

Chapter 1: Your Boe-Bot's Brain

Vocabulary words used in this lesson.

- **ASCII** stands for "American Standard Code for Information Interchange." ASCII character encoding provides a standard way to represent characters using numeric codes. These include upper and lower-case English letters, numbers, and punctuation symbols. ASCII uses 7 bits to represent each character. For example, a capital "T" is represented by the number 84 and a lowercase "t" is represented by 116.
- **Basic Stamp Hardware** a microcontroller chip on a printed circuit board (PCB) with a small, specialized BASIC language interpreter (*PBASIC*) built into ROM memory which is used for control of electronic devices and robots. Features of the microcontroller include analog-to-digital converters and *hardware*-based PWM which can run in the background.
- **BASIC Stamp** is a microcontroller on a chip with a small, specialized BASIC language interpreter (PBASIC) built into Random Access Memory (ROM). It is made by Parallax, Inc. and has been popular with electronics since the early 1990s.
- **Basic Stamp Software** a Windows-based editor software system for use with the BASIC Stamp microcontrollers, used to create programs to control the Boe-Bot robot and other electronic devices.
- **Browser** A web browser, or simply "browser," is an application used to access and view websites on the Internet. Common web browsers include Microsoft Internet Explorer, Google Chrome, Mozilla Firefox, and Apple Safari. The primary function of a web browser is to render HTML, the code used to design or "mark up" webpages. Each time a browser loads a web page, it processes the HTML, which may include text, links, and references to images and other items, such as cascading style sheets and JavaScript functions. The browser processes these items, then renders them in the browser window.
- **Comm Port** a communication port used to transfer information between devices. As part of computer hardware, a port serves as an interface between the computer and other computers or peripheral devices. Often a serial port is a serial communication interface through which information transfers in or out one bit at a time (in contrast to a parallel port which sends multiple bits at one time). Other types of computer ports include Ethernet, display, USB, HDMI, DVI, PS/2, eSATA, VGA, SCSI.
- **Debug** Programs sometimes have small errors, called "bugs," in them. These bugs can be minor, such as not recognizing user input, or more serious, such as a memory leak that crashes the program. During development, and before releasing their software to the public, programmers "debug" their programs, eliminating as many errors as possible. This debugging process can take a long time, as fixing some errors may introduce others. Debugging your windshield at a gas station is much easier than debugging a computer program.

- **Debug Terminal** a method of displaying information to the programmer about the status of the program, and to communicate from the robot. Two pre-defined symbols, CR and CLS, can be used to send a carriage-return or clear-screen command to the Debug Terminal. The CR symbol will cause the Debug Terminal to start a new line and the CLS symbol will cause the Debug Terminal to clear itself and place the cursor at the top-left corner of the screen.
- **Directives** are special lines of code that are needed by the language interpreter and must be included at the beginning of the program. They define what language is being used and what microcontroller you are working with.
- **File** A file is a collection of data stored in one unit, identified by a filename. It can be a document, program, picture, audio or video stream, data library, application, or other collection of data.
- **Hardware** the physical components of an electronic device. Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners. For the Boe-Bot, the hardware includes the printed circuit board, microcontroller chip, the chassis, wheels, electronic parts, and fasteners used – all the physical devices that come with the robot.
- **Hexadecimal** is a base-16 number system. It is a different method of representing numbers than the base-10 system we use in every day practice. While computers process numbers using the base-2, or binary system, it is often more efficient to visually represent the numbers in hexadecimal format. This is because it only takes one hexadecimal digit to represent four binary digits. Since there are eight binary digits in a byte, only two hexadecimal digits are needed to represent one byte.
- **I/O** stands for input/output. In computing, input/output or I/O (or, informally, io or IO) is the communication between an information processing system, such as a computer, and the outside world, possibly a human or another information processing system. Inputs are the signals or data received by the system and outputs are the signals or data sent from it.
- **Internet** The Internet is a global wide area network that connects computer systems across the world. It includes several high-bandwidth data lines that comprise the Internet "backbone." These lines are connected to major Internet hubs that distribute data to other locations, such as web servers and ISPs. In order to connect to the Internet, you must have access to an Internet service provider (ISP), which acts the middleman between you and the Internet. Most ISPs offer broadband Internet access via a cable, DSL, or fiber connection. When you connect to the Internet using a public Wi-Fi signal, the Wi-Fi router is still connected to an ISP that provides Internet access. Even cellular data towers must connect to an Internet service provider to provide connected devices with access to the Internet. A Browser is used to display web information from the Internet. Other uses of the Internet include social media, gaming, email, file or data storage (the cloud), etc.

- **Microcontroller** a computer present in a single integrated circuit which is dedicated to perform one task and execute one specific application. It contains memory, programmable input/output peripherals as well as a processor. Example applications of microcontrollers include digital wristwatch, cell phone, calculator, clock radio, robots, and appliances.
- **PBASIC program** A program is instructions that can be understood by a computer, written in a computer language. The microcontroller-based version of the BASIC language created by Parallax, Inc. in 1992. PBASIC was created to bring ease of use to the microcontroller and embedded processor world. BASIC (an acronym for Beginner's All-purpose Symbolic Instruction Code) is a family of general-purpose, high-level programming languages whose design philosophy emphasizes ease of use.
- **PBASIC** The programming language you will use to control the Boe-Bot is called PBASIC, which stands for: **P**arallax - Company that invented and manufactures BASIC Stamp microcontrollers. **B**eginners - Made for beginners to learn how to program computers. **A**ll-purpose - Powerful and useful for solving many different kinds of problems. **S**ymbolic - Using symbols (terms that resemble English word/phrases) **I**nstruction - To tell a computer what to do. **C**ode - In terms that the computer (and you) can understand.
- **Personal Computer** PCs are computers used for work or personal use, which usually have a Windows Operating System (OS), and either an IBM or AMD chip inside for processing. A typical PC includes a system unit, monitor, keyboard, and mouse or touchscreen. Most PCs also have a network or Internet connection, as well as ports for connecting peripheral devices, such as digital cameras, printers, scanners, speakers, external hard drives, and other components.
- **Program** is a common computer term that can be used as both a noun and a verb. A program (noun) is executable software that runs on a computer. It is similar to a script, but is often much larger in size and does not require a scripting engine to run. Instead, a program consists of compiled code that can run directly from the computer's operating system. When "program" is used as verb, it means to create a software program. For example, programmers create programs by writing code that instructs the computer what to do. The functions and commands written by the programmer are collectively referred to as source code. When the code is finished, the source code file or files are compiled into an executable program.
- **Pseudocode** Most software programs are developed using a programming language, like Basic, Python, C++ or Java. These languages have a specific syntax that must be adhered to when writing program's source code. Pseudocode, on the other hand, is not a programming language, but simply an informal way of describing a program. It does not require strict syntax, but instead serves as a general representation of a program's functions. Since each programming language uses a unique syntax structure, understanding the code of multiple languages can be difficult. Pseudocode remedies this problem by using conventional syntax and simple English phrases that are universally understood.

- **Software** Computer software is a general term that describes computer programs. Related terms such as software programs, applications, scripts, and instruction sets all fall under the category of computer software. Therefore, installing new programs or applications on your computer is synonymous with installing new software on your computer.
- **Syntax** Every spoken language has a general set of rules for how words and sentences should be structured. These rules are collectively known as the language syntax. In computer programming, syntax serves the same purpose, defining how declarations, functions, commands, and other statements should be arranged. It is the rules used for programming in a specific language.
- **Troubleshooting** is the process of diagnosing the source of a problem. It is used to fix problems with hardware, software, and many other products. The basic theory of troubleshooting is that you start with the most general (and often most obvious) possible problems, and then narrow it down to more specific issues.
- **USB drivers** USB stands for "Universal Serial Bus." USB is the most common type of computer port used in today's computers and hand-held devices. The USB drivers that install with the BASIC Stamp Windows Editor installer by default are necessary to use any Parallax hardware connected to your computer's USB port. VCP stands for Virtual COM Port, and it will allow your computer's USB port to look and be treated as a standard RS232 serial port by Parallax hardware. The USB VCP drivers included in the BASIC Stamp Windows Editor software are for certain Windows operating systems only.