the four of us all afternoon to invoice and package the orders. When my husband and 7 year old son came to pick me up they pitched in to help. As we finished boxing an order we would put them in large garbage bags and start filling up Lance's Ford pickup. We got it all done just in time to make it up to the UPS hub before 5 p.m. It was such a great feeling. My son is 21 and still remembers.

From fully automated pick-and-place machines and our recently-opened overseas manufacturing facility to our entirely "full-custom" Propeller Chip, things sure have progressed. As a family-owned business one thing that will never change is our commitment to providing quality products, services and cutting-edge ideas for businesses and individuals that are both fun and functional to use. All of us here at Parallax look forward to another 20 years and beyond with you, our valued customer!



Staff at our Rocklin, CA, office gathered for a 20th Anniversary photo.

Parallax, Inc. is a privately held company located in Rocklin, California. We design and manufacture microcontroller development tools and small single-board computers that are used by electronics engineers, educational institutions and hobbyists. Our current product line consists of BASIC Stamp microcontrollers and development software, SX chips and programmer/debuggers, project boards, sensors, educational tools, robotics kits, accessories and the Propeller chip.

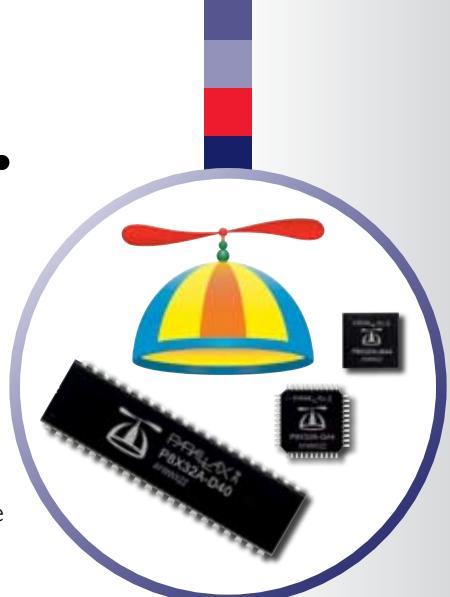
At Parallax, Inc. our mission is to "provide the electronics industry with products that are technically innovative, unique, and economical. This is achieved by a combination of thoughtful, creative design and quality workmanship. The end user appreciates the simplicity and affordability."

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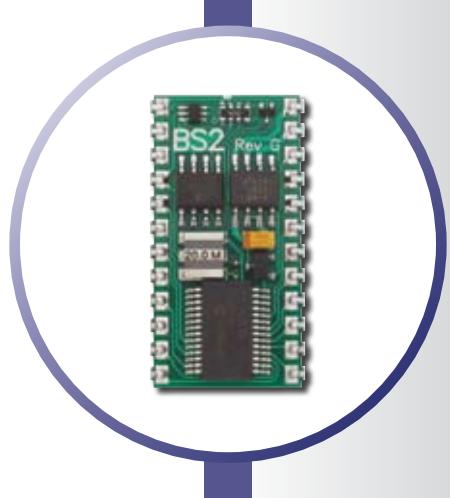
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3 Ways to Program...

Propeller – Introduced in 2006, the Propeller chip has eight 32-bit processors in one chip providing true multi-processing capabilities. The Propeller is programmed in both a high-level language, called Spin™, and a low-level (assembly) language. The large library of pre-built ‘objects’ for video, mice, keyboards, RF, LCDs, Stepper Motors and sensors allows for easy high-level integration. Its ability to emulate dedicated hardware such as video controllers, coupled with low cost, make the Propeller suitable to replace several components in production controllers and other devices. The Propeller product line is recommended for those with previous microcontroller experience. The Propeller is programmed through a serial interface consisting of either on-board USB, Prop Plug, Prop Clip or RS-232 converter.



BASIC Stamp® – Introduced in 1995, the BASIC Stamp is arguably the easiest to use microcontroller on the market. Close to the size of a postage stamp, the BASIC Stamp is programmed in PBASIC, using simple commands such as FOR...NEXT and IF...THEN. The Stamps in Class educational series was written specifically for the BASIC Stamp 2, providing a large selection of tutorials introducing circuits and programming, robotics, sensors, and process control. Free technical support, user forums, and plenty of example source code for accessory devices round out the resource base, speeding development of both simple and sophisticated applications. Available OEM options allow for lower cost mass production of BASIC Stamp-based products. BASIC Stamp modules are programmed through a serial interface, consisting of either a compatible USB to Serial adapter or direct connection to an RS-232 serial port.



SX Microcontroller – Introduced in 1997, the SX chip is extremely fast, providing up to 75 MIPS of processing power in an 8-bit microcontroller. Deterministic timing makes interrupt programming easy and the SX can be programmed in its native low-level (assembly) language or the free SX/B compiler. The SX chip is actually used as the interpreter for all BASIC Stamp models after the BASIC Stamp 2. The low cost makes it a good choice for high-volume, high-speed applications. The SX microcontroller is recommended for those who would like low cost and raw processing power. Previous microcontroller experience is recommended. SX chips require an SX-Key or SX-Blitz tool to program. The SX-Key provides real-time debugging features, while the lower-cost SX-Blitz provides only programming capability.



For more details on Parallax products, please visit our web site at www.parallax.com.

Propeller™

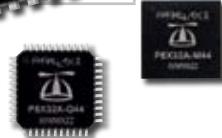


What can you do with eight 32-bit processors (cogs) in one chip? Real simultaneous multi-processing! The new Propeller chip is the result of our internal design team working for eight years.

The Propeller chip was designed at the transistor level by schematic using our own Altera Stratix tools to prototype the design. The Propeller is programmed in both a high-level language called Spin™, and low-level Propeller assembly language. With an ever-expanding set of pre-built Parallax “objects” for video, mice, keyboards, RF, LCDs, stepper motors and sensors, your Propeller application is a matter of high-level integration. The Propeller is recommended for those with previous microcontroller experience.

Propeller Chip Specifications

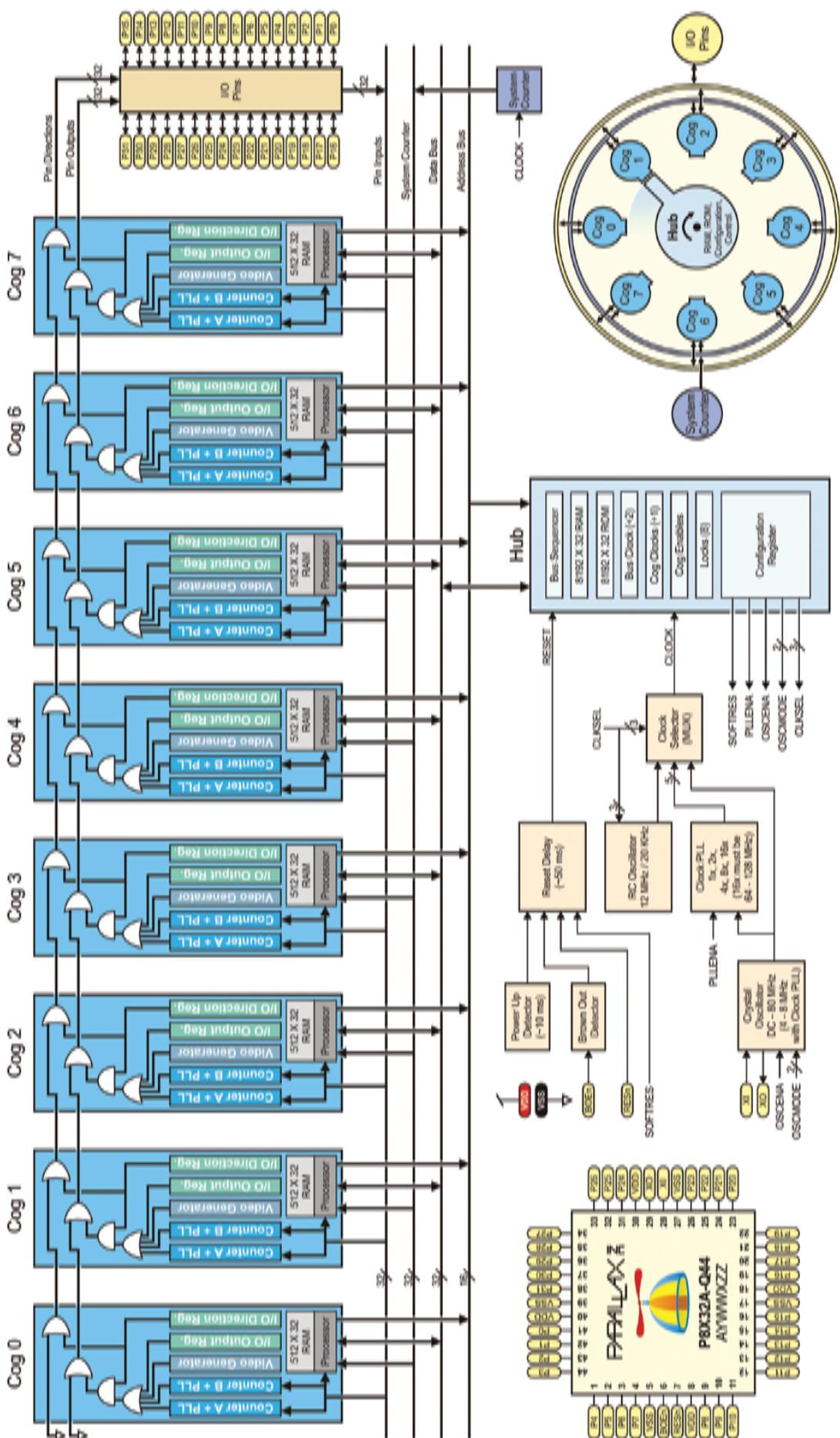
Power Requirements	500 µA/MIPS @ 3.3 volts DC
External Clock Speed	DC to 80 MHz (4 MHz to 8 MHz with clock PLL running)
Internal RC Oscillator	12 MHz or 20 kHz
System Clock Speed	DC to 80 MHz
Cogs	8
Performance	20 MIPS per Cog @ 80 MHz
Global RAM/ROM	32 KB RAM / 32 KB ROM
Processor RAM	512 x 32 per Cog
I/O Pins	32
Current Source/Sink per I/O	30 mA

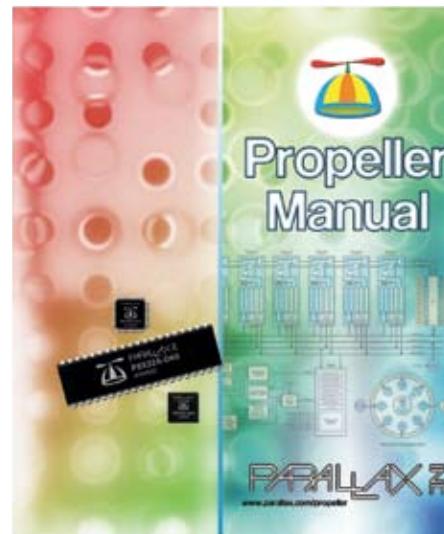


Propeller is the first custom all-silicon product designed by Parallax. For quantity pricing and availability please contact our Sales Department at 888-512-1024.

Propeller Chip	Stock Code	# Pins	Package	Price (Qty.1)
P8X32A-D40 Chip	#P8X32A-D40	40	DIP	\$12.95
P8X32A-Q44 Chip	#P8X32A-Q44	44	LQFP (10 x 10 mm)	\$12.95
P8X32A-M44 Chip	#P8X32A-M44	44	QFN (10 x 10 mm)	\$12.95

Call Parallax toll-free 888-512-1024





Propeller Starter Kit (#32300; \$99.95)

Propeller Demo Board Only (#32100; \$79.95)

Propeller Manual Printed Text Only (#122-32000; \$34.95)

The **Propeller Starter Kit** includes everything you need to get started with the Propeller microcontroller, including the Propeller Demo Board, the Propeller Manual, software on CD and a USB cable. The Propeller Demo Board visibly demonstrates the Propeller's varied capabilities in a compact and fun platform that includes a built-in Propeller (P8X32A-Q44), EEPROM and 5 MHz crystal pre-wired to connectors for interfacing to devices such as a mouse, keyboard, TV or VGA monitor and speakers. All the requisite power supply and USB loading circuitry is provided for you. Eight unused I/O pins are available for experimentation. The Propeller Demo Board is configured for immediate use by many objects from the Propeller Object Library (included with the Propeller Tool software). In just a few minutes you can see some of the impressive tasks the Propeller can perform.

The Propeller Manual explores the power and flexibility of true multi-processing with the Propeller microcontroller. The Propeller Manual provides:

- Detailed Propeller chip architecture information
- Complete syntax and reference guides for Spin and Propeller Assembly languages
- Example programs for accessing the Propeller chip's log, anti-log, and sine tables



The **Propeller Accessories Kit** (sold separately) contains a Parallax PS/2 Mini-Keyboard, Parallax PS/2 Optical Mouse and a 2.5" LCD A/V Display. Using objects written by Parallax, the Propeller is capable of reading input from a standard PS/2 keyboard and mouse, as well as sending output data to an NTSC Display. The Propeller Accessories Kit provides all three I/O peripherals in one package making it easy to get started. The Propeller Demo Board makes using these devices even easier by providing the necessary connectors and power.

HYDRA

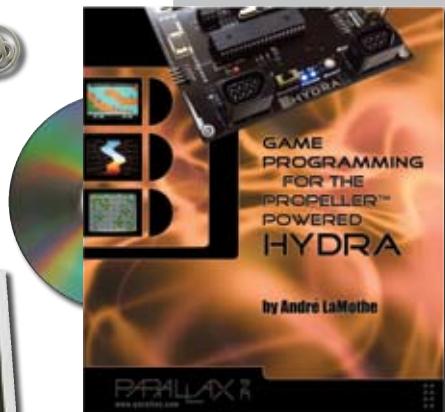


Develop games, graphics and media applications with the Propeller-powered HYDRA Game Console. For beginner to intermediate coders, you need only basic programming experience in any BASIC or C-like language. All of the hardware and software you need are included, along with a comprehensive book on game programming for the Propeller in Spin and assembly language. Additionally, the **HYDRA Game Development Kit** hardware is covered in detail with schematics, descriptions, and tips allowing you to take full advantage of its resources, including its expansion port and game card.

Written by best-selling game development author Andre' LaMothe, the included *Game Programming for the Propeller Powered HYDRA* is a complete guide to developing games, graphics, and media applications for the HYDRA Game console. The book assumes you have only basic programming experience in any BASIC or C-like language. It covers all aspects of the Propeller chip from its architecture to using the Propeller Tool IDE for programming in both Spin and assembly language, with numerous demo programs to use as starting points for your own games. Included on the CD is "HYDRA Tiny BASIC." With this classic version of BASIC you can write programs directly on the HYDRA with nothing more than your TV and keyboard.

The **HYDRA Xtreme 512K Card** (HX512) completes the HYDRA system giving it a full 512K of Static RAM (SRAM) and 128K BYTE EEPROM for program storage. The interface is made possible by a Lattice ispMach 4064 Complex Programmable Logic Device (CPLD) which acts as the memory controller and "glue" logic. The CPLD addresses the large 512K memory and acts as a simple memory controller capable of auto increment and decrement functionality to help accelerate your code. This card transforms your HYDRA into a full featured 32-bit computer that can host large programs, operating systems, interpreters, compilers, and more advanced games and graphics applications. Programming and User Manual with over 80 pages of illustrations, explanations, and source code comes on the included CD-ROM.

HYDRA Game Development Kit (#32360; \$199.95)

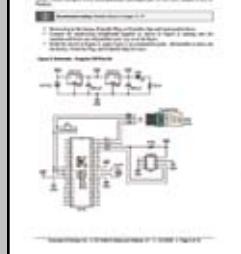


Game Programming for the Propeller Powered HYDRA

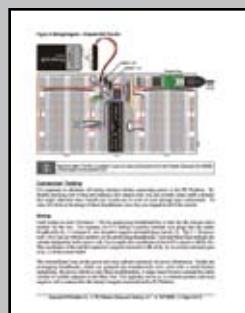
Printed Text and CD-ROM only
(#70360; \$39.95)



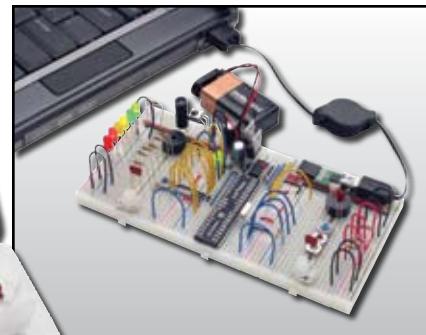
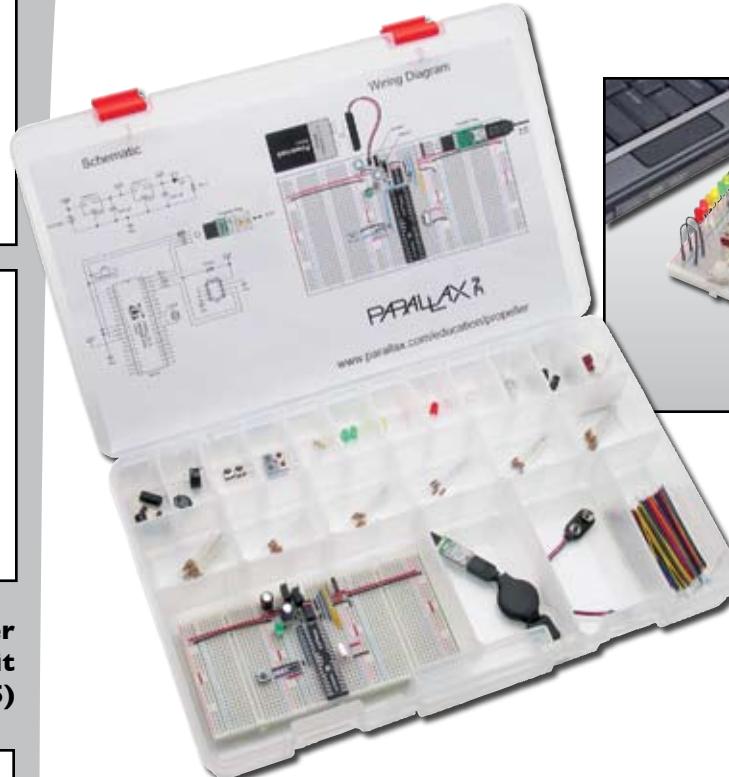
HYDRA Xtreme 512K SRAM Card (#27935; \$59.95)



Propeller Education Kit
(#32305; \$79.95)



PropStick USB
(#32210; \$79.95)



Download
FREE Propeller
Labs designed to
work with this kit
[at parallax.com!](http://parallax.com)

Learn Propeller programming with the **Propeller Education Kit** -- a complete kit with everything you'll need to get started with the Propeller microcontroller and educational labs from Parallax (except a 9 V battery). Download our free Propeller Education Lessons and Labs online which utilize the parts in this kit. New lessons are released periodically.

Propeller Education Kit Contents:

- **Propeller DIP Plus Kit** - A Propeller 40-pin DIP microcontroller "plus" all the electronic components and connectors for a fully functional system on your breadboard.
- **Prop Plug** - A USB to serial programming and communication tool. In addition to quick Propeller program downloads, it supports bidirectional Propeller-PC communication at up to 3 Mbps.
- **PE Kit Project Parts** - All the parts you'll need to work through the Startup and Fundamentals labs in the Propeller Education series, chosen with students' needs and budget in mind.
- **Interconnecting Breadboards** - 3 breadboards and 4 power rails interconnect and provide plenty of space to build the PE Platform and projects.
- **Plastic Storage Box** with adjustable compartments for your PE Platform project, parts, and room for a few extra tools as well. Great for organization, storage, or even transport in a backpack.

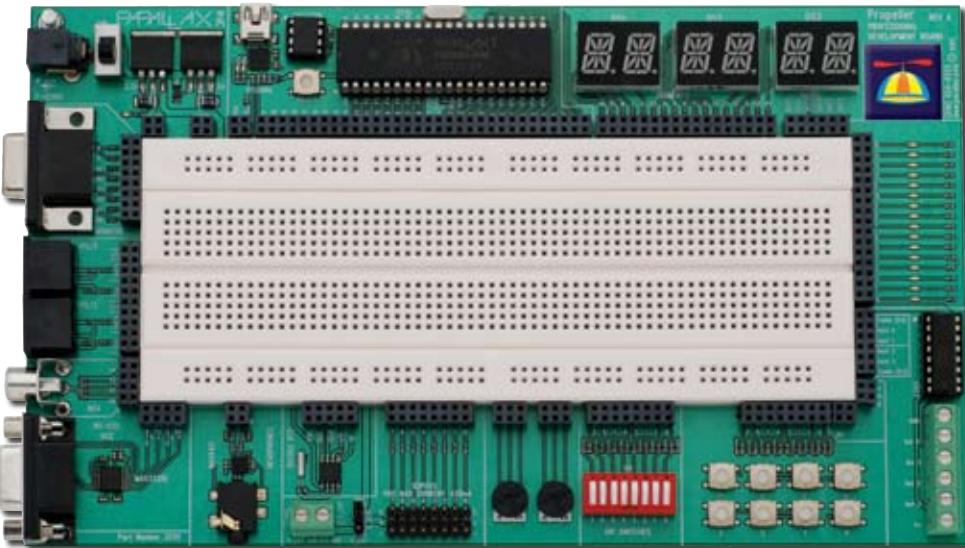


The **PropStick USB** is a rapid development tool for the Propeller chip which provides access to all 32 I/O pins on a 0.1" pin spacing format. It features a built-in P8X32A-M44 Propeller chip, 32 kB EEPROM, 3.3 V regulator, FTDI mini USB interface, and reset button. The 5.00 crystal is socketed for replacement. This module is intended to be used in a breadboard or other through-hole design, and could be used with the circuits and example code in the Propeller Education Labs.

Coming Soon!

Propeller Professional Development Board (#32111)

Please note: final circuit board color will differ from board pictured at left.



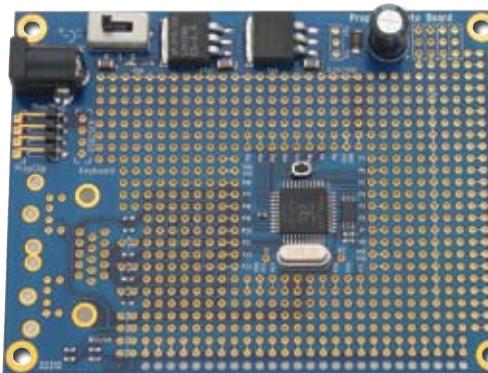
The **Propeller Professional Development Board** (PPDB) is a high-quality, fully-integrated development platform for the Propeller Chip. A wide variety of typical I/O (LEDs, buttons, etc.) devices and circuitry are built into the PPDB, providing the developer with an ideal platform for rapid Propeller Chip development. A 40-pin socket allows easy development and replacement using a through-hole version of the Propeller Chip.

Features of the Propeller Professional Development Board include:

- 40-pin DIP socket (supports P8X32A-D40, available separately)
- 32K EEPROM (24LC256 included) in socket
- Socketed Crystal (5 MHz included)
- 6-digit, 16-segment LED Display (Blue, RHDP)
- 16 blue LEDs
- L293D quad push-pull driver
- Eight push-buttons
- Eight DIP switches
- Two potentiometers (10K)
- Eight servo headers with selectable internal/external voltage source
- DS1302 real-time clock with backup battery input (battery not included)
- Stereo headphone amplifier with 1/8" (3.5 mm) stereo phone jack
- RS-232 line driver (MAX3232E)
- RCA jack for TV/Composite video output
- Two PS/2 connectors for mouse/keyboard interfacing
- VGA connector
- 2.1 mm barrel power jack and power switch
- 5 V and 3.3 V power supply connections
- Ground Terminal
- On-board USB Interface (mini-B, 5 pin)

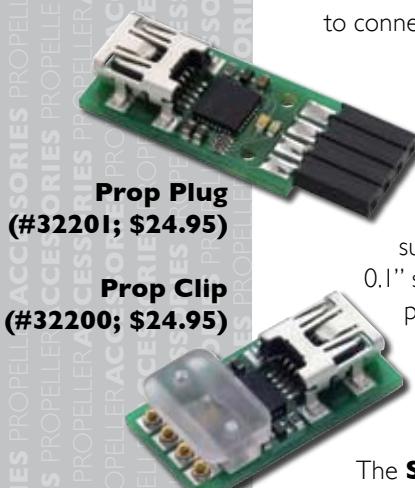
Note: The USB cable (mini-B) and power supply are not included since most of our customers have already received these with other Parallax purchases. Parallax recommends the 12 V/1 A power supply (#750-00007; \$9.95) for the Propeller Professional Development Board to cover the widest range of possible uses.

**Propeller
Proto Board
(#32212; \$19.95)**



Parallax's **Propeller Proto Board** is a low cost, high quality solution for permanent projects using the Propeller chip. To save the user some expense, the USB programming interface is not included on the Propeller Proto Board; we suggest you purchase a Prop Plug (below) for programming your Propeller Proto Boards.

The **Propeller Proto Board Accessory Kit** includes all the parts necessary to connect VGA, keyboard, mouse and servos to the Propeller Proto Board.



The **Prop Plug** and **Prop Clip** each provide a USB-to-serial port connection that is convenient for microcontroller programming and communication. These tiny devices are capable of asynchronous communication at up to 3 M baud with both 3.3 and 5.0 volt devices such as the Propeller and BASIC Stamp. The Prop Plug slips onto a 4-pin spaced header, allowing both PCB's and breadboards to provide in-circuit programming capability. Use the Prop Clip if programming with fewer components via a PCB edge connector is desired. Note: USB A to Mini Retractable Cable is included (#805-00010).

The **Spin Stamp** is a 24-pin module similar in form and size to the BASIC Stamp 2 family of 24-pin modules. The purpose of this microcontroller is to introduce the Propeller processor to the engineer who wants the features of the Propeller chip and ease of placement in an existing BASIC Stamp module project. The Propeller is a multi-processing chip with eight 32-bit processors (cogs) and shared memory with 32 KB of RAM and 32 KB of ROM holding a font, math tables and Spin interpreter. The Spin Stamp includes a Propeller, 32 KB EEPROM, 3.3 V regulator, and 10 MHz crystal oscillator. The Spin Stamp module is not intended to be a direct drop-in replacement for any BASIC Stamp module and there are some important points to consider before purchasing the Spin Stamp:

- A Prop Clip is required to program the Spin Stamp. It is plugged into the four-hole connector on the bottom edge of the Spin Stamp with the badge facing up.
 - The Spin Stamp module's I/O voltage is 3.3 V compared with the BASIC Stamp module's 5 V I/O. Existing projects may require adjustments in software and circuitry to prevent damage to the Spin Stamp. Any input pins that are subject to 5 V must have, at least, a $1\text{ k}\Omega$ or larger resistor that is series-connected.



Propeller Object Library

<http://obex.parallax.com>

The key to using a Propeller and having fun is the availability of objects. Objects provide structure and code reusability. They can be created by one developer and shared with others for use in their projects with or without modification. An object consists of Spin code and optional Propeller Assembly code.

If you've got the right objects, using a Propeller is a matter of high-level integration. The Propeller Object Exchange contains many source code objects for the Propeller chip. They are created and submitted by Propeller customers as well as Parallax engineers for use by everyone in the community. We invite you to share your objects in our new Propeller Object Exchange.

The Propeller Object Exchange is a user-managed, database-driven area where you can upload and download your objects.

To submit objects to the Propeller Object Library users must abide by these rules:

1. Files have no copyright. This is an open exchange among users.
 2. No financial payment from Parallax.
 3. Parallax will not test your objects.

Propeller Discussion Forum at <http://forums.parallax.com>

Check out our Propeller Discussion Forum; accessible from www.parallax.com via the Support » Discussion Forums menu. This is an on-line discussion group especially for Propeller users where you can post your questions or review previous discussions that may have already answered yours. The Propeller Discussion Forum welcomes Propeller users ranging from beginner to expert and even includes some Parallax staff members.



Order online at www.parallax.com

BASIC Stamp®

®

From its humble beginnings in 1992, our BASIC Stamp microcontroller line has expanded to include 8 different models with a broad array of features and capabilities.



The BASIC Stamp Microcontroller Module -

This miniature single-board computer runs the Parallax PBASIC Language Interpreter firmware in its microcontroller chip. The developer's code is stored in an EEPROM, which can also be used for data storage. The PBASIC language has built-in commands that allow the tri-state I/O pins to easily interface with sensors, switches, integrated circuits, LCDs and motors, as well as other BASIC Stamp modules, PCs, and similar devices operating in networks.

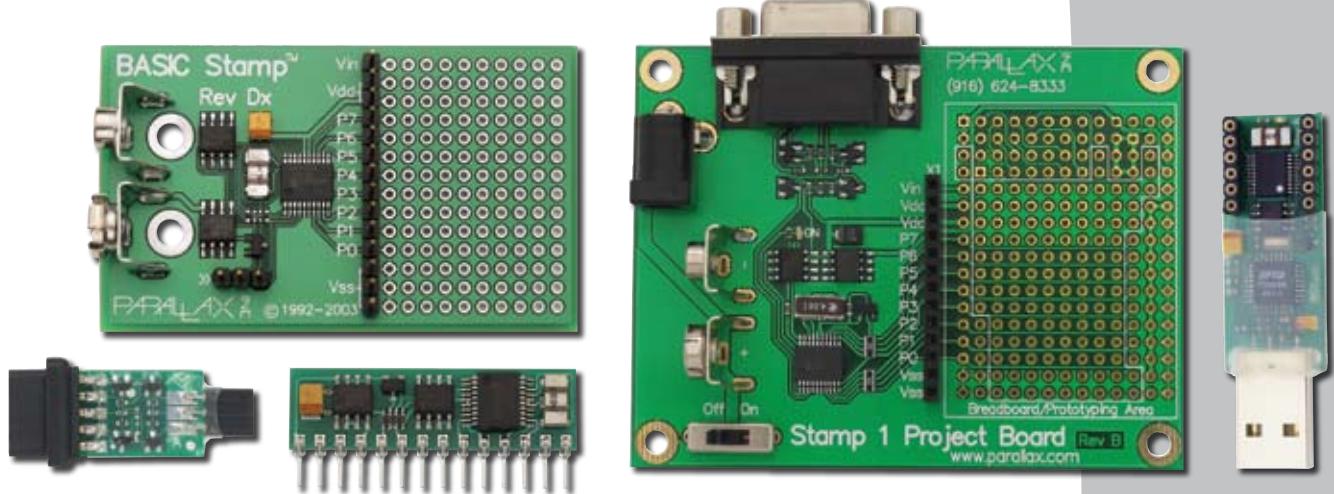
Modules, OEM, and Interpreter Chips -

BASIC Stamp modules have prospered in hobby, education, and custom industrial applications due to ease of use and a wide support base of free application resources. The modules allow engineers to rapidly prototype designs that are then manufactured with our affordable OEM components. For production quantity pricing for our PBASIC Interpreter chips, see our website or contact sales@parallax.com.

The PBASIC Programming Language - This simple, elegant, and powerful language allows anyone to program a microcontroller. Designed around standard BASIC, PBASIC includes familiar program structure commands such as IF...THEN, FOR...NEXT and DO...LOOP, as well as microcontroller specific I/O pin commands like PULSOUT, RCTIME and SERIN. The beauty of BASIC Stamp programming is that you have the power to tell the microcontroller exactly what to do, with high reliability and no guesswork. Your valuable time is saved because the learning curve is short and sample code and resources are abundant. All of our programming software, reference manuals, and educational texts are available for free download on our web site. They are also distributed on the Parallax CD-ROM, which is available for separate purchase (#27000; \$3.95).



All Parallax BASIC Stamp modules are manufactured at our Rocklin, California office. Circuit boards are silkscreened with solder paste (1 and 2). A Pick-and-Place machine places the parts (3). Parts are then visually inspected (4) prior to going through a reflow oven (5). Boards are then washed and cut apart (6) before they are legged and tested.



BASIC Stamp I Microcontroller

BASIC Stamp Rev.Dx (#27100; \$29.95) The original BASIC Stamp module, with a surface-mount BS1, 9 V battery clip, and soldering prototype board all in one package. The 3-pin programming header accepts the **BASIC Stamp I Serial Adapter** (#27111; \$4.95), sold separately.

BASIC Stamp I (#BSI-IC; \$29.00) Functionally equivalent to the Rev.Dx, this 14-pin SIP package is an ideal fit for applications with tight space limitations.

BSI Project Board (#27112; \$14.95) A BASIC Stamp I microcontroller and Serial Adapter built onto a board, along with a mechanically interlocked 9 V battery clip and 2.1 mm power jack, DB-9 programming connector, and an LM2936 regulator providing 40 mA for your projects. 220 ohm resistors inline with all I/O pins prevent damage from accidental short-circuits. A solderless breadboard is included. A good fit for the naturally curious student or engineer who needs a low-cost development platform for their projects.

BSIUSB (#BSIUSB; \$39.95) This handy little device features a BASIC Stamp I with an on-board USB interface and USB-A connector, perfect for adding a user-definable function to your PC.



BASIC Stamp performance, production quantity prices

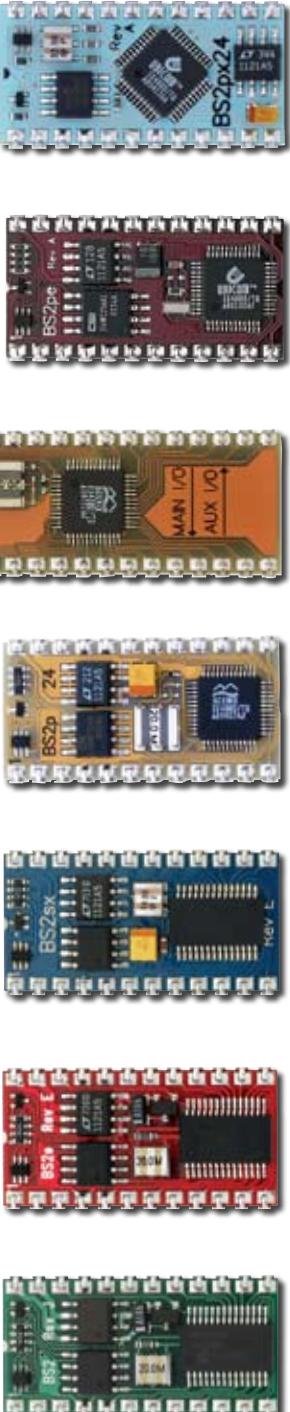
Ready to build in quantity? Build a BASIC Stamp microcontroller on your PCB with our PBASIC Interpreter Chip. We also stock resonators and EEPROM.

Stock code	Interpreter Chip	Ea. @ Qty 100	Ea. @ Qty 1000
PBASIC1/P	BS1 (DIP)	\$6.97	\$4.98
PBASIC1XT/SS	BS1 (SS)	\$6.27	\$4.00
PBASIC2C/P	BS2 (DIP)	\$8.37	\$5.98
PBASIC2CI/SS	BS2 (SS)	\$7.67	\$5.48
PBASIC2E/P	BS2e (DIP)	\$9.07	\$6.00
PBASIC2E/SS	BS2e (SS)	\$7.70	\$5.50
PBASICSX/P	BS2sx (DIP)	\$8.37	\$5.98
PBASICSX-28/SS	BS2sx (SS)	\$8.37	\$5.98
PBASIC48W/P24	BS2p24 (SS)	\$9.07	\$5.83
PBASIC48W/P40	BS2p40 (SS)	\$9.07	\$5.83
PBASIC48W/PE	BS2pe (SS)	\$9.07	\$5.83

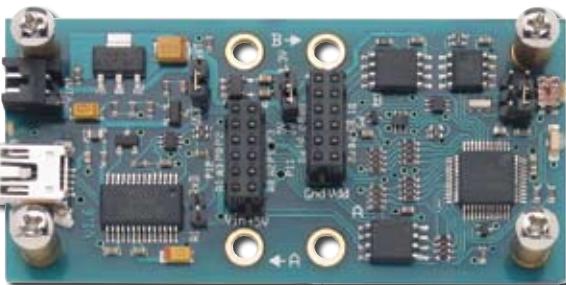
We factory preprogram our PBASIC Interpreter chips with our PBASIC Interpreter firmware so you can use them with OEM EEPROM and resonators to incorporate a fully functional programmable BASIC Stamp microcontroller into your custom PCB designs.

BASIC Stamp 2 Comparison Chart

Our BS2-style modules are easy to use and have an enormous amount of support. The standard BS2-IC is recommended for beginners. Each module's features vary to provide you with flexibility to solve problems.

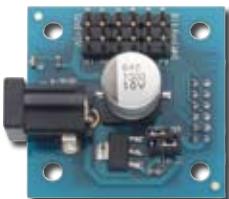


Name of module:	BASIC Stamp 2	BASIC Stamp 2e	BASIC Stamp 2sx	BASIC Stamp 2p24	BASIC Stamp 2p40	BASIC Stamp 2pe	BASIC Stamp 2px
Stock Code # and Price	BS2-IC; \$49.00	BS2E-IC; \$54.00	BS2SX-IC; \$59.00	BS2P24-IC; \$79.00	BS2P40-IC; \$89.00	BS2PE-IC; \$75.00	BS2PX-IC; \$79.00
Processor Speed:	20 MHz	20 MHz	50 MHz	20 MHz Turbo	20 MHz Turbo	8 MHz Turbo	32 MHz Turbo
Program Execution Speed:	~4,000 instructions/second	~4,000 instructions/second	~10,000 instructions/second	~12,000 instructions/second	~12,000 instructions/second	~6,000 instructions/second	~19,000 instructions/second
RAM Size:	32 bytes (6 I/O, 26 Variable)	32 Bytes (12 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)	38 Bytes (12 I/O, 26 Variable)	38 Bytes (12 I/O, 26 Variable)
Scratchpad RAM:	N/A	64 Bytes	64 Bytes	128 Bytes	128 Bytes	128 Bytes	128 Bytes
EEPROM (Program) Size:	2K Bytes, ~500 instructions	8 × 2K Bytes, ~4,000 instructions	8 × 2K Bytes, ~4,000 instructions	8 × 2K Bytes, ~4,000 instructions	8 × 2K Bytes, ~4,000 instructions	16 × 2K Bytes (16K for source), ~4,000 instructions	8 × 2K Bytes (16K for source), ~4,000 instructions
Voltage Requirements	5-12VDC	5-12VDC	5-12VDC	5-12VDC	5-12VDC	5-12VDC	5-12VDC
Current Draw @ 5 V	3 mA Run/ 50 µA Sleep	25 mA Run/ 200 µA Sleep	60 mA Run/ 500 µA Sleep	40 mA Run/ 350 µA Sleep	40 mA Run/ 350 µA Sleep	15 mA Run/ 150 µA Sleep	55 mA Run/ 450 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	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	60 mA/60 mA per 8 I/O pins	60 mA/60 mA per 8 I/O pins
PBASIC Commands	42	45	45	61	61	61	63



The BASIC Stamp 2pe Motherboard (#28300; \$79.95) or “MoBo” provides a compact, professional-grade platform for BASIC

Stamp applications. It includes a USB interface for programming, debugging and powering from an attached PC. With the MoBo and the growing assortment of plug-in daughterboards, you can integrate and package one-off or multiple application systems with ease.



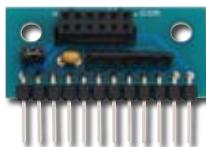
The **PWR-I/O-DB** (#28301; \$14.95) is a daughterboard that provides both power and a handy interface to potentiometers, servos and Parallax's various three-pin sensor devices.



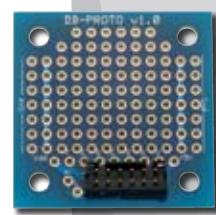
The **BS2PE Proto-DB Prototyping Daughterboard** (#28310; \$1.95) is a convenient through-hole board that allows you to build your own circuits with the MoBo motherboard.



The **7Seg-DB Master Unit Daughterboard** (#28312; \$24.95) provides four digits of LED display, including alphabetic and punctuation capability. With the master module installed, up to seven additional **7Seg-DB Slave Unit Daughterboards** (#28313; \$24.95), may be added, daisy-chain-style, for a total of 32 contiguously-displayed digits.



The **TCS230-DB Color Sensor** (#28302; \$65.95) is a complete color detector, including a TAOS TCS230 RGB sensor chip, white LEDs, collimator lens, and standoffs to set the optimum sensing distance.



The **DB-Expander Daughterboard-to-SIP Adapter** (#28325; \$9.95) provides the means to use daughterboards, designed for Parallax's motherboards, with solderless breadboards and other Parallax Products.



The **Daughterboard Extension Cable** (#800-28301; \$7.95) for convenient connection between the MoBo and daughterboards.



The **MoBo Power Cable** (#800-28300; \$3.20) allows you to connect external power to the BS2pe Motherboard without the need for the Power I/O daughterboard.

BASIC Stamp Discovery Kit

- with Serial Board and USB Adapter
(#27207; \$159.95)

BASIC Stamp Discovery Kit

- with USB Board
(#27807; \$159.95)



The **BASIC Stamp Discovery Kit**, our most popular starter kit, features the *What's a Microcontroller?* (WAM) text and includes all of the BASIC Stamp hardware required to complete the activities and challenges. All you need to add is a 9 V battery or power supply to get up and running.

Our most popular BASIC Stamp microcontroller 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 many applications.

The inclusion of the *What's a Microcontroller?* parts and text make the Discovery Kit 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 Stamp modules. The text contains clear explanations, defines electronics terms in a friendly manner, and most importantly builds your confidence so you can start building your own electronics inventions. Once you've mastered WAM, explore our other Stamps in Class texts.

If you're starting from scratch, this is also the most cost-effective approach. *The BASIC Stamp Discovery Kit includes:*

- BASIC Stamp 2 module
- Board of Education Programming Board
- BASIC Stamp Syntax and Reference Manual
- 10 jumper wires
- Programming cable
- *What's a Microcontroller?* Text
- *What's a Microcontroller?* Parts Kit

Note: Power supply sold separately. We recommend our 9 V, 300 mA supply (#750-00008; \$8.95) or our 7.5 V, 1 A supply (#750-00009; \$10.95).



BASIC Stamp Activity Kit (#90005; \$99.95)

The most successful special we ever created, the **BASIC Stamp Activity Kit** went on to become a permanent offering and features the HomeWork Board project platform with a surface mount BASIC Stamp 2 and the "What's a Microcontroller?" guide. The included components pack allows you to build over 40 projects! Once you've mastered WAM, try other Stamps in Class Kits. The BASIC Stamp Activity Kit is available through Parallax and at select RadioShack stores.



StampWorks Experiment Kit (#27297; \$289.95)

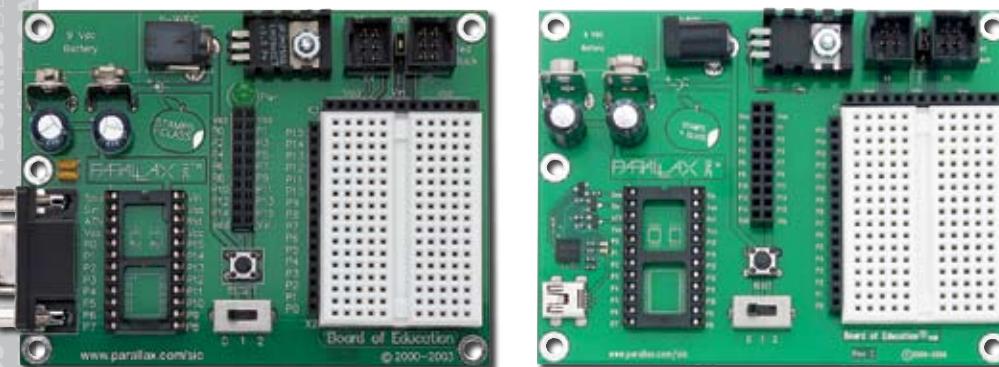
It's easy to get started micro-controlling your world with the **StampWorks Experiment Kit**. The StampWorks manual includes 35 experiments based on the BASIC Stamp 2 microcontroller and the Professional Development Board (included). StampWorks gives you the hardware, the electrical components, and most importantly, the know-how to become a confident embedded programmer. Working your way through StampWorks you will learn about efficient embedded design, connecting circuits and "smart" sensors to the BASIC Stamp, adding computer control to your projects, and "Power PBASIC" programming techniques.

After you've worked your way through StampWorks you'll be able to: flash LEDs, use 7-segment and LCD displays, monitor one or several push-buttons or switches, add sounds and sound effects to your projects, build a simple light-controlled Theremin, control servos and stepper motors, measure temperature, voltage, and much more!

Note: USB to (RS-232) Serial Adapter and USB A to Mini B cable included in this kit.

Originally created as an educational programming platform, the **Board of Education** has become our best selling board because it is so easy to use. The pluggable breadboard area eliminates the need for soldering and allows for easy experimentation. *Main Features of the Board of Education:*

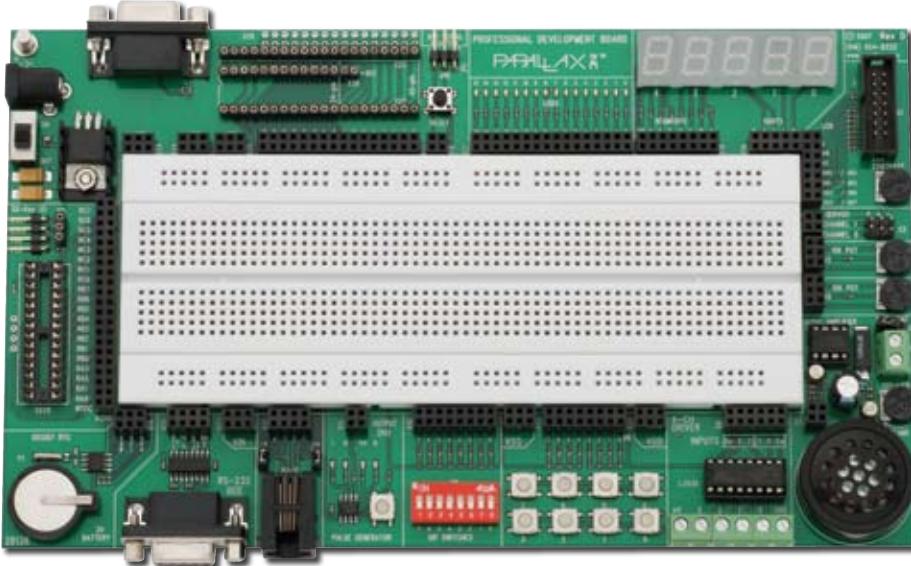
- DIP socket accepts 24-pin BASIC Stamp modules
- Mechanically interlocked power supply prevents dual use of wall-pack and battery
- I/O pins P0-P15,Vin,Vdd (+5 V), and Vss connections brought adjacent to 5.1 x 3.5 cm (2 x 1 3/8") breadboard area
- Four 3-pin servo headers with Vdd/Vin jumper for power source selection
- 3-position switch powers board with or without powering servo headers
- Female 2 x 10 AppMod header accepts optional accessory boards
- Designed for use with the Stamps in Class Parts & Text Kits



Through-Hole Development Boards - Is soldering more your speed? These through-hole boards are perfect for your dedicated projects. The BASIC Stamp Super Carrier Board fits all 24-pin BASIC Stamp modules and has an additional socket for the 14-pin BASIC Stamp 1 module. All three boards pictured below contain: through-hole prototype area, battery clip, and reset button. A 9V battery is required (not included) for the BASIC Stamp 1 and 2 Carrier Boards; the Super Carrier Board also accepts a power supply (sold separately; #750-00009). BS1 programming requires the BASIC Stamp 1 Serial Adapter (#27111; \$4.95) sold separately.



Call Parallax toll-free 888-512-1024



**Customer
Favorite!**

**Professional
Development
Board**
(#28138; \$149.95)

Note: Professional Development Board is included in the StampWorks Experiment Kit (page 17)

The **Parallax Professional Development Board** (PDB) is high-quality, fully-integrated development platform for BASIC Stamp, Javelin Stamp, and SX28AC/DP microcontrollers. A wide variety of typical I/O (LEDs, LCD interface, buttons, etc.) devices and circuitry are built into the PDB, providing the developer with an ideal platform for rapid microcontroller project development. Three sets of sockets are provided that allow the PDB to accommodate the BS1-IC module, the 24- or 40-pin BASIC Stamp modules, the 24-pin Javelin Stamp module, as well as the SX28AC/DP Microcontroller with an SX-Key. The SX28 socket is mechanically separated from the other modules and allows the SX28AC/DP to run with all BASIC Stamp and Javelin Stamp modules except the BS2p40.

Programming cables/adapters sold separately: Serial cable (#800-00003; \$10.00). USB to Serial Adapter and cable (#28031; \$17.95). BASIC Stamp 1 Serial Adapter (#27111, \$4.95). Power supply sold separately; we recommend our 12 V 1 Amp supply (#750-00007; \$9.95)

Features:

- 40-pin DIP socket (for all BASIC Stamp 24/40-pin and Javelin Stamp modules)
- 14-pin SIP socket (for BS1-IC)
- 28-pin "skinny" DIP socket (for SX28AC/DP)
- DB-9, BS1, and SX-Key programming connectors
- 2.1 mm, center-positive connector for DC power
- 5 volt, 1.0 amp voltage regulator with power switch
- 16 discrete blue LEDs
- Five blue 7-segment (with decimal point), common-cathode LED displays
- Parallel LCD (available separately) may be configured in 4-bit or 8-bit mode
- Two servo-compatible headers
- Two 10 kΩ potentiometers
- Audio amplifier with built-in speaker; with switch for external speaker
- L293D high-current driver (motors, solenoids, etc.)
- Eight normally-open pushbuttons (I/O lines protected and pulled to Vdd via 10 K)
- Eight DIP switches (I/O lines protected, and pulled-up to Vdd via 10 K)
- Pulse generator with selectable frequency (1 Hz, 10 Hz, 100 Hz, or 1 kHz)
- RJ-11 connector; configurable for X-10 and 1-Wire communications
- RS-232 DCE port with MAX232E transceiver
- DS1307 (I²C) real-time-clock with 3V back-up battery (pre-installed)

FTDI USB Chips

Parallax stocks the most common FTDI devices in production quantities; others are stocked in prototype quantities. If you are interested in volume pricing please inquire with our Sales Department (e-mail: sales@parallax.com).

Technical Support for Using FTDI in Circuits

Parallax technical support staff can answer your questions about interfacing FTDI chips. See our Support Resources to contact our support team. Our primary experience lies with the FT232BL, FT245BL, and the new FT232RL as we use them in our own designs (USB Board of Education, Oscilloscope, etc.), though all parts operate in a similar capacity and have well-documented datasheets. FTDI maintains an active web site with current datasheets.



FTDI Chip	Description	Qty. 1 Price
FT245RL (#604-00049)	32-pin LQFP; USB to parallel FIFO up to 1 Mbyte/s	\$4.15
FT232RL (#604-00043)	28-pin SSOP; USB to serial TTL-level UART up to 3 Mbit/s	\$3.99
FT232RQ (#604-00047)	32-pin QFN; USB to serial TTL-level UART interface	\$4.19
FT232BL (#604-00031G)	32-pin LQFP; USB to serial TTL-level UART up to 3 Mbit/s	\$4.95
FT245BL (#604-00032G)	32-pin LQFP; USB to parallel FIFO up to 1 Mbyte/s	\$4.95
FT2232L (#604-00033G)	48-pin LQFP; Dual channel configurable FT232BM or FT245BM with multi-protocol synchronous serial engine (for SPI, JTAG, etc.) with data rates up to 5.6 Mbits/s	\$6.95



The **Vinculum VNC1L-1A USB Host Controller**

Device (#604-00051; \$10.95) handles the USB Host Interface and data transfer functions, and owing to the inbuilt 8/32-bit MCU and embedded Flash memory the VNC1L-1A encapsulates the USB device classes as well. When interfacing to mass storage devices such as USB Flash drives, VNC1L-1A also transparently handles the FAT file structure communicating via UART, SPI or parallel FIFO interfaces via a simple-to-implement command set. The VNC1L-1A device features two USB Ports which can be individually configured by firmware as Host/Slave ports.

The **Memory Stick Datalogger** (#27937; \$34.95) is a USB host bridge which allows you to connect a USB mass storage device, such as a thumb drive, to your BASIC Stamp, SX or Propeller Microcontroller. The Vinculum Chip on the Datalogger handles the file system of the Memory Stick so that you can share the files with your PC using simple serial commands.



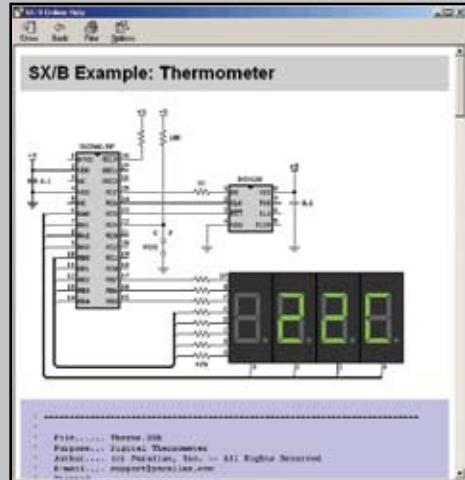
Call Parallax toll-free 888-512-1024

SX/B

Our **FREE** compiler allows you to program SX chips in **BASIC**!

SX/B is a BASIC compiler that allows you to develop professional and powerful applications using the SX series of microcontrollers. Interfacing with other devices is easy because SX/B has high-level commands for Serial, SPI, I²C and I-Wire.

The SX/B compiler is built right into the free SX-Key IDE software. It supports the entire SX series SX20, SX28, and SX48. BASIC keywords are highlighted automatically within the editor. The help file has a comprehensive list of all of the SX/B commands and many examples of their use.



With SX/B, interrupts have never been easier. Creating a periodic interrupt every millisecond is as simple as "INTERRUPT 1000". Best of all there is no restriction on what commands can be used in an interrupt routine. Interrupts on the SX microcontrollers are designed to be deterministic, so very accurate timing can be generated with interrupt code.

The Parallax support forum for SX/B is very active. Sometimes questions are answered within the hour. And not just simple questions, some of the best SX/B users patrol the forum daily. Don't spend hours or days trying to get your code working, take a couple minutes and put a thread on the forum.

Because speed is one of the SX's best features, the compiler generates code "in-line". That is each line of BASIC code generates the code to completely perform the BASIC code. This creates code that executes quickly, and allows users who are interested in assembly language to see "how it's done". And if you simply must have some assembly code in your program, SX/B allows you to add it easily using ASM...ENDASM. Or, single lines of assembly can simply be prefixed with a slash.

SX/B has powerful subroutine and function handling. The compiler performs parameter checking and subroutine and function name do not require any "GOSUB" or "CALL" prefixes. It's like the subroutine or function is part of the language. You can even create subroutines and functions that have optional parameters.

The SX microcontrollers also have integrated debugging facilities. Using the SX-Key programmer you can watch variables, set break points and single-step your code. The debugger also shows all the registers and a complete memory map. The SX-Key also contains a frequency generator that allows you to run your code at clock speeds from 400 kHz to 100 MHz with crystal-controlled accuracy.

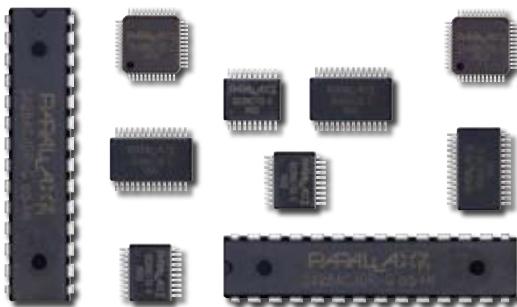
*Note that the SX-Blitz development tool does NOT support debugging or clock frequency generation.

SX Microcontroller

In 2005 Parallax and Ubicom formed an agreement in which Parallax became the only worldwide distributor of the SX microcontroller. Parallax currently supplies, distributes, packages, test/qualifies and supports the SX20AC/SS-G, SX28AC/SS-G, SX28AC/DP-G, SX48BD-G. All chips are RoHS compliant.

Parallax has actively supported the SX chip since 1997 and will continue to enhance this level of support with excellent telephone customer support, SX discussion forums, Design Contests, improved and expanded educational material, and low-cost development tools. Programming tools such as the SX Key, SX Proto Board, SX Blitz, SX Key Ring, SX Tech Board, and Professional Development Board allow for high-quality easy programming of every SX Chip commercially available. Parallax sells these tools and is dedicated to providing customers with the documentation and software needed to get up and running.

Chip Name/ Part #	Pins / I/O	EEPROM/RAM	Price	Rail/Tray Quantity
SX20AC/SS-G	20 / 12	2K / 137 bytes	\$2.79	67 per Rail
SX28AC/SS-G	28 / 20	2K / 136 bytes	\$2.79	48 per Rail
SX28AC/DP-G	28 / 20	2K / 136 bytes	\$2.79	16 per Rail
SX48BD-G	48 / 40	4K / 262 bytes	\$2.79	250 per Tray



Quantity discounts are available on all SX chips. Contact with our Sales Department via e-mail (sales@parallax.com) or by telephone 888-512-1024 (international customers use (916)624-8333).

Reasons why the SX chip might be perfect for your next project or product:

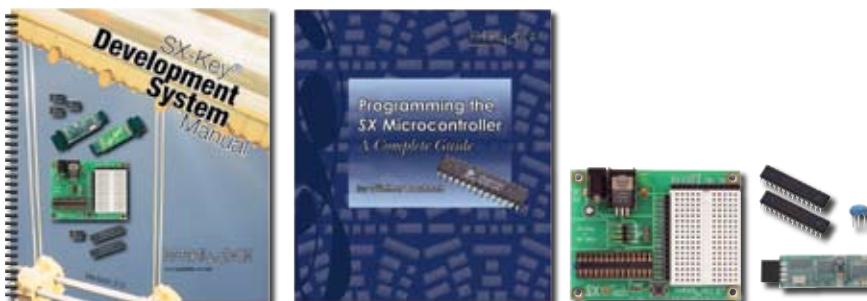
- Up to 75 MIPs performance
- Non-branch instructions are single cycle
- Fast and deterministic 3-cycle interrupts
- I/O pins have selectable internal pull-ups
- TTL, CMOS, or Schmitt Trigger selectable inputs
- Built-in comparator support
- On-chip in-system debugging support logic
- Programmable in Assembly, SX/B, and third-party C compilers

You can easily port your BASIC Stamp prototype to the SX chip for permanent/production units with the aid of the free SX/B BASIC compiler (previous page).

SX Programming Kits

Our SX Tech Tool Kits are an excellent starting point to get you developing SX projects with Parallax's SX-Key USB programming tool. Upon receiving the kit, you will be able to program SX chips within the hour!

Both kits include the SX Tech Tool Board, SX-Key USB programming tool and USB cable, two SX28 DIP chips, and two resonators. Both kits also include the SX-Key Development System Manual; the **SX Tool Kit Plus** adds Programming the SX Microcontroller; A Complete Guide. Note: A power supply is not included. We recommend the 7.5 V, 1 A power supply (#750-00009; \$10.95), sold separately.



SX Tool Kit LITE
(#45180; \$89.95;
not pictured)

SX Tool Kit PLUS
Includes Programming
the SX Microcontroller;
A Complete Guide by
Gunther Daubach
(#45181; \$99.95)



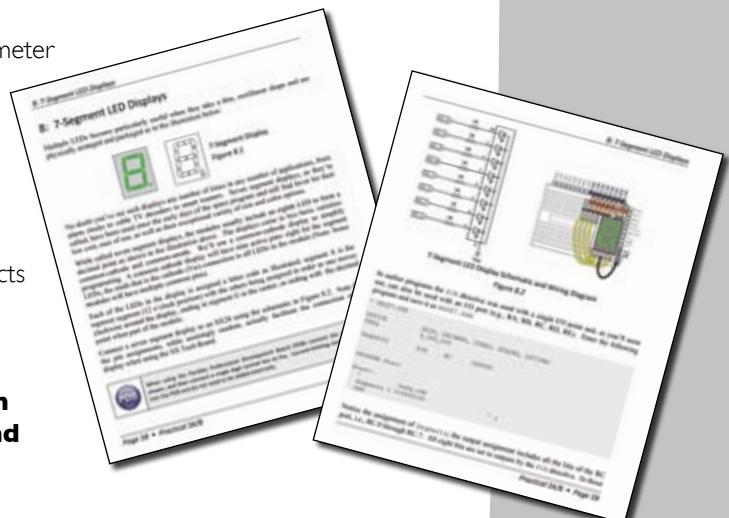
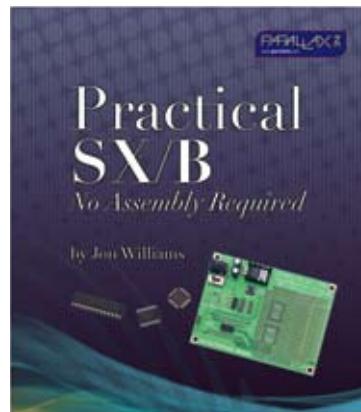
Coming Soon: Practical SX/B (No Assembly Required!) written by Jon Williams

This work-in-progress by popular Nuts & Volts' Stamp Application columnist Jon Williams introduces SX chip programming with SX/B in a beginner-friendly, step-by-step format. A sampling of chapter topics includes:

- Quick-start: Success in Under 30 Minutes
- The LED Blinker Program - How it Works
- Decision-Making and Program Flow
- Simple Analog Input - Reading a Potentiometer
- Using and Managing Variable Space

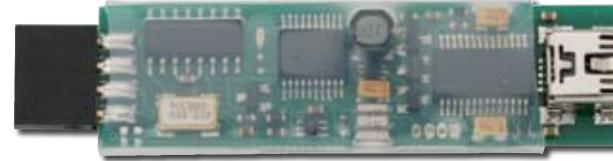
Schematics and wiring diagrams for the SX Tech Board are included. In addition to example programs and applications, practical advice for good programming habits and methods for tackling large programming projects equip the reader for success.

Check out the SX Microcontroller forum at forums.parallax.com for an advanced peek at chapter drafts, and news of the book's progress.



**SX-Key USB
Development
Tool (#552-
00007; \$49.95)**

The **SX-Key USB** is the main programming and debugging tool for the Parallax SX chips. This tool takes the place of the serial version and utilizes a USB programming interface. Supported by the SX-Key software, the SX-Key USB programming tool 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 Win2K/XP/Vista platforms.



**SX Blitz Module
- USB (#45170;
\$29.95)**

The **SX Blitz** is a low-cost alternative to the SX-Key development tool. The SX-Blitz provides programming capabilities for the SX line of microcontrollers, supporting every chip that is commercially available. Unlike the SX-Key however, it does not provide in-circuit source-level debugging capabilities.

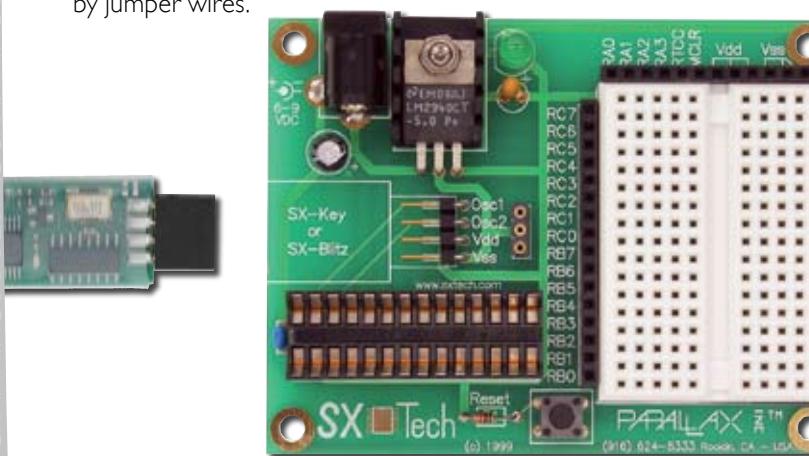


**Both of our SX programming tools (SX-Key and SX Blitz)
are now USB-compatible!**

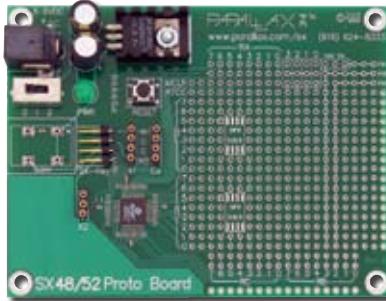
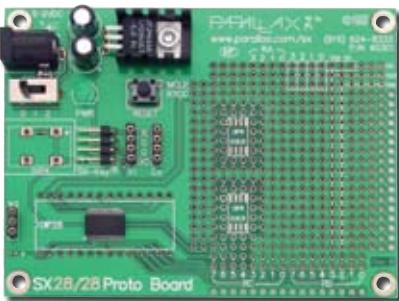


**SX Tech Board
(#45205; \$39.95)**

The **SX Tech Board** is our project area for the SX microcontroller. Simply plug in the SX-Key and power; then 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.



Connections to the SX-Key and resonator are already made. Note: 28-pin SX DIP chip (#SX28AC/DP-G; \$2.79) is required to use this board, but is not included. Power Supply sold separately. We recommend our 7.5 V, 1 A supply (#750-00009; \$10.95).

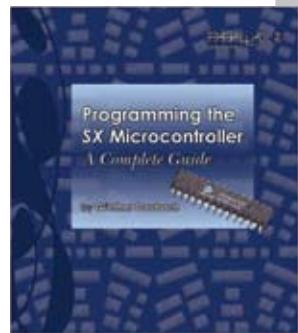
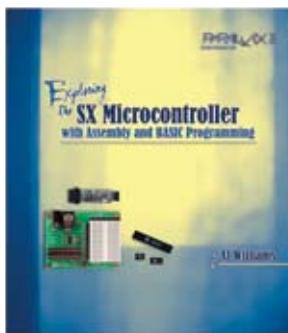


SX28 Proto Board
(#45302; \$9.95)

SX48 Proto Board
(#45300; \$9.95)

Parallax's **SX28 and SX48 Proto Boards** provide super low-cost, high quality solutions for using the surface mount SX chips easily. Features of the SX Proto Boards:

- Surface-mount SX chip (28-pin or 48-pin)
- LM2940 voltage regulator- input power supply of 6-9 vdc provides up to 1 Amp
- SX-Key programming port with TTL oscillator mechanical interlock prevents both from being used at the same time
- Three-position power switch (off, logic power, power to logic and servo ports)
- Clock configurations supported with additional components sold by Parallax: TTL oscillator (DIP-8); ceramic resonator (SIP3); Crystal (HC/49)
- Smart prototype holes for servo headers, DIP and SOIC8 components



The **SX-Key Development System Manual** is a complete hardware and assembly language reference for the Parallax SX-Key hardware and software. A detailed overview of the intuitive SX-Key IDE explains the features and functions in the software menu system. A section of special features of the SX is accompanied with coding tips to take advantage of the precise timing, interrupt capability and port configuration options for edge detection, wake-up and comparators.

Exploring the SX Microcontroller is recommended as your first introduction to the SX Microcontroller and assembly language. This text provides assembly code listings for typical circuits using the SX28. Circuits include indicator lights, pushbutton control switches, A/D and D/A conversion for reading sensors, RS-232 communication, and LCD displays. *Exploring the SX Microcontroller with Assembly and BASIC Programming* includes assembly and BASIC code examples with the SX/B compiler.

Programming the SX Microcontroller: A Complete Guide by Gunther Daubach covers the SX-Key debugger, registers and code windows while developing timing-based programs. The chapters provide detailed explanations of architecture including register use, memory configuration, interrupts, and stack management. Short program examples are used to demonstrate arithmetic and logic instructions, Virtual Peripherals and UARTs. Applications examples in the second half of the book include function generators, pulse width modulation, analog to digital conversion, reading keypads, controlling LED displays, and serial bus communication.

SX-Key Development System Manual
(#45111; \$16.95)

Exploring the SX Microcontroller
(#70014)
FREE DOWNLOAD

Programming the SX Microcontroller
(#70002; \$29.95)

Parallax Education

The Stamps in Class™ program was created in 1998 to support education. To this day, we strive to provide educators with affordable materials to teach students a range of microcontroller-related skills. This includes disciplines such as programming, robotics, analog and digital, electronics, and process control. The keys to jump-starting our educational program was the release of the Board of Education® programming platform, the availability of free educational texts via downloads, and our popular BASIC Stamp Educator's Courses. This 3-pronged effort of hardware, student guides, and training provided educators with a complete solution.

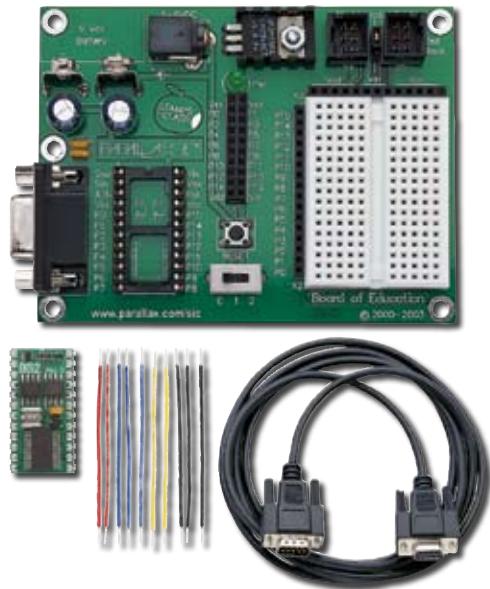


The BS2-IC microcontroller and the Board of Education platform have inspired students around the world to embark on engineering career paths. Educator's Courses have been held across the United States and around the world. The combination of industry-quality hardware/electronics with hands-on training, free software, documentation, and support provides educators and students with the opportunity to learn and teach on the cutting edge.

The Stamps in Class books are available for free download and duplication by educators when used with the correlating Parallax Stamps in Class hardware and BASIC Stamp hardware.

The **Board of Education "Full Kit"** contains a Board of Education carrier board, BASIC Stamp 2 module, pluggable wires, and programming cable. If you plan to purchase the Stamps in Class parts and text selections or if you have a workshop full of LEDs, resistors, capacitors, sensors and more, then this is the right kit for you. Note: Power supplies are sold separately. We recommend our 9 V, 30 mA supply (#750-00008; \$8.95) or our 7.5 V, 1 A supply (#750-00009; \$10.95).

- **Board of Education Full Kit - Serial Version; #28103; \$99.95**
- **Board of Education Full Kit - USB Version; #28803; \$99.95**

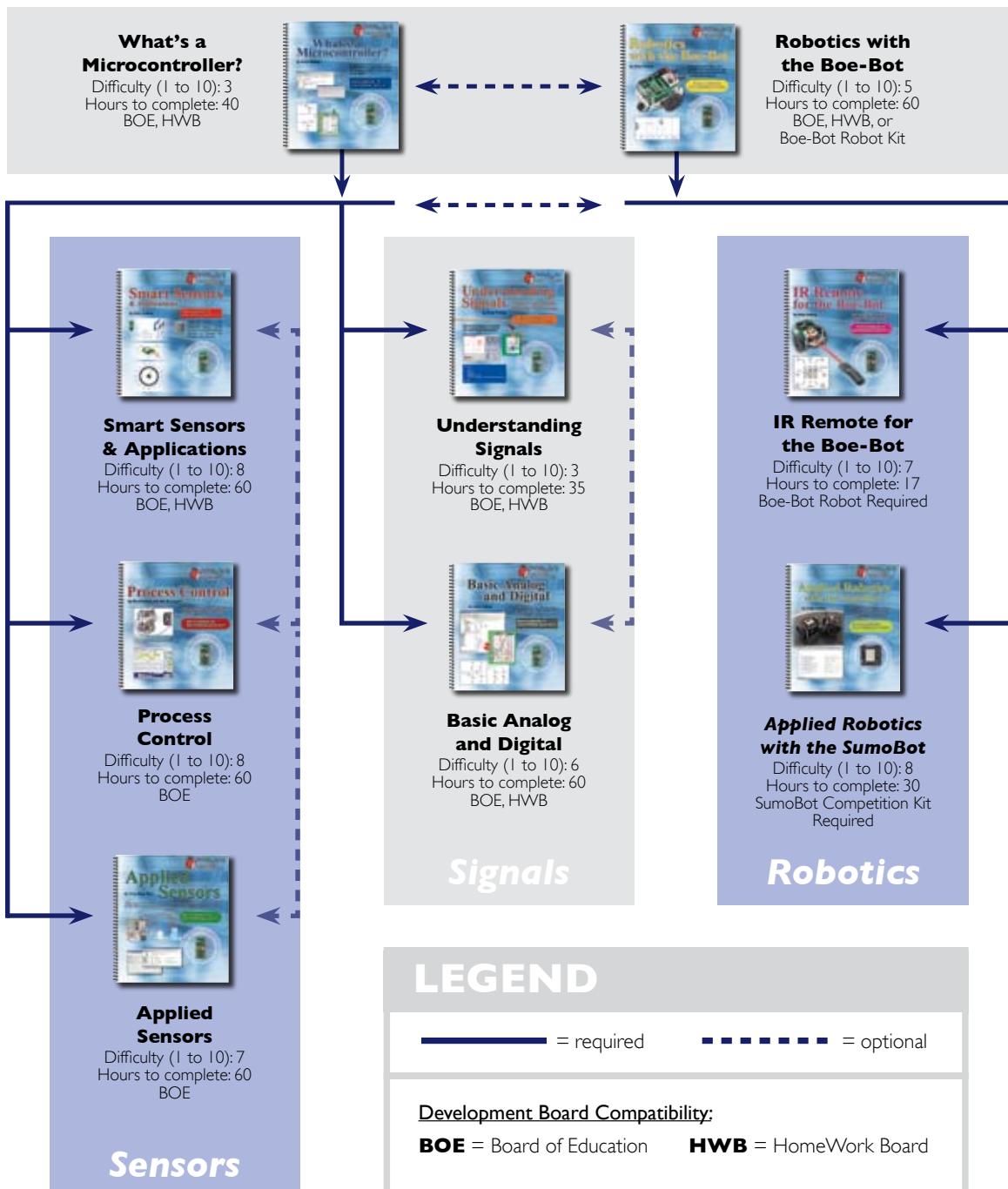


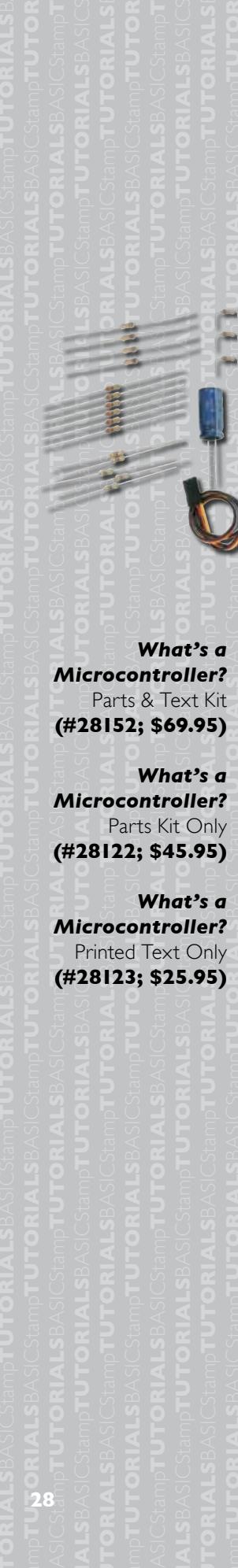
“Parallax products (hardware, software, and documentation) are quite formidable, even at the college/university level, I have used the Boe-Bot kits for teaching anywhere from K-12 (Outreach Program) through undergraduate students of our IEEE Chapter who want to be involved in the IEEE Micromouse contest. So, to all, keep up the good work!”

-Francisco A. Zabala

BASIC Stamp Education Flowchart

Use this handy flowchart to plot your path through the Stamps in Class tutorials. If you are an educator, choose an introductory tutorial and follow the path along whichever subject track will be most applicable for your students. Please note: while you can start with the Robotics with the Boe-Bot text, it is recommended that you have your class complete the What's a Microcontroller? text first. What's a Microcontroller? is our most complete introductory text that will explain all aspects of PBASIC programming to your students. Those students/classes who are already skilled in programming and circuit interaction do not need to complete the introductory texts to use our higher level tutorials. Parallax's educational paths do not necessarily require a completion of the entire progression.





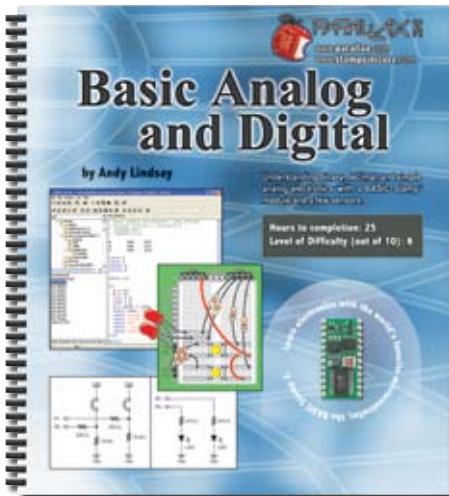
As titled, **What's a Microcontroller?** (WAM) answers the question of how to design customized, intelligent inventions using the BASIC Stamp 2 module. The activities incorporate a variety of fun and engaging experiments that appeal to one's imagination using motion, light, sound, and tactile feedback 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.

What's a Microcontroller? 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 ring tone player

Throughout the text, you are writing and downloading PBASIC code to a BASIC Stamp module, building circuits on a breadboard, and implementing them with components which include: LEDs (light emitting diodes), a 7-segment display, resistors, capacitors, a piezospeaker, 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.

This kit requires a Board of Education Full Kit (page 26) and power supply or 9 V battery, not included. It is also fully compatible with the HomeWork Board. For complete kits that include the What's a Microcontroller Parts & Text, check out the BASIC Stamp Discovery Kit on page 16 and the BASIC Stamp Activity Kit on page 17.

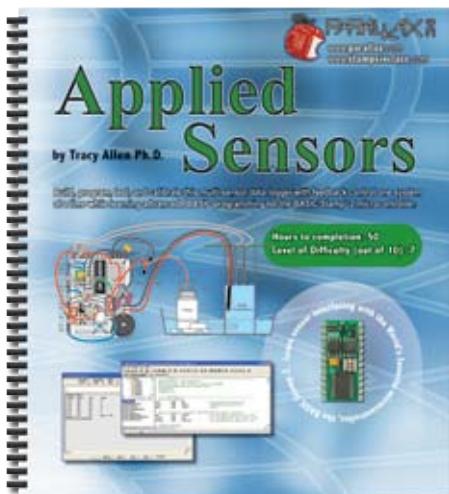


Basic Analog and Digital is a 162-page tutorial that covers the essentials of 8-bit A/D and D/A conversion using a BASIC Stamp module. The text introduces PBASIC commands for A/D conversion with resistor/capacitor circuits, interfacing an ADC0831 8-bit A/D converter, scaling analog outputs into meaningful digital values, analyzing time-varying signals, and using PWM as analog output. These concepts are conveyed using potentiometers, LEDs, speakers, photoresistors, and buttons. The text was written by Andrew Lindsay of Parallax, and is available for purchase or download. *This kit requires a Board of Education Full Kit (page 26) and power supply or 9 V battery, not included. It is also fully compatible with the HomeWork Board.*

Basic Analog and Digital Parts & Text Kit (#28155; \$49.95)

Basic Analog and Digital Parts Kit Only (#28128; \$29.95)

Basic Analog and Digital Printed Text Only (#28129; \$24.95)



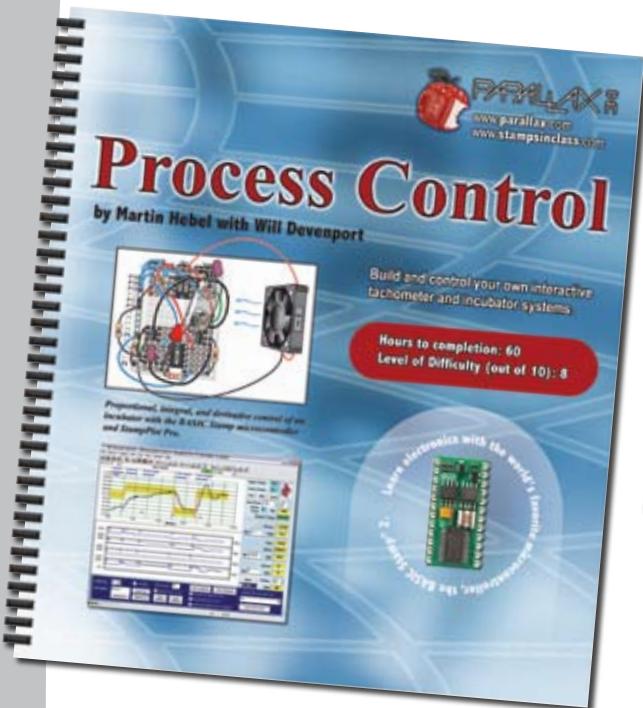
Applied Sensors (originally *Earth Measurements*) was written by Dr. Tracy Allen of Electronically Monitored Ecosystems in Berkeley, California. The 201-page text is an excellent primer on BASIC Stamp program structuring, sensor calibration, and serial

communication we offer. Concepts are taught using an earth science theme with emphasis on resistor/capacitor networks, serial communication, and data logging. The final *Applied Sensors* experiment (which is a favorite of many customers) 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 module's EEPROM. The BASIC Stamp module's debug command is used to receive all of the data into a PC where it may be pasted into a spreadsheet or other program for analysis. *This kit requires a Board of Education Full Kit (page 26) and power supply or 9 V battery, not included.*

Applied Sensors Parts & Text Kit (#28153; \$89.95)

Applied Sensors Parts Kit Only (#28126; \$59.95)

Applied Sensors Printed Text Only (#28127; \$31.95)



Virtually everything you use or consume has undergone some type of automated process in its production. With the activities in the **Process Control** tutorial, you will learn these principles hands-on:

- Flowcharting
- Mechanical and digital switching
- Open and closed loop systems
- Control methods including on-off, differential gap, and PID
- Managing error, spurious signals and bounce
- Transistor and Operation Amplifier principles
- High-voltage/Current interfacing and PWM

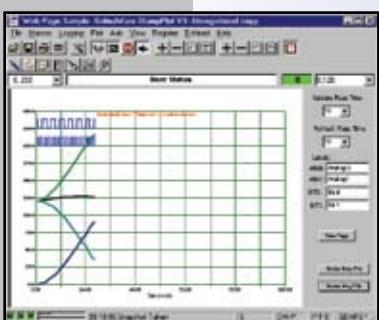
Process Control
Parts & Text Kit
(#28176; \$49.95)

Process Control
Parts Kit Only
**(#130-28176;
\$29.95)**

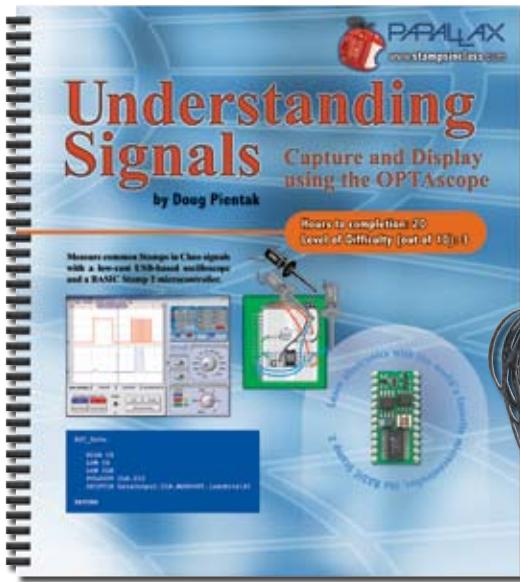
Process Control
Printed Text Only
**(#122-28176;
\$24.95)**

Embedded process control centers around the microcontroller; yet it is only one piece of the total control system. The process control technician must be part control engineer, electronics technician, and computer programmer. The text builds this foundation through hands-on laboratory circuits and experiments that reinforce short, relative discussions of control theory. You will experiment with event-based and time-based sequential control as well as various open-loop and closed-loop continuous control modes. You will understand the characteristics of these modes of control and how they lend themselves to different types of control applications.

This kit requires a Board of Education Full Kit, power supply and 9 V battery, not included.



An exciting and powerful software application comes with this text to help you visually understand the dynamics of a system as well as allow you to develop computer-based monitoring and control of your BASIC Stamp. The **StampPlot** software's multiple-channel graphing feature is used throughout the text to allow you to monitor and compare input and output relationships to better understand the dynamics of the control system. The StampPlot Pro graphical software interfaces provide monitoring, interactive control, and logging to help you analyze your data. StampPlot Pro, macros, and BS2 source code can be downloaded from www.parallax.com.



The *Understanding Signals* text provides an excellent introduction to using the Parallax USB Oscilloscope. Each activity includes a BASIC Stamp-controlled example circuit and code, directions for configuring the oscilloscope and placing the probes, and screen-captures of the Parallax USB Software interface displaying the signals. All electronic components needed are included in the *Understanding Signals* Parts and Text kit.

Topics covered in *Understanding Signals* include:

- Analog inputs from photoresistors and A/D converters
- RC-time in resistor-capacitor networks
- Asynchronous serial communication between the PC and a BASIC Stamp module
- Synchronous serial communication between a BASIC Stamp and ADC0831 A/D converter
- Single and dual sine waves
- Servo pulse signals over an entire range of motion
- Pulse width modulation with infrared
- Decoding of infrared remote control signals
- Voltage amplification and inversion with DC offset with an op-amp

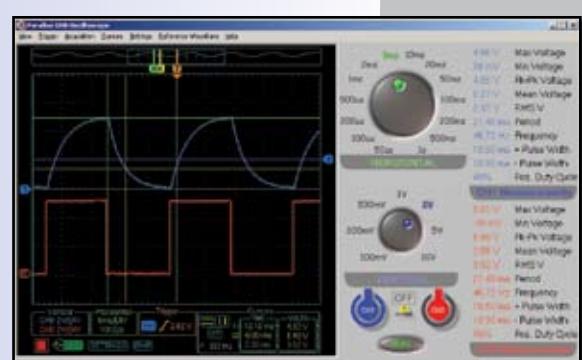
This kit requires a *Board of Education Full Kit* (page 26) and power supply or 9 V battery, not included. It is also fully compatible with the *HomeWork Board*.

***Understanding Signals* Parts & Text Kit (#28119; \$159.95)**

***Understanding Signals* Printed Text Only (#70009; \$19.95)**

For more information on the Parallax USB Oscilloscope see page 45 of this catalog.

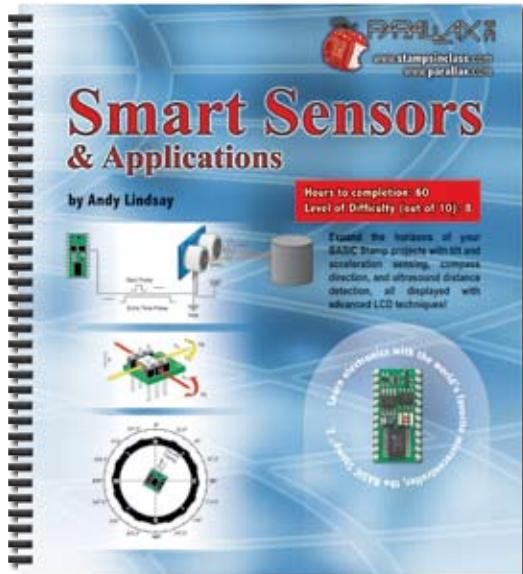
The activities in *Understanding Signals* v1.0 require the Parallax USB Oscilloscope software version 4.0, which runs on most Windows 2K and XP operating systems. The Parallax USB Oscilloscope Software Version 5 (right), which runs on most Windows XP and Vista systems, does not fully support the activities in *Understanding Signals*. Both versions of the software are available from the 28014 product page at www.parallax.com.



**Smart Sensors
and Applications**
Parts & Text Kit
(#28029; \$139.95)

**Smart Sensors
and Applications**
Parts Kit Only
(#130-28029;
\$129.95)

**Smart Sensors
and Applications**
Printed Text Only
(#122-28029;
\$29.95)

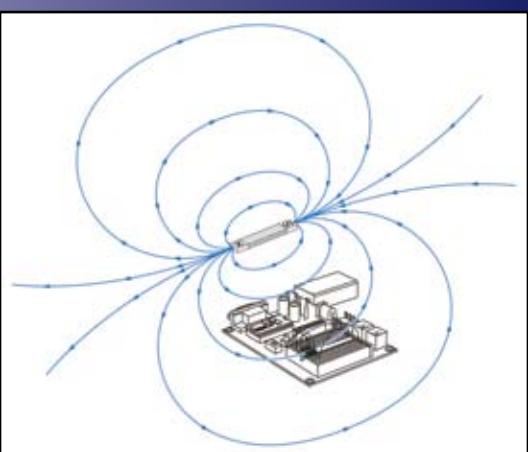
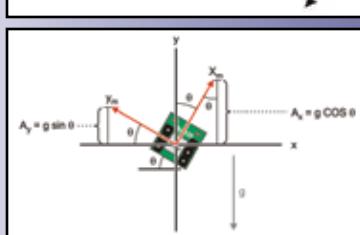
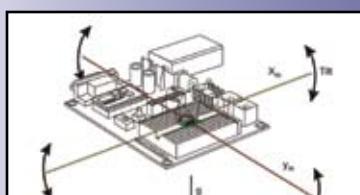


Smart Sensors and Applications is our newest programming tutorial in the Stamps In Class educational series. Expand the horizons of your BASIC Stamp projects with tilt and acceleration sensing, compass direction, and ultrasound distance detection, all displayed with advanced LCD techniques. Add powerful sensors and great LCD display tricks to your BASIC Stamp projects. This advanced Stamps In Class text is a perfect sequel to the *What's a Microcontroller?* or *Robotics with the Boe-Bot* tutorials. All electronic components for the breadboard circuits, LCD extension cables, and LCD mounting brackets are included. This book includes an in-depth introduction to each device:

- Measure distance with the PING))) Ultrasonic Distance Sensor, accounting for the change in the speed of sound with air temperature.
- Make a tilt-controlled video game and an acceleration datalogger with the Memsic Dual-Axis Accelerometer.
- Get oriented with the Hitachi HM55B Compass Module.
- Display sensor readings as scrolling text, bar graphs, custom characters and animations with the Parallax 2 x 16 Serial LCD.

This kit requires a Board of Education Full Kit (page 26) and power supply or 9 V battery, not included. It is also fully compatible with the HomeWork Board.

Learn how to use the Memsic Dual Axis Accelerometer to measure tilt (top left) or rotation (bottom left). Discover how the HM55B Compass Module detects the Earth's magnetic fields for navigation (right).





Learn from Parallax BASIC Stamp Educators Courses

BASIC Stamp Educators Courses are 2-day hands-on seminars that help new teachers get a running start preparing to use Stamps in Class kits and texts in their classroom. These seminars also provide more resources, techniques and concepts for instructors who are already using Stamps in Class materials. Courses are typically held during the summer at selected cities within the continental United States. Our 2008 schedule and online enrollment are available through the Education page at www.parallax.com. The cost to attend a standard BASIC Stamp Educators Course is \$199.00; this includes two days of training as well as the BASIC Stamp Activity Kit and Boe-Bot Robot Kit that are used during the seminar.

Attendees get to keep the kits so that they can continue preparing course material, and colleagues tend to really appreciate Boe-Bot robot demos and antics. The courses are open to educators only, from public and private middle schools, high schools, vocational and technical schools, colleges and universities, as well as homeschool teachers.

Educators Course Topics:

- How microcontrollers like the BASIC Stamp are the computer brains in the products we use every day
- Introduction to the BASIC Stamp microcontroller and PBASIC programming language
- Controlling digital output and monitoring digital input with light emitting diodes (LEDs) and pushbuttons
- Controlling analog output and measuring analog input with a variety of devices including servo motors, potentiometer knobs, light sensors, and speakers
- Controlling output devices such as motors and displays based on sensor measurements
- Robotics applications with the Boe-Bot, an autonomous mobile robot with a BASIC Stamp microcontroller brain
- After writing basic navigation programs, build and test contact and non-contact sensor circuits on the Boe-Bot prototyping area
- Teachers program the Boe-Bot robot to sense its surroundings, make navigation decisions and solve problems autonomously

How to Host a BASIC Stamp Educators Course



BASIC Stamp Educators Courses are a tremendous resource made possible by the generosity of local teachers who host these courses. After making sure enough local teachers will want to attend, (10 is a good minimum), any teacher interested in hosting is encouraged to contact StampsInClass@parallax.com. After the course is scheduled, Parallax promotes the course via our web site and our discussion forums. Our web site contains valuable downloads including set up arrangements and a sample syllabus.

Host Requirements*:

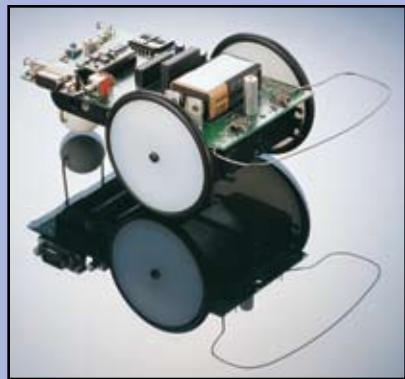
- Minimum enrollment of 10 participants who have purchased seats 8 weeks before the start of the course
- A computer laboratory with a minimum of 15 PCs that have serial or USB port connections and the BASIC Stamp Editor software installed and tested
- An LCD projector and screen
- Notification to your local and state technology groups that the course will occur

* For a complete list, see the Education page at www.parallax.com.

Robotics

PARALLAX TIME CAPSULE:

Parallax introduced our first robot kit in 1999. The robot was dubbed the "GrowBot" for its expandable and versatile nature. This robot was the jumping off point for what later became the Boe-Bot, our popular entry-level robot, a hit with hobbyists, engineers, and students alike.



The **Scribbler Robot** (#28136; \$79.95) is perfect for beginners age eight and up. This reprogrammable robot comes fully assembled including a built-in BASIC Stamp 2 microcontroller brain. It arrives pre-programmed with eight demo modes, including light-seeking, object detection, object avoidance, line-following, and more.

Place a marker in its Pen Port and the Scribbler draws as it drives. Write your own programs in two formats: graphically with the Scribbler Program Maker GUI software, or as PBASIC text with the BASIC Stamp Editor. Both software packages, programming guides, and many other resources are included on the Scribbler CD-ROM.

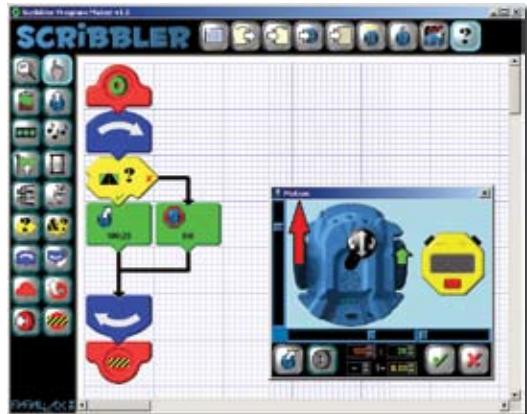
Your programs can interface with these Scribbler components:

- 3 photoresistor light sensors
- 2 Infrared object sensors
- 2 Infrared line detection sensors
- 2 independent DC motors
- Stall sensor
- Speaker with full range of notes
- 3 LED indicator lights

The Scribbler Robot kit includes:

- Fully assembled Scribbler Robot
- Programming Cable (serial)
- The Scribbler Robot Start-up Guide
- Scribbler Software and Documentation CD-ROM
- Requires 6 AA alkaline, standard or NiMH batteries, not included.

Programming the Scribbler requires a PC running Windows 2K/XP/Vista with an available serial port OR a USB port with a USB to Serial (RS-232) Adapter (#28031).

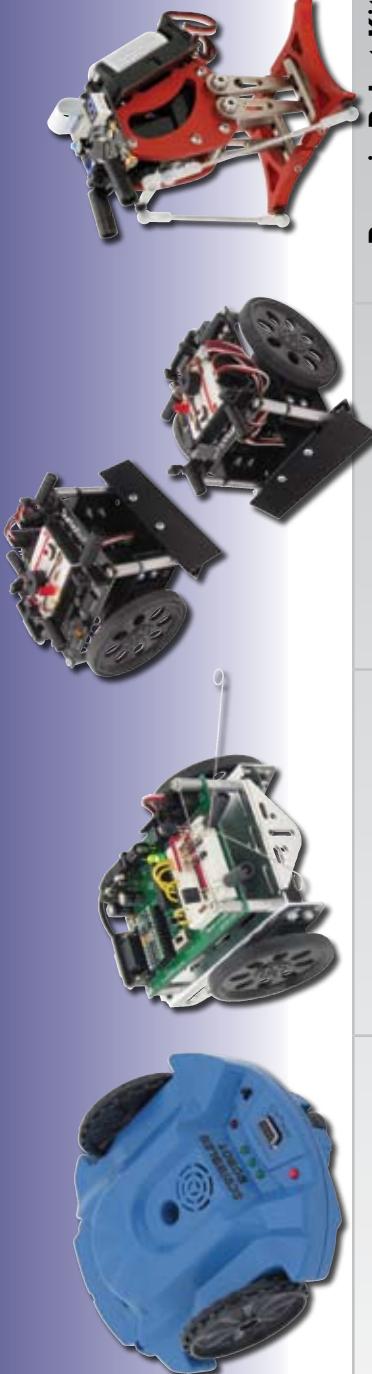


Call Parallax toll-free 888-512-1024

Robot Comparison Chart

Roll, push or walk? The choice is yours!

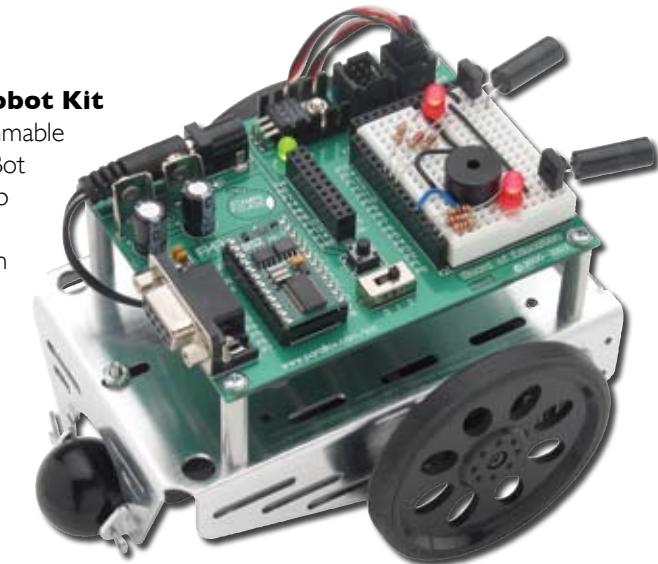
Our robots range from pre-programmed and simple to highly customizable mechatronic platforms.



Robot Name and Part Number: Scribbler Robot (#28136)	Boe-Bot Robot Kit (Serial & USB #28132, USB #28832)	SumoBot Robot Competition Kit (Serial & USB #27402)	Penguin Robot Kit (Red #27313, Blue #27314, Clear #27315, or Black #27316)
Audience: First-time programmers and roboticsists age 8+	General Robotics/Student	Competition Robotics/ Advanced Robotics Student	Advanced Robot Enthusiast
Microcontroller: BS2 OEM (inside case)	BS2 module; accepts any 24-pin BASIC Stamp module	Surface-mount BS2	Surface-mount BS2px
Features: Fully assembled with Demo Program, custom program with text (PBASIC) or graphics (Scribbler Program Maker GUI)	Versatile, Expandable, and Easy to program	For use in autonomous MiniSumo Tournaments or your own matches, breadboard for custom circuits	Walking biped; built-in infrared vision, photoresistors, compass, piezospeaker, and 7-segment LED.
Time Required to Assemble: None	1 hour	1 hour	3 hours
Time Required to Complete Initial Programming	Preprogrammed/ Reprogrammable	40 hours	40 hours

The ever-popular **Boe-Bot Robot Kit**

is our most complete reprogrammable robot kit. What makes the Boe-Bot robot unique is the BASIC Stamp microcontroller's flexibility of programming when coupled with breadboard circuit construction. Following along in *Robotics with the Boe-Bot*, users quickly learn about embedded projects, from wiring and components to programming and mechanical dependencies.



The Boe-Bot Robot Kit includes:

- **Board of Education** with programming cable
- **BASIC Stamp 2 module**
- **Passive components** (wires, resistors, capacitors)
- **Sensors** (photoresistors, bumpers, infrared)
- **Hardware** (chassis, motors, wheels, etc.) to assemble the robot's body

The Boe-Bot robot is built on an aluminum chassis that provides a sturdy platform for the continuous rotation servo motors and BASIC Stamp module's Board of Education. The Boe-Bot robot takes about 1-2 hours to put together; though each project in the Robotics text provides a unique new experience of wiring and source code tuning. Completing the entire set of projects takes 50 hours and is suitable for anybody over 12 years of age. The Board of Education (and BS2-IC) may also be removed to be used as your platform for the other kits in the Stamps in Class series.

After mastering the basics, Boe-Bot robot accessories let you branch out into new activities. Boe-Bot robot accessories are all sold separately (see facing page).



The **Bluetooth Boe-Bot Kit for Microsoft Robotics Studio** makes it possible to provide PC base station support for any and all robots. Some PC base station advantages include web monitoring and control, very large datalogging capacity, and the ability to code complex algorithms for your robot with Microsoft programming languages such as Visual C# and VB.Net. This special kit includes a Boe-Bot Robot Kit and an eb500 Bluetooth module so that Microsoft Robotics Studio

and the Boe-Bot robot can communicate with the PC wirelessly (computer must be Bluetooth capable).

Boe-Bot Robot Accessories



For a new way to get around, get crawling! The **Crawler Kit** (#30055; \$24.95) attaches easily to your Boe-Bot and runs on standard Boe-Bot source code with only minor adjustments for ground speed. Sample PBASIC code is included in the Crawler Kit's documentation.



Add pick-up and carry capability to your Boe-Bot. The **Gripper Kit** (#28202; \$54.95) features parallel plates that open, clamp onto and lift objects all with one cleverly utilized Parallax Standard Servo. Since the Gripper's servo plugs right into a servo port on the Board of Education, no additional battery pack is needed. The lightweight but sturdy aluminum, brass and plastic Gripper hardware weighs less than 7 ounces.



Simply remove the wheels from your Boe-Bot robot and attach the gears and tread from the **Tank Tread Kit** (#28106; \$34.95) to give your Boe-Bot robot the ability to traverse unfriendly terrain.



Track images by detecting color with the **Boe-Bot CMUcam** (#30051; \$139.95), designed specifically for our Boe-Bot robot. The board communicates using a TTL level serial port and can track user defined color blobs at 17 frames per second. The CMUcam can also automatically detect a color and drive a servo to track an object.



The **QTI Line Follower Kit** (#28108; \$29.95) add-on kit uses QTI infrared emitter/receiver modules to easily enhance the line following capability of your Boe-Bot robot. The QTI sensors mount underneath the front of the Boe-Bot chassis, and can be positioned to adjust to different width lines.



The **Digital Encoder Kit** (#28107; \$39.95) answers a customer request for wheel position feedback used to improve dead-reckoning, solve mazes, contests and map paths of travel. The infrared reflective sensors mount next to the Boe-Bot Robot's wheel to count cycles using the wheel holes.



The **Boe-Boost** (#30078; \$4.95) battery booster increases the battery capacity of the Boe-Bot from four to five AA cells. This results in a 7.5 V nominal output voltage for alkaline cells, making it possible to discharge them more fully before replacement. It also yields a 6 V nominal output voltage from nickel-cadmium (NiCad) and nickel-metal-hydride (NiMH) rechargeable batteries, permitting their use with the Boe-Bot, a task not readily feasible before now.



SumoBot Robot Competition Kit
- with Serial Boards and USB Adapter
(#27402; \$219.95)

Build and program two high-quality SumoBot robots designed to wrestle in the mini-sumo competition ring! The electronics consists of a surface-mounted BASIC Stamp 2 module and an array of infrared sensors to detect your opponent and the edge of the Sumo Ring. Additional components include piezospeakers, resistors, pushbuttons and LEDs to build custom breadboard circuits for program mode selection and sensor state feedback. The hardware package includes components for two complete SumoBot robots.

The *SumoBot Manual* has assembly instructions and test programs that take you from basic moves to one-on-one combat. Once you have your SumoBot robots up and running, give them a competitive edge and expand your skills by following the step-by-step activities in *Applied Robotics with the SumoBot* - an advanced text in our Stamps in Class series. Activities include friction analysis, self-calibrating sensors, memory optimization with multipurpose variables and a sensor flags register; and state-machine diagrams for sensor-based navigation. EEPROM data logging lets you record your robot's sensor and program states during a match, then display them afterward in the BASIC Stamp Editor's Debug Terminal - an excellent way to troubleshoot and analyze the performance of your program strategies.

Hold your wrestling matches on the durable 36 x 36" SumoBot Robot Competition Ring Poster; designed to use with the instructions and programs included in *Applied Robotics with the SumoBot*.

8 AA batteries required, not included. Programming SumoBot robots requires a PC running Windows 2K/XP with an available serial port or a USB port with a USB-to-serial adapter. *Applied Robotics with the SumoBot* builds on concepts introduced in *Robotics with the Boe-Bot*, available as a download at www.parallax.com.



Call Parallax toll-free 888-512-1024

Penguin Robot

The **Penguin Robot** is a precision-machined 4" tall biped with an embedded BASIC Stamp 2px24 microcontroller. The Penguin walks forward with a tilt-stride action and turns by sweeping both feet on the ground in opposite directions. This basic biped design works best in the Penguin's small scale. The Penguin's parts have a close-tolerance fit and are designed to make use of precise electronic control. Set aside three hours to assemble a Penguin.

Features of the Penguin Robot:

- BASIC Stamp 2px module chipset
- CNC-machined 6061 aluminum parts
- (2) Micro servos
- Hitachi HM55B Digital Compass sensor
- Blue seven-segment LED for feedback
- (2) Photoresistors
- (2) Infrared emitters and one detector
- Piezospeaker in body
- Mini USB programming port
- (2) CR123 batteries for 6V power supply are included
- Blue power indicator LED
- Expansion I/O port, power and ground header for accessories

Writing code for the Penguin is quite easy. First, the servo center and tilt/stride limits are set and written to EEPROM using the Penguin-ServoCalibration.bpx program. Subsequent programs use the values stored in EEPROM, making it easy to share Penguin code without having to adjust servo PULSOUT constants in each program.

Sensors are added into the subroutines, and a direction of travel is executed by assigning a value to the WALK variable (forward, back, left or right). Sensors are monitored between walking movements, without the headache of linking walking movements being handled by the rest of the PBASIC program.

The Penguin robot performs best on your desk or other hard surfaces. It is not designed for long-distance adventuring across thick carpet, but a tight, low-pile carpet is an acceptable walking surface. The Penguin's electronics are fully assembled and wired to an assortment of sensors and output devices.



*Our
newest and
smallest
robot!*

Penguin Robot
- RED (#27313;
\$199.95)

Penguin Robot
- BLUE (#27314;
\$199.95)

Penguin Robot
- CLEAR (#27315;
\$199.95)

Penguin Robot
- BLACK (#27316;
\$199.95)



Order online at www.parallax.com



Parallax Prototype: Gas-Powered Robot

This giant gas-powered robot, dubbed the Propeller™ QuadRover™, sports a 4-stroke engine and hydraulic powertrain. It is controlled by a Propeller chip for the ultimate in customizable robots; eight 32-bit cogs at 20 MIPS each create endless programming possibilities. A 64KB EEPROM leaves 32KB for nonvolatile data storage, and ample expansion ports provide plenty of flexibility for added sensors.

Four solenoid valves allow for the hydraulic power to be independently enabled, disabled, or reversed for either side of its skid steer system. The robot can rotate in place or make traditional turns while traveling up to 10 miles per hour. Servo controlled throttle and disk brakes make for precise acceleration and deceleration even with a powerful 2.5 horsepower 49cc engine.

We'll sell these robots someday, so stay tuned! Naturally, sample programs will be included for fly-by-wire control that can be easily integrated into an autonomous navigation system.



Order online at www.parallax.com

Parallax E-mail Newsletter

We started a Parallax e-mail newsletter in August 2007. The newsletter is entitled "The Parallaxian." To join the thousands that are already keeping up with Parallax, simply send an e-mail with the subject "Subscribe" to parallaxian@parallax.com.

Dear Valued Parallax Customer,

In an effort to thank you for your continued business and support, Parallax is kicking off our Customer Appreciation Program and we are asking for your help to make it successful.

If you are interested in receiving monthly updates regarding Parallax specials, new product offerings, discounts, surveys, monthly newsletters and general informational updates from the world of Parallax, please e-mail parallaxian@parallax.com with the subject "Subscribe" and be sure to include your shipping address in the body of the message.

Parallax will be sending coupons, gifts and other promotional offerings along with these updates. It is our way of saying thank you for your business and for being a Parallax customer. In addition, Parallax will be choosing one customer each month for a year to win Parallax credits, products, or additional discounts on merchandise.

Parallax has no intention of filling up your inbox. You can expect one, sometimes two e-mails per month, tops. Your information will not be shared with anyone outside of Parallax, Inc., and you may choose to discontinue this service at any time. This is just our way to show you how much we appreciate you as a customer and value your business.

Thank you and we look forward to continuing to serve you and meet your electronic and robotic needs.

Sincerely,
Parallax Marketing Team



The Parallaxian

PARALLAX
www.parallax.com

Here is the first edition of the Parallaxian Newsletter. We hope you will enjoy what we have to offer. As a family-owned business, Parallax feels our customers are part of our family too. As we're known to each other around the office and as our newsletter title suggests, we "Parallaxians" take pride in sharing the goings on here at Parallax. If you have any suggestions on what you'd like to see in future newsletters, drop us a line at parallaxian@parallax.com.

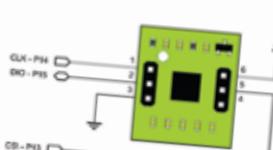
Did you know?

September 2007 will mark the 20th anniversary for Parallax, Inc. Since 1987 Parallax has been making products that allow individuals to learn and build creative projects. Parallax has always based its ideas and products on a simple philosophy: Build something people will think is fun and discover its possibilities. From the BASIC Stamp® to the Propeller™ chip, we are proud that our customers have enjoyed our products and continue to support our new endeavors. Stay tuned for Parallax 20th Anniversary celebration specials and giveaways!



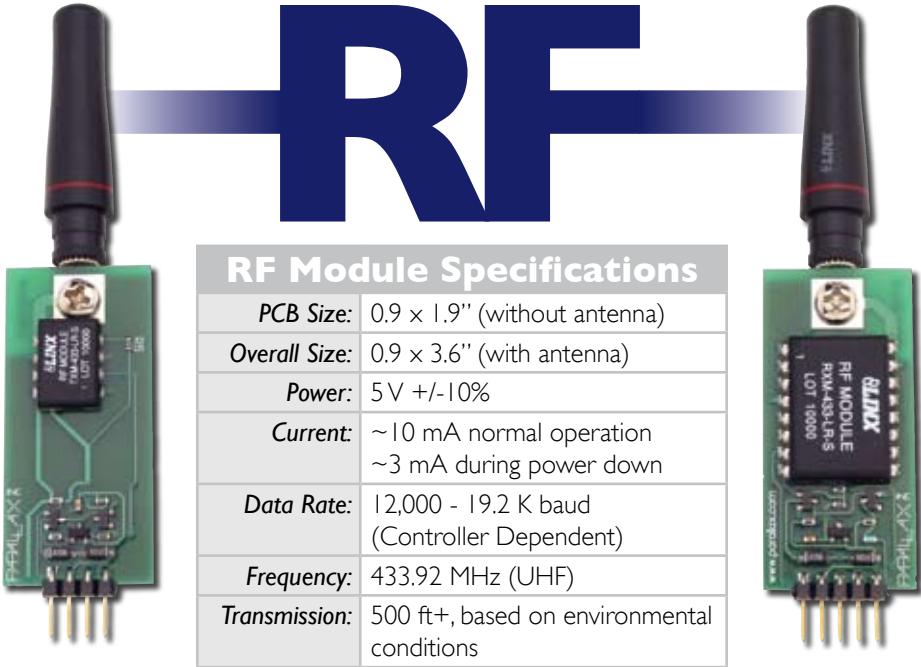
Tech Corner by Dave Andree

The Hitachi H48C 3-Axis Accelerometer is an integrated module that can sense gravitational (g) force of $\pm 3g$ on three axes (X, Y, and Z). The module contains an onboard regulator to provide 3.3-volt power to the H48C, analog signal conditioning, and an MCP3204 (four channel, 12-bit) analog-to-digital converter to read the H48C voltage outputs. All components are mounted on a breadboard-friendly, 0.7 by 0.8 inch module. Acquiring measurements from the module is simplified through a synchronous serial interface. With the BASIC Stamp® 2 series, for example, this is easily handled with the SHIFTOUT and SHIFTIN commands.



Some of the applications ...

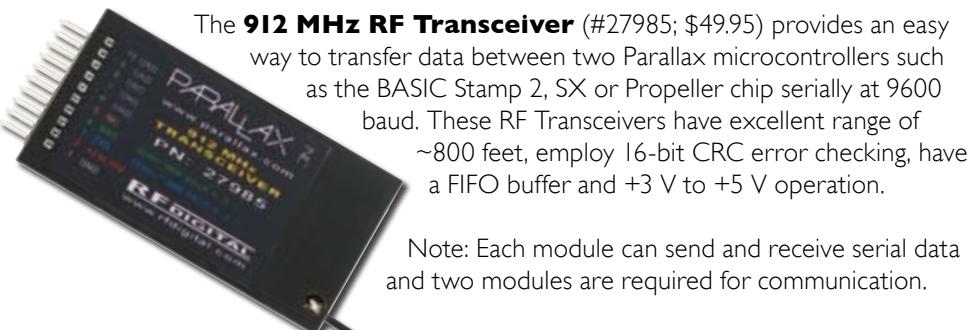
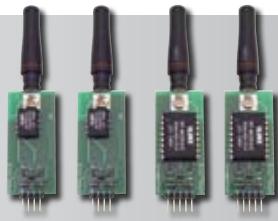
Accessories



We produced our own RF modules from products made by the wireless module leader, Linx Technologies. The Parallax RF modules provide a very easy and low-cost method of sending data between microcontrollers from 500 ft+ line-of-sight (depending on conditions).

The **Parallax 433 MHz RF Transmitter** (#27980; \$29.95) and **433 MHz RF Receiver** (#27981; \$39.95) devices can be connected to a PC serial port using a MAX232 line driver. The circuit isn't supported by Parallax, but it's possible to make this connection with a few dollars of parts. The RF Transmitter has a power down feature. The RF Receiver has a power down feature and an RSSI signal for strength indication.

We also offer an **RF Transceiver Package** (#28180; \$109.95) that comes with two receivers and two transmitters, everything you need for bi-directional communication!



The **912 MHz RF Transceiver** (#27985; \$49.95) provides an easy way to transfer data between two Parallax microcontrollers such as the BASIC Stamp 2, SX or Propeller chip serially at 9600 baud. These RF Transceivers have excellent range of ~800 feet, employ 16-bit CRC error checking, have a FIFO buffer and +3 V to +5 V operation.

Note: Each module can send and receive serial data and two modules are required for communication.

Designed in cooperation with Grand Idea Studio, the **Parallax Radio Frequency Identification (RFID) Reader Module**

is the first low-cost solution to read passive RFID transponder tags. The RFID Reader Module can be used in a wide variety of hobbyist and commercial applications, including access control, automatic identification, robotics, navigation, inventory tracking, payment systems, and car immobilization.

Features of the RFID Reader Module:

- Fully-integrated, low-cost method of reading passive RFID transponder tags
- 2400 baud TTL serial interface (output only) to PC, BASIC Stamp modules and other processors
- Requires single +5 VDC supply
- Bi-color LED for visual indication of activity
- 0.100 pin spacing for easy prototyping and integration
- Compatible with the EM4100 family tags rated at 125 kHz

This device can be connected to a PC serial port using a MAX232 line driver. The circuit is not supported by Parallax, but it's possible to make this connection with a few dollars of parts.



RFID Reader Module (#28140; \$39.95)

An excellent way to get started with RFID is to order our **RFID Reader Module and Tag Sampler Kit** (#32390; \$49.95) which includes the RFID Reader and 5 assorted RFID transponder tags. Serial LCDs (sold separately), for viewing tag data, are also a nice addition to an RFID project and are found on page 48.



BEST VALUE!
RFID Reader Module and Tag Sampler Kit (#32390; \$49.95)



We offer a variety of transponder tags in different package types. Each tag has a specific range that is within 10% of the given distance for each type of tag. The reason for the 10% variation is due to environmental conditions and RFID modules.

- 54 x 85 mm Rectangle Card: Range ~6.3 cm
- 50 mm Round "World" Tag: ~6.8 cm
- 25 mm Disc Sticker: ~5 cm
- 13 x 3 mm Glass RFID Tag: ~2.5 cm
- Key Fob Tag: ~5 cm

Note: Tag styles may vary slightly from those pictured.



54 x 85 mm Rectangle Tag (#28141; \$2.75)

50 mm Round "World" Tag (#28142; \$2.75)

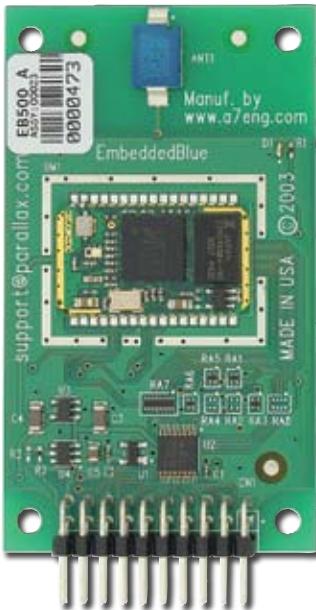
25 mm Disc Sticker (#28148; \$2.75)

13 x 3 mm Glass RFID Tag (#28149; \$2.75)

Key Fob Tag (#28147; \$6.95)

**EmbeddedBlue
Transceiver
(eb500) AppMod**
(#30068; \$79.95)

The **EmbeddedBlue Transceiver AppMod** provides standard Bluetooth connectivity for Parallax microcontroller 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 (www.a7eng.com) based on specifications provided by Parallax, the exclusive distributor of the EmbeddedBlue Application Module. Note: Free technical support is provided when used with microcontrollers that Parallax advertises. Other processors are not supported.



**Stache: BASIC
Stamp Field
Programmer**
(#27330; \$99.95)

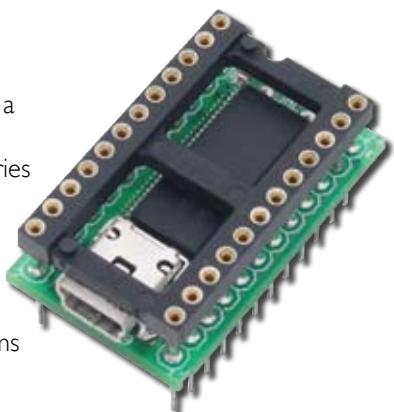
The communication potential with Bluetooth is rather amazing when compared to proprietary RF, especially with the proliferation of Bluetooth-enabled hardware devices. The documentation includes a detailed overview and sample source code for EmbeddedBlue projects with the BASIC Stamp 2 series, including interfacing to standard Bluetooth devices.



**BASIC Stamp
Logic Analyzer**
(#30010; \$79.95)

Any PBASIC program you write on a PC can be downloaded into the **Stache: BASIC Stamp Field Programmer**, after which you can transport the Stache to another location and deliver the program to your BASIC Stamp module with a press of a button. The Stache is essential for anyone who sets up BASIC Stamp-based equipment in difficult locations, outdoors, in factories, schools, competitions, or even on the other side of a room - anywhere you do not want to carry or operate a PC. There are no cables to attach, no software to boot, no ports to configure, and no need to have on-site personnel or customers see your program code. The Stache can be operated by untrained personnel, working in less than ideal conditions, where the process of loading a program into the BASIC Stamp microcontroller must be fast, foolproof and secure.

The **BASIC Stamp Logic Analyzer (BSLA)** is a collaborative design between Parallax and CWAV, the developer of the popular USBee Pod logic analyzer series (www.usbee.com). The BSLA fits between any 24-pin BASIC Stamp and its programming socket.



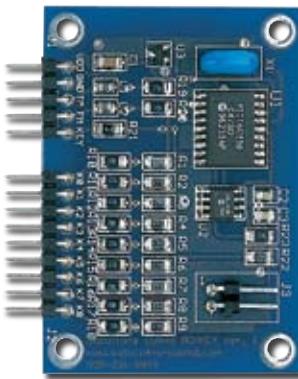
The BSLA software has the following features:

- Compatible with Win2K/XP/Vista operating systems
- Multiple triggering options on all channels
- PC, asynchronous serial, SPI bus decoder
- Minimum sample depth of 1 million samples up to available PC RAM
- Sample clock generated internally
- Zoom in, zoom out and zoom all
- Save, Open and Print captured data and settings
- Movable cursors for easy measurements

Use the **MEMKey** matrix keypad decoder to add user input to your Parallax microcontroller application. 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 4 X 5.

The MEMKey has the following programmable features:

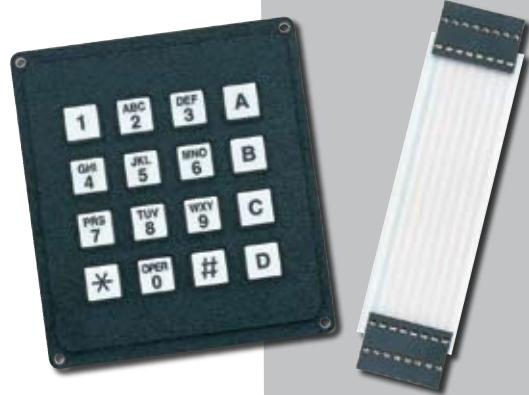
- 1 or 2 wire, 2400 baud, 8N1 format
- Each key can be programmed to return any value from 0-255 and standard keys in the PC/AT protocol
- Key alarm pin and fully programmable debounce time
- Typematic action with programmable typematic times
- Features retained in EEPROM even without power
- 64 bytes of user-accessible EEPROM for general use
- 15-pin SIP package measuring 2.25" wide x 1.6" tall



MEMKey
(#27963; \$39.95)

4 x 4 Matrix Keypad (#27944; \$19.00)

4 x 4 Matrix Keypad Custom Cable (#27943; \$9.00)



The recommended keypad for the MemKey is the **4 x 4 Matrix Keypad**.

This 4 x 4 Grayhill keypad has conductive rubber contacts with an operational life of 3 million cycles, and a good tactile feel for positive feedback. **4 x 4 Matrix Keypad Custom Cable** is required and sold separately.

The **Parallax USB Oscilloscope** connects to your PC via USB. The hardware is small, portable, elegant and requires no power supply. The case is powder-coated aluminum. All oscilloscope controls are managed through a point-and-click PC interface. The software provides an easy method of obtaining quality screen captures for reports and live demonstrations. You will have the ability to measure acquired waveforms with easy-to-use cursors. Common scope features including trigger settings, waveform measurements (MIN, MAX, frequency, period), ability to save customized setups, BMP screen captures, etc are standard in the software. Special features include 3 cursor functions with the option to snap to the waveform.

Additional technical specifications:

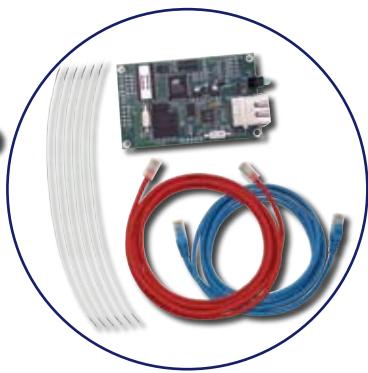
- 2 Channels
- 1 Ms/s Maximum Sample Rate with One Channel
- 500 Ks/s Sample Rate with Two Channels
- 20 Vpp Maximum Input for Channel 1 and Channel 2
- 200 kHz Bandwidth
- 8-Bit Vertical Resolution
- 1 M Ohm Input Impedance
- Trigger on Rising or Falling Edge at any Voltage
- Variable Trigger voltage on Channels 1 and 2
- Horizontal Trigger Position Settings at 10%, 50%, and 90%
- Auto and Normal Trigger Modes
- 3 probes



Parallax USB Oscilloscope
(#28014; \$139.95)

The Parallax USB Oscilloscope is also sold with the *Understanding Signals Parts and Text Kit* (#28119; \$159.95) For details see page 31.

**Parallax Internet
Netburner Kit
(#30013; \$129.95)**



With the **Parallax Internet Netburner Kit (PINK)** you can provide World Wide Web control to any Parallax microcontroller project you can create with ethernet connectivity. The easy drag-and-drop FTP interface for uploading files makes development a breeze. A handy telnet debug server also aids in the development of projects. An easy 4-wire connection is all it takes to put your projects online.

Parallax Internet Netburner Kit (PINK) features:

- 256 Kbytes for web files
- Embedded web server (without proprietary file formats)
- Send and receive UDP packets (Stamp-to-Stamp communication)
- Send e-mail (via SMTP)
- Password protect user selected web pages, files, and configurations
- 100 web accessible variables, allowing for dynamic web pages
- Flash memory for setting default variable values

Tech Corner by Chris Savage

If you're like me you've probably built some BASIC Stamp projects that could benefit from remote monitoring or control of the project. With high-speed internet now so readily available internet control is not only more feasible, but easier and more powerful than the old dial-up method.

I built an alarm system using two BASIC Stamp modules and several sensors (PING), PIR and magnetic switches all available from Parallax). I wanted to be able to check on the status of the system while away from home and even have some control over it, including the ability to turn lights on/off or adjust the temperature before I get home; even receive text messages on my cell phone in an emergency.

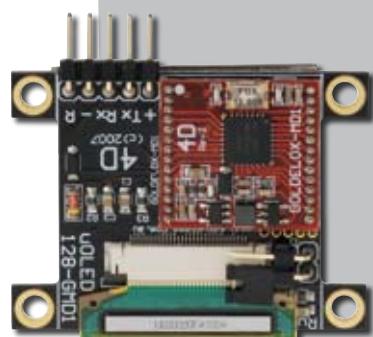
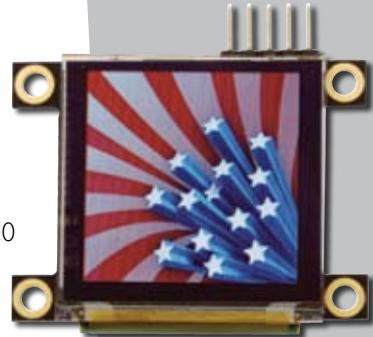
The PINK (Parallax Internet Netburner Kit) is an embedded web server which can allow the BASIC Stamp to realize all these goals and more. The PINK module provides a web server with password protected pages which can allow me to securely access my system seeing the real-time status of sensors and temperature. Through the web page interface I can interact with the BASIC Stamp by turning lights and other devices on/off or adjusting the temperature in the house. All of this can be done from anywhere in the world where there is internet access.

Using the PINK module I was able to realize my overall design goals easily and add more features and functions to the system in the process. The text message to the cell phone was accomplished by sending an e-mail to the text message service provided by my cell phone carrier. The PINK module also supports UDP message transmission and reception allowing the microcontroller to communicate with another microcontroller or PC over LAN or WAN.

The **μOLED 128 GMDI** is a compact and cost effective all-in-one “Smart” OLED Display with an embedded graphics controller that will deliver ‘stand-alone’ functionality to your project. The simple to use embedded commands control foreground and background color. They can also produce text in a variety of sizes and draw shapes (which can include user-defined bitmaps, such as logos) in 262,000 colors. The μOLED 128 GMDI is compatible with all Parallax microcontrollers.

Features of the μOLED 128 GMDI:

- 128 × 128 pixel resolution, 65K or 262K true to life colors
- 1.5" diagonal display (module size 45.5 × 33.5 × 8.8 mm)
- Easy 4-pin interface to host (Vcc, TX, RX, GND, Reset)
- Voltage supply 3.6 V to 6.0 V, 40 mA nominal @ 5.0 V
- 3.3 V Serial interface with auto-baud feature (300 to 256 K baud)
- Serial lines are 5 V tolerant using 1 K resistor on the RX line
- On-board micro-SD memory card connector to add memory for storing of icons, images, animations, etc. (64 MB to 1 GB cards supported)
- Three selectable font sizes (5 × 7, 8 × 8, 8 × 12) for ASCII characters as well as user-defined bitmapped characters (64 @ 8 × 8)
- Built-in graphics commands such as LINE, CIRCLE, RECTANGLE, TEXT, USER BITMAP, BACKGROUND COLOR, PUT PIXEL, IMAGE, etc.

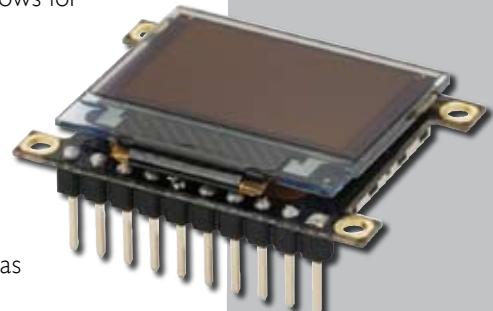


μOLED 128 GMDI (#27925; \$85.95)

The **μOLED 96 PROP** is a compact and cost effective OLED Display with an embedded Propeller chip microcontroller that can deliver ‘stand-alone’ functionality to your project. The on-board Propeller chip provides a development system built right into the display as well since the display system does not use all of the available Propeller resources or I/O pins. The on-board Propeller also has access to up to 2GB of flash memory from an on-board SD Card slot. Included software allows for integrated functionality right out of the box.

Features of the μOLED 96 PROP:

- Propeller chip based design
- 96 × 64 pixel resolution (256 or 65 K colors)
- 0.96" diagonal OLED display
- Voltage supply from 3.6 V to 6.0 V
- Simple 5-pin interface provides the programming interface as well as power to the display, Propeller chip and SD Card (sold separately)
- On-board micro-SD interface can be used for storing Propeller programs, icons, images animations, movie clips and data logging.
- Optional USB interface available
- Compatible with the Propeller Tool IDE for programming and application development

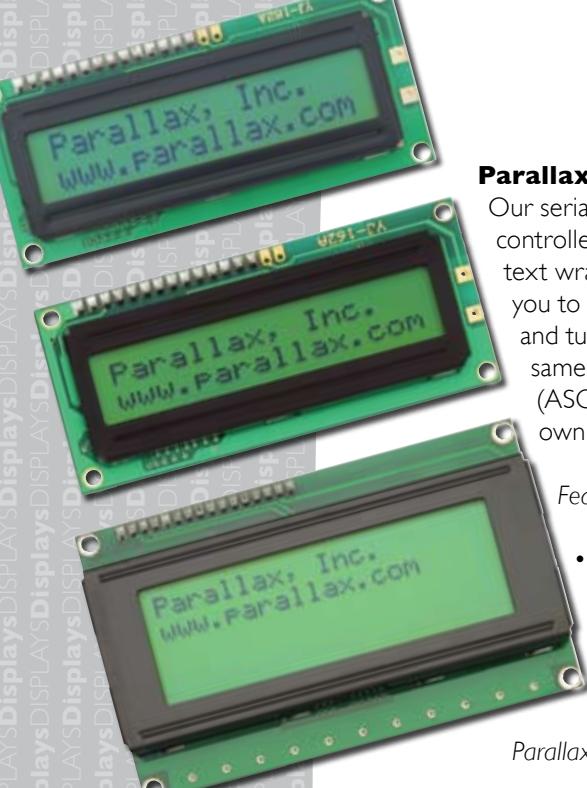


μOLED 96 PROP (#27307; \$79.95)

Micro-SD Card 1 GB (#27978; \$24.95)



The **Micro-SD Card 1GB** is a great companion for the μOLED display. For the μOLED-128-GMDI it allows you to download image data directly to the display for recall by serial commands. 1GB allows you to store a large amount of pictures, icons, animations, etc. For the μOLED-96-PROP the micro-SD Card can be used for pictures, icons, animations and even Propeller Code and data. With a Propeller object already written you can use the micro-SD Card on the μOLED-96-PROP for data logging applications and the data can be read by a PC with a card reader capable of reading this type of card (sometimes an adapter is required for PC use).



Parallax Serial LCDs are available in backlit or non-backlit versions. Our serial LCDs are very functional, low-cost LCDs that can be easily controlled by a BASIC Stamp microcontroller. The LCDs provide basic text wrapping, and full control over all advanced LCD features, allowing you to move the cursor anywhere on the display with a single instruction and turn the display on and off in any configuration. It supports the same visible characters as the BASIC Stamp Editor's Debug Terminal (ASCII Dec 32-127). In addition, you may define up to eight of your own custom characters to display anywhere on the LCD.

Features of the Parallax Serial LCD (non-backlit) include:

- Professional-looking text user interface on any microcontroller application
- Easy-to-implement serial debugging without a PC
- Real-time sensor data output on autonomous robotics applications

Parallax Serial LCDs are available in three package types:

- **2 x 16 Serial LCD - Non-Backlit** (#27976; \$29.95)
- **2 x 16 Serial LCD - Backlit** (#27977; \$29.95)
- **4 x 20 Serial LCD - Backlit** (#27979; \$39.95)

The **LCD Terminal AppMod** is a low-cost display perfectly suited for your smaller projects. The module has a 2 x 8 display, 4 pushbuttons, and will connect to any programming board that has a 2 x 10 AppMod header. Perfect for robotic applications!

The **120 x 32 Graphic LCD** can display text in four different sizes, allowing 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. Size is 80 x 36 mm (3.2 x 1.4 in.).

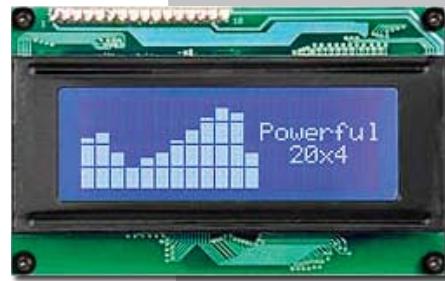


**112 x 16
Serial Graphic
VFD (#27970;
\$69.95)**

If you're looking for a truly unique display the **112 x 16 Serial Graphic VFD** (Noritake GUI12X16G-7003 Vacuum Fluorescent Display) provides a standard 2 x 16 character mode and also supports graphics at 112 x 16 pixels. With user-definable windows, screen saver, selectable brightness level and font magnification, this display packs a lot of power into a compact space with a wide operating temperature and single 5 volt power supply requirement.

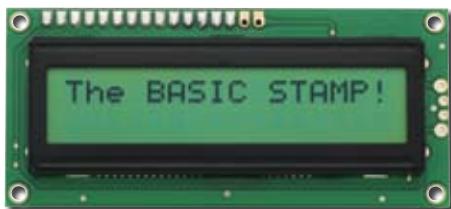
Call Parallax toll-free 888-512-1024

The **4 x 20 Serial LCD with Keypad Interface** allows you to draw bar graphs (either horizontal or vertical) and define up to eight special characters. The keypad interface (up to a 5 x 5 Keypad) is a valuable feature which processes the keypad row/column matrix into a serial (RS-232 or I2C) data byte stream. This LCD is pre-modified for TTL level BASIC Stamp module-compatibility and displays an inverse blue with white back light. The Matrix Orbital part number is LK204-25-WB.



The **2.5" LCD A/V Display** is equipped with a high resolution color LCD monitor. This product is portable and you can bring it anywhere easily. Great for displaying NTSC video from the Propeller Chip or any other device which has a Audio/Video Out connector.

Note: Power supply sold separately. We recommend our 12 V, 1 A supply (#750-00007; \$9.95).



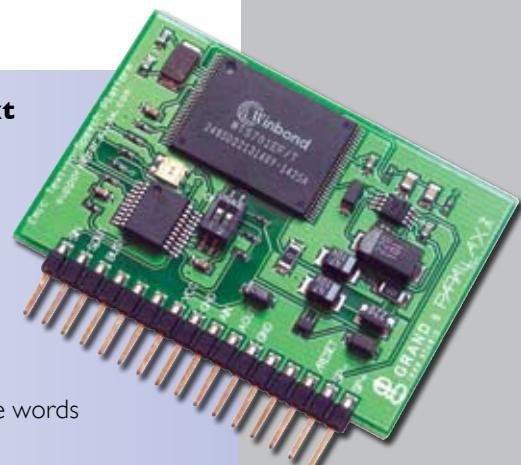
The **2 x 16 Parallel LCD** is a 8-bit or 4-bit parallel interfaced LCD. It allows you to display text, numeral data, and custom created characters. The LCD uses the HD44780 series LCD driver from Hitachi. The LCD is connected to a female 14-pin connector for easy interface with the Parallax

Professional Development Board (#28138). Though the device has the ribbon cable and 14-pin connector, it may also be hooked up manually.

Parallax is the exclusive supplier of the Grand Idea Studio **Emic Text to Speech Module**. This SIP module will let your robot speak, provide a real human-console interface to your control system, or simply provide some entertainment to your Parallax microcontroller projects. Based on the Winbond WTS701, this device intelligently handles values, sentences, numbers and common abbreviations with an extremely natural female voice with simple serial string sentences.

Features of the Emic Text-to-Speech module:

- Capable of embedded phonetic control for difficult-to-pronounce words
- Single +5 V supply with TTL serial interface (2-wire, 2400 baud)
- On-board 300 mW speaker driver
- Bi-color LED for visual feedback of activity
- Audio input pin for amplification of BASIC Stamp-generated amplification sounds and sound effects



Emic Text to Speech Module
(#30006; \$72.95)

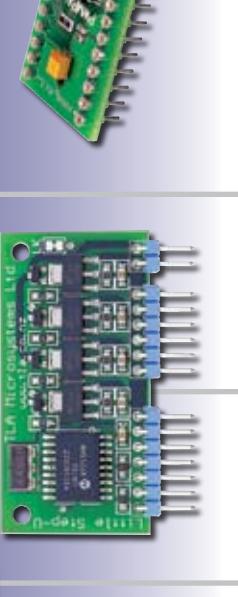
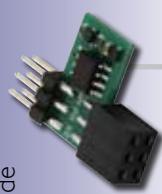
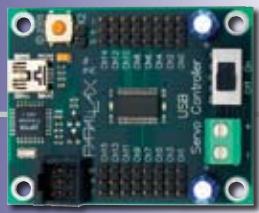
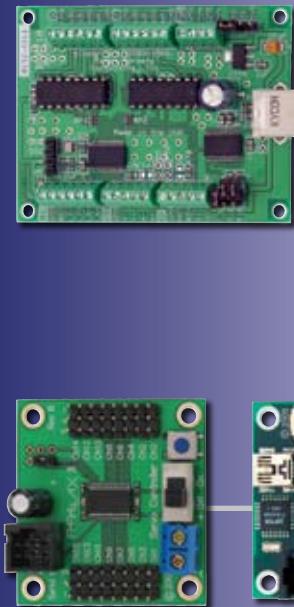
The **SoundPAL** is a tiny module that plays canned and custom sound sequences. Completely self-contained, it includes a microcontroller for generating sounds and a small speaker for producing them. The SoundPAL interfaces easily to a BASIC Stamp and can play sounds while the BASIC Stamp is busy with other chores.



SoundPAL
(#28825; \$24.95)

Motor Controllers

What kind of motor would you like to control?
 Parallax provides a variety of motor controllers for your latest application. Coupled with a BASIC Stamp microcontroller, these controllers provide you with an efficient setup.



PRODUCT	ServоПAL	Motor Mind B	Parallax Servo Controller	Pololu Micro Dual Serial Motor Controller	Bi-Step Motor Controller (USB)	Little Step-U	HB-25 Motor Controller	PWM/PAL
PRICE AND STOCK CODE	\$19.95;#28824	\$29.95;#27961	Serial; \$39.95; #28023 USB; \$39.95; #28823	\$23.95;#30052	\$109.95;#27969	\$69.95;#27938	\$49.95;#29144	\$29.95;#28020
EASE OF USE*	●●●●●	●●○○○	●●●●○	●●○○○	●●○○○	●●●●○	●●○○○	●●○○○
MOTOR TYPE	Servos	DC Motors	Servos	DC Motors	Unipolar and Bipolar Stepper Motors	Unipolar Stepper Motors	DC Motor	DC Motors / Servos
# OF MOTORS	2	1	16 (32 w/ 2 PSC units)	1 or 2	1 or 2	1	1 (or 2 in same dir.)	4
AMPS & VOLTS	30V; 3.5 A peak, 2A continuous	4-7.5 V	1.8V - 9V @ 1A Peak/Motor	6.5 to 15V; 1 A	35V; 3 A	6-16 V; Up to 25 A continuous	0.3 Hz; Up to 20 kHz	

* Ease of Use rating system: 5 black dots (easiest to use) to 1 black dot (more difficult to use).



From left to right:

The **Parallax Continuous Rotation and Standard Servos**

are made exclusively by Futaba. Servos may be controlled directly from a BASIC Stamp I/O pin by using the PULSOUT command. The continuous rotation version is particularly well-suited to robotic applications and includes an adjustable potentiometer to center the servo. Standard servo: 5 to 9 VDC. Continuous rotation servo: 5 to 7.5 VDC.

The **(GWS) Pico Servo** is smaller and lighter than a standard servo, but it delivers the performance of a standard servo. It is recommended for smaller robots, or in projects where space is tight. Servos may be controlled directly from a BASIC Stamp I/O pin by using the PULSOUT command. Two Pico servos are used to make the Parallax Penguin Robot walk. Size: 22.0 mm x 11.24 mm x 21.35 mm.

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 7.5 degrees and requires 12 VDC for operation.

**Parallax (Futaba)
Continuous
Rotation Servo
(#900-00008;
\$12.95)**

**Parallax (Futaba)
Standard Servo
(#900-00005;
\$12.95)**

**(GWS) Pico
Servo (#900-
00014; \$11.95)**

**4-Phase 12 Volt
Unipolar Stepper
Motor (#27964;
\$10.95)**

Visit Parallax.com to see our complete collection of electrical components, integrated circuits, hardware, and more. Just click on the “Store” tab and follow the link to components.

Please Note: There is a \$10 minimum on orders from the component shop.

Order online at www.parallax.com

The **Stamp PLC (Program Logic Controller)** is sized for automating small machines. 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. The Stamp PLC is housed by a strong and sleek enclosure that offers an integral DIN rail mount. Unlike other PLC's which have proprietary code, you can create code for your Stamp PLC and customize it to fit your needs. This non-restrictive power will allow you to design and modify your systems much faster. Note: 24-pin BASIC Stamp module (required) sold separately.

Technical features include:

- Safe 24 V industrial control in a DIN rail package
- 10 Digital Inputs. 8 inputs are grouped together using an on-board shift register.
- 8 Digital Outputs are optically isolated, electrically and thermally protected.
- 4 Analog Inputs
- Front Panel LEDs indicate the status of all ten inputs and all eight outputs via a light-pipe array.
- Heavy-duty power supply with 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 300-50 K Baud.

Industrial application? Many BASIC Stamp modules are manufactured to meet industrial-rated standards with an operating temperature of -40° to +85° C (-40° to +185° F).

The **SX Controller Board** is a single-board solution that is perfectly suited for high-performance control applications. With speeds of up to 50 MIPS, sophisticated multitasking applications are possible with the SX Controller Board and in your choice of programming language: SX assembly, BASIC (we use SX/B), or C. The SX Controller Board offers 16 I/O pins, is powered by either 12 or 24 VDC, and may control TTL outputs (5 VDC), hobby servos, 12-24 VDC solenoids, low voltage lamps, and small DC motors.

The SX Controller Board includes a DB-9 serial port that may be used in customer applications, as well as a 32K EEPROM for external data storage. A three-position power switch allows the use of one power supply, or two isolated power supplies (for mixed-voltage projects). Its moderate size and mounting holes allow the SX Controller Board to be concealed in many small environments.

The **Stamp Controller Interface** allows the BASIC Stamp microcontroller to connect directly to industrial type digital I/O control boards produced by Opto22, Grayhill, Allen-Bradley, and others that accept 0-5 VDC voltage control levels. The Stamp Controller Interface accepts the BSI and all 24-pin BS2 models and has a parallel port connection for monitoring status of I/O pins. A clever driver/resistor configuration allows the user to mix and match up to 16 inputs and outputs in any configuration. A 9-12 VDC, 2.1 mm jack is included for external power supply (sold separately; #750-00007; \$9.95).

Don't forget a power supply!

Please note that many of our BASIC Stamp, SX, and Propeller Programming Kits do not include a power supply. The **7.5 VDC 1 Amp Power Supply** is a good universal solution. Please e-mail support@parallax.com if you have any questions regarding the proper power supply for your project. If you have any compatibility questions we also offer a Power Supply Recommendation chart at www.parallax.com.



7.5 VDC 1 Amp Power Supply (#750-00009; \$10.95)

No Serial Port? No Problem!

Parallax designed a **USB to Serial (RS-232)** adapter that is compact and economical. This adapter works with all of our products. If you don't have a serial port on your machine, this is an easy solution. To use this adapter simply download the driver installer from our web site, run the installer and then plug the unit in to your machine's USB port using a USB A to mini B cable. A new Virtual COM Port will be available to your BASIC Stamp Editor, SX-Key Editor or Propeller Tool for programming and communication. Parallax designed it using the latest FTDI chip (FT232RL). This adapter supports multiple operating systems. FTDI provides fully functional drivers, maintaining and improving them as operating systems change (such as Windows).



Parallax USB to Serial (RS-232) Adapter Only (#28030; \$14.95)



Parallax USB to Serial (RS-232) Adapter with USB A to Mini B Cable (#28031; \$17.95)

Installing USB Drivers

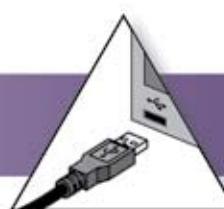
step 1 Download
'Parallax USB Driver Installer'

Click Here to Download

step 2 Run the Installer
Follow the steps provided by the Wizard to install your hardware drivers.



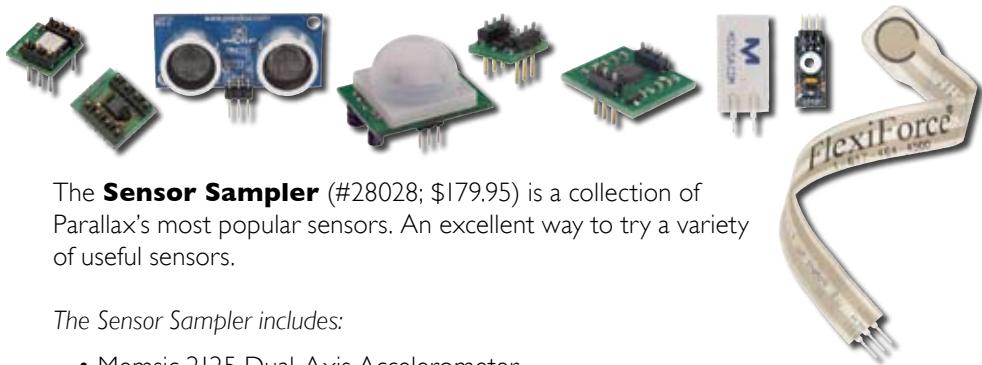
step 3 Connect Your Hardware



A note on Parallax USB boards and adapters:

When using USB versions of Parallax products, you will need to have the FTDI USB Driver installed on your PC before you will be able to use the product. A link to the latest driver for Windows NT/2K/XP/Vista can be found on the home page of our web site (parallax.com) along with a troubleshooting guide.

Sensors



The **Sensor Sampler** (#28028; \$179.95) is a collection of Parallax's most popular sensors. An excellent way to try a variety of useful sensors.

The Sensor Sampler includes:

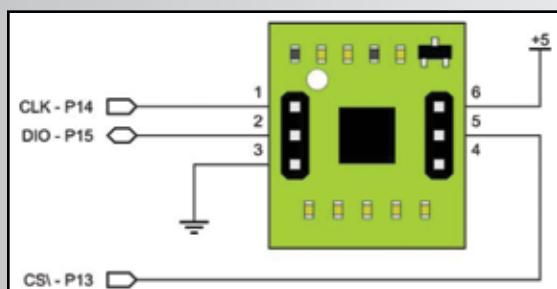
- Memsic 2125 Dual-Axis Accelerometer
- Sensirion Temperature and Humidity Sensor
- Flexiforce Pressure Sensor Demo Kit
- PING))) Ultrasonic Distance Sensor
- PIR (Passive Infrared) Motion Sensor
- Hitachi HM55B Compass Module
- Hitachi H48C Tri-Axis Accelerometer Module
- Piezo Film Vibra Tab Switch
- QTI Infrared Phototransistor Line/Object Sensor

Tech Corner by Dave Andreae

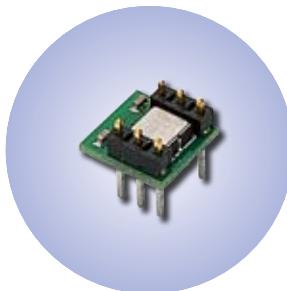
One of my favorite Parallax devices is the Hitachi H48C 3-Axis Accelerometer. This integrated module can sense gravitational (*g*) force of ± 3 g on three axes (X, Y, and Z). The module contains an onboard regulator to provide 3.3 V power to the H48C, analog signal conditioning, and an MCP3204 (four channel, 12-bit) analog-to-digital converter to read the H48C voltage outputs. All components are mounted on a breadboard-friendly, 0.7 by 0.8 inch module. Acquiring measurements from the module is simplified through a synchronous serial interface. With the BASIC Stamp 2 series, for example, this is easily handled with the SHIFTOUT and SHIFTIN commands.

Some of the applications that we have seen this product used with are model airplanes and rockets, not to mention a wide variety of other applications that it can be used with that require tilt and force measurements. These principles can be applied to real-world applications such as automatic pilot circuit in aircraft or flight control systems for NASA. Programmers of all ages and backgrounds can benefit from this tiny little device and have fun while doing so!

Here is a diagram showing the connections to the BASIC Stamp:



ACCELEROMETER & TILT



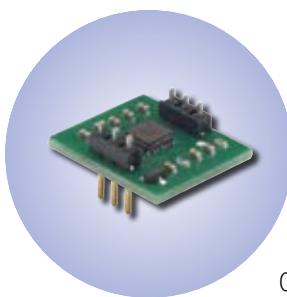
The **Memsic 2125 Dual-Axis Accelerometer** is a low cost thermal accelerometer capable of measuring dynamic acceleration (vibration) and static acceleration (gravity) with a range of ± 3 g. For integration into existing applications, the Memsic 2125 is electrically compatible with other popular accelerometers. Key Features of the Memsic 2125:

- Measure 0 to ± 3 g on either axis; less than 1 mg resolution
- Temperature compensated over 0-70° C range
- Simple, pulse output of g-force for X and Y axis
- Analog output of temperature (TOut pin)
- 3.3 or 5 V operation
- Low current draw: less than 4 mA at 5 VDC

A sampling of possible microcontroller applications with the Memsic 2125 include:

- Dual-axis tilt sensing for autonomous robotics applications
- Single-axis rotational position sensing
- Movement/Lack-of-movement sensing for alarm systems
- R/C hobby projects such as autopilots

Memsic (<http://www.memsic.com>) provides the 2125 in a surface-mount format. Parallax mounts the circuit on a through-hole providing all I/O connections so it can easily be inserted on a breadboard or through-hole prototype area.



The **Hitachi H48C Tri-Axis Accelerometer** is an integrated module that can sense gravitational (g) force of ± 3 g on three axes (X, Y, and Z). The module contains an onboard regulator to provide 3.3 V power to the H48C, analog signal conditioning, and an MCP3204 (four channel, 12-bit) analog-to-digital converter to read the H48C voltage outputs. All components are mounted on a 0.7 by 0.8 inch module. Acquiring measurements from the module is simplified through a synchronous serial interface. With the BASIC Stamp, for example, this is easily handled with the SHIFTOUT and SHIFTIN commands.

Features of the Hitachi H48C Tri-Axis Accelerometer:

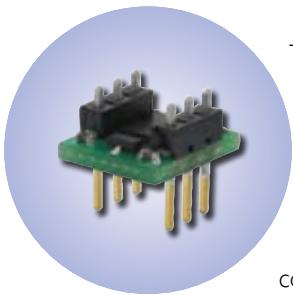
- Measure ± 3 g on any axis
- Uses MEMS (Micro Electro-Mechanical System) technology, with compensation for calibration-free use
- Onboard regulator and high-resolution ADC for simple connection to microcontroller host - compatible with BASIC Stamp 2 series SHIFTOUT and SHIFTIN commands
- Free-fall output indicates simultaneous 0 g on all axes
- Wide operational range: -25° to 75° C

**Memsic 2125
Dual-Axis
Accelerometer**
(#28017; \$29.95)

**Hitachi H48C
Tri-Axis
Accelerometer**
(#28026; \$39.95)

COMPASS & GPS

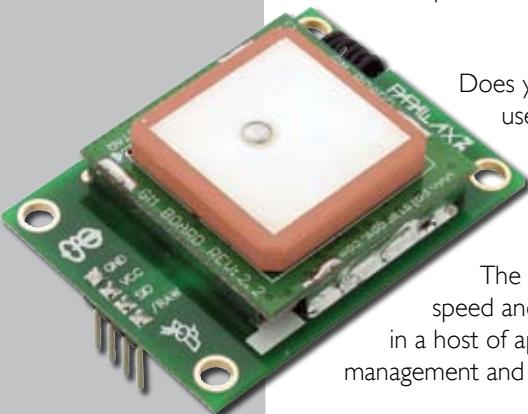
**Hitachi HM55B
Compass Module
(#29123; \$29.95)**



This **Hitachi HM55B Compass Module** made exclusively by Parallax is a dual-axis magnetic field sensor built around the Hitachi HM55B IC. Parallax has made this compass IC accessible by providing Hitachi's surface mount sensor chip with a 3V onboard voltage regulator and resistor protection, all in a 0.3" wide 6-pin DIP module. The Hitachi HM55B Compass Module is compatible with the BASIC Stamp microcontroller's 5V supply and signal levels. Acquiring measurements from the module is made easy with a synchronous serial interface, and even easier with the BASIC Stamp 2 commands SHIFTIN and SHIFTOUT.

Features of the Hitachi HM55B Compass Module:

- Sensitive to microtesla (μ T) variations in magnetic field strength
- Simplifies direction by resolving magnetic field measurements into two components axes
- 6-bit (64-direction) resolution after software calibration
- Only 30 to 40 ms between start measurement and data-ready with simple synchronous serial interface
- Built-in resistor protection for data pins eliminates bus conflict risks
- Compact and breadboard-friendly 0.3 inch, 6-pin DIP package
- Compatible with Parallax microcontrollers



**Parallax GPS
Module
(#28146; \$89.95)**

Does your project need to be able to track its position globally? When used in an outdoor environment, the **Parallax GPS Receiver Module** with its integrated patch antenna can provide standard raw NMEA0183 strings or specific data from up to 12 satellites via a standard serial interface.

The module provides current time, date, latitude, longitude, altitude, speed and travel direction/heading among other data, and can be used in a host of applications, including navigation, tracking systems, mapping, fleet management and robotics.

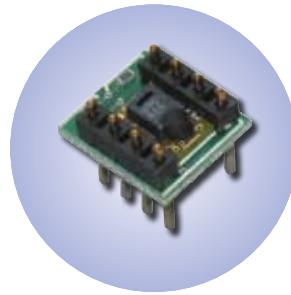
The Parallax GPS Receiver Module includes a programmable Parallax SX microprocessor and open-source control firmware for advanced users who wish to modify it. This source code is not supported by Parallax, but is offered as a free download online.

Features of the Parallax GPS Module:

- Single-wire 4800 bps TTL Serial interface to BASIC Stamp, SX and Propeller microcontrollers
- Provides either raw NMEA0183 strings or specific data, making it easier to use on the BASIC Stamp microcontrollers
- Simple/raw mode selectable via I/O control
- Single +5 VDC supply @ 115 mA (typical)
- Standard 4-pin header interface (0.100" spacing)

TEMPERATURE & HUMIDITY

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.



**Sensirion SHT1x
Temperature/
Humidity Sensor
(#28018; \$29.95)**

The **Sensirion SHT1x Temperature/Humidity Sensor** 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 your microcontroller 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. The SHT1x is factory calibrated so that it returns temperature with a resolution of 0.01 degrees Celsius and relative humidity with a resolution of 0.03 percent. The accuracy is better than most other sensors too. Worst-case temperature accuracy is +/- 2° C - but in the "room temperature" range the accuracy better than +/- 1° C. The relative humidity sensor is similarly accurate: +/- 3.5% in the range 20% to 80%. This is quite remarkable for a low-cost sensor. Excellent for commercial or home-based projects that require such readings.

The **DS2760 Thermocouple Kit** provides a low-cost, reliable means of measuring temperature over a wide range. The Dallas/Maxim DS2760 High Precision Li+ Battery Monitor is very easily configured into an effective thermocouple interface. The Parallax DS2760 Thermocouple Module capitalizes on this application and provides a complete connection between any BS2p BASIC Stamp microcontroller and a standard thermocouple element.



**DS2760
Thermocouple
Kit (#28022;
\$34.95)**

The DS2760 Thermocouple has the following features:

- I-Wire interface allows multiple devices with just one BASIC Stamp I/O pin
- Cold Junction measurement: 0° C to +127° C (0.125° C resolution)
- Low power consumption: Active current = 90 µA max,
Sleep current: 2 µA max

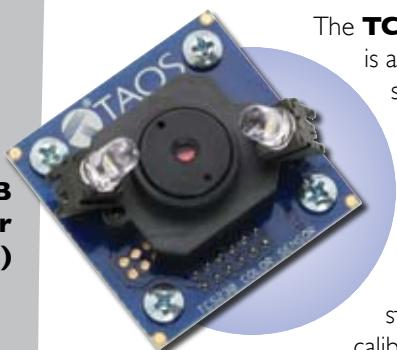
The kit also includes 3 Thermocouple elements:

- K-type: 32° F to 1873° F (0° to 1023° C)
- J-type: 32° F to 1873° F (0° to 1023° C)
- T-type: 32° F to 752° F (0° to 400° C)

This product is ideally suited to work with a BASIC Stamp 2p module (BS2P24-IC, BS2P40-IC, BS2PE-IC). Other BASIC Stamp modules will require a Serial-to-I-Wire protocol converter, as well as code to manage the large tables across program slots, thus we recommend the BS2p series.

COLOR & LIGHT

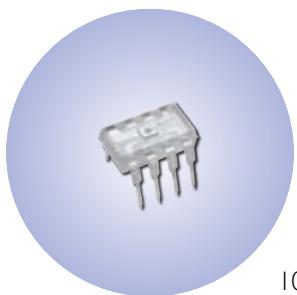
**TCS230-DB
Color Sensor
(#28302; \$65.95)**



The **TCS230-DB Color Sensor Daughterboard Sensor** is a complete color detector, including a TAOS TCS230 RGB sensor chip, white LEDs, collimator lens, and standoffs to set the optimum sensing distance. It plugs directly into the BASIC Stamp-2pe Motherboard and will also interface to any BASIC Stamp module or Propeller board using the optional DB-Expander SIP Converter (#28325; \$9.95). The TCS230-DB can detect and measure a nearly limitless range of visible colors. Applications include test strip reading, sorting by color, ambient light sensing and calibration, 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.

**TSL230R Light
to Frequency
Converter
(#27924; \$5.95)**



The Texas Advanced Optical Systems (TAOS) **TSL230R Light to Frequency Converter** sensor precisely measures light using an array of photodiodes, with an output of digital square waves. The TSL230R Light to Frequency Converter has an input dynamic range of 160 dB; that is, it can measure light over a range of 100,000,000-to-1.

The TSL230R programmable light-to-frequency converter combines a configurable silicon photodiode and a current-to-frequency converter on single monolithic CMOS integrated circuits. The output is a square wave (50% duty cycle) with frequency directly proportional to light intensity. The sensitivity of the device is selectable and the output frequency can be scaled by one of four preset values. An output enable (OE) is provided that places the output in the high-impedance state for multiple-unit sharing of a microcontroller input line.

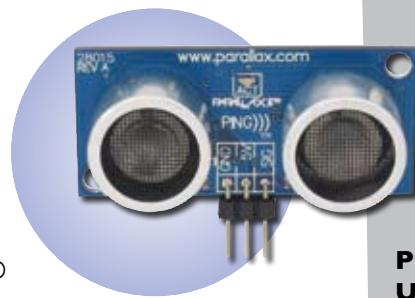
**QTI Sensor
(#555-27401;
\$5.95)**



The **QTI Sensor** was originally meant to sense the outer rim of a SumoBot ring; however these little line sensors can serve other purposes. These sensors also come as a kit of four with mounting hardware that enables line following with the Boe-Bot robot (page 37).

OBJECT DETECTION

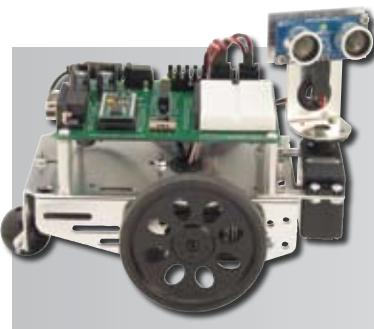
Parallax's **PING))) Ultrasonic Sensor** provides a low-cost and easy method of distance measurement. This sensor is perfect for any number of applications that require you to perform measurements between moving or stationary objects. Naturally, robotics applications are very popular but you'll also find this product to be useful in security systems or as an infrared replacement if so desired. You will definitely appreciate the activity status LED and the economic use of just one I/O pin.



**PING)))
Ultrasonic Sensor
(#28015; \$29.95)**

The PING))) sensor measures distance using sonar. An ultrasonic (well above human hearing) pulse is transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return. Output from the PING))) sensor is a variable-width pulse that corresponds to the distance to the target.

Interfacing to the BASIC Stamp microcontrollers is a snap: a single (shared) I/O pin is used to trigger the Ping sensor and "listen" for the echo return pulse. The intelligent trigger hold-off allows the PING))) to work with the BS1! An onboard three-pin header allows the PING))) to be plugged into a solderless breadboard, and to be connected to its host through a standard three-pin servo extension cable.



Mounting a PING))) detector on your Boe-Bot with the **PING))) Bracket Kit** (#570-28015; \$19.95) opens up a variety of autonomous navigation options. For video and sample code of this robot scanning its environment then driving to the closest object, visit our Video Gallery in the Resources section of our web site.

The **PIR Sensor** detects motion up to 20 feet away by using a Fresnel lens and infrared-sensitive element to detect changing patterns of passive infrared emitted by objects in its vicinity. Inexpensive and easy to use, it's ideal for alarm systems, motion-activated lighting, holiday props, and robotics applications. The PIR Sensor is compatible with all Parallax microcontrollers; sample BS1, BS2, and SX/B programs and product documentation are available online.



**PIR Sensor
(#555-28027;
\$9.95)**

Features of the PIR Sensor:

- Simple 3-pin connection
- Single bit output
- Small size - easy to conceal (0.96 x 1.0 x 1.27 in.)

PRESSURE, FLEX & RPM

**Flexiforce
Sensor Demo Kit
(#30056; \$25.95)**



**QT113-D
Touch Sensor
(#604-00038;
\$7.95)**



**Piezo Film
Vibra Tab Mass
(#605-00004;
\$1.79)**



**Melexis 90217
Hall-Effect
Sensor (#605-
00005; \$4.95)**



The active sensing area of the **Flexiforce Sensor** is a 0.375" diameter circle at the end of the sensor. The conductive leads are easy to connect to a breadboard or through-hole area. The Flexiforce has an ideal output for A/D conversion - 0V is no force and 4.2V is 100 lbs. The RCTIME command may be used with a LOOKUP table or calibration formula to execute some math to make the output useful. The kit includes a 220 ohm resistor, 0.1 µF and 0.01 µF capacitors, and the Flexiforce sensor.

The **QT113-D Touch Sensor** comes from the QT113 family QTouchT ICs which create sense fields through dielectric surfaces such as plastic or glass up to 100 mm (4") thick, and can even turn small objects into sensors. These sense fields work easily through gloved hands.

The **Piezo Film Vibra Tab Mass** vibration sensor (model LTD0) is manufactured by Measurement Specialties. Whether used as a vibration sensor, a flexible switch, or a frequency response device, piezo film is an interesting sensor to interface with Parallax microcontrollers. For example, it is easy to use with the COUNT or PULSIN commands on a BASIC Stamp. Note: Output needs to be conditioned before connecting to a BASIC Stamp I/O pin. We recommend a Zener Diode (#153-00001; \$0.50).

Parallax has worked with the **Melexis 90217 Hall-Effect Sensor** in applications including CNC milling machine spindle speed measurement and feedback on motor RPM. With the CNC milling machine it reliably measured the top spindle speed of 7,500 RPM. This is a cost-effective and highly functional hall-effect sensor.

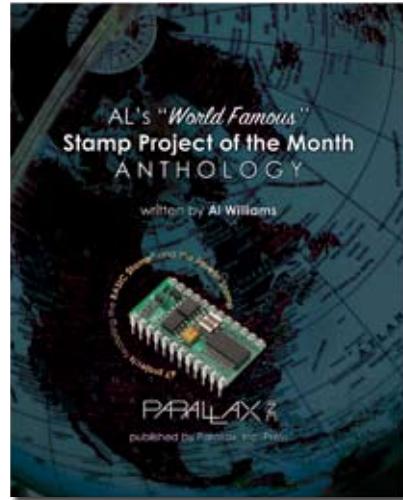
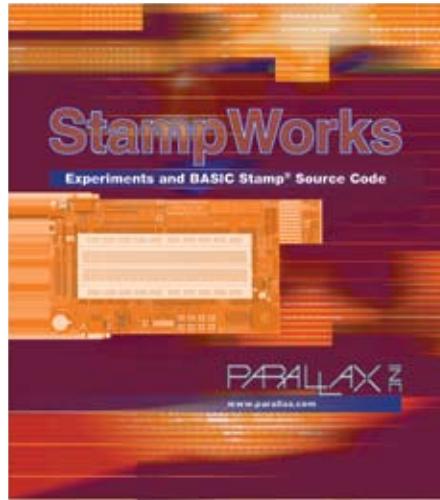
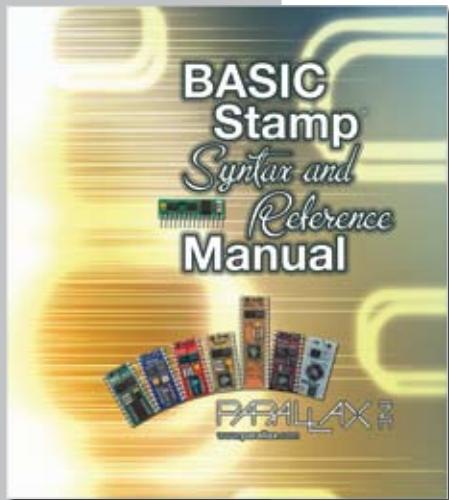
The Melexis 90217 is designed to be used with a bias magnet (#605-00006; \$0.79) south facing the back (non-marked) side of the IC. With a single Hall plate this sensor is immune to common rotary alignment problems.

Parallax Web Site

In November of 2007, Parallax introduced our newest web site to our customers. While we know change can be a bit trying for some, we are excited about our new web site and the new features it offers. Some of those features are: better search functionality, easier browse features, and additional ordering options.

The image displays three separate screenshots of the Parallax website, arranged vertically. The top screenshot shows the homepage with navigation links for Home, Store, Product Info, Education, Support, Resources, and Company. It features a banner for BASIC Stamp, SX, Propeller Chip, Robots, FTDI, and Downloads. Below the banner are sections for Microcontrollers, Sensors, Compare Robots, and Discussion Forums. The middle screenshot shows the Support page with a large 'Support' heading, a sub-section for Product Information, Downloads, and Technical Support, and a sidebar with links to Home, Store, Product Info, Education, Support, Resources, and Company. The bottom screenshot shows the Shopping Cart page, which includes a sidebar with links to Home, Store, Product Info, Education, Support, Resources, Company, My Account, and Shopping Cart. The main content area displays a table of items in the cart, including a BASIC Stamp Kit and a 9000 Reader Module and Tag Decoder Kit, with a total subtotal of \$29.00. There are also fields for Additional Instructions and a 'Place Order' button.

Order online at www.parallax.com



**BASIC Stamp
Syntax and
Reference Manual**
(#27218; \$25.95)

**StampWorks
Manual (#27220;
\$24.95)**

**Al's Stamp Project
of the Month
Anthology**
(#70013; \$9.95)

The **BASIC Stamp Syntax and Reference Manual** is a complete resource for BASIC Stamp microcontroller programming. The detailed PBASIC syntax support includes example programs demonstrating all commands. An illustrated tour of the BASIC Stamp Editor v2.2 introduces its many features, including syntax highlighting, interactive communication via the Debug Terminal, and conditional compilation techniques for code that will run on any BASIC Stamp model.

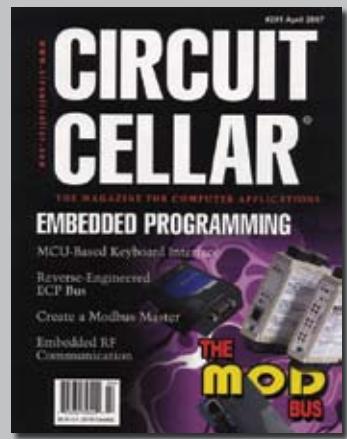
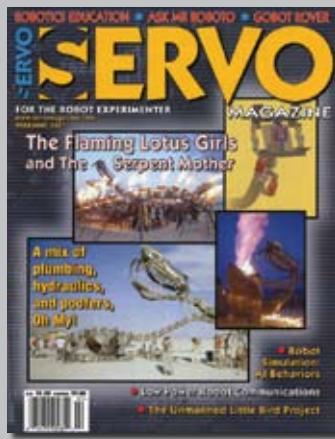
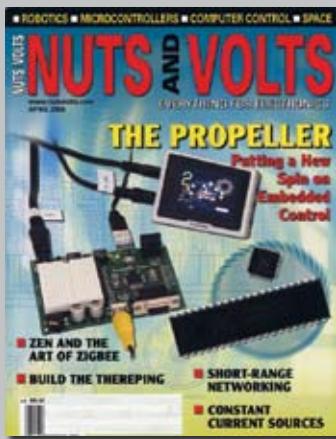
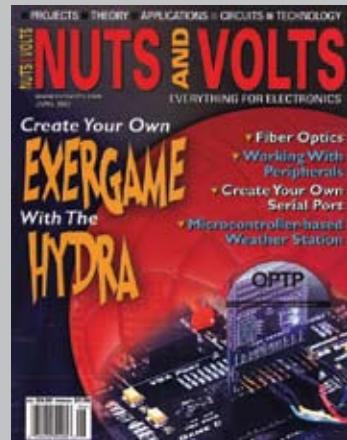
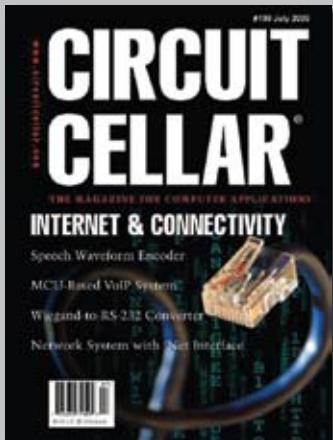
StampWorks is a hands-on book that guides you through 35 experiments designed to build your BASIC Stamp programming skills and confidence at the same time. You'll start simple and before you know it you'll be confidently writing sophisticated programs using Jon Williams' "Code like a Pro" tips and techniques. StampWorks is recommended for customers that have some PBASIC programming experience.

The entire collection of 67 "Stamp Project of the Month" columns by Al Williams is available in this printed book **Al's "World Famous" Stamp Project of the Month Anthology**. Al's columns feature detailed examples of BASIC Stamp applications with popular electronic and hardware interfaces. From time to time, Al also featured projects with the SX or Javelin Stamp module.



ALWAYS FREE DOWNLOADS AT PARALLAX.COM!

The downloads section on our web site is one of the most visited sections due to the vast amounts of available software and documentation. The most downloaded items are our free BASIC Stamp and Propeller editor software as we continually offer the latest feature-rich versions for free. The Stamps In Class student guides are also in the top 5 as well as the BASIC Stamp and Propeller manuals. If you're constantly seeking out technical information on a certain product or if it's 2 a.m. and you want to read 500+ pages of Nuts & Volts "Stamp Application" columns, then you should visit Downloads, located in the Support section of Parallax.com. Our goal is to provide you with as much information as possible whether you are reviewing a product prior to purchase or if you're deep in development. If you ever need technical assistance feel free to e-mail us at support@parallax.com



See Parallax in your favorite programming magazines!

Circuit Cellar - www.circuitcellar.com - Circuit Cellar attracts an international audience of qualified engineers who continually influence the design and production of embedded hardware and software systems. These hands-on embedded systems engineers participate in our many design contests and evaluation programs, consistently proving their design skills and qualification.

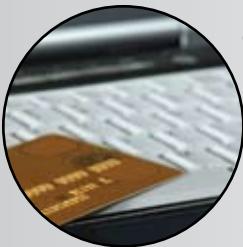
Nuts & Volts - www.nutsvolts.com - Established in 1980, Nuts & Volts is written for the hands-on hobbyist, design engineer, technician, and experimenter. The diversity of subjects appeals to all levels of experience and spans such topics as amateur robotics, circuit design, lasers, computer control, home automation, data acquisition, new technology, DIY projects, electronic theory, analog, and myriad microcontrollers.

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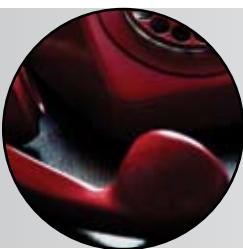


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