

PARALLAX INC.



# product catalog

PARALLAX   
[www.parallax.com](http://www.parallax.com)

# PARALLAX:

THE APPARENT DISPLACEMENT OF AN OBSERVED OBJECT DUE TO A CHANGE IN THE POSITION OF THE OBSERVER

**Parallax Inc.**  
**599 Menlo Drive**  
**Rocklin, CA 95765**  
**USA**

**Telephone**  
All callers, including  
International:  
Office: (916) 624-8333  
Fax: (916) 624-8003

Callers in the United States:  
Toll-Free Sales: 888-512-1024  
Toll-Free Tech Support: 888-99-STAMP

Office/Sales/Technical Support hours are Monday-Friday from  
7:00 a.m. to 5:00 p.m., Pacific Time.

**Internet**  
Company Web Site - <http://www.parallax.com>  
Discussion Forums - <http://forums.parallax.com>  
Propeller Object Exchange - <http://obex.parallax.com>

**E-mail**  
[support@parallax.com](mailto:support@parallax.com)  
[sales@parallax.com](mailto:sales@parallax.com)  
[education@parallax.com](mailto:education@parallax.com)

**Note:** As our catalogs are referred to by our customers for many months, we reserve the right to change prices without notice. Prices may vary between our ads and our catalogs. Product description, typographic, pricing, and photographic errors are unintentional and subject to change.



BASIC Stamp, Board Of Education, Boe-Bot, Scribbler, Stamps In Class, SumoBot, and SX-Key are federally registered trademarks of Parallax Inc.

Parallax, the Parallax logo, HomeWork Board, Penguin, PING))), Propeller, Spin, QuadRover, and SX/B are trademarks of Parallax Inc.

I-Wire is a registered trademark of Dallas Semiconductor.

Dallas Semiconductor Corporation is a trademark of Maxim Integrated Products.

Flexiforce is a trademark of Tekscan.

FTDI is a trademark of Future Technology Devices Intl Ltd.

Futaba is a registered trademark of Hobbico, Inc.

Hitachi is a registered trademark of Hitachi, Ltd.

HYDRA is a trademark of Nurve Networks LLC.

I<sup>2</sup>C is a registered trademark of Philips Semiconductors.

Philips is a registered trademark of Koninklijke Philips Electronics N.V.

Memsic is a registered trademark of MEMSIC, Inc.

Microsoft, Windows, MSDN, and Excel are trademarks or registered trademarks of the Microsoft Corporation. Windows 2K, Windows XP, and Windows Vista are registered trademarks of the Microsoft Corporation.

All product and service names mentioned herein are the trademarks of their respective (and respected) owners.

Thanks to MicrobotiX for the use of their photography (page 41).

Catalog design and layout by Jen Jacobs. Product photography, line drawings, and schematics by Rich Allred. Special thanks to our editors Dave Andrae, David Carrier, Jeff Martin, Jim Carey, and Lauren Davis. Super special thanks to our "Red Pen Lady" Stephanie Lindsay!

# TRY:

USE, TEST, OR DO (SOMETHING NEW OR DIFFERENT), IN ORDER TO SEE IF IT IS SUITABLE, EFFECTIVE, OR PLEASANT.

**Why Parallax?** Our goal is to provide you with excellent service. From the professional engineer to the part-time hobbyist or student, we have something for you. Ease in slowly or jump in with both feet. Whatever your project style, we have a level of support to meet your needs. *A few ways we can help you:*

- **Free Technical Support by telephone** - Our Tech Support staff is available to assist you Monday - Friday, 7:00 a.m. to 5:00 p.m. Pacific Time. Just a toll-free call (1-888-99-STAMP; in the U.S.) or a quick e-mail ([support@parallax.com](mailto:support@parallax.com)) away.
- **Free downloads online** - Our web site contains a vast amount of information, ranging from product documentation, software, source code and articles, to books and educational materials. It's all available at [www.parallax.com](http://www.parallax.com), and most all of it is free.
- **Online Discussion Forums** - Visit <http://forums.parallax.com> to get involved in the fun. Browse threads anonymously or sign up to join in the talk. The Forums are a great place to get your questions answered by Parallax staff and other knowledgeable users, share projects, and find inspiration.
- **Educational materials** - Parallax has been in the electronics education business since 1998. What began with our acclaimed "What's a Microcontroller?" text has expanded to include texts on many electronics subjects (including robotics). We offer a high level of educator support and, most recently, advanced education labs for the Propeller chip.
- **Microcontrollers for every level** - The BASIC Stamp module has been around since 1992. This unique microcontroller put the power in the hands of the people and continues to generate excitement. Our selection has since expanded to include the speedy SX microcontroller and our first custom all-silicon chip, the multi-processing Propeller.

**Give us a try. Parallax's 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. We're a great place to start.**



# GET STARTED:

## EMBARK ON A CONTINUING ACTION OR A NEW VENTURE.



have a bona fide "Getting Started" kit for microcontroller programming and experimentation.

The BASIC Stamp Discovery Kit includes: Board of Education, BASIC Stamp 2 module, *What's a Microcontroller? Parts & Text*, BASIC Stamp Manual, and programming cable.

The *What's a Microcontroller? Parts & Text* Kit guides you through over 40 activities designed to provide you with the best possible introduction to the world of BASIC Stamp programming. 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. You may use your Board of Education with the other parts and text kits in our Stamps in Class series.

With the BASIC Stamp Discovery Kit you will learn to: Send signals with blinking LEDs, sense contact with pushbuttons, read a dial using a potentiometer, measure light with a photoresistor, control a servo motor, make music on a piezospeaker, display data on a 7-segment LED, expand your projects with peripheral ICs, and more!

**BASIC Stamp® Discovery Kit  
(Serial with USB adapter and cable) - #27207; \$159.99**

**BASIC Stamp® Discovery Kit (USB) - #27807; \$159.99**

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. Combined with our Board of Education platform and the *What's a Microcontroller? Parts & Text* Kit, you



**Propeller™ Starter Kit - #32300; \$99.99**  
*(Read full product description of the Propeller Starter Kit on page 04)*

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 includes a surface-mount Propeller chip (P8X32A-Q44), EEPROM and 5 MHz crystal pre-wired to connectors for interfacing to devices such as a mouse, keyboard, TV, VGA monitor and speakers. This is all 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 chip can perform.

### **Best Seller! BASIC Stamp**

**Discovery Kit** (Read the full product description of the BASIC Stamp Discovery Kit on the facing page.)



### **Best Seller! BASIC Stamp Activity Kit - #90005; \$99.99**

Great resource for STEM programs!

The most popular special we've ever created features the HomeWork Board project platform with a surface mount BASIC Stamp 2 microcontroller along with the 350-page *What's a Microcontroller?* text. Also included is a components pack to support you in building over 40 projects! Parallax also provides complete technical support for the BASIC Stamp Activity Kit. USB to Serial Adapter sold separately, see page 58.

**What's a Microcontroller? (WAM) is the foundation of the BASIC Stamp Discovery and Activity Kits, and is also the introductory text to our Stamps In Class series. Read more about WAM and our BASIC Stamp education program beginning on page 49.**

### **StampWorks Experiment Kit #27297; \$289.99**

The StampWorks manual includes 35 experiments based on the BASIC Stamp 2 microcontroller and the Professional Development Board (more about the board on page 15). StampWorks gives you the hardware, the electrical components and, most importantly, the know-how to become a confident embedded systems 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.

By StampWorks' end you'll be able to: flash LEDs, use 7-segment and LCD displays, monitor push-buttons and switches, produce sound effects, control servos, measure temperature, and more.

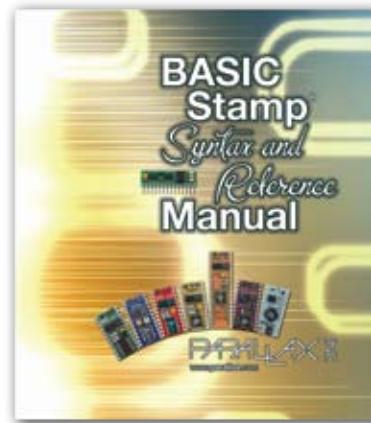


Order online [www.parallax.com](http://www.parallax.com)

### **BASIC Stamp I Starter Kit - #27205; \$79.99**

This convenient kit includes a BSI module, Super Carrier Board, BSI Adapter and serial cable, and the comprehensive BASIC Stamp Manual.

The BASIC Stamp I microcontroller, with its 8 I/O pins, is ideal for your more straightforward designs. Due to its small size (1.4 x 0.6 x 0.1 in) the BSI is perfect for fitting into tight spaces, and at less than \$30 per module, we're sure that you will find many applications for it. This starter kit includes a special BSI Serial Adapter that allows you to program in the Windows environment - the BSI Adapter connects your PC via a serial cable to the BSI programming header on the Super Carrier Board. The Super Carrier Board also accepts all 24-pin BASIC Stamp 2 modules, making this starter kit a versatile choice.



**For more information on BASIC Stamp microcontrollers, see page 06. For complete details click the "BASIC Stamp" link on the home page of [www.parallax.com](http://www.parallax.com).**



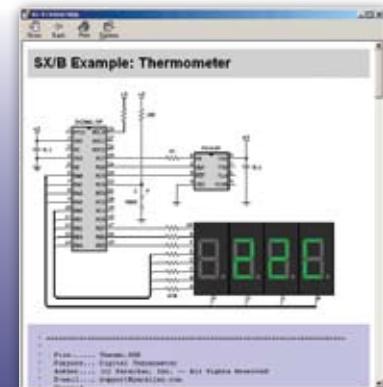
### **SX Tech Tool Kit - #45180; \$99.99**

If you have not yet programmed an SX, now is the time to get started. Parallax offers free development software, including SX/B, a BASIC language compiler for the SX microcontroller designed to help the transition from higher-level programming to assembly language. Using the SX-Key® USB, the primary development tool for the SX line of microcontrollers, you can program SX chips in-system and perform in-circuit source-level debugging.

The SX Tech Tool Kit is well-equipped with supporting material that makes it a great starting point to begin developing projects with the SX microcontroller. The SX Tech Tool Kit includes: SX-Key USB, SX Tech Board, (2) SX 28AC/DP chips, 50 MHz resonator, 4 MHz resonator, Scrolling Text Medal (available in kits while supplies last), SX-Key USB Manual v2.0, Programming the SX Microcontroller book by Gunther Daubach, and a USB cable.

We recommend a 7.5 VDC 1 Amp Power Supply (sold separately; #750-00009; \$10.95).

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 microcontroller is recommended for those who would like low cost and raw processing power. Previous microcontroller experience is also recommended. For more information on the SX microcontroller, see page 08.



**SX/B** - Program an SX as easily as a BASIC Stamp. Download SX/B for free at [www.parallax.com](http://www.parallax.com). For more information on SX/B see page 09.



### **Best Seller! Propeller Starter Kit - #32300; \$99.99**

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 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, VGA monitor, and speakers. This is all 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.



### **Propeller Accessories Kit - #32311; \$99.99**

Three I/O peripherals for your Propeller Demo Board! The Propeller chip is capable of reading input from a standard PS/2 keyboard and mouse, as well as sending output data to a PAL/NTSC A/V display. Example keyboard, mouse, and display driver objects are provided with the Propeller Tool software; you may use and modify these or write your own.



**Best Seller! Propeller-Powered HYDRA Game Development Kit - #32360; \$199.99**

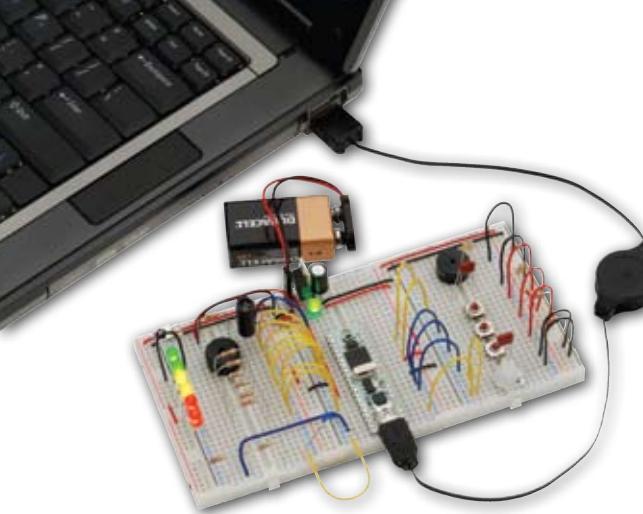
Develop games, graphics, and media applications with the Propeller-powered HYDRA Game Console. For beginner to intermediate coders, you need only basic programming experience in any BASIC or C-like language. All of the hardware and software you need is included, along with the comprehensive book on game programming for the Propeller in Spin and assembly language entitled *Game Programming for the Propeller Powered HYDRA*. Within the book, the HYDRA 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. Note: Printed book is black and white.

Kit comes complete with HYDRA system, book, 128 K Memory card, Blank Experimenter card, mouse, keyboard, gamepad, video and USB cables, power supply, CD, and more!



See page 20 for our selection of HYDRA Game Development Kit-compatible accessories.

Order online [www.parallax.com](http://www.parallax.com)



**Propeller Education Kit (40-Pin DIP Version) - #32305; \$99.99**

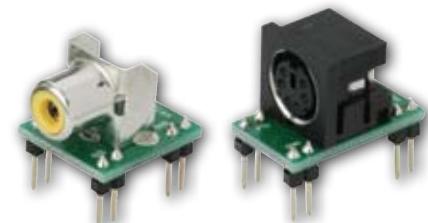
**NEW! Propeller Education Kit (PropStick USB Version) - #32306; \$99.99**

It's easier to get started with the Propeller than you can imagine. Our education team has developed an ongoing series of Propeller Education Kit Lessons and Labs (available free online) which work seamlessly with our Propeller Education Kits. Both versions of the Propeller Education Kit include everything you'll need to get started, including components, breadboards, connectors, and of course, the Propeller microcontroller.

The Propeller Education Kit PropStick USB Version features the PropStick USB, a module that you can plug into a breadboard and get up and running with minimal time and wiring. The Propeller Education Kit 40-Pin DIP Version features a breadboard-friendly DIP version of the same Propeller chip that is built into the PropStick USB module. Students can plug in and connect all the parts to build their own system right on the breadboard. Circuit mistakes aren't so scary with the 40-pin DIP version, because each part is inexpensive and easy to replace. 9V battery not included.

**RCA to Breadboard Adapter - #28050; \$4.99  
PS/2 to Breadboard Adapter - #28060; \$4.99**

Excellent for use with the Propeller Education Kits to enable the connection of A/V displays and computer mice or keyboards. These small modules connect easily to breadboards, protoboards and perfboards with 1/10-inch hole spacing.



# DESIGN:

DO OR PLAN WITH A SPECIFIC PURPOSE OR INTENTION IN MIND



As a rapid prototyping tool for engineers, an affordable controller for hobbyists, and an easy-to-learn platform for technology students, the BASIC Stamp microcontroller prospers in many fields. Common uses include classroom robotics and lab projects from middle schools to universities, scientific field research tools, process control systems, and custom or lower-volume engineering projects. A wide base of sample applications and source code is available free online.

A BASIC Stamp module is a single-board computer that runs the Parallax PBASIC language interpreter in its microcontroller. The developer's code is stored in an EEPROM, which can also be used for data storage. The PBASIC language has easy-to-use commands for basic I/O, like turning devices on or off, interfacing with sensors, etc. More advanced commands let the BASIC Stamp module interface with other integrated circuits, communicate with each other, and operate in networks.

The screenshot shows the BASIC Stamp Editor software interface. On the left is the code editor with the following PBASIC code:

```
/*$STAMP BS2
* $PBASIC 2.5)

a VAR Word
b VAR Word

DEBUG "Enter a number between 0 and 65535", CR, CR
DEBUGIN DEC5 a

DEBUG CRSRXY, 0, 1, "decimal number: ", DEC a, CR
DEBUG "hexadecimal number: ", HEX a, CR
DEBUG "binary number: ", BIN a, CR, CR
```

On the right is a terminal window titled "Debug Terminal" displaying the output of the program:

```
1025
Enter a number between 0 and 65535
decimal number: 1025
hexadecimal number: 401
binary number: 100000000001
```

The PBASIC language is very powerful yet very easy to learn. BASIC Stamp programming is the perfect entry to technology literacy.

## Choose your model:

**For full technical details on each module, see the table on the facing page.**

**BASIC Stamp 1 Module** - Affordable yet capable; perfect for smaller projects or tight spaces.

**BASIC Stamp 2 Module** – Ideal for beginners yet quite powerful, with a vast resource base and sample code. The BS2 is the core of our Stamps in Class program (see page 49).

**BASIC Stamp 2e Module** - Perfect for those who have experience with the BASIC Stamp 2 and would like more variable and program space.

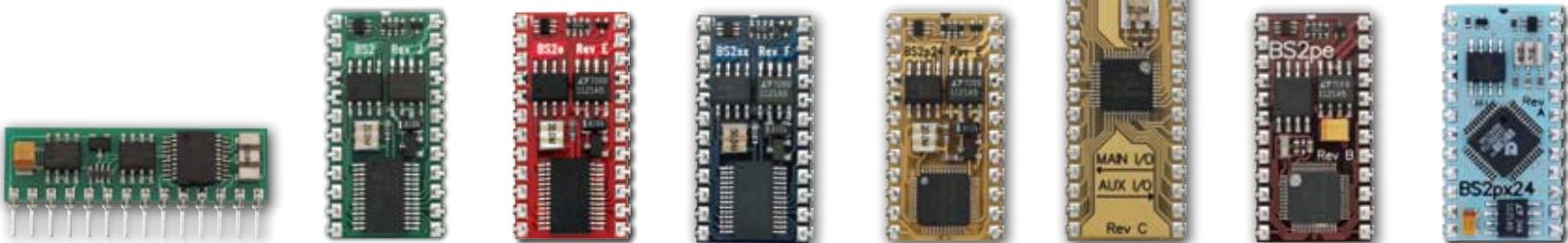
**BASIC Stamp 2sx Module** - Supports the BS2 command set with more variable and program space at more than twice the execution speed.

**BASIC Stamp 2p24 Module** - In addition to more speed and variable space, special commands support I/O polling, character LCDs, and I<sup>2</sup>C and I-Wire protocols. The **BASIC Stamp 2p40** has these features plus 16 additional I/O pins.

**BASIC Stamp 2pe Module** - BS2p command set paired with lower power consumption and more memory for battery-powered data logging applications.

**BASIC Stamp 2px Module** - Our fastest BASIC Stamp microcontroller supports the BS2p command set as well as special I/O configuration features.

# BASIC Stamp Modules



Name of module	<b>BASIC Stamp 1</b>	<b>BASIC Stamp 2</b>	<b>BASIC Stamp 2e</b>	<b>BASIC Stamp 2sx</b>	<b>BASIC Stamp 2p24</b>	<b>BASIC Stamp 2p40</b>	<b>BASIC Stamp 2pe</b>	<b>BASIC Stamp 2px</b>
<b>Stock Code # and Price</b>	<b>BS1-IC; \$29.00</b>	<b>BS2-IC; \$49.00</b>	<b>BS2E-IC; \$54.00</b>	<b>BS2SX-IC; \$59.00</b>	<b>BS2P24; \$79.00</b>	<b>BS2P40; \$89.00</b>	<b>BS2PE; \$75.00</b>	<b>BS2PX24; \$79.00</b>
<b>Processor Speed</b>	4 MHz	20 MHz	20 MHz	50 MHz	20 MHz Turbo	20 MHz Turbo	8 MHz Turbo	32 MHz Turbo
<b>Execution Speed (instructions/ Sec.)</b>	~2,000	~4,000	~4,000	~10,000	~12,000	~12,000	~6,000	~19,000
<b>RAM Size</b>	16 Bytes (2 I/O, 14 Variable)	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)
<b>Scratchpad RAM</b>	N/A	N/A	64 Bytes	64 Bytes	128 Bytes	128 Bytes	128 Bytes	128 Bytes
<b>EEPROM (Program) Size</b>	256 Bytes, ~80 instructions	2K Bytes, ~500 instructions	8 x 2K Bytes, ~4,000 instructions	8 x 2K Bytes, ~4,000 instructions	8 x 2K Bytes, ~4,000 instructions	8 x 2K Bytes, ~4,000 instructions	16 x 2K Bytes (16K for source), ~4,000 instructions	8 x 2K Bytes (16K for source), ~4,000 instructions
<b>Voltage Requirements</b>	5-15VDC	5-15VDC	5-12VDC	5-12VDC	5-12VDC	5-12VDC	5-12VDC	5-12VDC
<b>Current Draw @ 5 V (Run/Sleep)</b>	1 mA/25 µA	3 mA/50 µA	25 mA/200 µA	60 mA/500 µA	40 mA/350 µA	40 mA/350 µA	15 mA/150 µA	55 mA/450 µA
<b># of I/O Pins</b>	8	16 + 2 Serial	16 + 2 Serial	16 + 2 Serial	16 + 2 Serial	32 + 2 Serial	16 + 2 Serial	16 + 2 Serial
<b>Source/Sink Current per I/O</b>	20 mA/ 25 µA	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
<b>Source/Sink Current per Unit</b>	40 mA/50 µA	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
<b>PBASIC Commands</b>	32	42	45	45	61	61	61	63

# PROTOTYPE:

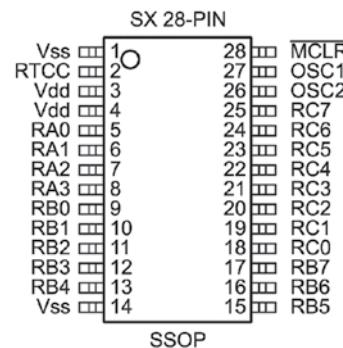
A FIRST OR PRELIMINARY MODEL OF SOMETHING, FROM WHICH OTHER FORMS ARE DEVELOPED OR COPIED

Parallax SX chips are 8-bit, high-speed microcontrollers with flash program memory, and in-system programming and debugging capability. Choose the SX for your design if you need:

- Speed - operating frequencies up to 75 MHz
- A pipelined instruction set - non-branching commands execute in a single cycle
- Jitter-free 3-cycle internal interrupt response
- Flexible I/O, with selectable internal pull-ups and TTL or CMOS logic level
- Schmitt-trigger or analog comparator support on select ports
- Outputs capable of sourcing/sinking 30 mA
- A built-in 8-bit real-time clock, watchdog timer, and brown-out detector
- Multi-input wakeup logic on 8 pins
- An internal RC oscillator configurable from 31.25 kHz to 4 MHz
- RoHS compliance
- Free programming software for Assembly and SX/B (BASIC)
- Generous production-quantity price breaks; see page 12



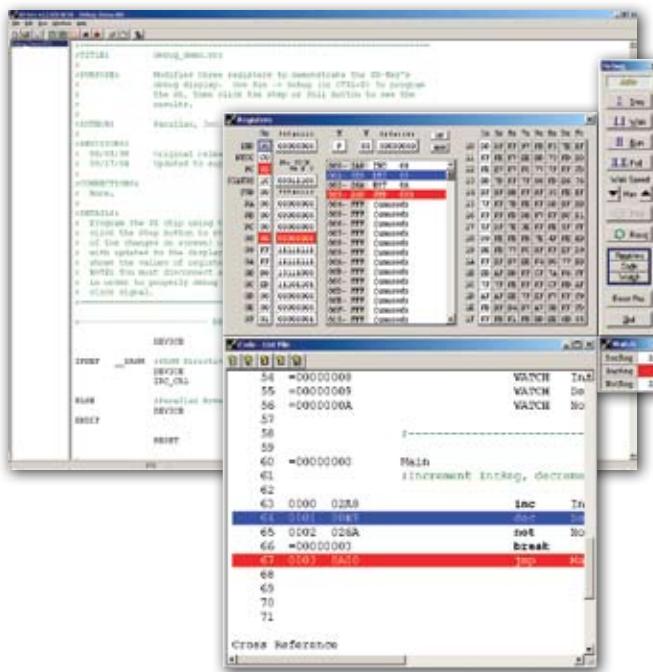
**SX Microcontroller IC - any package type; \$2.79**



Stock #	Pins	I/O	EE/Flash (Words)	RAM (Bytes)	Voltage Required	Operating Temperature @ 3.0 - 5.5 V, 50 MHz	4.5 - 5.5 V, 75 MHz
SX20AC/SS-G	20	12	2 K	137			
SX28AC/DP-G	28	20	2 K	136	3.0 - 5.5 VDC	-40 to +85 °C	0 to +70 °C
SX28AC/SS-G	28	20	2 K	136			
SX48BD/TQ-G	48	36	4 K	262			

## SX-Key Editor Software

This free software package is an integrated development environment for the SX line of microcontrollers, supporting every chip in production. Used in conjunction with the SX-Key or SX-Blitz programming tools, the user can write code, assemble/compile it, and download to the SX chip. The SX-Key USB also enables in-circuit source-level debugging, allowing the user to step through the code line-by-line or stop at set breakpoints.



Also at the user's fingertips is an on-board programmable clock. The frequency output of this clock is adjusted from the software IDE with a slider bar between 4 and 100 MHz.

The SX-Key Editor Software is compatible with Windows 98/NT/2K/XP/Vista platforms. Obtain the latest version free from the Downloads link at [www.parallax.com/SX](http://www.parallax.com/SX).

## SX/B

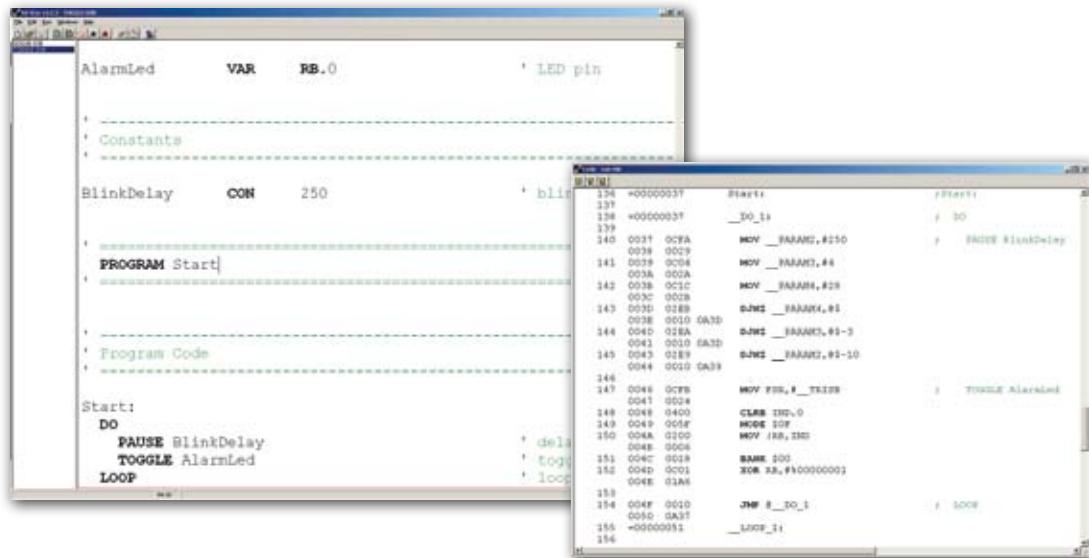
SX/B is a BASIC compiler designed for the Parallax SX family of microcontrollers, with two specific goals in mind:

1. Expedite the task of the professional engineer by creating a simple, yet robust high-level language for the SX microcontroller. This allows SX-based projects to be prototyped and coded quickly.
2. Assist the student programmer wishing to make the transition from pure high-level programming (i.e. BASIC Stamp) to low-level programming (SX assembly language).

The SX/B compiler is built right into the free SX-Key IDE software and supports the entire series of SX chips. 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. Interfacing with other devices is easy because SX/B has high-level commands for Serial, SPI, I<sup>2</sup>C, and I-Wire.

With SX/B, interrupts have never been easier. Creating a periodic interrupt every millisecond is as simple as "INTERRUPT 1000" with no restriction on what commands can be used with an interrupt routine.

Because speed is one of the SX chip's best features, the compiler generates code "in line." The code created executes quickly, and the View List feature allows those who are interested to see the generated assembly language. Assembly code can be added to SX/B programs in single lines with a slash, or in blocks with the ASM...ENDASM instruction.



# SIMPLIFY:

TO MAKE LESS COMPLEX OR COMPLICATED; MAKE PLAINER OR EASIER: *TO SIMPLIFY A PROBLEM.*



## Do you remember when programming was actually fun?

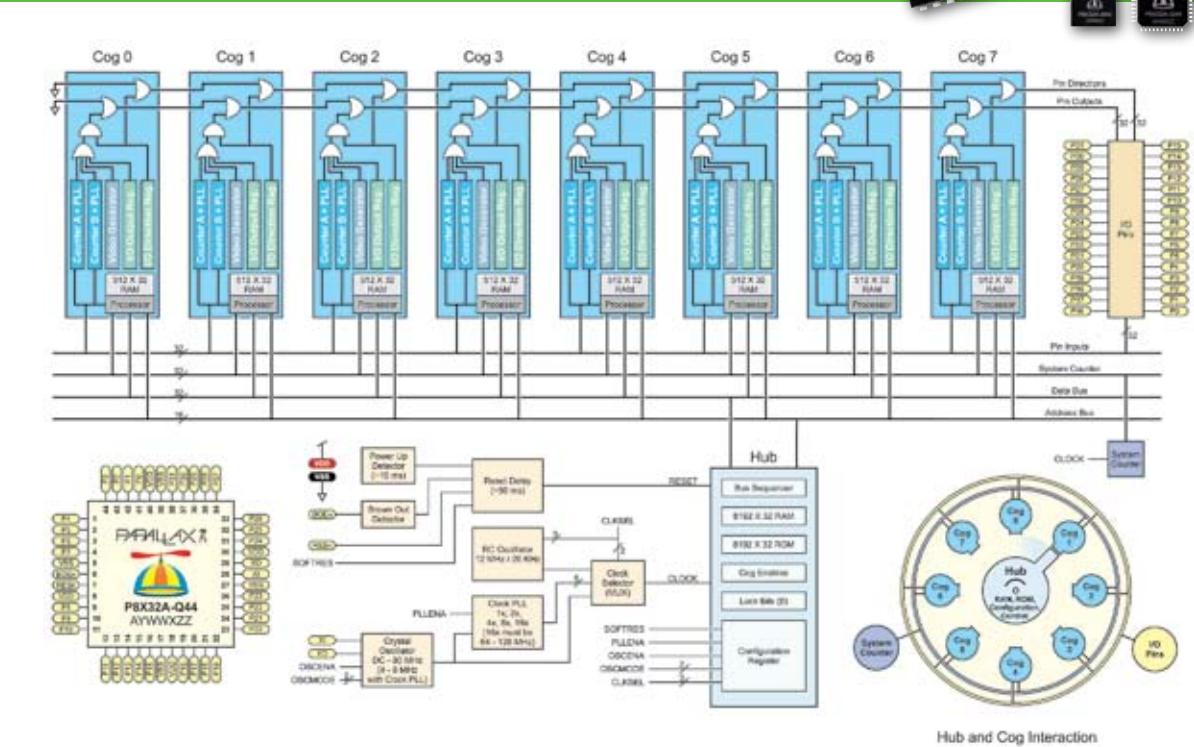
With eight 32-bit processors in one chip, integrating peripheral devices is suddenly simplified. The Propeller chip gives programmers both the power of true multi-processing and deterministic control over the entire system.

Each of the Propeller chip's cogs can operate simultaneously, both independently and cooperatively with other cogs, sharing access to global memory and the system clock in a round-robin fashion through a central hub. Each cog has access to all 32 I/O pins, with pin states being tracked in its own I/O output and direction registers. Each cog also has its own memory, as well as two counter modules and a video generator module capable of producing NTSC, PAL and VGA signals.

There are two native languages, object-based Spin and low-level assembly, and a third-party C compiler. Example objects, such as keyboard, mouse, and graphics drivers as well as floating-point math functions, come standard with the free Propeller Tool software. Many others, including C objects, are available through the Propeller Object Exchange. With the right objects, using the Propeller is a matter of high-level integration.

A Parallax creation from the silicon on up, the Propeller chip's unique architecture and languages will change the way you think about embedded system design. ***Simplify!***

New! ICCV7 C Compiler for Propeller (pg. 19)



Power Req.	Operating Temp.	Processors (Cogs)	I/O Pins	External Clock Speed	Internal RC Oscillator	Execution Speed	Global ROM/RAM	Cog RAM
3.3VDC	-50 to +125 °C	8	32 CMOS	DC to 80 MHz	~12 MHz or ~20 kHz	0-160 MIPS (20 MIPS/cog)	32768 / 32768 bytes	512 x 32 bits/cog

Propeller Chip - any package type; \$12.99 - See page 12 for more details.



**Propeller Object Exchange** - The Propeller Object Exchange (obex.parallax.com) contains many source code object files created and submitted by customers as well as Parallax engineers for use by everyone in the community. Objects are available for data storage, displays, motor control, communication protocols, human input devices, sensors, math functions, and many other categories. All objects in the Propeller Object Exchange are free for personal and commercial use under the MIT License.

## **Propeller Tool Software**

**(Win2K+)** - This free software is the primary development environment for Propeller programming in Spin and Assembly Language. There are many features that facilitate organized development of object-based applications. Multi-file editing, code and document comments, color-coded blocks, keyword highlighting, and multiple window and monitor support aid in rapid code development.

Optional view modes allow you to quickly drill down to the information you need- by hiding comment lines, method bodies, or by showing the object's compiled documentation only. An object's normal code view (top left) can quickly be switched to its documentation view (bottom left) to determine what public methods exist and how to use them. These multiple views enable quick interfacing of existing objects to your Propeller application. Many useful objects are included with the Propeller Tool, and many more are available online from the Propeller Object Exchange.



**New! Propellant Library and Executable**

**(Win2k+)** - For software developers to add support for the Propeller chip to their projects and for users needing command-line driven Propeller chip support. The Parallax Propellent software is a Windows-based tool for compiling and downloading to the Parallax Propeller chip- without using the Propeller Tool development software. The Propellent Executable provides the ability to do things like compile Spin source, save it as a binary or EEPROM image, identify a connected Propeller chip, and download to the Propeller chip, all via simple command-line switches or drag-and-drop operations. Pictured above; Propellent Executable compiling source code to a Propeller-compatible EEPROM.



Propeller creator Chip Gracey (seated) with Parallax Engineer Jeff Martin performing silicon surgery at the FIB machine.

# MASS PRODUCE:

THE PRODUCTION OF LARGE AMOUNTS OF STANDARDIZED PRODUCTS ON PRODUCTION LINES.

## PBASIC INTERPRETER CHIPS

Pre-programmed with our PBASIC Interpreter, chips are available for every BASIC Stamp model to incorporate into your PCB for production. Prices are Ea@Qty.



Model	Stock #	100	1000
BS1 DIP	PBASIC1/P	\$6.99	\$5.00
BS1 SS	PBASIC1XT/SS	\$6.29	\$4.50
BS2 DIP	PBASIC2C/P	\$8.39	\$6.00
BS2 SS	PBASIC2CI/SS	\$7.69	\$5.50
BS2e DIP	PBASIC2E/P	\$9.09	\$6.50
BS2e SS	PBASIC2E/SS	\$8.39	\$6.00
BS2sx DIP	PBASIC2SX/P	\$9.09	\$6.50
BS2sx SS	PBASIC2SX-28/SS	\$8.39	\$6.00
BS2p24 SS	PBASIC48W/P24	\$9.09	\$5.85
BS2p40 SS	PBASIC48W/P40	\$9.09	\$5.85
BS2pe SS	PBASIC48W/PE	\$9.09	\$5.85
BS2px SS	PBASIC48W/PX24	\$9.09	\$5.85

We also stock compatible resonators and EEPROM chips, and two OEM reference kits:

- BS2 OEM Module Kit - #27291; \$30.99**
- BS2sx OEM Module Kit - #27302; \$49.99**

Microcontrollers in Quantity

## SX MICROCONTROLLER CHIPS

The high-speed SX microcontroller is an affordable solution for larger-volume production. Parallax Inc. is the world-wide supplier for all models in production.

Stock #	Pins	Package Type
SX20AC/SS-G	20	SSOP 5.3 mm W
SX28AC/DP-G	28	DIP 0.3 in W
SX28AC/SS-G	28	SSOP 5.3 mm W
SX48BD-G	48	TQFP 7x7 mm

Datasheets are available from the SX Software and Documentation Downloads link at <http://www.parallax.com/SX>.



We offer price breaks at the following quantities. For higher volume orders and custom pre-programming, please contact [sales@parallax.com](mailto:sales@parallax.com) for quotes. Prices shown are Ea@Qty.

Qty.	1	5	100	1000
Price	\$2.79	\$2.51	\$2.23	\$1.89

## PROPELLER MICROCONTROLLER CHIPS

The extremely versatile Propeller microcontroller is available as a DIP chip for prototyping, and in two different package types for volume manufacturing.

Stock #	Pins	Package Type
P8X32A-D40	40	DIP 0.6 in W
P8X32A-Q44	44	LQFP 10 x 10 mm
P8X32A-M44	44	QFN 9 x 9 mm

The Propeller Datasheet is available from the Downloads link at [www.parallax.com/propeller](http://www.parallax.com/propeller).

With its 8 parallel-processing cogs, the Propeller chip can perform multiple functions and thereby reduce component count in your finished design, improving overall economy in high-volume production. We offer price breaks at the following quantities. For higher volume orders, please contact [sales@parallax.com](mailto:sales@parallax.com) for quotes. Prices shown are Ea@Qty.

Qty	1	100	1000	5000
Price	\$12.99	\$11.17	\$8.05	\$7.53



# BUILD:

TO CONSTRUCT (esp. SOMETHING COMPLEX) by ASSEMBLING AND JOINING PARTS OR MATERIALS



**Professional Development Board (Serial)** - #28138; \$159.99 *(Read full product description on page 15. Also featured in the StampWorks Experiment Kit, page 03)*

Our Professional Development Board (PDB) is a 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 with a BS1 Serial Adapter, 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. We recommend our 12 V, 1 A power supply (#750-00007; \$9.99; sold separately), Microcontrollers, BS1 Serial Adapter (page 14), and SX-Key (page 08) not included.



**Board of Education (Serial)** - #28150; \$69.99  
**Board of Education Full Kit (Serial)** - #28103; \$99.99

Includes Board of Education development board, BASIC Stamp 2 module, jumper wires, and serial cable. Recommended setup for use with Stamps In Class educational texts. *(Read full product description of the Board of Education on page 50)*



**Board of Education (USB)** - #28850; \$69.99  
**Board of Education Full Kit (USB)** - #28803; \$99.99

Includes Board of Education development board, BASIC Stamp 2 module, jumper wires, and USB cable. Recommended setup for use with Stamps In Class educational texts. *(Read full product description of the Board of Education on page 50)*



**Propeller Proto Board (Serial)** - #32212; \$29.99  
Low-cost, high-quality solution for permanent projects using the Propeller chip, available in Serial and USB versions. *(Read full product description of the Propeller Proto Board on page 17)*

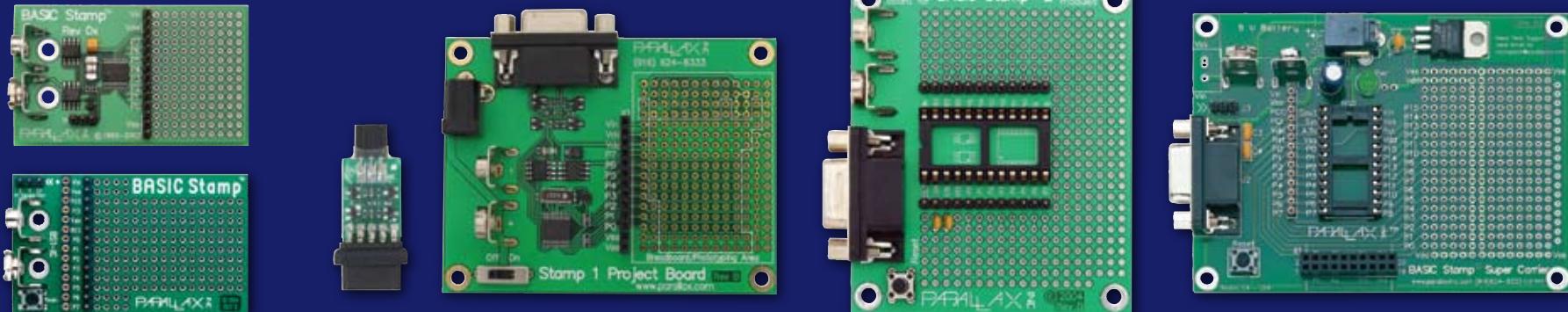


**Propeller Proto Board (USB)** - #32812; \$39.99 *(not pictured)*



**SX28 Proto Board** - #45302; \$9.99  
*(Read full product description of the SX28 Proto Board on page 16)*

**Parallax stocks several different development boards to suit the needs of many different programming languages, projects and budgets.**



### **BASIC Stamp Rev.Dx Microcontroller - #27100; \$29.99**

Need an inexpensive platform for small dedicated projects? The Rev.Dx is a BASIC Stamp 1 microcontroller mounted on a space-saving PCB with a 9V battery clip and a wire-wrap or solder area for your application circuit. A 3-pin header accepts the BASIC Stamp Serial Adapter required for programming (#27111, sold separately below). Dimensions: 1.55 x 4.1 in (3.9 x 10.4 cm)

### **BASIC Stamp I Carrier Board - #27110; \$4.99**

Low-cost through-hole carrier boards are still available separately. This board provides a wire-wrap or solder area for permanent BASIC Stamp projects, a 9V battery clip, and a programming connection. BS1-IC not included. Programming requires the BASIC Stamp I Serial Adapter (#27111, sold separately below). Dimensions: 1.5 x 2 in (3.8 x 5.1 cm)

### **BASIC Stamp I Serial Adapter - #27111; \$4.99**

The BASIC Stamp I Serial Adapter is designed to program the BASIC Stamp I via your PC's serial port using the Windows-based BASIC Stamp Editor. One end plugs into a serial cable and the other onto a 3-pin header provided on BASIC Stamp I development boards. Required for BS1 programming with the BASIC Stamp I Rev. Dx, BASIC Stamp I Carrier Board, Super Carrier Board, Professional Development Board, or direct BS1-IC programming.

### **BASIC Stamp I Project Board - #27112; \$14.99**

For students, hobbyists, and professionals who desire the small form and features of the BASIC Stamp I microcontroller, but need a development platform in the mold of the Parallax BOE and HomeWork boards, the BASIC Stamp I Project Board is low-cost solution that is sure to fit the bill. The BS1 Project Board consists of a surface-mounted BASIC Stamp I on a 3.25 x 2.5 in (8.3 x 6.4 cm) printed circuit board. The board includes a 9V battery clip, a mechanically interlocked 2.1 mm power jack, DB-9 connector for programming (no adapter needed), and LM2936 regulator providing 40 mA for your projects. Solderless breadboard included.

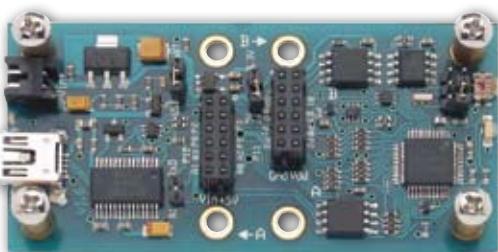
### **BASIC Stamp 2 Carrier Board - #27120; \$15.99**

The BASIC Stamp 2 Carrier board supports all 24-pin BASIC Stamp models (BS2, BS2e, BS2sx, BS2p24, BS2pe, and BS2px). The board also features a serial (DB9) programming connection, generous through-hole prototyping area, reset button, and 9V battery clip (battery not included). Board measures 8.1 x 6.6 cm.

### **Super Carrier Board - #27130; \$19.99**

The BASIC Stamp Super Carrier board supports all 24-pin BASIC Stamp models (BS2, BS2e, BS2sx, BS2p24, BS2pe, and BS2px) as well as the BS1 and Javelin Stamp. *This board offers the following features for experiments or permanent projects:*

- 1.5 x 2 in. solder or wire-wrap prototyping area arranged to support servos, 300 or 600 mil DIP ICs, DB9, DB25, or RJ-11 connectors.
- Reset button
- Serial (DB9) connector for programming and communication with 24-pin BASIC Stamp or Javelin Stamp modules
- 3-pin header for the BASIC Stamp I Serial Adapter (description left; #27111, sold separately)
- AppMod header accepts our LCD Terminal (#29121; \$14.99; page 23)
- Onboard 5 V regulator
- Mechanically interlocked 9V battery clip and 6-12VDC barrel jack for flexible power supply options
- Dimensions: 4 x 3 x 0.65 in (10.2 x 7.62 x 1.65 cm)



### BS2pe Motherboard - #28300; \$79.99

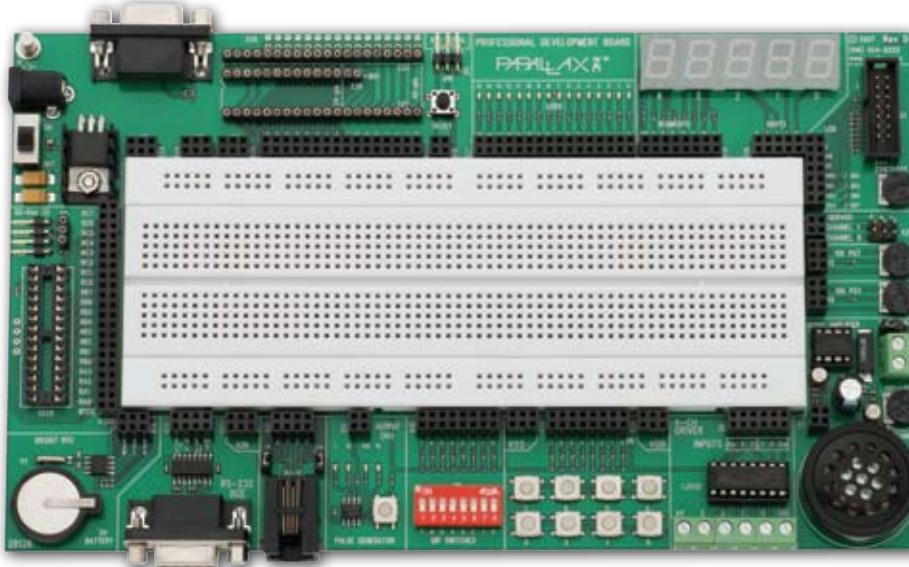
A compact, professional-grade platform for BASIC Stamp applications. With the MoBoStamp-pe and an assortment of plug-in daughterboards, users can easily develop systems requiring more processing power than a BS2pe alone can provide. The MoBoStamp-pe includes a USB interface for programming and debugging on an attached PC. The motherboard can either be powered by the USB connection or for portable applications, the motherboard can be powered through an attached daughterboard and external power source.

- Compact size: 2.75 x 1.35 in (69.9 x 34.3 mm)
- BS2pe chip for high performance (~6000 instructions/sec)
- Onboard power select jumpers: USB or external (6 to 9VDC) power supply
- Multiple Vdd levels: 3.3 and 5VDC, jumper selectable
- Power consumption as low as 18 mA
- User-programmable multi-color status LED

Interfacing to the outside world is possible using the two daughterboard sockets. Compatible plug-in daughterboards perform a variety of functions for data acquisition, light sensing, and display output.

#### Compatible daughterboards (DB) include:

- Power Input, 3-pin Header I/O DB (#28301; \$14.99)
- TCS230-DB Color Sensor (#28302; \$65.99; page 28)
- BS2PE Prototyping Daughterboard (#28310; \$1.99)
- 7Seg-DB Display Master Unit (#28312; \$24.99; page 25)
- 7Seg-DB Display Slave Unit (#28313; \$24.99; page 25)
- DB-Expander DB-to-SIP (#28325; \$9.99; page 58)
- Daughterboard Extension Cable (#800-28301; \$7.99; pg. 58)



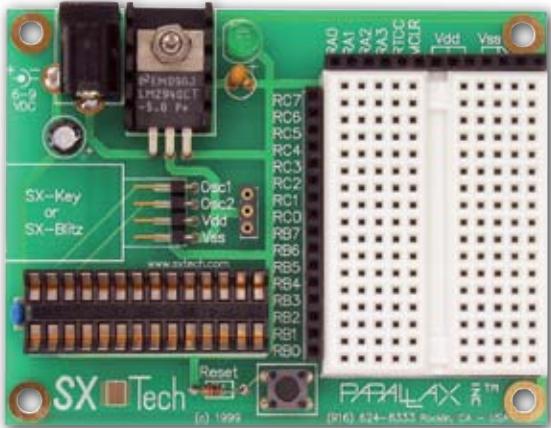
### Best Seller! Professional Development Board - #28138; \$159.99

Our 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.

- Power Requirements: 6-12 VDC (IA Power Supply Recommended, 65 mA quiescent current)
- Programming Interface: RS-232 DB-9 Female Connector (#28031 required for USB connection)
- Dimensions: 9 x 5.25 x 1 in (22.75 x 13.25 x 2.54 cm)
- Operating temp range: 32 to 158 °F (0 to 70 °C)

#### Features of the Professional Development Board include:

- Five blue 7-segment (plus 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 k Ohm potentiometers
- Audio amplifier with built-in speaker; with switch for external speaker
- L293D high-current driver for motors, solenoids, etc.
- Eight, normally-open pushbuttons (I/O lines protected, and pulled-up 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 I-Wire communications
- RS-232 DCE port with MAX232E transceiver
- DS1307 (I<sup>2</sup>C) real-time-clock with 3 V back-up battery (pre-installed)



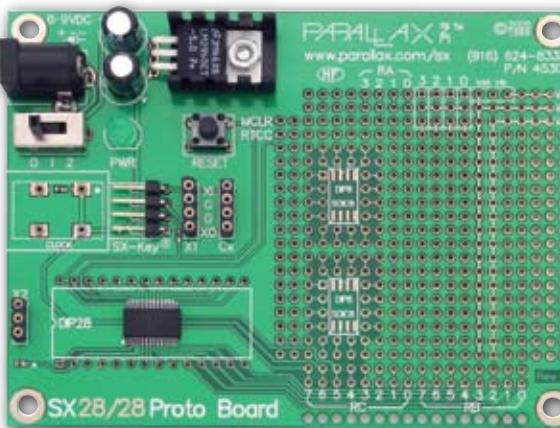
### **SX Tech Board - #45205; \$39.99**

The SX Tech Board is our recommended development platform for the SX microcontroller. The 28-pin socket accepts the SX28AC/DP-G (not included, see page 08). Simply place the SX chip in the socket, and then build your project on the breadboard. The SX chip's I/O ports and control lines are brought to the SIP headers alongside the breadboard, as are Vdd (+5 V) and Vss (ground) connections. This board also features 6-9 V barrel jack for power, a 5 V regulator, and a power reset button. A 4-pin header accepts the SX-Key or SX-Blitz required for programming (not included, see page 08). Dimensions: 3.25 x 2.5 x 0.65 in (8.3 x 6.4 x 1.7 cm)

*Power supply not included; we recommend our 7.5 V, 1 A supply (#750-00009; \$10.99).*



Note: The SX Tech Board is also included in our SX Tech Tool Kit (#45180; \$99.99). Read about it on page 04.



### **SX28/28 Proto Board - #45302; \$9.99**

### **SX48 Proto Board - #45300; \$9.99**

Parallax's SX Proto Boards provide a low-cost, high quality, solution for using the surface mount SX easily.

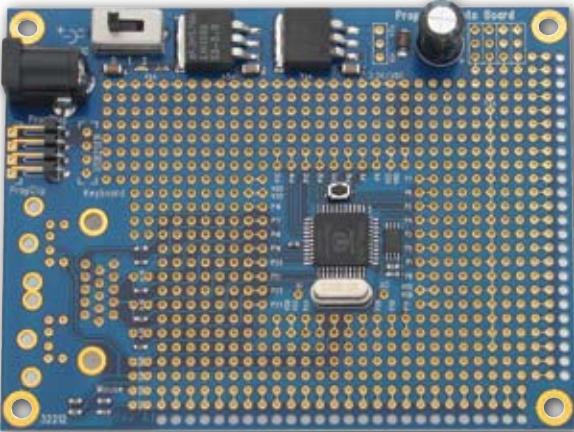
#### **Features of the SX Proto Boards include:**

- Surface-mount SX microcontroller
- 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 (which can damage the SX-Key and TTL oscillator)
- 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 package); ceramic resonator (SIP3 package); and Crystal (HC/49 package)
- Smart prototype holes for servo headers, DIP and SOIC8 components
- Dimensions: 3 x 4 x 0.6 in (76 x 102 x 15 mm)

*These boards require an SX programming tool for use (see page 08 for product details).*

### **SX-Key USB Development Tool - #45214; \$49.99 SX Blitz Programming Tool - #45170; \$29.99**





#### Propeller Proto Board (Serial) - #32212; \$29.99

#### New! Propeller Proto Board (USB) - #32812; \$39.99

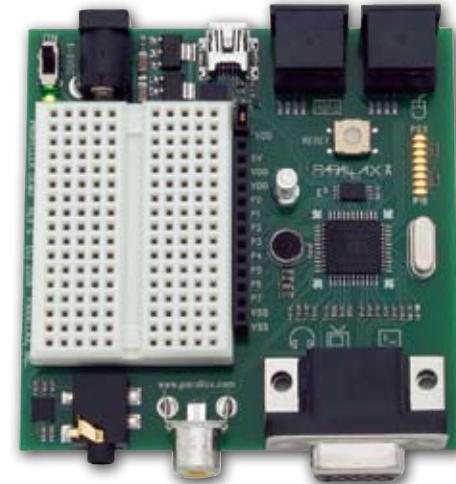
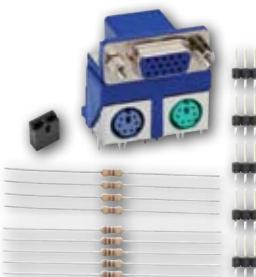
Low cost, high quality solutions for permanent Propeller chip projects. The Serial version saves the user some expense by leaving off the USB programming interface; it is ready for use with the Prop Plug (sold separately, see page 19) and is also compatible with the USB2SER with the addition of a 4-pin header (not included). The USB version requires only a USB A to Mini-B cable to connect to your PC (sold separately, see page 59).

#### Features of the Propeller Proto Board include:

- P8X32A-Q44 Propeller chip
- 64 KB EEPROM for program and data storage
- LM1086 3.3 and 5 V regulators provide up to 1.5 Amps with an input power supply of 6-9 VDC
- Accepts the optional VGA, mouse and keyboard interface available in the Accessory Kit (below)
- Three-position power switch (off, logic power, power to logic and servo ports)
- Unplated row of holes along perimeter to provide stress relief to off-board connections
- Dimensions: 3.05 x 4 in (7.75 x 10.16 cm)

#### Propeller Proto Board Accessory Kit - #130-32212; \$14.99

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



#### Propeller Demo Board - #32100; \$79.99

The Propeller Demo Board visibly demonstrates the Propeller chip's varied capabilities in a compact and fun platform. You can use it to learn Propeller programming and then develop full-blown applications which generate video and sound and utilize mice and keyboards. Power supply and USB loading circuitry is provided for you. Eight unused I/O pins are available for experimentation. Features of the Propeller Demo Board include:

- P8X32A-Q44 Propeller chip
- 24LC256-I/ST EEPROM for program storage
- Replaceable 5.000 MHz crystal
- 3.3 and 5 V regulators with on/off switch
- USB-to-serial interface for loading and communication
- VGA output and TV output
- Stereo output with 16-ohm headphone amplifier
- Electret microphone input
- Two PS/2 connectors for mouse and keyboard I/O
- Eight LEDs (share VGA pins)
- Pushbutton for reset
- Big ground post for scope hookup
- I/O pins P0-P7 are free and brought out to a header
- Breadboard for custom circuits
- Dimensions: 3 x 3 in (7.62 x 7.62 cm)

# (PPDB)

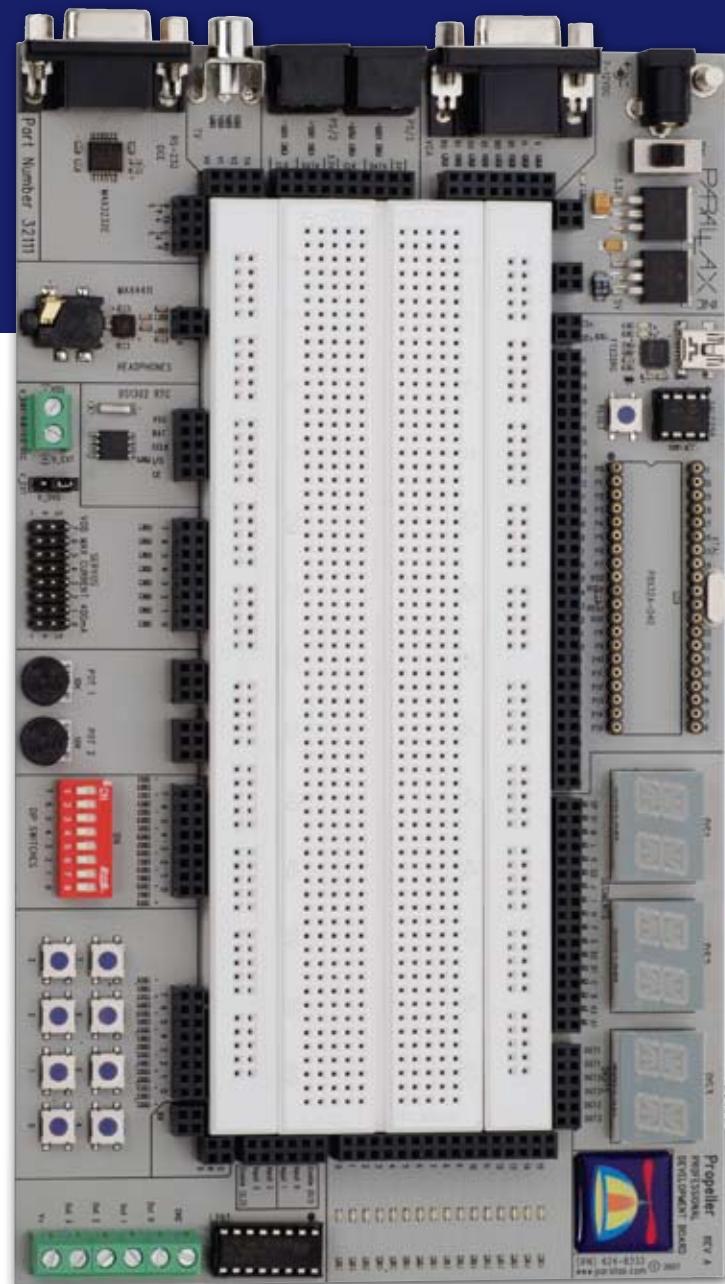
THE NEWEST, MOST FEATURE-RICH PROPELLER BOARD WE STOCK

## New! Propeller Professional Development Board; #32111; \$169.99

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:

- 40-pin DIP socket for Propeller chip (#P8X32A-D40, sold separately, see page 10)
- 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 and eight DIP switches
- Two potentiometers (10 K)
- 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 in (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
- 3.3 and 5 V power supply connections, and ground terminal
- On-board USB Interface (mini-B, 5-pin)
- Dimensions: 9 x 5.25 x 0.75 in (23 x 13.5 x 2 cm)
- Operating temperature range: 32 to 158 °F (0 to 70 °C)

Note: The USB cable (A to Mini-B; #805-00006; \$6.99) and power supply are sold separately. We recommend the 12 V 1 A power supply (#750-00007; \$9.99) to cover the widest range of possible uses.



# ENHANCE:

TO PROVIDE WITH IMPROVED, ADVANCED, OR SOPHISTICATED FEATURES

## PropStick USB - #32210; \$79.99

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 inch pin spacing format. The 5.00 MHz crystal is socketed for replacement. This module is intended to be used in a breadboard or other through-hole design, and is also sold inside the Propeller Education Kit (PropStick USB Version; read more on pages 05 and 54) for use with the Propeller Education Labs. *The PropStick USB features:*

- Propeller P8X32A-M44 chip
- 32kB 24LC256-I/ST EEPROM
- FT232RG and mini USB connector
- USB data transfer indicator LEDs
- 5.00 MHz crystal in a removable socket
- 3.3V 500 mA voltage regulator
- Reset pushbutton switch
- USB A to Mini-B retractable cable is included

*Note: the PropStick USB is not intended to be plugged into 40-pin DIP sockets on any Parallax programming boards, including either of our Professional Development Boards. This is due to differences in pinouts and operating voltages among the Propstick USB, BS2p40, and P8X32A-D40.*



## Prop Plug - #32201; \$24.99

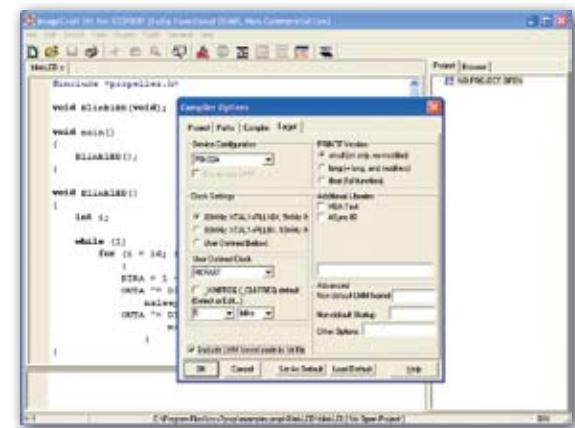
The Prop Plug provides a USB-to-serial port connection that is convenient for microcontroller programming and communication. This tiny device is capable of asynchronous communication at up to 3 M baud with both 3.3 and 5 V devices such as the Propeller and BASIC Stamp. The Prop Plug slips onto a 4-pin, 0.1 inch spaced header, allowing both PCB's and breadboards to provide in-circuit programming capability. *USB A to Mini B Retractable Cable is included (#805-00010).*



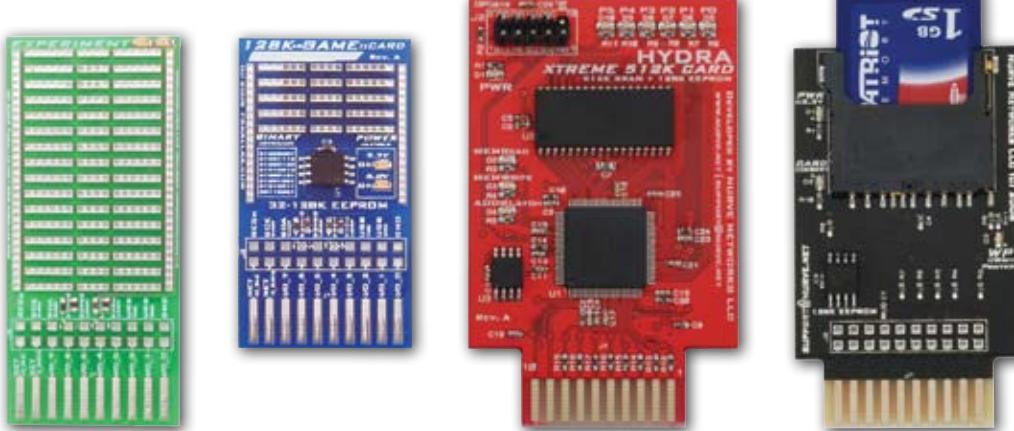
- New! ICCV7 for Propeller (Non-Commercial) - #32380; \$99.00**  
**New! ICCV7 for Propeller (Standard) - #32385; \$249.00**

Available as a download from Parallax.com, ICC for Propeller from ImageCraft is an ANSI C development tool for the Parallax Propeller chip. The IDE features project-based design and supports C86 dialect source and C-based Propeller objects. The Propellent Library is directly supported by the IDE for ease in build-to-run development cycles. ICC for Propeller comes in a Non-Commercial (supports programs as large as 16 K) or Standard (supports programs as large as Hub RAM) version. *Features of ICCV7 for Propeller:*

- Ansi C compiler/optimizer/assembler/linker
- Libraries and built-in terminal included
- Uses Large Memory Model (LMM) to bypass 2 K byte limits of cog code; typically 5-10x faster than Spin
- Access Propeller multiprocessing and other Propeller-specific features in C
- Write native assembly code and launch it in another cog for high-performance drivers
- Integrated Parallax Propellent Library for program downloading



**Free full-function 45-day demo, then becomes code size limited to 8K bytes.**



### **HYDRA Blank Experimenter Card - #32362; \$24.99**

Fits into the 20-pin expansion interface on the HYDRA board. Features a large through-hole prototyping area with enough space to fit a single 16-pin DIP device or smaller 8 and 14-pin DIP devices. *This card is included in the HYDRA Game Development Kit (page 05).*

### **HYDRA 128 K Memory Expansion Card - #32361; \$29.99**

Need more space for your games and applications? This card fits into the 20-pin expansion interface on the Hydra and comes with 128K serial EEPROM for non-volatile storage. No special programming is needed, simply insert the card, program the Hydra, and the program is stored on the card's first 32K. Then use the remaining 96K for data and/or other application data generated in real-time. *This card is included in the HYDRA Game Development Kit (page 05).*

### **HYDRA Xtreme 512 K SRAM Card - #27935; \$59.99**

The interface between the HYDRA and the HX512 is made possible by a state-of-the-art Lattice ispMach 4064 Complex Programmable Logic Device (CPLD) which acts as the memory controller and “glue” logic interfacing the HYDRA and the HX512.

### **New! HYDRA SD-MAX Storage Card - #27960; \$49.99**

The HYDRA SD Max Storage Card completes the HYDRA system by expanding the capabilities of the HYDRA to read and write SD cards via the HYDRA expansion port. The HYDRA SD Max card also comes equipped with a 128K EEPROM on-board, so driver firmware can be loaded right on the card.

### **PropRPM - #32202; \$49.99**

The Propeller Rapid Prototyping Module is a high quality solution for Propeller project prototyping. The ICs and LED bar are all socketed, making it easy to replace parts if necessary. An RS-232 serial interface means no extra hardware is required to program the Propeller if you have a DB-9 Serial Port on your PC.

#### **Features of the PropRPM include:**

- Propeller Chip P8X32A-D40
- 32 KB EEPROM
- 5 MHz quartz crystal
- RS-232 interface with MAX3232 IC
- Input voltage 5-9 VDC
- 3.3 V low-dropout regulator delivers up to 500 mA
- Power LED
- 10 Status LEDs (removable LED bar)
- Reset switch
- RCA video output jack
- Large prototyping area
- 4 mounting holes
- Dimensions: 5.1 x 3.3 in (13 x 8.4 cm)

# INVENT:

AN INNOVATIVE GUITAR EFFECTS PEDAL, THE COYOTE-1 HAS A PROPELLER BRAIN



Designed by Parallax customer Eric Moyer, the OpenStomp™ Coyote-1 is an open source audio effects processor built for guitar players. With the Coyote-1, users can develop custom audio effects in software (distortion, echo, chorus etc.), mix multiple effects to build “patches,” and exchange those effects and patches with the OpenStomp community.

A companion Windows application (OpenStomp Workbench) allows Users to combine effects into patches graphically, and to move patches and effects between the Coyote-1 device and their PC's disk. The Coyote-1 O/S is open source so users can tweak it to behave any way they like, and the hardware is fully documented so that developers can take control of the whole pedal, dedicating all available system resources toward the implementation of unique custom solutions.

The Propeller chip's revolutionary architecture allows it to generate video in software using just three resistors, so the Coyote-1 includes a video out port. Developers can use it for debugging or adapt it to implement things like graphical tuners, spectrum analyzers, oscilloscopes, or light shows. Eric Moyer got his start in Propeller chip programming with the HYDRA Game Console (page 05). With the Parallax Propeller chip you too can create and design the products of your dreams! It worked for OpenStomp.

**The Coyote-1 Open Source Guitar Effects Pedal retails for \$349.00. For more information, technical specifications, or to order the OpenStomp Coyote-1 Digital Guitar Effects Pedal, visit Eric Moyer's web site at [www.OpenStomp.com](http://www.OpenStomp.com).**



The OpenStomp Coyote-1's creator, Eric Moyer, demonstrates the effects pedal at Embedded Systems Conference 2008.



# MAKE NOISE:

THE CREATION OF SOUND OF ANY KIND: THE ONLY NOISE WAS THE RASPING GROWL OF THE MECHANICAL HOUND

## Emic Text-to-Speech SIP Module - #30006; \$72.99

This 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 foreign and difficult-to-pronounce words
- Easy-interface SIP format 2.0 x 1.375 in. with 0.1 inch pin spacing
- Single 5 V supply with TTL serial interface (2-wire, 2400 baud)
- On-board 300 mW speaker driver
- Easy-to-use ASCII or hexadecimal command sequences
- Bi-color LED for visual feedback of activity
- Audio input pin for amplification of BASIC Stamp-generated sounds and sound effects
- Compatible with BASIC Stamp 2 module (and a PC serial port when connected using a MAX232 line driver)

## SoundPAL - #28825; \$19.99

The SoundPAL is a tiny module that plays canned and custom sound sequences. It is completely self-contained, including a microcontroller for generating the 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 and its compact size makes it stackable side-to-side with additional modules on 0.1 inch servo headers. TTL Serial interface (9600 to 19200 Baud); 5 V max

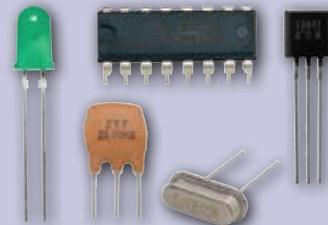


## Components at Parallax.com

Obtain additional parts or replacement part with ease. Need a special sensor for your robot? Or an LED to finish off your home automation project? We stock most popular individual components contained in our kits and products and list them on our site as a convenience to you. Visit [www.parallax.com](http://www.parallax.com) for one-stop-shopping.

In the Components section of our web site, you will find:

- Resistors
- LEDs
- Capacitors
- Wire/Connection
- Optoelectronics
- Resonators/Crystals
- Integrated Circuits
- Transistors
- Hardware

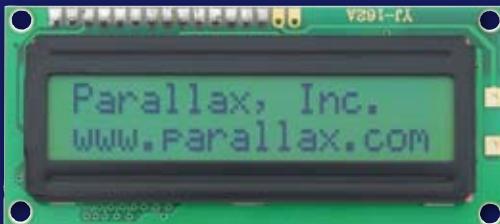


Go to [www.parallax.com](http://www.parallax.com) to see our complete collection of electrical components, integrated circuits, hardware, and more. Just click on the "Store" tab at the top of the page and follow the link in the left-hand menu to Components.

Note: There is a \$10 minimum on orders placed at [parallax.com](http://parallax.com).

# SHOW OFF:

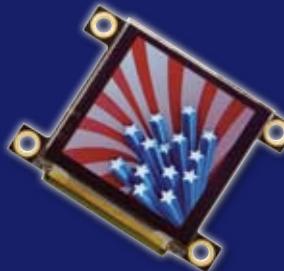
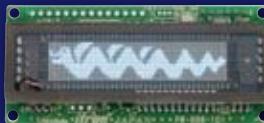
TO CAUSE OR ALLOW TO BE SEEN; A DISPLAY, AN EXHIBITION, OR DEMONSTRATION; A SIGHT OR SPECTACLE



**Parallax 2x16 Serial LCD (Non-Backlit) - #27976; \$24.99**

**Parallax 2x16 Serial LCD (Backlit) - #27977; \$29.99** (Read full product description of the Parallax Serial LCDs on page 24)

Parallax Serial LCDs provide very functional, low-cost LCDs that can be easily controlled by a BASIC Stamp. The LCD display is two lines by 16 characters and provides basic text wrapping so that your text looks correct on the display. In addition, the Serial LCD provides you with full control over all of its 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.



**LCD Terminal AppMod - #29121; \$14.99**

This low-cost display is excellent for your smaller projects. The module has a 2x8 display, four pushbuttons, and will connect to any programming board that has a 2x10 AppMod header. Use the LCD Terminal AppMod on a robot for an inexpensive method of visual feedback.

**112x16 Serial Graphic VFD - #27970; \$69.99**

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. (Read full product description of the 112x16 Serial Graphic VFD on page 25)

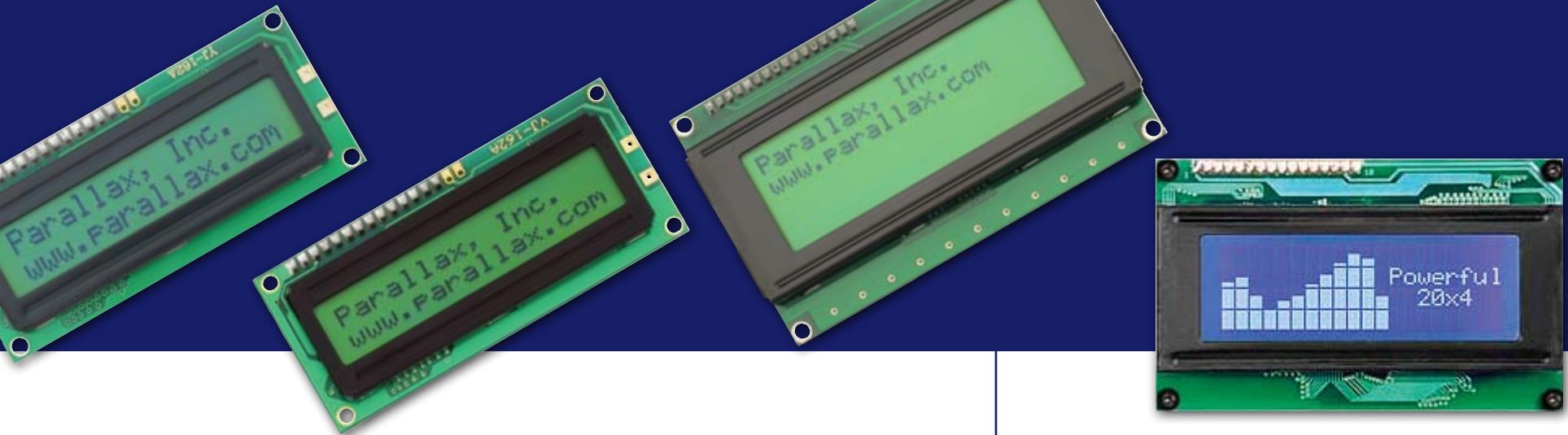
**μOLED-96-PROP - #27307; \$79.99**

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. (Read full product description of the μOLED-96-PROP on page 26)

**Mini LCD A/V Color Display - #603-32000; \$89.99**

This 3.5" LCD A/V PAL/NTSC display features a 320 x 240 pixel color screen and a built-in speaker. Conveniently portable, this product can display NTSC video output generated by the Propeller chip or any other device which has an Audio/Composite Video Out connector. (Read full product description on page 26. Mini LCD A/V Color Display is included in the Propeller Accessory Kit on page 04)

Parallax stocks several different displays to suit the needs of many different programming languages, connection types, projects, boards and budgets.



**Best Seller! Parallax 2x16 Serial LCD (Non-Backlit) - #27976; \$24.99**

**Best Seller! Parallax 2x16 Serial LCD (Backlit) - #27977; \$29.99**

**Parallax 4x20 Serial LCD (Backlit) - #27979; \$39.99**

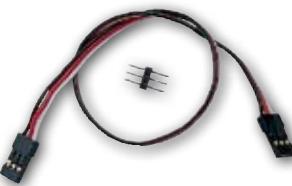
Parallax's Serial LCDs are very functional, low-cost solutions for adding displays to your microcontroller applications. They support ASCII decimal characters 32-127 (the same visible characters as the BASIC Stamp Editor's Debug Terminal). In addition, you may define up to eight custom characters. Text wrapping to the next line is automatic. Additional control codes allow you to place the cursor anywhere on the display, and turn the display on or off with a single instruction. Features include:

- Switch-selectable baud rates: 2400, 9600, and 19200
- Adjustable contrast dial
- Simple 3-pin 0.1 inch SIP connection for RX, power and ground
- Power requirements: 5 VDC; 20 mA backlight off, 80 mA backlight on
- Operating temperature: -4 to +158 °F (-20 to +70 °C)
- Dimensions: 2x16 modules, 1.5 x 3.15 in (3.8 x 8 cm); 4x20 module, 2.4 x 3.9 in (6 x 10 cm). Sizes are approximate and may vary.

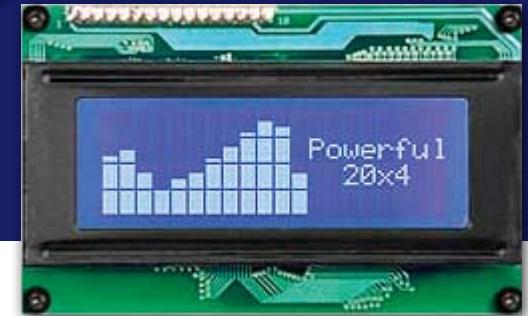
Our 3-lead Extension Cables come with 3-pin male/male headers to make easy breadboard or through-hole board connections for 3-pin devices.

**10-inch Extension Cable - #805-00011; \$1.99**

**14-inch Extension Cable - #805-00012; \$2.50**



Smart Sensors and Applications includes many BASIC Stamp activities for your Parallax Serial LCD, including scrolling text, sliding text windows, defining custom characters, pixel-animation sequences, and bar graphs. See page 33.



**4x20 Serial LCD with Keypad Interface - #30058; \$99.99**

Do you need more general purpose outputs, a keypad interface (up to a 5x5 Keypad), and a cool screen? If you answered yes to more than one of these items, this is the LCD for you. The Matrix Orbital part number is LK204-25-WB. This version is pre-modified for BASIC Stamp module-compatibility (TTL level). Features of the 4x20 Serial LCD with Keypad Interface include:

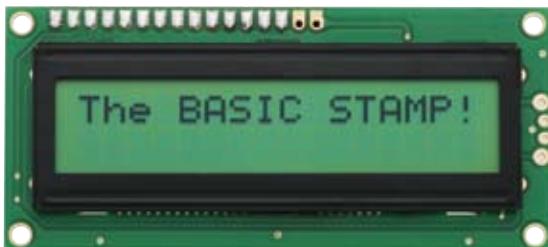
- General purpose output: 6
- Module size: 98 x 60 x 27.5 mm
- Display size: 76.3 x 25 mm
- Character size: 2.95 x 4.75 mm
- Appearance: inverse blue with white backlight
- Communicate over RS-232 or I<sup>2</sup>C  
(Connect up to 16 displays over I<sup>2</sup>C)
- Display text, horizontal & vertical bar graphs and large digits
- Line wrapping, scrolling, contrast, backlight and time-out setting (up to 180 minutes)
- Software and manual on CD-ROM
- Available in a PC drive bay insert
- Operates at 0 to +50 °C
- Supply voltage: 4.75 to 5.25 VDC
- Supply current: 10 mA typical
- Backlight supply current: 90 mA typical



### Best Seller! 112x16 Serial Graphic VFD - #27970; \$69.99

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. If you're looking for a truly unique display, the Noritake GUI12X16G-7003 Vacuum Fluorescent Display provides a standard 2x16 character mode and also supports graphics at 112x16 pixels.

- 11 built-in fonts and 16 custom characters
- Display area: 0.45 x 2.05 in (1.14 x 5.08 cm)
- Font magnification and screen saver features
- High brightness blue-green display with 8 brightness levels (software selectable)
- Asynchronous serial interface @ 38.4 Kbps (Up to 115.2 Kbps)
- Buffered input with busy flag
- 6-pin SIP male header with 0.1 inch spacing
- Single 5 V supply @ 260 mA
- Board dimensions: 1.4 x 3.2 in (3.56 x 8.13 cm)
- Operating Temperature: -40 to +85 °C



### 2x16 Parallel LCD - #603-00006; \$29.99

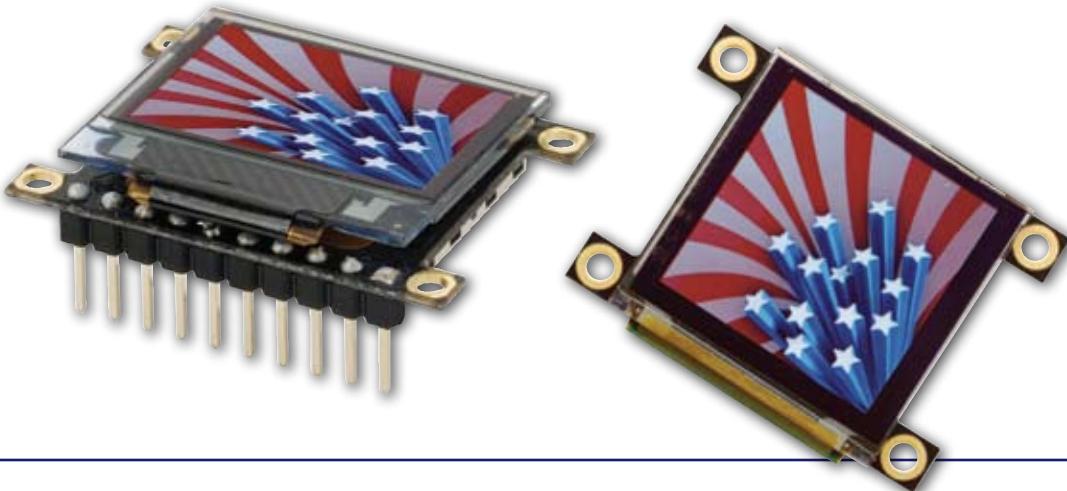
The 2x16 Parallel LCD is an 8-bit or 4-bit parallel interfaced LCD. It allows you to display text, numeral data, and custom created characters. The LCD uses the HD44780 series LCD driver from Hitachi. The LCD is connected to a female 14-pin connector for easy interface with the Parallax Professional Development Board (#28138; page 15). The device has the ribbon cable and 14-pin connector; it may also be hooked up manually.

### 7Seg-DB Daughterboard (Master Unit) - #28312; \$24.99 7Seg-DB Daughterboard (Slave Unit) - #28313; \$24.99



Created for use with the BS2pe Motherboard (page 15), the 7Seg-DB Daughterboard modules provide four digits of LED display each, including some alphabetic and punctuation capability. The master module plugs directly into the BS2pe Motherboard and then up to seven additional slave modules can be added, daisy-chain-style, for a total of 32 contiguously-displayed digits.

- Displays four digits (alphanumeric characters) apiece
- Daisy-chainable for up to one master and seven slaves (32 digits total)
- Includes shift registers for refresh with 25% duty cycle
- Includes a dimming input for PWM control of overall intensity
- Downloadable firmware handles refresh, character display, and special effects automatically
- Downloadable PC program for creating your own character sets
- Compatible with both 3.3 and 5VVdd installations
- Dimensions: 34 x 34 mm



### **µOLED-96-PROP Display - #27307; \$79.99**

The µOLED PROP is a compact and cost effective micro-organic LED display with an embedded Propeller chip microcontroller development system built right in, since the display does not use all of the available Propeller resources or I/O pins. An on-board SD card slot allows access to up 2GB of flash memory for application data. Write programs for the display with the Propeller tool software and download via the Prop Plug (not included, #32201; \$24.99; see page 19).

- 0.96 inch diagonal display with 96 x 64 pixel resolution (65 K colors)
- 10-pin SIP header with 0.1 inch spacing plugs into breadboard or through-hole board
- 4 general purpose I/O pins for interfacing additional devices (all pins on single 10-pin header)
- Display voltage required: 3.6 to 6.0 V; current draw 65 mA nominal (varies with image)
- Operating temperature range: -40 to +185 °F (-40 to +85 °C)

### **µOLED-128-G1 - #27925; \$86.99**

The µOLED 128-G1 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, produce text in a variety of sizes, and draw shapes. An on-board SD card slot allows access to up 2GB of flash memory for custom images. Features include:

- 1.5 inch diagonal display with 128 x 128 pixel resolution (65 K colors)
- Easy 4-pin interface to host device (pluggable jumper wires included)
- 3.3 V serial interface (auto-baud 300 to 256 K) is compatible with any Parallax microcontroller
- Display voltage required: 3.6 to 6.0 V; current draw 40 mA nominal (varies with image)
- Operating temperature range: -40 to +185 °F (-40 to +85 °C)



### **Mini LCD A/V Color Display - #603-32000; \$89.99**

This 3.5 inch LCD A/V PAL/NTSC display features a 320 x 240 pixel color screen and a built-in speaker. Conveniently portable, this product can display NTSC video output generated by the Propeller chip or any other device which has an Audio/Composite Video Out connector. Features of the Mini LCD A/V Color Display include:

- 3.5 in (8.9 cm) TFT display panel
- PAL/NTSC auto select
- 320 x 240 pixel resolution
- 2 Video inputs, 1 Audio input
- Built-in speaker
- Remote control
- Power requirements: +12 VDC, 300 mA
- Overall Dimensions: 4 x 5.2 x 2 in (10.6 x 13.2 x 5.1 cm)
- Operating temp. range: 32 - 122 °F (0 - 50 °C)

*Note: This product requires a 12 VDC regulated power supply, not included. We recommend our 12 V 1 A Power Supply (#750-00007).*

# SENSE THE WORLD:

A DEVICE, SUCH AS A PHOTOELECTRIC CELL, THAT RECEIVES AND RESPONDS TO A SIGNAL OR STIMULUS



## Sensor Sampler Kit - #28028; \$179.99

A collection of Parallax's best-selling sensors.

### The Sensor Sampler Kit includes:

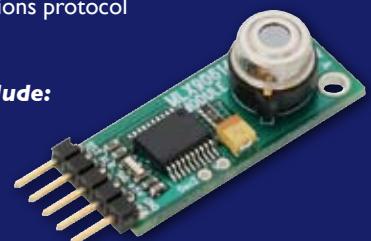
- PING))) Ultrasonic Distance Sensor (*page 29*)
- Memsic 2125 Dual-Axis Accelerometer (*page 30*)
- QTI Infrared Line Sensor (*page 28*)
- Hitachi HM55B Compass Module (*page 32*)
- Piezo Film Vibra Tab Mass (*page 31*)
- Hitachi H48C Tri-Axis Accelerometer Module (*page 30*)
- PIR (Passive Infrared) Motion Sensor (*page 29*)
- Sensirion Temperature and Humidity Sensor (*page 30*)
- Flexiforce Pressure Sensor Demo Kit (*page 31*)

## New! MLX90614 Infrared Thermometer - #28040; \$49.99

The MLX90614 module is an intelligent infrared temperature sensor for serial connection to the BASIC Stamp. Communication with the MLX90614 is handled through a bi-directional serial connection on any selected pin of the BASIC Stamp. This module mounts directly on a circuit peg board or connection socket and can sense and measure surface temperatures without surface contact. Sensor inputs may operate under software or hardware control. The Parallax AppMod communications protocol is used, allowing baud rates of 9600, 19,200 and 38,400 baud.

### Features of the MLX90614 Infrared Thermometer include:

- Alarm alert for over temperature conditions
- Background running of sensing devices
- Outputs continuous data flow with an active alarm running in background
- 16-bit digital temperature output data, ranging from -70 to 380 °C
- Multiple modules can be connected off a single I/O processor pin for serial data flow
- Module can act as a stand alone sensor for alarming control
- Sleep setting for low power consumption
- Starts up active without pre-programming using preset writeable defaults



# SEE:

TO SCAN, VIEW, OR PERCEIVE, esp. by ELECTRONIC MEANS

## TSL230R Light to Frequency Converter - #27924; \$5.99

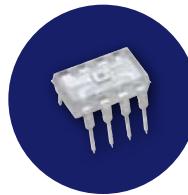
The Texas Advanced Optical Systems (TAOS) TSL230R sensor precisely measures light using an array of photodiodes, with an output of digital square waves. The TSL230R has an input dynamic range of 160 dB; that is, it can measure light over a range of 100,000,000-to-1.

The TSL230R programmable light-to-frequency converter combines a configurable silicon photodiode and a current-to-frequency converter on single monolithic CMOS integrated circuit. The output is a pulse train (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. *Features of the TSL230R Light to Frequency Converter include:*

- High-resolution conversion of light intensity to frequency with no external components
- Programmable sensitivity and full-scale output frequency
- TTL compatible I/O for direct communication with a microcontroller
- Absolute output frequency tolerance of  $\pm 20\%$
- Nonlinearity error typically 0.2% at 100 kHz
- Stable over wide operating temperature range: -25 to 70 °C

## TCS230-DB Color Sensor - #28302; \$65.99

TCS230-DB color sensor daughterboard 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, page 58). 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. 2.7 to 5.5 V operation. 5 V required for LEDs.



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. Measures: 35 x 35 x 30 mm.

## QTI Sensor - #555-27401; \$5.99

The QTI Sensors use unmodulated infrared for line detection. Originally meant to sense the outer rim of a SumoBot ring, these line sensors are well-suited for other robotic applications that require line detection.



## QTI Line Follower AppKit for the Boe-Bot - #28108; \$29.99

This add-on kit uses QTI infrared emitter/receiver modules to easily enhance the line following capability of your Boe-Bot robot. The application in this kit uses three QTI sensor/mounting hardware sets, arranged to follow 3/4 inch black electrical tape on white poster board. 4 sets of sensors and hardware are included in the kit.



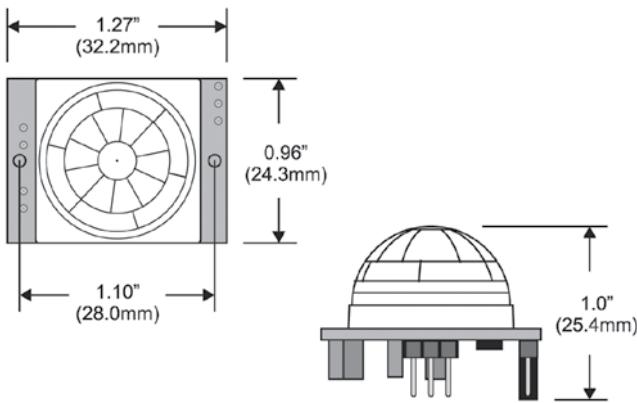


### Best Seller! PIR Sensor - #555-28027; \$9.99

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 BSI, BS2, and SX/B programs and product documentation are available at [www.parallax.com](http://www.parallax.com).

#### Features of the PIR sensor include:

- Simple 3-pin connection
- Single bit output, TTL/CMOS compatible
- Small size - easy to conceal ( 0.96 x 1.0 x 1.27 in.)
- Power requirements: 3.3 to 5 V; < 100  $\mu$ A



**The PING))) Ultrasonic Sensor is featured in our "Smart Sensors and Applications" Parts and Text Kit, see page 33 for product details.**

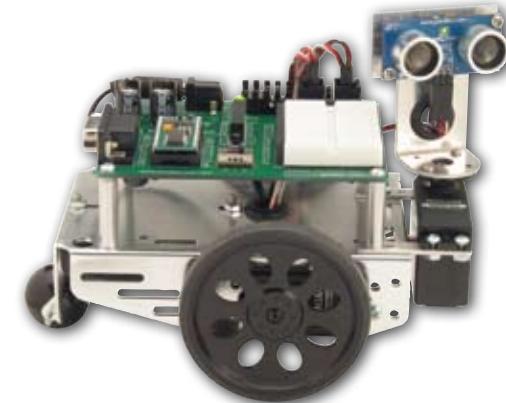


### Best Seller! PING)))™ Ultrasonic Sensor - #28015; \$29.99

The 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 1 I/O pin. Plus, the 3-pin header makes it easy to connect using a servo extension cable, no soldering required.

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 to return. Output from the PING))) is a variable-width pulse that corresponds to the distance to the target.

- Range: 2 cm to 3 m (~0.75 in. to 10 ft)
- Supply Voltage: 5V +/-10% (Absolute: Minimum 4.5 V, Maximum 6 V)
- Supply Current: 30 mA typ; 35 mA max
- 3-pin interface (power, ground, signal)
- 20 mA power consumption
- Narrow acceptance angle
- Simple pulse in/pulse out communication
- Indicator LED shows measurement in progress
- Input Trigger: positive TTL pulse, 2  $\mu$ s min, 5  $\mu$ s typ.
- Echo Pulse: positive TTL pulse, 115  $\mu$ s to 18.5 ms
- Echo Hold-off: 750  $\mu$ s from fall of Trigger pulse
- Burst frequency: 40 kHz for 200  $\mu$ s
- Dimensions: 22 x 46 x 16 mm (0.85 x 1.8 x 0.6 in)
- Operating temperature: 0 - 70 °C



### PING))) Mounting Bracket Kit - #570-28015; \$19.99

# FEEEL:

TO HAVE A PARTICULAR SENSATION OR IMPRESSION OF; TO PERCEIVE OR EXAMINE BY TOUCH

## Memsic 2125 Dual-Axis Accelerometer - #28017; \$29.99

The Memsic 2125 is a low cost, dual-axis thermal accelerometer capable of measuring tilt, acceleration, rotation, and vibration with a range of  $\pm 3$  g. Many exciting applications for the Memsic Accelerometer may be found in our Smart Sensors & Applications text (see page 33). *Features of the Memsic 2125:*

- Fully temperature compensated over 0 to 70 °C range
- Analog output of temperature (TOut pin)
- Low current 3.3 or 5 V operation: less than 4 mA at 5 VDC



## Hitachi H48C Tri-Axis Accelerometer - #28026; \$39.99



An integrated module that can sense gravitational (g) force of  $\pm 3$  g 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 0.7 by 0.8 inch module. Acquiring measurements from the module is simplified through a synchronous serial interface. With the BASIC Stamp series, for example, this is easily handled with the SHIFTOUT and SHIFTIN commands.

- Dimensions: 0.7 x 0.8 in (17.8 x 20.3 mm)
- Wide operational range: -25° to 75° C

## DS2760 Thermocouple Kit - #28022; \$34.99

Our Thermocouple Module provides a low-cost, reliable means of measuring temperature over a wide range. Provides a complete connection between microcontrollers a standard thermocouple element, and provides for cold junction temperature compensation. Its I-Wire protocol is supported by the BASIC Stamp 2p series, SX/B for SX chips, and I-Wire objects for the Propeller chip. Kit includes three thermocouple elements:

- K-type (Chromel/Alumel) Range: 32 to 1873 °F (0 to 1023 °C)
- J-type (Iron/Constantan) Range: 32 to 1873 °F (0 to 1023 °C)
- T-type (Copper/Constantan) Range: 32 to 752 °F (0 to 400 °C)



## Sensirion Temperature/Humidity Sensor - #28018; \$29.99

The Sensirion SHT1x is a smart sensor for both humidity and temperature that incorporates an 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. Worst-case temperature accuracy is  $\pm 2$  °C - but in the "room temperature" range the accuracy better than  $\pm 1$  °C! The relative humidity sensor is similarly accurate:  $\pm 3.5\%$  in the range 20% to 80%.

Other available temperature sensors include:

### AD592 Temperature Probe - #28130; \$15.99 - 2-wire lead. Range: -45 to +105 °C

### LM34 Temperature Probe - #800-00027; \$7.90 - 3-wire lead. Range: 0 to 100 °C

### Digital Thermometer - #604-00002; \$6.99 - 8-pin DIP thermostat, Range: -55 to +125 °C

### LM34 Temperature Sensor - #604-00011; \$3.99 - 3-pin SIP. Range: -45 to +148 °C

# TOUCH:

TO BRING INTO CONTACT WITH SOMETHING; TO COME INTO OR BE IN CONTACT WITH

## FlexiForce Sensor - #30056; \$25.99

The active sensing area of the FlexiForce is a 0.375 inch 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 kit includes a 220 ohm resistor, 0.1 uF and 0.01 uF capacitors and the Flexiforce sensor. Operating temperature range: 15 to 140 °F (-9 to +60 °C)

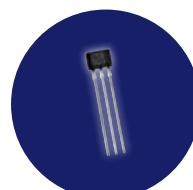


## Piezo Film Vibra Tab Mass - #605-00004; \$1.79

This vibration sensor is model LTD0 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. Note: Output needs to be conditioned before connecting to an I/O pin. We recommend a Zener Diode (#153-00001; \$0.50).

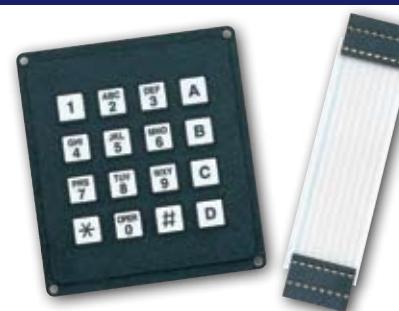
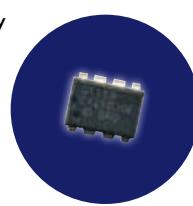
## Melexis 90217 Hall-Effect Sensor - #605-00005; \$4.99

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). With a single Hall plate, this sensor is immune to common rotary alignment problems.



## QT113-D Touch Sensor - #604-00038; \$7.99

This IC creates sense fields through dielectric surfaces such as plastic or glass up to 100 mm (4 in) thick, and can even turn small objects into sensors. These sense fields can work easily through gloved hands and can also be used for material sensing. The devices require only an external sampling capacitor and an electrode (wire) to operate. The QT113-D Touch Sensor requires no special calibration or adjustment, and automatically adapts to changing environments. 2.5 to 5.5 V operation



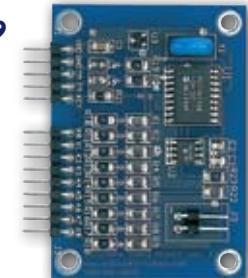
## 4x4 Matrix Keypad - #27944; \$18.99

## 4x4 Matrix Keypad Cable - #27943; \$9.99

Recommended keypad for the MEMKey (below). This 4x4 Grayhill keypad has conductive rubber contacts with an operational life of 3 million cycles, and a good tactile feel for positive feedback. 8-pin SIP header. Dimensions: 2.7 x 3 in (6.9 x 7.6 cm) The 4x4 Matrix Keypad Cable is recommended for use with the Matrix Keypad (#27944).

## MEMKey - #27963; \$39.99

Use this matrix keypad decoder to add user input to your 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. Software CD included. Dimensions: 1.6 x 2.3 in (4.1 x 5.8 cm)



# POSITION:

CONDITION WITH REFERENCE TO PLACE; LOCATION; SITUATION

## Hitachi HM55B Compass Module - #29123; \$29.99

This 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 inch wide 6-pin DIP module. 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 include:

- Sensitive to microtesla ( $\mu$ T) variations in magnetic field strength
- Simplifies direction by resolving magnetic field measurements into two components axes
- 6-bit (64-direction) resolution after 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 all Parallax microcontrollers
- 3.3 or 5V operation
- Operating temperature range: 32 to 158 °F (0 to 70 °C)

## Parallax GPS Receiver Module - #28146; \$89.99

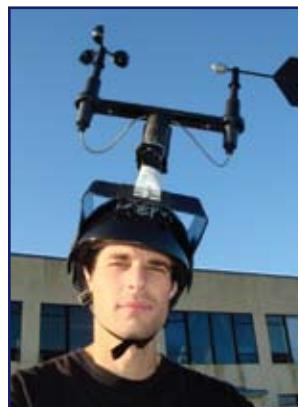
Does your project need to be able to track its position globally? When used in an outdoor environment, the Parallax GPS Receiver with its integrated patch antenna can provide standard raw NMEA0183 strings or specific data from up to 12 satellites via a standard serial interface.



The module provides Current Time, Date, Latitude, Longitude, Altitude, Speed and 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 microcontroller and open-source control firmware available at our web site for advanced users who wish to modify it.

- Single-wire 4800 bps TTL Serial (bi-directional) interface to any microcontroller
- Provides either raw NMEA0183 strings or specific data
- Simple/Raw mode selectable via I/O control
- Standard 4-pin header interface (0.1 inch spacing)
- 5 VDC @ 115 mA (typical)
- 1.9 x 1.4 x 0.6 in (48 x 35 x 15 mm)
- Operating temperature: 32 to 158 °F (0 to 70 °C)
- Average accuracy: ±5 M position, ±20 M altitude



**Read our interview with the creator of the GPS Receiver Module, engineer Joe Grand, on page 37.**

# INTERACT:

ACT TOGETHER TOWARD OTHERS OR WITH OTHERS; ACT IN SUCH A WAY AS TO HAVE AN EFFECT ON ANOTHER

**Applied Sensors Text v2.0 - #28127; \$29.99**  
**Applied Sensors Parts Kit v2.0 - #28126; \$49.99**  
**Applied Sensors Parts & Text Kit v2.0 - #28153; \$75.99**

Written by Dr. Tracy Allen of Electronically Monitored Ecosystems in Berkeley, CA, this text is an excellent primer on BASIC Stamp program structuring, sensor calibration, and serial communication. Concepts are taught using an earth science theme with emphasis on resistor/capacitor networks, serial communication, and data logging. Data input devices include a pushbutton tact switch, digital air temperature sensor IC, analog water temperature probe, photodiode light sensor, and a conductivity probe. Sensor data is logged into the BASIC Stamp EEPROM, displayed on the PC in the Debug Terminal, and conveyed with blinking LEDs and Morse code via a piezospeaker. The optional final experiment builds a measurement and control system to maintain the water level in a cup with the conductivity probe and a pump (a low-voltage pump is required, not included in parts kit).



**Smart Sensors and Applications Text - #122-28029; \$29.99**  
**Smart Sensors and Applications Parts Kit - #130-28029; \$129.99**  
**Smart Sensors and Applications Parts & Text Kit - #28029; \$139.99**

Expand the horizons of your BASIC Stamp projects with tilt and acceleration sensing, compass readings, and ultrasound distance detection. Then, display your data using the advanced techniques included for the Parallax 2x16 Serial LCD. The *Smart Sensors and Applications* text provides a well-illustrated in-depth introduction to each device included with the kit:

- PING))) Ultrasonic Sensor (page 29) - Measure distance and account for the change in the speed of sound with air temperature.
- Memsic Dual-Axis Accelerometer (page 30) - Make a tilt-controlled video game and an acceleration datalogger
- Hitachi HM55B Compass Module (page 32) - Get oriented with 64 headings
- Parallax 2x16 Serial LCD (page 24) - Display sensor readings as scrolling text, bar graphs, custom, etc.
- All electronic components for the breadboard circuits are included, along with LCD mounting hardware.

Conduct your own acceleration studies for your favorite hobby. As an example, the author Andy Lindsay describes his experiment to record the g-forces generated when he performs an ollie on his skateboard.



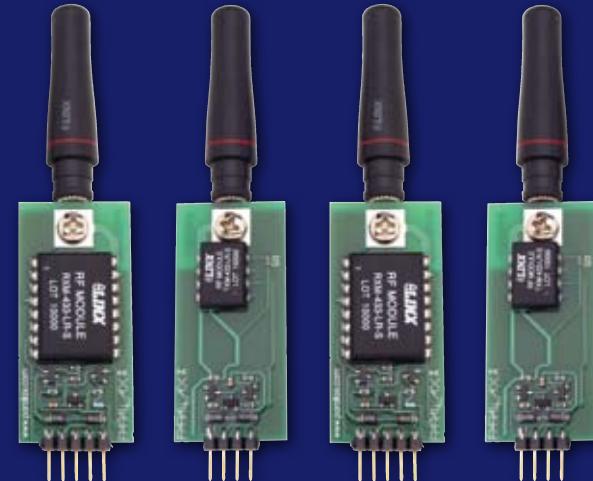
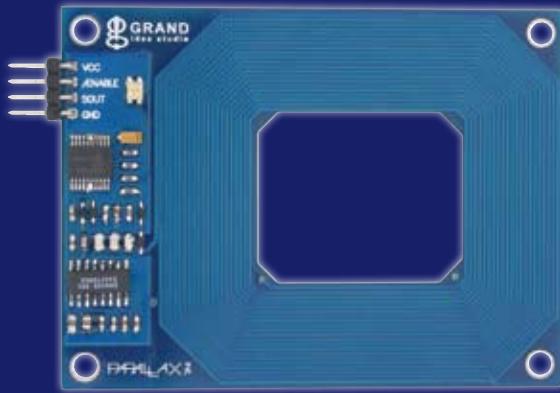
This advanced Stamps in Class text is a perfect sequel to *What's a Microcontroller?* or *Robotics with the Boe-Bot*. All the activities in *Smart Sensors and Applications* require a Board of Education Full Kit, or a HomeWork Board (available with the BASIC Stamp Activity Kit, see page 03).

**For more information on our education program and an explanation of the entire series of Stamps In Class texts, see the "Learn" section that begins on page 49.**

A great resource for STEM programs!

# COMMUNICATE:

TO GIVE OR INTERCHANGE THOUGHTS, FEELINGS, INFORMATION, OR THE LIKE, by WRITING, SPEAKING, ETC.



## RFID Reader Module and Tag Sampler Set - #32390; \$45.99

This handy RFID kit groups our popular RFID Reader module with various assorted tags to help you begin experimentation. Read all about the RFID Reader module on page 36. The Sampler Set includes an RFID Reader module (Serial), and one each of the four transponder tags listed below.

We offer transponder tags in different package types. Each tag has a unique range within 10% of the given distance for each type of tag, performance may also vary with environmental conditions and specific RFID modules.

### RFID Blue Eye Key Fob Tag - #28161; \$1.49 (Range: ~5 cm)

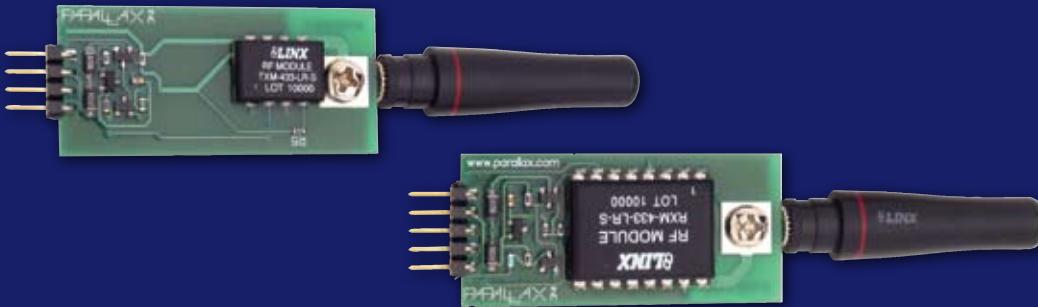
54 x 85 mm Rectangle Tag - #28141; \$1.49 (Range: ~6.3 cm)

50 mm Round "World" Tag - #28142; \$2.75 (Range: ~6.8 cm)

25 mm Disc Sticker - #28148; \$2.75 (Range: ~5 cm)

## Parallax 433 MHz RF Transceiver Package - #28180; \$119.99

Parallax produces our RF modules from products made by the wireless module leader, Linx Technologies. With two transmitter and two receiver modules included, this transceiver package is ready for two-way communication. Sample source code is available on our web site. *Read more about these RF modules on the facing page.*



**Parallax 433 MHz RF Transmitter - #27980; \$29.99**

**Parallax 433 MHz RF Receiver - #27981; \$39.99**

Parallax produces 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 or to a PC from 500 ft+ line-of-sight (depending on conditions).

This device 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.

- PCB Size: 0.9 x 1.9 in (without antenna)
- Overall Size: 0.9 x 3.6 in (with antenna)
- Power: 5V ±10%
- Current: ~10 mA normal operation & ~3 mA during power down
- Data Rate: 12,000 - 19.2 K baud (controller dependent)
- Frequency: 433.92 MHz (UHF)
- Transmission 500 ft+, based on environment conditions
- Power down mode
- Operating temperature range: 32 to 158 °F (0 to 70 °C)

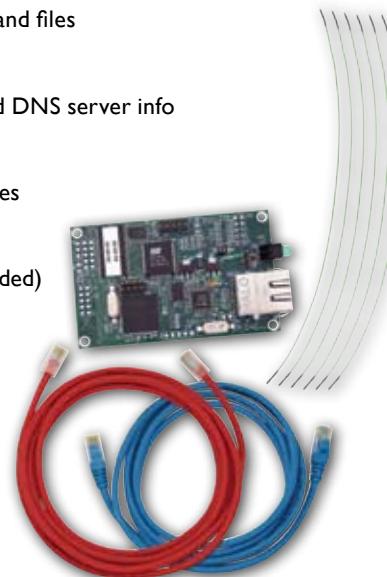


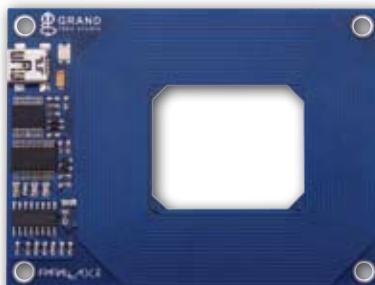
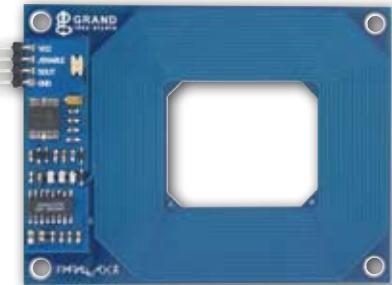
**PINK (Parallax Internet NetBurner Kit) - #30013; \$129.99**

The Parallax Internet NetBurner Kit (PINK) is an embedded web server which enables your BASIC Stamp, SX or Propeller microcontroller to communicate over a network or even the Internet. The PINK Module allows your microcontroller to send e-mail or UDP messages to alert you to events or provide status messages. Communication with the host controller is done using a simple TTL serial interface. *Features of the Parallax Internet Netburner Kit include:*

- Embedded web server with 256 K flash memory for web pages and files
- FTP interface for uploading web pages and files
- Telnet interface for debugging and serial communication
- Send/Receive UDP packets on any port
- Password protection of configuration, FTP, and selected web pages and files
- Over 100 web-accessible variables, allowing for dynamic web pages
- Over 20 variables can be written to flash memory for default values
- Serial access to PINK IP address, network mask, default gateway and DNS server info
- 100 web-accessible variables, allowing for dynamic web pages
- E-mail authentication supported (plain text, non-SSL)
- Current IP address, subnet mask, gateway and DNS available as variables
- UDP port can be changed to any valid port number
- Variable for IP address of last incoming UDP packet
- Supply voltage 5VDC @ ~350 mA (500 mA power supply recommended)
- Dimensions: 3 x 2 in (76.2 x 50.8 mm)
- Operating temperature range: 32 to 158 °F (0 to 70 °C)

The Parallax Internet Netburner Kit includes: PINK Ethernet Module, blue Cat5 straight-through cable, red Cat5 cross-over cable, six hookup wires, and documentation.





Designed in cooperation with Grand Idea Studio, our (RIFD) Reader Modules are convenient low-cost solutions to read EM 4100 low-frequency (125 kHz) passive RFID transponder tags. The RFID Reader Modules 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. Board dimensions are 3.25 x 2.45 in (8.25 x 6.22 cm).

#### **Best Seller! RFID Reader Module (Serial) - #28140; \$39.99**

This 4-pin module is designed for easy prototyping and integration into stand-alone microcontroller-based applications. Parallax provides sample code in PBASIC and SX/B on the 28140 product page. Features include:

- 4-pin 0.1 inch SIP header for power, ground, enable, and data-out connections
- 2400 baud TTL serial output (81N) to any Parallax microcontroller or other processor
- Transponder tag ID data given as a 12-byte ASCII string
- Bi-color LED for visual indication of activity
- Power required: 5 VDC; 10 mA idle, 90 mA active

#### **New! RFID Reader Module (USB) - #28340; \$49.99**

This module connects directly to a USB port both for power and to output transponder tag data to your custom PC application. A sample Visual Basic (VB.net) application is provided on the 28340 product page. Features include:

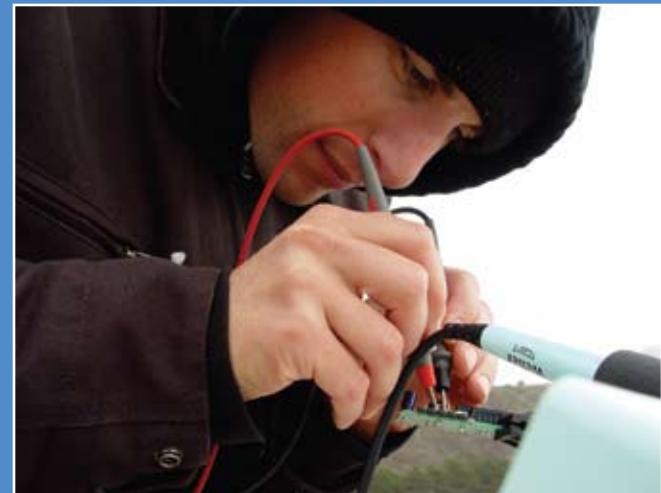
- Built-in USB interface for easy connection to your PC
- 2400 baud serial output stream to PC is accessible from any programming language that can open a COM port
- Transponder tag ID data given as a 12-byte ASCII string
- Bi-color LED for visual indication of activity
- Power required: 5 V (via USB connection); 10 mA idle, 90 mA active

Note: a USB A to Mini-B cable is required, sold separately (#805-00006; \$6.99)  
Several transponder tag styles are available from Parallax, see page 34.



# INTERVIEW:

## WITH "HARDWARE HACKER" JOE GRAND



Be sure to look for Joe Grand on "Prototype This!" on the Discovery Channel.

**An interview with Joe Grand of Grand Idea Studio. An electrical engineer and inventor living in San Francisco, California, Joe kindly agreed to take time from his packed schedule to answer a few questions.**

**Q: How did you get started with Parallax microcontrollers?**

**A:** I actually started using Parallax microcontrollers late in the game. My first real development experience with the BASIC Stamp wasn't until 2003 when I licensed the Emic Text-to-Speech Module to Parallax. Prior to that, I was using Motorola - now Freescale - and Microchip PIC parts exclusively. I knew Parallax was well known in the hobbyist and robotics community and thought they'd be a great company to work with on some of my designs (I was right!).

I have recently started working with the Propeller chip for some higher-end applications, which has been a lot of fun. I check the Object Exchange every once in a while to see what new modules people have written for it.

The discussion forums and open communication channels of people working with Parallax products is unparalleled (no pun intended). Having so many people active in the community to bounce ideas off of, share source code, get help, and discuss projects is really great, whether you're a beginner just learning about electronics and microcontrollers or a seasoned professional.

**Q: Why RFID?**

**A:** I've been interested in the potential uses of RFID and the associated security risks for a number of years. The goal of designing the Parallax RFID Reader was simply to have a low-cost platform that people can use to experiment with and easily incorporate RFID into their own projects.

Prior to this product coming out, there just weren't a lot of easily accessible development tools. Most tools from the large RFID manufacturers were out of reach for the hobbyist community due to cost constraints and lack of engineering support (which was close to non-existent for individuals or small design firms).

Seeing how RFID is becoming so popular in mainstream and the number of interesting projects that people can do and have done, the RFID Reader is one product I'm most proud of.

**Q: What are some of your favorite uses for the BASIC Stamp microcontroller?**

**A:** I use the BASIC Stamp (typically either the BS2 or BS2sx) on many of my hobbyist projects and experiments.

One of my favorite projects is the RoboFlush Automatic Toilet Flusher (<http://www.parallax.com/tid/579/Default.aspx>) that's installed in my bathroom. It was a good excuse to play with one of the older BS1 devices and solve a nagging problem in a unique way.

Recently I used the BS2sx as part of a test platform for the DEFCON 16 conference badge ([www.grandideastudio.com/portfolio/defcon-16-badge](http://www.grandideastudio.com/portfolio/defcon-16-badge)) to help the manufacturer verify that the infrared transmission portion of the badge was working properly. I connected an infrared receiver and 2 LEDs to the BS2sx and wrote a simple application to wait for a certain string of data. If the data was correct, the green LED would turn on,

indicating a passed test. Otherwise, the red LED would turn on. This particular design took me less than an hour to put together and I think it would have taken at least a few days if I had to work with any other microcontroller and development environment.

I also use the BASIC Stamp in many of the projects on Prototype This! (an engineering build show I am a co-host on, set to air in October 2008 on Discovery Channel), including things like a high-tech firefighter pack and a control system for a remote-control demolition derby. Since we have very tight development timeframes on the program, I need to craft together systems quickly and with as little learning curve as possible. Being able to make use of my existing code base from previous designs and the huge pool of BS2 resources online has been key to getting these builds done on time.

**Q: You've created some excellent products for Parallax including the RFID Readers (facing page) and the GPS Receiver (page 32) modules. What's next?**

**A:** Right now I'm in the process of designing a low-cost laser range finder for Parallax. There are lots of high-end, very expensive laser range finders available on the market, but none that are easily integrable into hobbyist or robotics projects. My goal is to use time-of-flight to measure the time a laser pulse takes to reach an object and reflect back. The product is using a Parallax SX processor and the full source code will be released to the public (like we did with the Parallax GPS Receiver Module) to allow customers to add or modify the code to their liking. I have a long way to go and it's a very challenging project, but hopefully people will enjoy it and use it as a building block in their own projects.

**For more information on Grand Idea Studio, visit Joe Grand's web site: [www.grandideastudio.com](http://www.grandideastudio.com)**



Stache at work in the field.



### Stache: BASIC Stamp Field Programmer - #27330; \$99.99

The Stache is a palm-size module for loading up to 15 PBASIC programs into BS2 through BS2pe modules under field conditions. Any PBASIC program you write on a PC can be downloaded into the Stache, 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 product was created by EME Systems of Berkeley, California. EME Systems has additional technical data on the product at <http://www.emesystems.com/>, but the Stache product is shipped with complete user documentation.

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.

Each program size is 2K (this means a full BS2 program or one of eight slots for a BS2p program). To retrieve multiple programs from the Stache, hold the Stache's button until the LED flashes to represent the number of program you want to download to the BASIC Stamp module. Release the button and your BASIC Stamp module is programmed in-field.

- 9 V battery (not included)
- Communication: Serial
- Dimensions: 75 x 35 x 15 mm
- Operating temperature range: 32 to 158 °F (0 to 70 °C)

### Memory Stick Datalogger - #27937; \$34.99

The Memory Stick Datalogger 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 micro-controller. 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. This device is ideal for remote logging of large quantities of data, and hosting large database for RFID Access Control or other applications. *Features of the Memory Stick Datalogger include:*

- Simple Serial or SPI interface to Microcontroller
- Extended or Short Form Command Set/Responses
- 5 V supply with 3.3/5 V safe I/O
- Easy firmware update (can be field-updated)

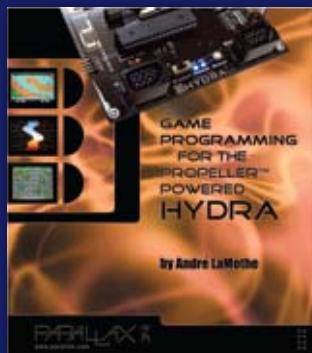
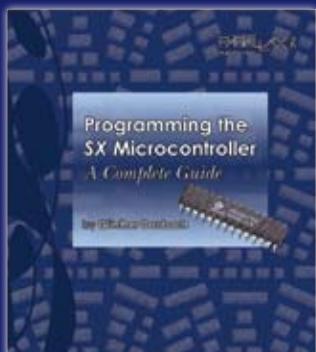
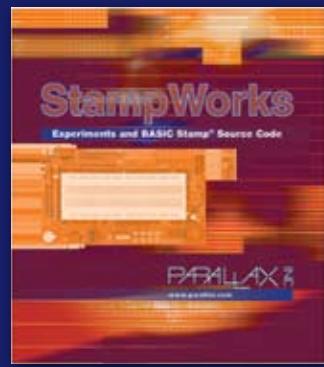
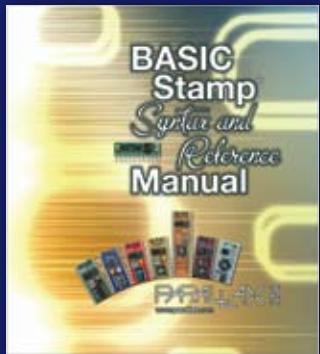
### FTDI VNCIL-1A Vinculum USB Host Controller Device - #604-00051; \$10.90

Add USB Flash drive connectivity to a wide range of consumer and industrial products. Complete with FTDI's in-house developed firmware, no knowledge of USB is required. Features two USB ports which can be individually configured by firmware as Host or Slave ports.



# READ:

TO LOOK AT CAREFULLY SO AS TO UNDERSTAND THE MEANING OF (SOMETHING WRITTEN, PRINTED, ETC.)



Most all of our books are available as free downloads on our web site. The following books are also included with their respective programming kits.

**BASIC Stamp Manual - #27218; \$25.99**

**StampWorks Manual - #27220; \$24.99**

The *BASIC Stamp Manual* is incorporated into a few of the BASIC Stamp programming kits, including the StampWorks Experiment Kit (see page 02-03).

**SX-Key Development System Manual - #45111; \$16.99**

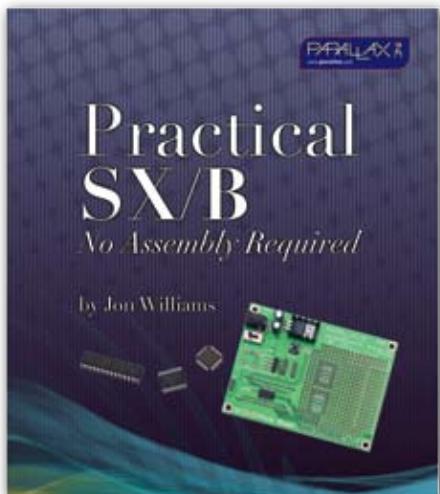
**Programming the SX Microcontroller: A Complete Guide - #70002; \$29.99**

Both books are included in the SX Tech Toolkit (page 04) for your introduction to SX microcontroller programming.

**Propeller Manual - #122-32000; \$34.99**

**Game Programming for the Propeller-Powered HYDRA - #70360; \$49.99**

These books represent two great ways to begin with the Propeller chip. The *Propeller Manual* is included in the Propeller Starter Kit (page 04) and *Game Programming* is the backbone of the HYDRA Game Development Kit (page 05).



## Nuts & Volts "Stamp Applications" Articles - Free Downloads

Since 1995 BASIC Stamp module users Scott Edwards (Scott Edwards Electronics), Lon Glazner (Solutions Cubed), and Jon Williams (EFX-TEK) have authored the "Stamp Applications" column in Nuts & Volts Magazine. These columns are an excellent resource for project ideas, programming tips and circuit ideas. Parallax now has over 150 columns. **Download them at: <http://www.parallax.com/tqid/272/Default.aspx>**

## BS2p Commands, Features, and Projects - #70001; Free Download

A detailed overview of the Parallax BASIC Stamp 2p module. This 295-page book includes a complete command reference with short examples and BS2p-specific projects. The code examples in the book include 11 for the BS2p and 17 for the BS2. Projects demonstrate how to interface the BS2p to Dallas Semiconductor I-Wire sensors, GPS receivers, I<sup>2</sup>C enabled circuits, serial networks and LCDs.

## Practical SX/B: No Assembly Required - Coming Soon

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

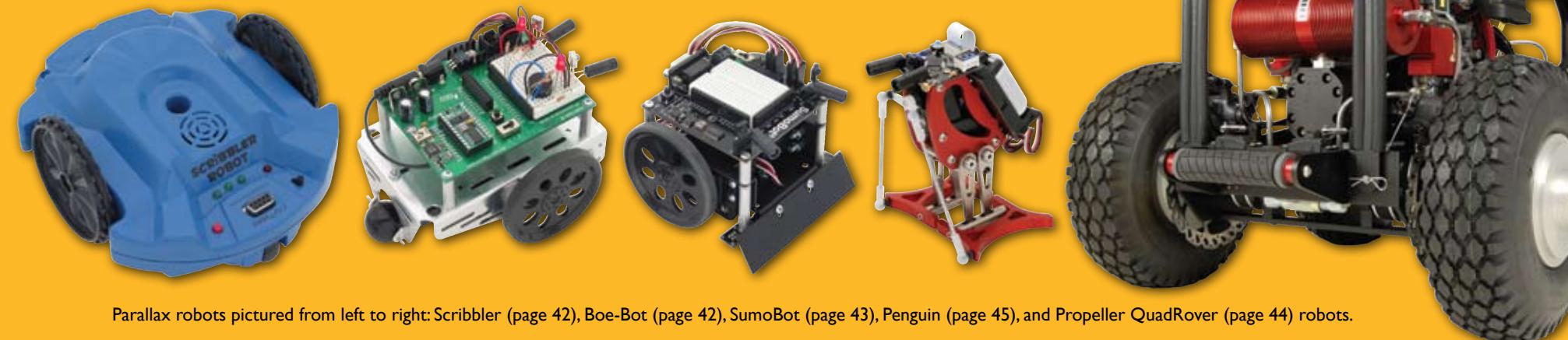
Schematics and wiring diagrams for the SX Tech Board are included. In addition to example programs and applications, practical advice for good programming habits and methods for tackling large programming projects equip the reader for success. Check out the SX Microcontroller forum at <http://forums.parallax.com> for an advanced peek at chapter drafts, and news of the book's progress.

We also offer our series of Stamps In Class texts online. We currently have 8 titles spanning topics from beginning PBASIC programming to industrial control. Our texts have been translated into eleven different languages -- all available for free download. More on our educational texts beginning on page 49.



# Robot:

A MECHANICAL DEVICE THAT IS CAPABLE OF PERFORMING A VARIETY OF OFTEN COMPLEX HUMAN TASKS ON COMMAND OR BY BEING PROGRAMMED IN ADVANCE.



Parallax robots pictured from left to right: Scribbler (page 42), Boe-Bot (page 42), SumoBot (page 43), Penguin (page 45), and Propeller QuadRover (page 44) robots.



A young robot enthusiast programs a Scribbler robot.



A teacher plays "follow the leader" with Boe-Bot robots.



OSURC's custom QuadRover modification (see page 44).

# ROLL:

TO MOVE ALONG A SURFACE by REVOLVING OR TURNING OVER AND OVER, AS A BALL OR A WHEEL



## Scribbler Robot - #28136; \$79.99

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 and can be programmed in pictures with the Scribbler Program Maker GUI or with text via the BASIC Stamp Editor. *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), Scribbler Robot Start-up Guide, software and documentation on CD-ROM. Requires 6 AA alkaline, standard or NiMH batteries, not included.

## Best Seller! Boe-Bot Robot Kit (Serial with USB Adapter) - #28132; \$159.99

## Best Seller! Boe-Bot Robot Kit (USB) - #28832; \$159.99

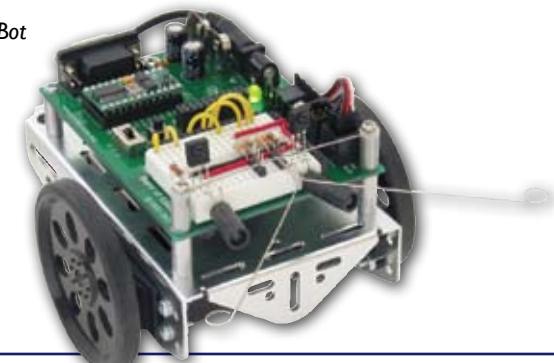
What makes the Boe-Bot great is the BASIC Stamp microcontroller's flexibility of programming when coupled with breadboard circuit construction. Following along in Robotics with the Boe-Bot, users quickly learn about embedded projects, from wiring and components to programming and mechanical dependencies. The kit includes a set of passive components (wires, resistors, capacitors), sensors (photoresistors, bumpers, infrared sensors) and hardware (whisker touch-sensor kit) to complete the different projects.

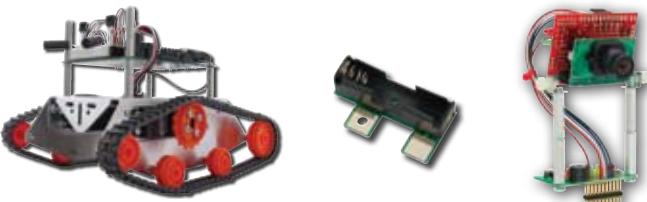
The Boe-Bot robot is built on a high-quality brushed aluminum chassis that provides a sturdy platform for the continuous rotation servo motors and BASIC Stamp 2 on a Board of Education. Many mounting holes and slots may be used to add custom robotic equipment or off-the-shelf Parallax add-ons. The rear wheel is a slider ball held in place with a cotter pin. Drive wheels are molded to fit precisely on the servo spline and held in place with a small screw.

The Boe-Bot robot takes about 1-2 hours to put together, though each project in the *Robotics with the Boe-Bot* 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 (see page 51).

We're particularly proud of Andy Lindsay's *Robotics with the Boe-Bot* text. The text includes 41 activities for the Boe-Bot robot with structured PBASIC 2.5 source code support and bonus challenges with solutions in each chapter. Starting with basic movement and proceeding to sensor-based projects, customers quickly learn how the Boe-Bot is expandable for many different robotic projects. No previous robotics, electronics or programming experience is necessary.

A great resource for STEM programs!

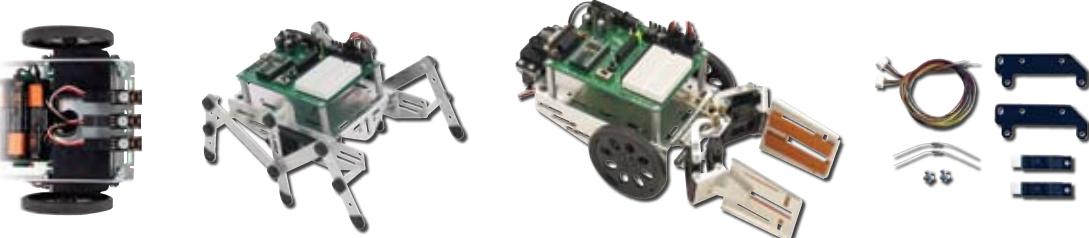




The **Tank Tread Kit** (#28106; \$34.99) gives your Boe-Bot robot the ability to traverse unfriendly terrain. Simply remove the wheels and attach the gears and treads.

The **Boe-Boost** (#30078; \$4.99) increases the battery capacity of the Boe-Bot from four to five AA cells.

Track images by detecting color with the **Boe-Bot CMUcam** (#30051; \$139.99), designed specifically for our Boe-Bot robot.



The **QTI Line Follower Kit** (#28108; \$29.99) mounts underneath the front of the Boe-Bot chassis and uses infrared emitter/receiver modules to provide line following capability. Four sensors included.

The **Crawler Kit** (#30055; \$24.99) attaches easily to your Boe-Bot and runs on standard Boe-Bot source code with only minor adjustments for ground speed. Sample PBASIC code available online.

The **Gripper Kit** (#28202; \$54.99) adds pick-up and carry capability to your Boe-Bot. It features parallel plates that open, clamp onto, and lift objects all with one cleverly utilized Parallax Standard Servo.

The **Digital Encoder Kit** (#28107; \$39.99) answers a customer request for wheel position feedback used to improve dead-reckoning, solve mazes, contests, and map paths of travel.



### **Best Seller! SumoBot Robot Competition Kit (Serial with USB Adapter and Cable) - #27402; \$219.99**

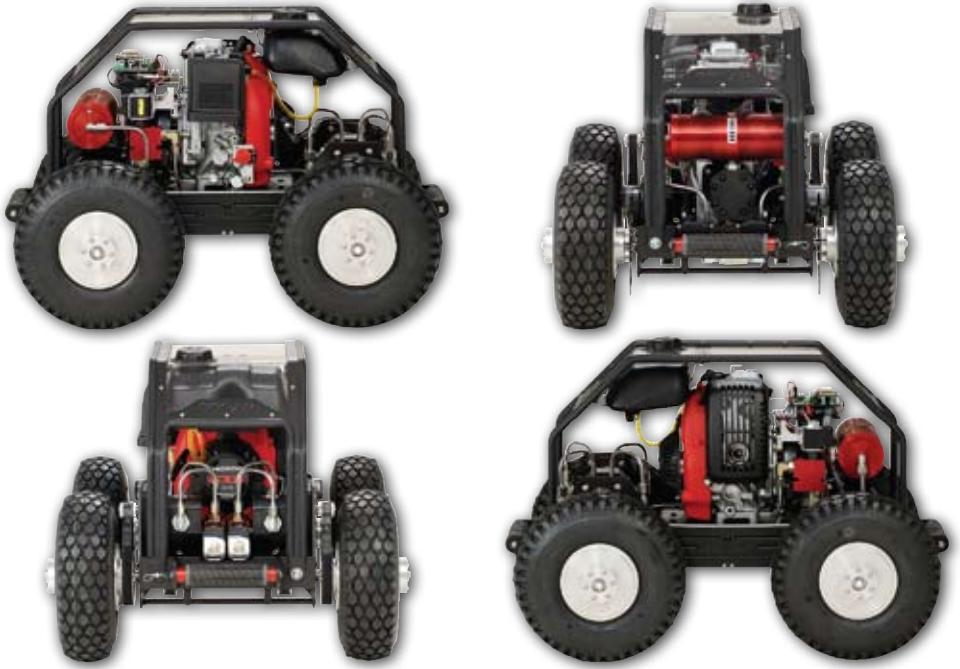
Build and program two SumoBot Robots designed to wrestle in the mini-sumo competition ring! The electronics consists of a surface-mounted BS2 module and an array of infrared sensors to detect your opponent and the edge of the Sumo Ring. Additional components include piezospeakers, resistors, pushbuttons and LEDs to build custom breadboard circuits for program mode selection and sensor state feedback. The hardware package includes black anodized aluminum chassis and scoops, servo motors, wheels, two battery packs (8 AA batteries not included), mounting standoffs, and screws for two complete robots.

This kit comes with two printed texts. The *SumoBot Manual* has assembly instructions and test programs that take you from basic moves to one-on-one combat. When your bots are 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 in. SumoBot Robot Competition Ring Poster, designed to use with the instructions and programs included in *Applied Robotics with the SumoBot*.

### **SumoBot Robot Kit (not pictured) - #27400; \$159.99**

*Includes electronics, hardware and components for single robot, serial programming cable, and SumoBot Manual.*



### Propeller QuadRover Robot - #28195; \$4,999.00

This gas-powered robot is built using a Honda 2.5 HP 4-stroke engine and hydraulic power system. 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 64 KB EEPROM leaves 32 KB for non-volatile 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 position by making a complete hydrostatic turn or by braking one side and making an arc-turn, which can be accomplished at low or high speed. Straight-away top speed is up to 12 miles per hour. Servo controlled throttle and disk brakes make for precise acceleration and deceleration.

The Propeller QuadRover robot ships fully assembled and ready to program. The electronics include a Propeller-powered control board with connections for GPS, compass, and 3-axis accelerometer sensors. A remote is also included. Prior to operation the user needs to add the hydraulic oil and gasoline, load the Propeller program and perform benchtop testing. This process requires up to a full day. Shipping package measures approximately 29 x 19 x 23 in (73 x 48 x 58 cm). Robot weighs 89 lbs. (shipping weight 135 lbs.).



### OSURC and the Propeller QuadRover

In early 2008, Parallax supplied students from the Oregon State University Robotics Club (OSURC) with a Propeller QuadRover and armed them with a few electronic parts to get them on their way. In June 2008, at the Mars Desert Research Station in Hanksville, Utah, the team won Grand Prize in the NASA University Mars Rover Challenge. Combining their knowledge, creativity and determination with the toughness and reliability of the Propeller QuadRover, the team was able to take first place in 3 of 4 tasks to take the overall win. Oregon State was pushed over the top by being the only team to successfully locate the "distressed astronaut" during the navigation challenge. Congratulations!



# WALK:

TO ADVANCE OR TRAVEL ON FOOT AT A MODERATE SPEED OR PACE; PROCEEDED BY STEPS

**Penguin Robot Kit (Red) - #27313; \$199.99**

**Penguin Robot Kit (Blue) - #27314; \$199.99**

**Penguin Robot Kit (Clear) - #27315; \$199.99**

**Penguin Robot Kit (Black) - #27316; \$199.99**

The Penguin robot is a precision-machined 4 inch 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 robot.

Writing code for the Penguin is easy. First, the servo center and tilt/stride limits are set and written to EEPROM using the "Penguin-ServoCalibration.bpx" program from our web site. 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.

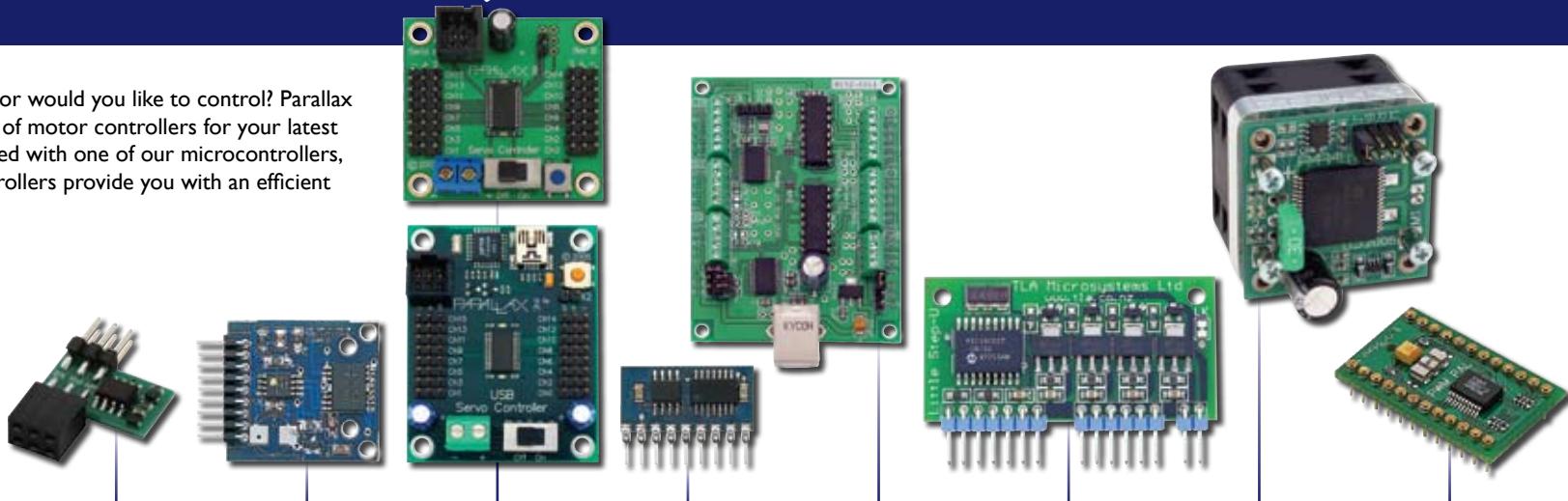
Two CR-123A lithium batteries are included in the kit, and also sold separately (#752-00003; \$2.75).



# IN CONTROL:

TO EXERCISE AUTHORITATIVE OR DOMINATING INFLUENCE OVER; DIRECT

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



PRODUCT	ServoPAL	Motor Mind B	Parallax Servo Controller	Micro Dual Serial Motor Controller	BiStep Motor Controller (USB)	Little Step-U	HB-25 Motor Controller	PWMPAL
Stock Code; Price	#28824; \$19.99	#27961; \$29.99	Serial; #28023; \$39.99 USB; #28823; \$39.99	#30052; \$23.99	#27969; \$109.99	#27938; \$69.99	#29144; \$49.99	#28020; \$29.99
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/ PSC units)	1 or 2	1 or 2	1	1 (or 2 turning in the same direction)	4
Amps & Volts	6.5 VDC	30V; 3.5 A peak, 2 A continuous	4 - 7.5V	1.8 - 9V @ 1 A Peak/Motor	6.5 to 15V; 1 A	35V; 3 A	6 - 16V; 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).

## New! Motor Mount & Wheel Kit with Position Controller - #27971; \$279.99

Finally your robot can have the mobility and style it deserves! With the Motor Mount and Wheel Kit, powerful 12VDC motors are combined with precisely machined aluminum hardware to provide the power, strength, and beauty demanded by your mid-sized robot. All custom parts are CNC machined in-house at Parallax headquarters in Rocklin, CA. The mounting block makes securing this kit a breeze; and the included 6 in. (15.3 cm) pneumatic rubber tires are durable enough to handle smooth or rugged terrain without hesitation.

The included Position Controllers use a quadrature encoder system to reliably track the position and speed of each wheel and report the data on demand. They can also be interfaced with HB-25 motor controllers (#29144; sold separately on facing page) to automatically provide smooth speed ramping and accurate position control. This leaves the main processor free to handle more important tasks like reading GPS coordinates, processing sensors, and maneuvering complex environments.

### Features of the Motor Mount & Wheel Kit include:

- Powerful 12VDC motors provide plenty of torque
- Precision machined 6061 aluminum hardware
- Conveniently positioned screw holes make mounting this kit a breeze
- Rugged pneumatic tires are well-suited for a variety of terrains
- 5 V supply for Position Controllers
- 36 encoder positions per revolution; approx. 0.5 in. resolution with 6 in. diameter wheel
- Compatible with any microcontroller
- Single I/O line can control up to 4 Position Controllers
- Strong yet light - only 3.2 lbs (1.45 kg) per wheel assembly (kit contains two)

### Key Specifications:

- ~150 RPM @ 12.0 VDC, 1.50 A, no load
- ~190 RPM @ 14.5 VDC, 1.60 A, no load
- 4.5 to 5.5 VDC supply range for Position Controllers
- 50 mA average supply current at 5.0 VDC for Position Controllers
- 36 encoder positions per revolution. Approx. 0.5 inch (1.27 cm) linear distance per position
- 19.2 kbps serial communication
- Operating temp range: -40 to 185 °F (-40 to 85 °C)

Coming in 2009! A high-quality machined aluminum caster wheel to coordinate with your Motor Mount and Wheel Kit!



All of the aluminum parts in the Motor Mount & Wheel Kit have been machined on our CNC mill at our headquarters in Rocklin, California.



# MOVE:

TO PASS FROM ONE PLACE OR POSITION TO ANOTHER; TO ADVANCE OR PROGRESS



## GWS Naro Servo - #900-00014; \$11.99

The GWS Naro Servo is smaller and lighter than our Parallax Standard Servo but delivers great performance and 11 oz-in of torque. It is recommended for smaller robots or in project where space is tight. Two GWS Naro Servos are employed to make the Parallax Penguin walk. Size: 22 x 11.24 x 21.35 mm. Weighs just 0.31 oz. Voltage requirements: 4.8 to 6 VDC.

## Parallax (Futaba) Standard Servo - #900-00005; \$12.99

## Parallax (Futaba) Continuous Rotation Servo - #900-00008; \$12.99

Our Standard and Continuous Rotation servos are made exclusively by Futaba. Both servos may be controlled easily from a BASIC Stamp or SX chip I/O pin using PBASIC's or SX/B's PULSOUT commands. The Continuous Rotation Servo is especially well-suited to robotics applications and includes an adjustable potentiometer port to center the servo.

	Standard Servo	Continuous Rotation Servo
<b>Voltage</b>	5 to 9VDC	5 to 7.5 VDC
<b>Movement</b>	Holds position in 180° range	Bidirectional continuous rotation
<b>Performance</b>	41.6 oz-in torque @ 6V	0 to 50 RPM, linear response to PWM
<b>Weight</b>	42.5 g (1.50 oz)	42 g (1.48 oz)
<b>Dimensions</b>	approx. 2.2 x 0.8 x 1.6 in (5.58 x 1.9 x 4.06 cm ) excluding servo horn	

Servo-compatible 3-lead extension cables: 10-inch (#805-00011; \$1.99) and 14-inch (#805-00012; \$2.50)

## 4-Phase 12 Volt Unipolar Stepper Motor - #27964; \$10.99

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. It is used and included in the StampWorks Experiment Kit (see page 03).

# LEARN:

TO ACQUIRE KNOWLEDGE OF OR SKILL IN BY STUDY, INSTRUCTION, OR EXPERIENCE; TO BECOME INFORMED



## TEACHER RESOURCES AVAILABLE FROM PARALLAX

### **Educators Courses**

These courses for instructors are taught by Parallax engineers or experienced teachers who are using Parallax educational materials in their classrooms. To learn more, click on the “Education” tab at [Parallax.com](http://Parallax.com) and then visit “Educator’s Course Information.”

### **Parallax Educator’s Forum**

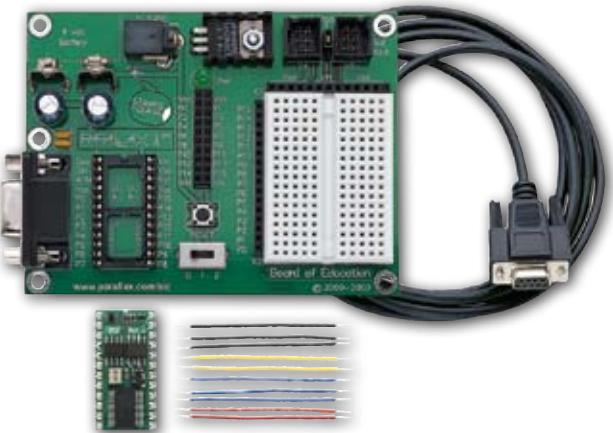
We maintain a free, private forum especially for educators, where they can ask questions and share their experiences with using Parallax products in their classrooms. In addition, Supplemental Educational Materials are posted here. To enroll in the Parallax Educator’s forum, please e-mail [education@parallax.com](mailto:education@parallax.com) for directions; proof of status as an educator will be required.

### **Supplemental Educational Materials**

These resources, posted in the Parallax Educator’s Forum, are exclusively for use by teachers. Select Parallax educational texts have a supplemental set of unpublished questions and solutions; we invite educators to copy, paste and modify this material at will for the quick preparation of homework, quiz, and test material. In addition, you may find Power Point presentations and test materials prepared by other educators posted to the forum.

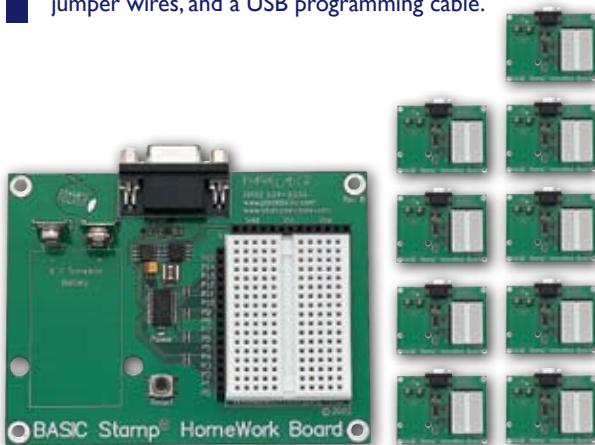
### **Copyright Permissions for Educational Use**

Our Stamps in Class texts, *BASIC Stamp Manual*, *Propeller Manual*, and *Propeller Education Labs* are all available as free pdf downloads, and may be duplicated as long as it is for educational use with Parallax products and the student is charged no more than the cost of duplication. No site license is required for the download, duplication and installation of Parallax software for educational use on as many school or student computers as needed.



**Best Seller! Board of Education Full Kit (Serial) - #28103; \$99.99** Includes a Serial Board of Education, BASIC Stamp 2 module, jumper wires, and a serial programming cable.

**Best Seller! Board of Education Full Kit (USB) - #28803; \$99.99** (not pictured) Includes a USB Board of Education, BASIC Stamp 2 module, jumper wires, and a USB programming cable.



**HomeWork Board (10-Pack) - #28158; \$450.99** The HomeWork Board is also included in the BASIC Stamp Activity Kit (#90005; \$99.99; more information on page 03).

## Board of Education vs. HomeWork Board

The BASIC Stamp microcontroller is most commonly used in classrooms and laboratories in the 24-pin version socketed in the Board of Education (Serial or USB). Our Stamps In Class texts were originally written with the Board of Education Full Kit (#28103) as the base hardware. This is absolutely the best option for the most versatile user experience with the Stamps In Class series.

An alternative is the BASIC Stamp HomeWork Board, a low-cost board similar to the Board of Education with a BASIC Stamp microcontroller built right into the PCB. The lower cost HomeWork Board also makes it ideal for take-home projects and dedicated uses. **Read the table below for a comparison of features:**

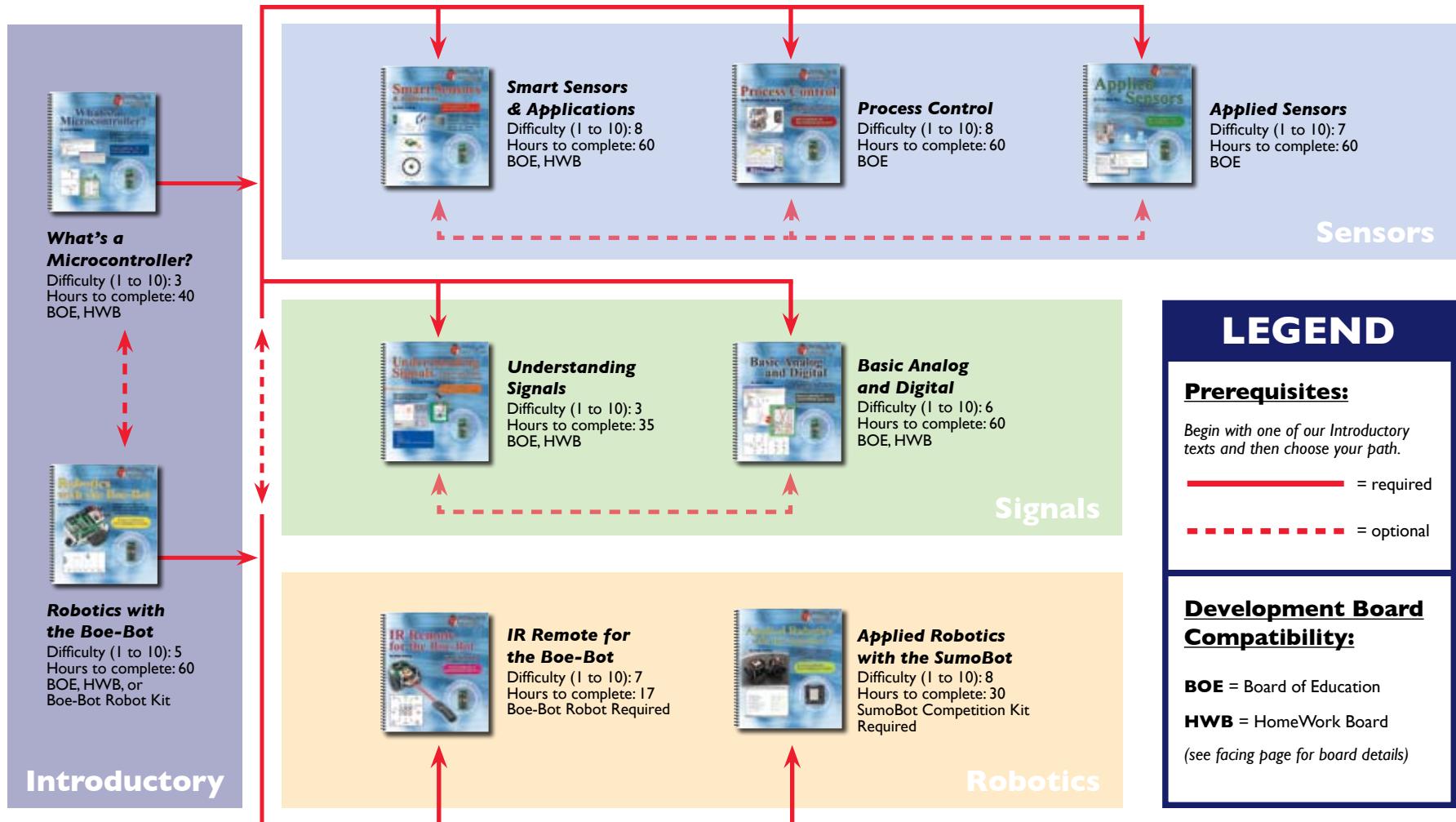
	BS2-IC with Board of Education	BASIC Stamp HomeWork Board
<b>Cost</b>	~\$99 each in Board of Education Full Kit (#28103 (Serial); #28803 (USB); quantity discounts are available)	Only sold in 10-packs (#28158) or in the BASIC Stamp Activity Kit (#90005; \$99.99; includes WAM? Parts & Text; more details page 03)
<b>BASIC Stamp</b>	BASIC Stamp 2 (#BS2-IC) module may be removed from the board, accepts any 24-pin module	BASIC Stamp 2 microcontroller built directly into the HomeWork board
<b>I/O Protection</b>	None, requires attentive wiring and programming	220 ohm resistors built into each I/O pin
<b>Dimensions</b>	3 x 4 in (76.2 x 101.6 mm)	3 x 4 in (76.2 x 101.6 mm)
<b>Power Supply</b>	9 V battery or 2.1 mm jack for wall-pack provides 5V and unregulated input voltage	9 V battery only (not included)
<b>Servo Ports</b>	(4) servo connections	None, but may be done on a breadboard with 3-pin headers
<b>Support Provided in Stamps In Class Texts</b>	All Stamps In Class texts (except Applied Robotics - the SumoBot robot has its own development board)	Specific support in <i>What's a Microcontroller?</i> , <i>Robotics with the Boe-Bot</i> , <i>Smart Sensors and Applications</i> , <i>Understanding Signals</i> , and <i>Basic Analog and Digital</i>

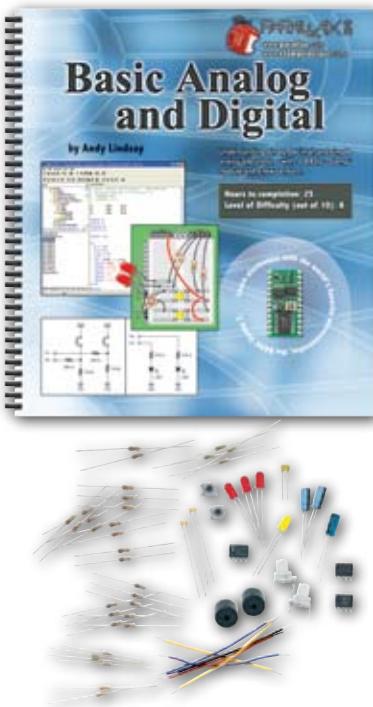
The HomeWork board may appear less robust, but it's a favorite of many customers, and every bit as capable as a Board of Education depending on how you provide power. On the HomeWork Board, the power LED is only lit while the BASIC Stamp microcontroller is running a program, so you could put it in SLEEP/NAP for months and still use the same 9V battery.

*Our Stamps in Class hardware and tutorials are great resources for STEM programs!*

# BASIC Stamp Education Flowchart

Use this handy flowchart to plot your path through the Stamps in Class texts. 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. **Download the full versions of our educational texts free online!**





**What's a Microcontroller? Text - #28123; \$25.99**  
**What's a Microcontroller? Parts - #28122; \$45.99**  
**What's a Microcontroller? Parts & Text - #28152; \$69.99**

The *What's a Microcontroller?* (WAM) introductory microcontroller programming text introduces downloading PBASIC code to a BASIC Stamp module, building a circuit on a breadboard, and both simple and advanced circuits with LEDs, tact switch, pushbuttons, and a servo. WAM is our most introductory BASIC Stamp tutorial for education. WAM introduces the essentials of writing and downloading a simple program. It's a starting point for middle school, high-school and college level students. It may even serve as a background reference for higher levels.

The activities in this text are designed to introduce the student 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.

**BASIC Analog and Digital Text - #28129; \$29.99**  
**BASIC Analog and Digital Parts - #28128; \$29.99**  
**BASIC Analog and Digital Parts & Text - #28155; \$49.99**

Analog to digital (A/D) and digital to analog (D/A) conversion make it possible for a digital device, like the BASIC Stamp 2, to both measure and control "real world" values such as voltage, light level, and frequency. The BASIC Analog and Digital experiments introduce 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 pushbuttons. Activities included in *Basic Analog and Digital*:

- Building a comparator
- Building a simple digital DC voltmeter
- Building a resistive ladder network for D/A conversion
- Recording and displaying frequency and light data
- D/A conversion with pulse width modulation



**Smart Sensors & Applications** (page 33) - Learn to interface a variety of sensors to a BASIC Stamp then display and interpret the data you collect.



**Process Control** (page 61) - Learn to control automated industrial processes with the BASIC Stamp and analyze your data with StampPlot software.



**Applied Sensors** (page 33) - An electronics text with an earth science theme. Emphasis on resistor/capacitor networks, serial communication, and data logging.



**Robotics with the Boe-Bot** (page 42) - One of our most popular texts. Learn basic robotics while you build and program our best selling educational robot, the Boe-Bot.



**IR with the Boe-Bot Text - #70016; \$24.99**  
**IR Remote Parts Kit - #29122; \$12.99**  
**IR with the Boe-Bot Parts & Text - #28139; \$34.99**

Add infrared communication and control to your Boe-Bot robot. You can directly control the Boe-Bot game-controller style, remotely set roaming speed and distance, combine remote control and autonomous roaming functions, and remotely select autonomous roaming modes.



**Applied Robotics with the SumoBot** (page 43) - An advanced robotics text. Learn friction analysis, memory optimization, state-machine diagrams, and self-calibrating sensors to aid you in programming a winning SumoBot.



**Understanding Signals** (page 56) - Learn to make the most out of oscilloscope data with the BASIC Stamp and the Parallax USB Oscilloscope.

# INSPIRE:

TO FILL WITH AN ANIMATING, QUICKENING, OR EXALTING INFLUENCE



## Teachers Institutes with the American Radio Relay League (ARRL)

The Teachers Institute on Wireless Technology (TI) is a four-day in-service learning opportunity designed for motivated teachers and other school staff who want to learn more about wireless technology and bring that knowledge to their students. A variety of topics are covered through hands-on activities, including basic wireless technology literacy, electronics, and the science of radio; bringing space into the classroom; ham radio operation; introduction to micro controllers with the BASIC Stamp; and basic robotics with the Boe-Bot robot.

To learn more, select “Teachers Institute on Wireless Technology” from the Education menu at <http://www.arrl.org>

**Pictured top left:** Education and Technology Program Coordinator Mark Spencer, WA8SME, explains radio astronomy to Teachers Institute participants at ARRL HQ. (S. Khrystyne Keane, KISFA, Photo)

**Pictured Bottom left:** Building the Boe-Bot robot is the highlight of the Teachers Institute. [Photo courtesy of William Richardson, N5VEI]



## Summer Teachers Institutes with the Marine Advanced Technology Education (MATE) Center

MATE's week-long Summer Teachers Institutes equip educators to prepare their students for careers in marine research, exploration, and industry. MATE also coordinates international and regional ROV competitions for students. 2008 Summer Institute participants built ROVs using two BASIC Stamp HomeWork Boards linked by a tether. The “bottom side” board in the ROV hosted motor control and sensors, while the “top side” board hosted a joystick and an LCD to display.

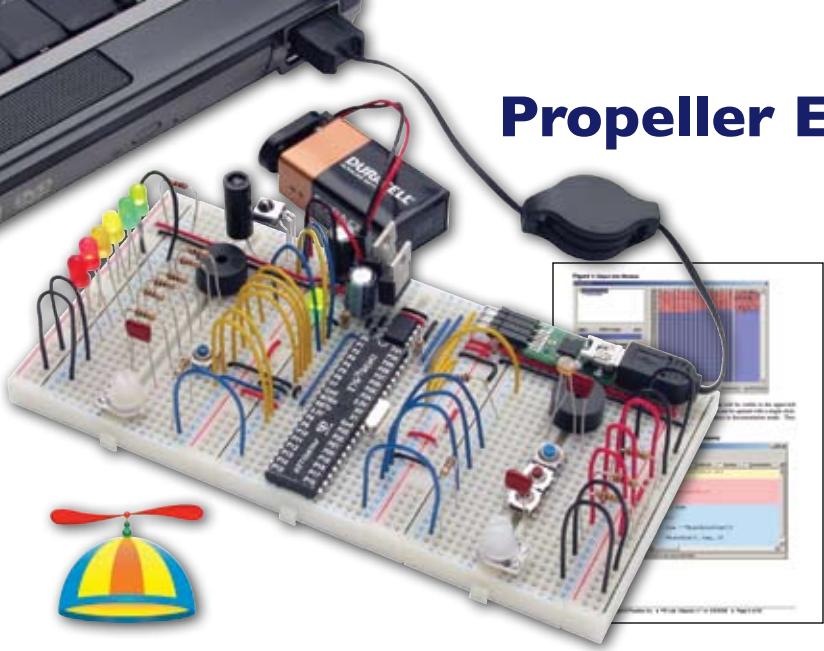
Learn more about the MATE Center’s Teacher Institutes and ROV Competition at <http://www.marinetech.org>

**Pictured top right:** MATE Instructor Tad Masek helps an ROV team test their code.

**Pictured center right:** Another team tests their ROV in the test pool.

**Pictured bottom right:** A third team’s ROV explores the test pool.





# Propeller Education

- Propeller Education Kit (40-Pin DIP Version) - #32305; \$99.99**
- Propeller Education Kit (PropStick USB Version) - #32306; \$99.99**

Our Propeller Education Kits are our most flexible and affordable options for college students who are ready to explore cutting-edge multiprocessor technology. These complete kits have everything you'll need to get started with the Propeller microcontroller and educational labs from Parallax, except a 9V battery. Download the free Propeller Tool software and Propeller Education Lessons and Labs from [www.parallax.com](http://www.parallax.com).

## Propeller Education Kit Contents:

- **PE Platform Parts:** A Propeller microcontroller “plus” all the programming circuitry for a fully functional system. The 40-pin DIP version includes separate breadboard-friendly Propeller chip, EEPROM, resonator, regulators, and programming connection components for easy maintenance, while the PropStick USB version mounts all of those on a 40-pin PCB that plugs into the breadboard for quick and easy start-up.
- **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, making it easy to keep both simple and complex circuits well organized.
- **Plastic Storage Box:** This handy box features 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.

## Enhance your Propeller education with ViewPort

ViewPort combines a graphical application with software for the Propeller to help you build advanced projects more quickly. Variables used in a Propeller program are shared over a serial connection with ViewPort so that you can control and monitor the program as it runs. Data can be graphed, measured, or logged. Configurable controls allow you to change variables in your program while it's running. ViewPort can be integrated into any Spin program - it requires one cog and a single line of code at the start of your program. It's easy to get started with plenty of tutorials, videos and documentation but it is also configurable, extensible, and customizable. *ViewPort features include:*

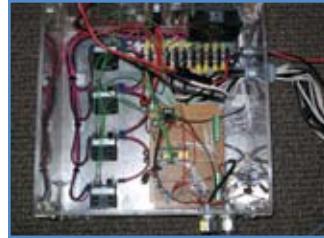
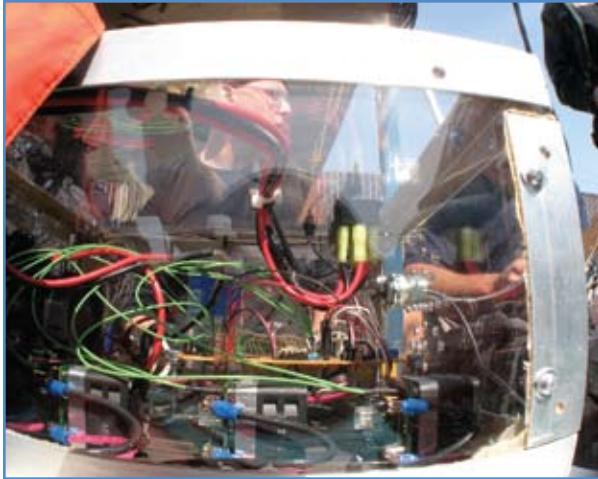
- Change and monitor variables in your program as it runs - data is transferred up to 2 Mbps
- View the state of the input/output port at up to 80 MHz
- Analyze data with oscilloscope, logic state analyzer, and spectrum analyzer views
- Create custom views with the visual editor using existing or custom controls
- Control panels for fuzzy logic, video streaming, etc.
- Export to Matlab, CSV, TXT, FTP server or other programs



Free trial at <http://mydancebot.com/viewport>

# WIN:

TO SUCCEED BY STRIVING OR EFFORT; TO GAIN THE VICTORY; TO RECEIVE AS A PRIZE OR REWARD FOR PERFORMANCE



## Hartnell Community College Robotics Club's ROV

Justin Jordan of the Hartnell Community College Robotics Club manning the ROV they built for the 2008 MATE International ROV competition held in San Diego. Justin's team won the "Biggest Bang for the Buck" award for spending the least amount of money on a vehicle that performed well. Their design features a BASIC Stamp 2p40. Read more about MATE on page 53.

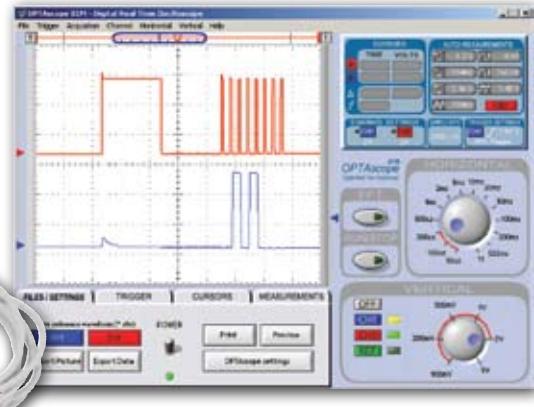
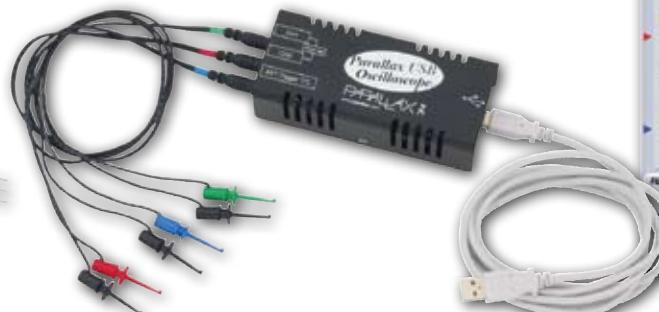
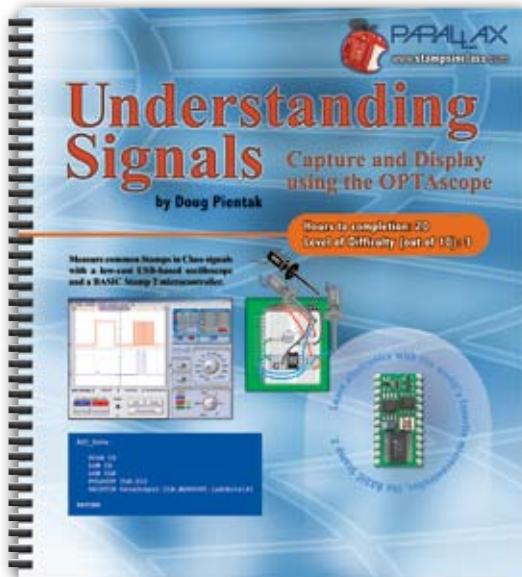
## Toni Abney's Solar-Powered RFID Gate Control

American River College student Toni Abney took first place in the 2008 California State Fair Closed Caption Award with her Solar-Powered RFID Gate Control. Toni's project was a well-built working model of a closed-loop security system. The visitor uses an RFID keytag to activate the gate. A magnet and reed switch are used to detect the fully open position. The whole project is powered by a 6 V solar cell and a charge circuit. This is the second California State Fair award Toni has won with the support of her instructor Fred Evangelisti.



# MEASURE:

THE ACT OR PROCESS OF ASCERTAINING THE EXTENT, DIMENSIONS, OR QUANTITY OF SOMETHING; MEASUREMENT



**Understanding Signals Text - #70009; \$19.99**

**Understanding Signals Parts & Text (includes USB Oscilloscope) - #28119; \$159.99**

**Parallax USB Oscilloscope (more on facing page) - #28014; \$139.99**

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. Learn how to generate, view, and measure a variety of wave forms. 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 signal. Topics covered in the *Understanding Signals* text 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
- Voltage amplification and inversion with DC offset with an op-amp
- Servo pulse signals over an entire range of motion
- Pulse width modulation with infrared
- Decoding of handheld infrared remote control signals
- Single and dual sine waves

## Parallax USB Oscilloscope - #28014; \$139.99

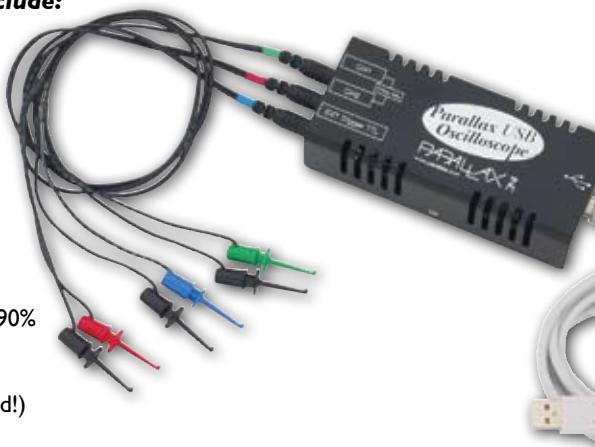
This portable two-channel digital storage oscilloscope is a handy and affordable tool for both the hobbyist and student. Three pairs of probes connect to the compact powder-coated aluminum case, two for signal channels and a third for external TTL triggering. The hardware connects to your PC with the included USB cable for both data transfer and power, so no external power supply is needed.

All oscilloscope controls are managed through one of our two software interface platforms. Both platforms include classic scope features such as Auto and Normal trigger modes, variable trigger voltage, external triggering, and auto-measurements (Min, Max, Frequency, Period). Three easy-to-use cursor functions to measure acquired signals manually, with the option to snap to the waveform. Each platform also allows you to save customized setups, and to export data and bitmaps for analysis and inclusion in reports.

### Features of the Parallax USB Oscilloscope include:

- 2 Channels
- 1 Ms/s maximum sample rate with one channel
- 500 Ks/s sample rate with two channels
- 20Vpp 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
- USB 1.1 Support (no additional power supply required!)
- Size: 5 x 2.25 x 1.5 in (12.7 x 5.7 x 3.8 cm)
- Weight: 8 oz (227 gm)

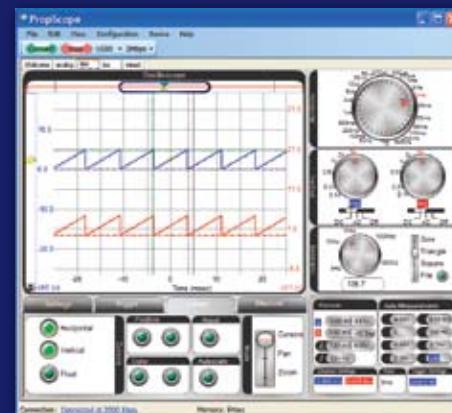
The activities in Understanding Signals v1.0 require the Parallax USB Oscilloscope software version 4.0, which runs on most Windows 2K and XP operating systems. The Parallax USB Oscilloscope Software Version 5 (right), which runs on most Windows XP and Vista systems, does not fully support the activities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



## Coming Soon! 20 MHz PropScope USB

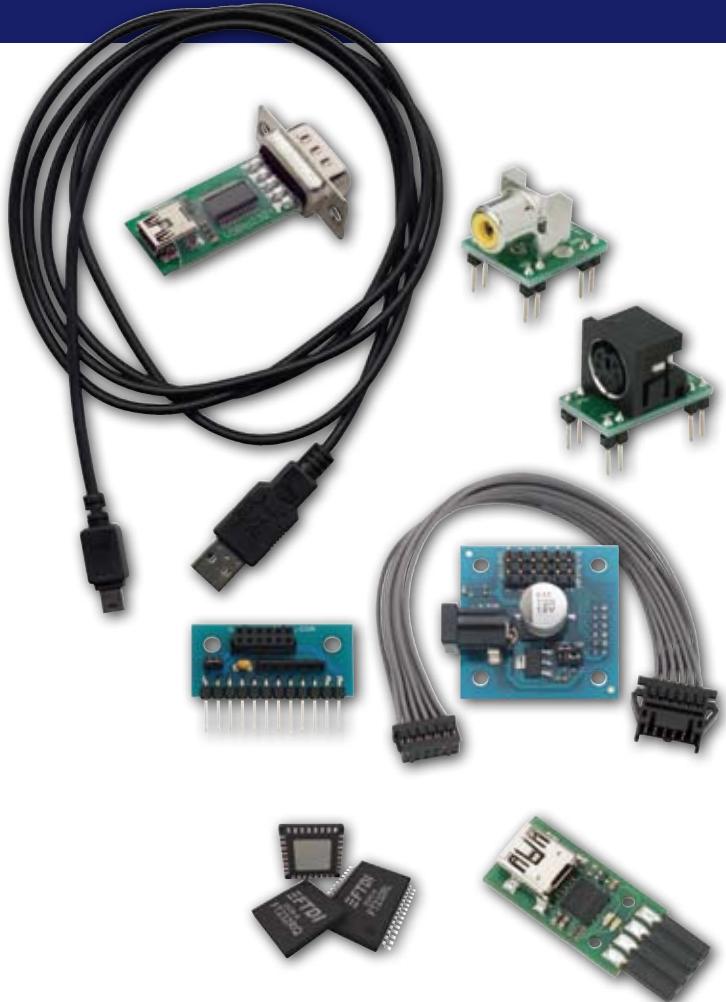
Built on Propeller technology, this device provides everything you need for electronic projects: a high speed Oscilloscope, Logic Analyzer, Spectrum Analyzer and Function Generator. The hardware connects to your PC for data and power and supports 2 channels of analog input-through professional BNC connectors. A 10 pin connector provides 8 channels of digital IO and a channel of arbitrary waveform output. The full-featured software integrates all the classic features in an easy to use, graphical environment. *Planned features of the PropScope USB include:*

- 20 Ms/s maximum sample rate with one channel
- 30Vp-p maximum input (as low as 2 mV resolution)
- Combination oscilloscope/logic analyzer/function generator
- Professional BNC connections
- Variable trigger voltage and variable horizontal trigger Positions
- Logic analyzer includes bit, edge and pattern triggers with sample rate up to 80 MSPS
- Skinnable views and plug-in architecture allow for complete customization
- Export to Matlab, CSV, TXT, FTP server or other programs



# ADAPT:

TO MAKE SUITABLE TO REQUIREMENTS OR CONDITIONS; ADJUST OR MODIFY FITTINGLY



**Parallax USB to Serial (RS-232) Adapter with Cable - #28031; \$19.99  
Parallax USB to Serial (RS-232) Adapter Only - #28030; \$14.99**

This USB to Serial (RS-232) adapter is compact, economical, and works with all of our products that have a DB9 connector. To use this adapter with your PC, simply download and run the USB Driver Installer, then connect the adapter to your PC's USB port with a USB A to Mini-B cable. Parallax designed this adapter with FTDI's FT232RL chip. The required FTDI USB drivers for Windows 2K/XP/Vista are available from the Downloads page at [www.parallax.com](http://www.parallax.com), and are also built into the BASIC Stamp, SX-Key, and Propeller programming software packages. For Macintosh, Linux, and older Windows systems, you may obtain drivers directly from FTDI's VCP Drivers page at [www.ftdichip.com](http://www.ftdichip.com). USB Version 1.1 and 2.0 compatible.

**RCA to Breadboard Adapter - #28050; \$4.99  
PS/2 to Breadboard Adapter - #28060; \$4.99**

Excellent for use with the Propeller Education Kits to enable the connection of A/V displays and computer mice or keyboards. Read more about PE Kits on pages 05 and 54.

**BASIC Stamp DB-Expander Daughterboard-to-SIP - #28325; \$9.99  
Power-Input, 3-Pin Header I/O Daughterboard - #28301; \$14.99  
Daughterboard Extension Cable - #800-28301; \$7.99**

Designed for use with the BS2pe Motherboard (page 15), and a great way to interface to additional boards.

**FTDI 2232L Dual-Channel USB to Serial Chip - #604-00033G; \$5.25  
FTDI FT232RL USB to Serial Chip - #604-00043; \$4.50  
FTDI FT232RQ USB to Serial Chip - #604-00047; \$4.50  
FTDI VNCIL-1A Vinculum USB Host Controller Device - #604-00051; \$10.90 (pg. 38)**

Parallax stocks the more common FTDI devices in production quantities. If you are interested in volume pricing please contact our Sales Department ([sales@parallax.com](mailto:sales@parallax.com)).

**Parallax USB2SER Development Tool - #28024; \$32.99**

This device is a mini development tool based on the FT232BM USB to Serial UART interface chip. It is also a reference design for customer-based applications using the FTDI chip in-circuit; download the complete Bill of Materials and schematics from the 28024 product page at [www.parallax.com](http://www.parallax.com).

# POWER UP:

TO SUPPLY WITH ELECTRICITY OR OTHER MEANS OF POWER; TO TURN ON



## Parallax Power Supply Recommendations

Order the correct power supply for your microcontroller/development board configuration. If you have any questions relating to power supplies, contact our Tech Support Department by e-mail ([support@parallax.com](mailto:support@parallax.com)).

	Board of Education	Super Carrier Board	Professional Development Boards	SX Tech Board	SX28 and SX48 Proto Boards	Propeller Demo Board
<b>BASIC Stamp 1</b>	--	● ▢ ▲	● ▢ ▲	--	--	--
<b>BASIC Stamp 2</b>	● ▢	● ▢ ▲	● ▢ ▲	--	--	--
<b>BASIC Stamp 2e</b>	● ▢	● ▢ ▲	● ▢ ▲	--	--	--
<b>BASIC Stamp 2sx</b>	● ▢	● ▢ ▲	● ▢ ▲	--	--	--
<b>BASIC Stamp 2p</b>	● ▢	● ▢ ▲	● ▢ ▲	--	--	--
<b>BASIC Stamp 2pe</b>	● ▢	● ▢ ▲	● ▢ ▲	--	--	--
<b>BASIC Stamp 2px</b>	● ▢	● ▢ ▲	● ▢ ▲	--	--	--
<b>SX28AC/DP</b>	--	--	● ▢ ▲	●	●	--
<b>SX48BD</b>	--	--	--	--	●	--
<b>Propeller chips</b>	--	--	● ▢ ▲	--	--	●

### LEGEND:

- = 7.5VDC 1 Amp Power Supply (#750-00009; \$10.99)
- = 9VDC 300 mA Power Supply (#750-00008; \$8.99)
- ▲ = 12VDC 1 Amp Power Supply (#750-00007; \$8.99)



### Serial Cable - #800-00003; \$10.99

Programming cable for your serial (RS-232) boards. If you do not have a serial connector on your PC, consider our Serial to USB Adapter (opposite page).

### USB A to B Cable - #805-00007; \$5.99 USB A to Mini B Cable - #805-00006; \$6.99 USB A to Mini B Retractable Cable - #805-00010; \$4.99

We offer three type of USB cables to suit your needs. Many of our programming kits include cables. Check [parallax.com](http://parallax.com) for a full list of what is included in each kit.

# AUTOMATE:

TO INSTALL AUTOMATIC PROCEDURES, AS FOR MANUFACTURING; FOLLOW OR UTILIZE PRINCIPLES OF AUTOMATION



## Stamp PLC - #30064; \$199.99

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 may have proprietary code, you may create the 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. A 24-pin BASIC Stamp module or Javelin Stamp module is required and sold separately. Features include:

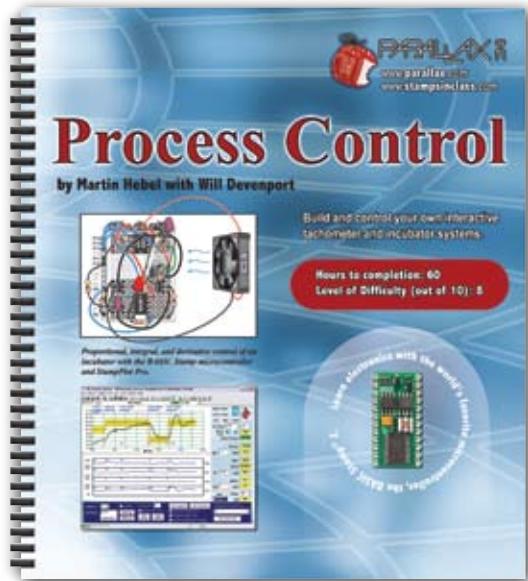
- Safe 24V industrial control in a DIN rail package, only 4.4 x 4.7 in (11.2 x 11.9 cm)
- 10 Digital Inputs: Eight of these inputs are grouped together using an on-board shift register. The remaining two inputs are read directly by the Stamp. All inputs are optically isolated.
- 8 Digital Outputs are optically isolated, electrically and thermally protected.
- 4 Analog Inputs: Installing the optional Maxim 1270 12-bit A/D converter adds four analog input channels. Each channel can be independently configured as 4-20 mA, 0-5 VDC, ±5 VDC, ±10 VDC.
- Front Panel LEDs indicate the status of all ten inputs and all eight outputs via a light-pipe array.
- Heavy-duty power supply has built-in noise protection.
- RS-232 Serial Port: once programming is completed, the on-board serial port can be used to send and received data at any baud rate between 300-50 K Baud.
- 24-pin socket accommodates any 24-pin BASIC Stamp module or Javelin Stamp module. This means that this PLC can do virtually anything that your chosen BASIC Stamp can perform: logic functions, numerical computation, conditional branching, even non-volatile memory for data-logging.
- Product includes jumpers for A/D converter and serial cable (power supply and A/D converter sold separately)



## Stamp Controller Interface - #27945; \$49.99

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. These optically isolated modules are ideal for interfacing microcontrollers to the real world. The Stamp Controller Interface accepts the BS1 and all 24-pin BS2 modules, 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, see page 59). Dimensions: 3.7 x 4.1 in (9.4 x 10.4 cm)

A BASIC Stamp module or Javelin Stamp module is not included with this board.



**Process Control Text - #122-28176; \$24.99**  
**Process Control Parts - #130-28176; \$29.99**  
**Process Control Parts & Text - #28176; \$49.99**

Virtually everything you use or consume has undergone some type of automated process in its production. With the activities in the *Process Control* you can build your own A/D converter, light sensor, tachometer, and incubator control systems to learn these principles hands-on:

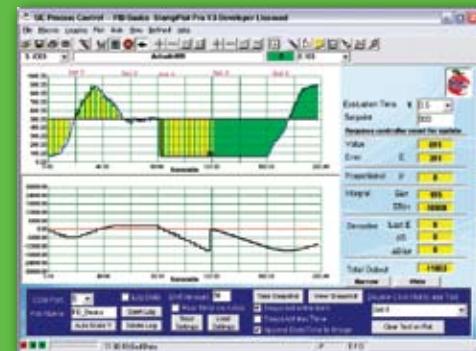
- Flowcharting
- Mechanical and digital switching
- Open and closed loop systems
- Control methods including on-off, differential gap, and PID
- Managing error, spurious signals and bounce
- Transistor and Operation Amplifier principles
- High-voltage/Current interfacing and PWM

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 9V battery (not included).

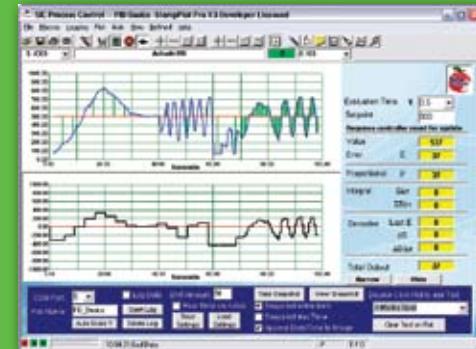


## Analyze industrial control processes using StampPlot

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 free from [www.parallax.com](http://www.parallax.com).



# CREATE:

TO EVOLVE FROM ONE'S OWN THOUGHT OR IMAGINATION, AS AN INVENTION

An interview with John Twomey of Ignite Automation. An engineer and inventor living in Ireland, John is a Propeller enthusiast and frequent contributor to the Parallax Discussion Forums (his screen name is "QuattroRS4").

**Q: How did you get started with the Propeller chip?**

**A:** I had agreed to build a control system for a particular customer (new build machine) and I set about building it - but, midway through the build, the spec was changed quite drastically and the need for a multitasking micro was an absolute essential. I built several prototypes using different microcontrollers - all to no avail. The Propeller was just launched at this stage and I had been reading about it - no datasheet or specs yet and I knew nothing of Spin or the finer details at this point. Yet I ordered a Proto Board, manual, and confirmed my deadline! After many a late night with the manual, Proto Board and the Parallax Forum - I chiseled out a fully functional prototype with added features! Once the final design was completed the customer was so happy that I then received multiple orders for that machine and many others - with one brief - 'Use the same control' - so I did, and still am. The Propeller is now used as my 'solution of choice' on a daily basis. It was at this point that I realized that for the first time in years I was actually enjoying my work again. The Propeller Rocks!

**Q: You specialize in creating industrial machines, what's your favorite part of your job?**

**A:** I love a new challenge! I have been guilty of 'overdoing' certain control systems - since almost every solution I build these days gets a Propeller as its heart - I find myself adding features - just because some control systems do not flex the Propeller I find myself adding to the initial spec. I also really enjoy the 'perplexed look' when other solution providers view the Propeller's capabilities...I have been known to stand back and watch!

**Q: What are some of your favorite uses of the Propeller chip?**

**A:** It is difficult to pick any individual use - The Propeller is so versatile in that any I/O can be configured to suit any purpose. I derive a certain amount of satisfaction from revisiting a customer site and viewing a solution in a mission critical application and watching how an operator interacts with the machines.

**Q: What is on the horizon?**

**A:** More of the same! Currently there are multiple orders for replication of the Propeller-based solutions previously provided. I also have a desire to design a universal modular control system around a Propeller. A main controller having Keyboard, Mouse, ethernet, VGA, RS232, I<sup>2</sup>C, SPI and SD (nothing unusual there - all proven capabilities of the Propeller) and then add I/O Expanders - both analogue and digital. Each application will have a common core controller and the I/O modules will be chosen to suit any given application.



# 4 Ways to Order with Parallax

## Online Ordering:

[www.parallax.com](http://www.parallax.com) is the most popular way to order products from Parallax.

## Why do customers shop online?

- Order entry process is secure, fast, and easy to understand
- Order confirmation and tracking number are sent via e-mail
- Exclusive sales and promotions

Online orders may be placed anytime through our secure server on [www.parallax.com](http://www.parallax.com). Online orders require Visa, MasterCard, or American Express and are shipped UPS and USPS. Orders received before 2:00 p.m. PT will be shipped the same business day if all items are in stock. Orders received after 2:00 p.m. will be processed for shipment the following business day (business hours are Monday-Friday, 7:00 a.m. - 5:00 p.m. Pacific Time).

## By Telephone:

You may place your order by telephone during the hours of 7:00 a.m. to 5:00 p.m. PT. Customers in the continental United States may call toll-free 888-512-1024, and international customers dial (916) 624-8333.

## By Fax:

You may send us your pre-approved Purchase Orders to the attention of the Sales Department at (916) 624-8003. P.O.s must have a minimum purchase amount of \$100, and contain an authorized signature. To apply for Net 30 terms contact our sales department at 888-512-1024. Publicly funded schools are automatically pre-approved.

## By Mail:

Send Parallax your Purchase Orders, pre-paid orders with a personal check or money order addressed to:

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

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

If you have any questions about the ordering process, please call the Parallax Sales Department toll-free at 888-512-1024 or e-mail [sales@parallax.com](mailto:sales@parallax.com).



# Product Index

Looking for a specific product but can't find it in this topsy turvy tome? Use this handy index which has been organized like our web store to find the product information you seek.

## MICROCONTROLLERS

### BASIC Stamp

#### Modules

- BASIC Stamp Rev.Dx (Page 14)
- BASIC Stamp 1 (Page 06-07)
- BASIC Stamp 2 (Page 06-07)
- BASIC Stamp 2e (Page 06-07)
- BASIC Stamp 2sx (Page 06-07)
- BASIC Stamp 2p24 (Page 06-07)
- BASIC Stamp 2p40 (Page 06-07)
- BASIC Stamp 2pe (Page 06-07)
- BASIC Stamp 2px (Page 06-07)

#### OEM

- EEPROM and Resonators (Page 12)
- OEM Kits (Page 12)

#### Programming Kits

- BASIC Stamp 1 Starter Kit (Page 03)
- BASIC Stamp Activity Kit (Page 03)
- BASIC Stamp Discovery Kits (Page 02-03)
- StampWorks Experiment Kit (Page 03)

#### Development Boards

- BASIC Stamp 1 Carrier Board (Page 14)
- BASIC Stamp 1 Project Board (Page 14)
- BASIC Stamp 2 Carrier Board (Page 14)
- BASIC Stamp Super Carrier Board (Page 14)
- Board of Education (Page 13, 50)
- BS2pe Motherboard (page 15)
- Professional Development Board (Page 15)

## Propeller

### Chips

- P8X32A-D40 (Page 10)
- P8X32A-M44 (Page 10)
- P8X32A-Q44 (Page 10)

#### Tools

- HYDRA 128 K Memory Expansion Card (Page 20)
- HYDRA Blank Experimenter Card (Page 20)
- HYDRA Xtreme 512 K SRAM Card (page 20)
- ICCV7 for Propeller Software (Page 19)
- Prop Plug (Page 19)

Propeller Accessory Kit (Page 04)  
PropStick USB (Page 19)

#### Programming Kits

HYDRA Game Development Kit (Page 05)  
Propeller Education Kits (Page 05, 54)  
Propeller Starter Kit (Page 02, 04)

#### Development Boards

Propeller Demo Board (Page 17)  
Propeller Professional Development Board (Page 18)  
Propeller Proto Boards (Page 17)  
PropRPM (Page 20)

## SX

#### Chips

SX20AC/SS-G (Page 08-09)  
SX28AC/DP-G (Page 08-09)  
SX28AC/SS-G (Page 08-09)  
SX48BD-G (Page 08-09)

#### Tools

SX Blitz Programming Tool (Page 08)  
SX-Key USB Development Tool (Page 08)

#### Programming Kits

SX Tech Tool Kit (Page 04)

#### Development Boards

SX28 Proto Board (Page 16)  
SX48 Proto Board (Page 16)  
SX Tech Board (Page 16)

## ROBOTS

#### Rolling

Boe-Bot Robot Kit (Page 42)  
Propeller QuadRover (Page 44)  
Scribbler Robot (Page 42)  
SumoBot Robot Competition Kit (Page 43)

#### Walking

Penguin Robot Kits (Page 45)

#### Robotic Accessories

Boe-Boost (Page 43)  
Boe-Bot CMUCam (Page 43)  
Crawler Kit (Page 43)  
Digital Encoder Kit (Page 43)  
PING))) Bracket Kit (Page 29)  
QTI Line Follower Kit (Page 28, 43)  
Tank Tread Kit (Page 43)

#### Robotic Components

See [www.parallax.com](http://www.parallax.com)

## ACCESSORIES

#### Displays

μOLED-96-PROP Display (Page 26)  
μOLED-128-G1 (Page 26)  
2x16 Parallel LCD (Page 25)  
4x20 Serial LCD with Keypad Interface (Page 24)  
7-Seg-DB Daughterboards (Page 25)  
112x16 Serial Graphic VFD (Page 25)  
Mini LCD A/V Color Display (Page 26)  
Parallax 2x16 Serial LCDs (Page 23-24)  
Parallax 4x20 Serial LCD (Page 24)

#### Communication

MEMKey (Page 31)  
Memory Stick Datalogger (Page 38)  
Parallax 433 MHz Transmitter (Page 35)  
Parallax 433 MHz Receiver (Page 35)  
Parallax Internet Netburner Kit (Page 35)  
RFID Reader Modules (Page 36)  
RFID Transponder Tags (Page 34)

#### Motor/Servo Controllers

Bistep Motor Controller (Page 46)  
HB-25 Motor Controller (Page 46)  
Little Step-U (Page 46)  
Micro Dual Serial Motor Controller (Page 46)  
Motor Mind B (Page 46)  
Parallax Servo Controllers (Page 46)  
PWMPAL (Page 46)  
ServoPAL (Page 46)

#### Motors/Servos

4-Phase Unipolar Stepper Motor (Page 48)  
GWS Naro Servo (Page 48)  
Motor Mount & Wheel Kit (Page 47)  
Parallax (Futaba) Continuous Rotation Servo (Page 48)  
Parallax (Futaba) Standard Servo (Page 48)

#### Sound

Emic Text to Speech Module (Page 22)  
SoundPAL (Page 22)

#### Tools

4x4 Matrix Keypad and Cable (Page 31)  
Parallax USB Oscilloscope (Page 57)  
Parallax USB2SER Development Tool (Page 58)  
Stache: BASIC Stamp Field Programmer (Page 38)

#### Cables/Converters

BASIC Stamp Daughterboard-to-SIP (Page 58)  
Daughterboard Extension Cable (Page 58)  
Parallax USB to Serial (RS-232) Adapter (Page 58)

PS/2 to Breadboard Adapter (Page 05, 58)  
RCA to Breadboard Adapter (Page 05, 58)  
Serial Cable (Page 59)  
USB Cables (Page 59)

#### Power Supplies

Power Supply Compatibility Chart (Page 59)

## SENSORS

#### Acceleration/Tilt

Hitachi H48C Tri-Axis Accelerometer (Page 30)  
Memsic 2125 Dual-Axis Accelerometer (Page 30)

#### Color/Light

TCS230-DB Color Sensor (Page 28)  
TSL230R Light to Frequency Converter (Page 28)

#### Compass/GPS

Hitachi HM55B Compass Module (Page 32)  
Parallax GPS Receiver Module (Page 32)

#### Object Detection

PING))) Ultrasonic Sensor (Page 29)  
PIR Sensor (Page 29)  
QT113-D Touch Sensor (Page 31)  
QTI Sensor (Page 28)

#### Temperature/Humidity

DS2760 Thermocouple Kit (Page 30)  
MLX90614 Infrared Thermometer (Page 27)  
Sensirion Temperature/Humidity Sensor (Page 30)

#### Pressure/Flex/RPM

FlexiForce Sensor (Page 31)  
Melexis 9017 Hall-Effect Sensor (Page 31)  
Piezo Film Vibra Tab Mass (Page 31)

## EDUCATION

#### Texts, Parts, and Kits

Applied Robotics with the SumoBot (Page 43, 52)  
Applied Sensors (Page 33, 52)  
Basic Analog and Digital (Page 52)  
IR with the Boe-Bot (Page 52)  
Process Control (Page 52, 61)  
Propeller Education Kits (Page 05, 54)  
Robotics with the Boe-Bot (Page 42, 52)  
Smart Sensors and Applications (Page 33, 52)  
Understanding Signals (Page 52, 56-57)  
What's a Microcontroller? (Page 52)

# PARALLAX POLICIES

## INTERNATIONAL CUSTOMERS

We encourage international customers to purchase through our distributors. Distributors provide reasonable prices as a result of consolidating their shipments, working with local customs offices and using preferred freight carriers. This usually results in a savings for the international customer.

Should you decide to place an international online order, the cost of shipping will be higher than if you order through a local distributor. Parallax is NOT responsible for any brokerage, customs fees, VAT, or country taxes that may be due upon the receipt of the package. The actual value of all orders is indicated on the invoice, and restatements using lower values are not permitted. The cost of the order would be higher than if you ordered directly from a distributor in your area.

## Authorized Parallax Distributors

You may order directly from us or from any of our Authorized Distributors. To see a complete listing of Authorized Distributors, please visit our web site.

## ORDERING POLICIES

**Payment Terms** - Orders may be paid with VISA, MasterCard, American Express, check, or money order. Sorry, no C.O.D.s. Contact us at [sales@parallax.com](mailto:sales@parallax.com) for wire transfers. Customers desiring Net 30 days payment terms must submit three credit references and bank information. Approval for Net 30 days payment terms normally requires 2-5 days before the first order is shipped. A finance charge of 1.5% per month (18% annual percentage rate) will be charged on all past due amounts. Reasonable attorney fees will also be charged by seller in the event of any action proceeding for collection of the sums billed on the invoice.

**Shipping Methods** - Domestic and International orders placed on-line are sent by available UPS and USPS methods. Orders placed by telephone or fax have the additional methods available: U.S. Priority Mail, DHL Worldwide, Airborne Express, or Federal Express.

**California & Indiana Sales Tax** - All orders shipped to California addresses will be charged Placer County sales tax of 7.25%, and all orders shipped to Indiana addresses will be charged sales tax of 6.00%, unless you have a tax exemption certificate on file with Parallax.

## WARRANTY, REPAIRS, AND MONEY BACK GUARANTEE

**Quality Assurance**- Parallax, Inc. has stringent quality control procedures in place to insure the best quality products.

**90 Day Limited Warranty**- Parallax, Inc. warrants its products against defects in materials and workmanship for a period of 90 days. If you discover a defect, Parallax, Inc. will, at its option, repair, replace, or refund the purchase price. After 90 days, products can still be sent in for repair or replacement, but there will be a \$10.00 USD minimum inspection/labor/repair fee (not including return shipping and handling charges).

**14-Day Money-Back Guarantee**- If, within 14 days of having received your product, you find that it does not suit your needs, you may return it for a refund. Parallax, Inc. will refund the purchase price of the product in the same payment form, excluding shipping/handling costs, once the product is received. This refund does not apply if the product has been altered or damaged. If you decide to return the products after the 14-day evaluation period, a 20% restocking fee will be charged against the credit.

**Disclaimer**- Warranty does not apply if the product has been altered, modified, or damaged. Parallax, Inc. makes no other warranty of any kind, expressed or implied, including any warranty of merchantability, fitness of the product for any particular purpose even if that purpose is known to Parallax, Inc., or any warranty relating to patents, trademarks, copyrights or other intellectual property. Parallax, Inc. shall not be liable for any injury, loss, damage, or loss of profits resulting from the handling or use of the product shipped.

**How to return a product**- When returning, you must first call the Sales Department (toll free 888-512-1024) for a Return Merchandise Authorization number. No packages will be accepted without the RMA number clearly marked on the outside of the package. After inspecting and testing, we will return your product, or its replacement, using the same shipping method used to ship the product to Parallax, Inc. within 15 days. In your package, please include a note with a brief explanation of the problem.

**Parallax Inc.**  
**599 Menlo Drive**  
**Rocklin, CA 95765**  
USA

PRESORTED STANDARD  
U.S. POSTAGE PAID  
**ROSEVILLE, CA**  
**PERMIT #944**

**[www.parallax.com](http://www.parallax.com)**