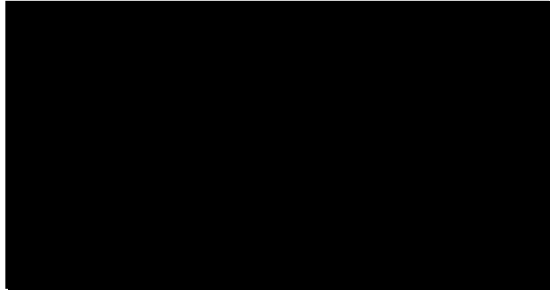


Stache Quick Start.

To download a program from your PC to the Stache...

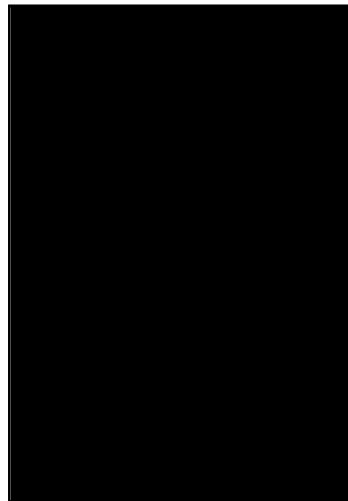
Start the Parallax Stamp II programming software, and load the program you wish to transfer to the Stache. You can use either the DOS or the Windows software. If you are running Windows software, be sure that the proper stamp is targeted (BS2, BS2sx, BS2e or BS2p), and the *All* option selected for downloads under *preferences/editor operation*). Connect the Stache to your normal programming cable, using the DB9 gender-changer provided, as shown in the photo. Power the Stache with a good 9-volt battery. *RUN* the program just as if you were programming an ordinary BASIC Stamp. The progress bar should appear on the computer screen, and the LED on the Stache should flash on and off green as the program is transferred to the Stache. (If it flashes red, see the *error codes* below.) You can now disconnect the programming cable, and you can disconnect the battery from the Stache. The program data is stored in non-volatile memory in the Stache.



Special for BS2sx, BS2e & BS2p. These stamps can hold more than one program in up to 8 program banks. In the Windows software, the programs can be organized into *projects* by use of the \$STAMP directive. When you choose *RUN*, and if *ALL* is selected under *preferences/editor operation*, then all of the programs associated with the project will be downloaded to the Stache. If you are using the DOS software for the BS2SX, BS2e, or BS2P, you must load and *RUN* each program in your project separately, using the ALT-n option to select the target bank before each download. In either case, Windows or DOS, the Stache will store and keep track of all the parts of your project as one unit.

To upload a program from the Stache to a BASIC Stamp...

When you connect the Stache to a good 9 volt battery, the green light will flash briefly. Plug the Stache into the programming connector on your Stamp project or carrier board. Refer to the box if you do not have a standard connector and need to construct an adapter. Be sure the power to your project is also turned on—the Stache battery does not power your Stamp project. There must be a connection (direct or via a capacitor) from pin 4 of the DB9 connector to pin 3 of the BASIC Stamp. The type of program in the Stache must match the type of Stamp to be programmed, or else you will get an error message.



Stache to stamp, program upload adapter Stache pin 2 of DB9, to pin 1 of the BASIC Stamp Stache pin 3 of DB9, to pin 2 of the BASIC Stamp Stache pin 4 of DB9, to pin 3 of the BASIC Stamp Stache pin 5 of DB9, to pin 4 of the BASIC Stamp
--

Press and quickly release the pushbutton on the Stache. The green light should flash on and off as the program is transferred to the BASIC Stamp, and then finish up with a longer green flash. (If it flashes red,

see the *error codes*.) There is no special action required for the BS2sx, BS2e or BS2p. All of the programs in the project will be transferred in quick succession. That's it! Your Stamp is programmed. Unplug the Stache and detach the battery, or move on to program other Stamps.

error codes (number of red flashes): 1: check connections and power supplies. 2: no program for the stamp detected. 3: check for loose connections or bad data. long red: out of stache memory

Stache User Guide.

New features added with firmware revision 1.4 and 1.5: Please see page 8.

Definitions:

- *download* refers to the process of storing Basic Stamp programs into the Stache by commanding the Parallax editor- to *RUN* the program. You can use either the DOS (Stamp2.exe) or the Windows (Stampw.exe) version of the Parallax programming software.
- *upload* refers to the process of transferring programs from the Stache to a Basic Stamp.
- *program* refers to a complete BASIC Stamp II program, or to one 2-kbyte bank of a BS2sx, BS2e or BS2P project. (Note: the BASIC Stamp I is not supported.)
- a *project* on a BS2sx, BS2e or BS2P consists of up to 8 *programs*.

Operator Interface: The Stache's *keyboard* is a momentary switch and its *monitor* is a single light emitting diode (LED). The switch is used only to activate uploads as described below. The LED is used to indicate the status of various processes and to signal error conditions (see Error Codes). When power is applied, your Stache's LED glows green for approximately one second. The Stache then assumes a low-power mode awaiting download or upload processing. If connected to a PC and a download is initiated, the Stache mimics a Stamp to receive the program from the editor-loader. If connected to a Stamp and the operator activates the momentary switch, the Stache mimics the editor-loader to upload selected programs to the Stamp. The Stache automatically recognizes the type of Stamp II to which it is connected and uploads only programs that match that type.

Connection to PC for downloading programs to the Stache: Use the same cable from the PC that you would use to program a BASIC Stamp. Connect the cable to the Stache using the DB9F gender changer provided. Power the Stache with a standard 9 volt battery.

Connection for uploading programs from the Stache to the BASIC Stamp: If your BASIC Stamp system uses a DB9F for its system serial port (as do all of the Parallax carrier boards), then you can plug the Stache directly into the carrier board, without any adapter or gender changer. On the other hand, if your BASIC Stamp system has an unusual connector, you will have to construct an adapter. Please refer to the box for the connections to the BASIC Stamp II pins. Note that there must be a connection (either direct or via a capacitor)

Stache to stamp, program upload adapter

Stache pin 2 of DB9, to pin 1 of the BASIC Stamp
Stache pin 3 of DB9, to pin 2 of the BASIC Stamp
Stache pin 4 of DB9, to pin 3 of the BASIC Stamp
Stache pin 5 of DB9, to pin 4 of the BASIC Stamp (common)

from pin 4 of the DB9 connector to pin 3 of the BASIC Stamp. You can provide power to the Stache from a standard 9 volt battery, or from any power source in the range of 6 to 15 volts DC connected to the battery clips. You should see a one-second long green flash when you first connect the power. You will not damage the Stache by connecting the battery backwards, however, it will not operate.

The following text shows how to use the Stache with the original BS2, and then moves on to instructions for the BS2sx and the BS2e. The Stache can accommodate programs for all types of Stamps at once. That mixed use will be explained last.

Downloading to the Stache, for the original BS2: Start the Parallax programming software and load your program. If you are using the Windows software, be sure the file extension is ".BS2" and that "BS2" is selected as the *default stamp mode* under *Preferences/editor operation*. Connect the cable and power source as described above. *RUN* the program just as if you were programming an ordinary BASIC Stamp. The progress bar should appear on the computer screen, and the LED on the Stache should flash on and off green as the program is transferred to the Stache memory. (If it

flashes red or if the PC gives an error message, see the *error codes* on page 6) If your program contains a debug command, a message from the Stache will appear on the debug screen. The message describes how the memory in the Stache is allocated. This is described in greater detail below. You can now disconnect the programming cable, and you can disconnect the battery from the Stache. The program data is stored in non-volatile memory in the Stache.

Upload to the BS2: When you are ready to upload the program to a Stamp, connect the battery and plug the Stache into the programming connector on your Stamp project or carrier board. We will assume that you have an appropriate adapter if necessary as described above. Be sure the power to your project too is turned on—the Stache 9 volt battery does not power your Stamp project. Press and release the pushbutton on the Stache. The green light should flash on and off as the program is transferred to the BASIC Stamp, and then finish up with a longer green flash. (If it flashes red, see the *error codes*.) That's it! Your Stamp is programmed.

Operation with multiple BS2 programs: The Stache can store up to 15 BS2 programs. In order to identify the additional programs, a DATA statement of the following form must appear as the first DATA statement in your program:

```
DATA "!n!"
```

where the n is a number from 0 to 9 or a letter from A to E (upper case only). For example, to create a program number 1, include the statement,

```
DATA "!1!"
```

as the first data statement in the program.

Program #0 is the same as the default program. It is the one that is uploaded with a single quick click on the pushbutton. You do *not* have to put the DATA "!0!" statement in the default program.

Note, if you already have data statements in your program, be sure that your program adjusts correctly for the additional data. The 3-byte ascii string !n! will be burned into the BS2 at location zero, so that other data will have to move up to location 3. The program can reuse those three bytes at run time if need be.

When you are ready to upload the program #1 to a Stamp, hold down the pushbutton on the Stache for about three seconds, and you will see the LED blink green. During or just after that first blink, release the button and the Stache will immediately upload program #1 to the target Stamp. Similarly, if you have a program #2, release the pushbutton on the Stache after you see the second blink of the green LED. And so on, for programs up to number E (=14 blinks of the LED). The Stache will only attempt to upload programs for which you have assigned a number. For example, if you release the pushbutton after 4 blinks, and there exists no program #4 for the BS2 in the Stache memory, then two red blinks will be emitted ("No program for the stamp detected").

To erase a numbered program, create a program with only the statement

```
DATA "!n!"
```

where n is 0 to 9 or A to E. The BS2 program with that number will be erased from the Stache.

Downloading to the Stache, for the BS2sx, BS2e or BS2p: A BS2sx, BS2e or BS2p project may include up to 8 programs, loaded into 8 individual banks of memory in the Stamp. Each of these programs can be up to 2k bytes of program code, and each is equivalent to one program in the original BS2. When downloaded to a Stache, each of those programs occupies one program slot. You program the Stache just as if you were programming a BS2sx, BS2e or BS2p directly. Please refer to the Parallax documentation. The Stache automatically keeps track of projects and program bank assignments. The procedure differs depending on whether you are using the DOS software or the Windows

software.

Using the DOS software: (STAMP2SX.EXE or STAMP2e.EXE or STAMP2P.EXE): Start the programming software and load the program you wish to download to the Stache. The program extensions should be .bsx, .bse or .bsp. This will be the first of up to eight programs you may upload as part of this one project. It doesn't matter what order you send them. If this program is supposed to go into bank zero, then press ALT-0 to target it to bank zero. Or ALT-1 for bank 1 and so on. The DOS software requires that you select the target bank for each program manually. With the cable and power source connected as described above, *RUN* the program just as if you were programming an ordinary BASIC Stamp. The progress bar should appear on the computer screen, and the LED on the Stache should flash on and off green as the program is transferred to the Stache memory. (If it flashes red or if the PC gives an error message, see the *error codes* on page 6) A message from the Stache may appear on the debug screen (see page 6). Subsequently you can load the next program in this project into the Stamp programming environment, and again press ALT-n to target it to the correct bank n. Again *RUN* the program and observe the progress bar and the green LED. Continue this process until you have downloaded all of the programs in this project to the Stache. This is just like programming a BS2sx, BS2e or BS2p. You can now disconnect the programming cable, and you can disconnect the battery from the Stache. The project data is stored in non-volatile memory in the Stache. Once all of these separate programs that comprise one project are downloaded into the Stache, they become a unit, and subsequently they will all be uploaded as a unit to a BASIC Stamp.

Using the Windows software: (STAMPW.EXE — you should use version 1.1 or later): Start the programming software and load the project you wish to download to the Stache. Be sure the file extension is .bsx, .bse or .bsp, as appropriate. Also be sure that the download mode is set to *All*, at least until you understand exactly how it works. The Windows software allows up to 8 programs to be linked together into one project. Please refer to the software documentation to see how it is done, using the \$STAMP directive. With the cable and power source connected as described above, *RUN* the project just as if you were programming an ordinary BASIC Stamp 2sx, 2e or 2p. The progress bar should appear on the computer screen, and the LED on the Stache should flash on and off green as the program(s) are transferred to the Stache memory. All of the programs associated with the project will be downloaded to the Stache in quick succession. The Stache will store and keep track of all the parts of your project as one unit. (If the l.e.d. flashes red or if the PC gives an error message, see the *error code s* on ppage 6) A message from the Stache may appear on the debug screen (page 6). You can now disconnect the programming cable, and you can disconnect the battery from the Stache. The project data is stored in non-volatile memory in the Stache.

Upload to the Stamp 2sx, 2e or 2p: When you are ready to upload the project, connect the power source and plug the Stache into the programming connector on your Stamp project carrier board. We will assume that you have an appropriate adapter if necessary, as described on page 2. Be sure the power to your project is also turned on—the Stache 9 volt battery does not power your Stamp project. Press and release the pushbutton on the Stache. The green light should flash on and off as the program is transferred to the BASIC Stamp, and it should continue to flash for each program bank in the project, and then finish up with a longer green flash. (If it flashes red, see the *error codes* on page 6) Note that the Stache automatically uploads all of the programs associated with the project.

Operation with multiple BS2sx, BS2e or BS2p projects: The Stache can store up to a total of 15 program banks. In order for the Stache to identify additional programs as parts of distinct projects, a DATA statement of the following form must appear as the first DATA statement in each program associated with a project :

DATA " ! n! "

where the n is a number from 0 to 9 or a letter from A to E (upper case only). For example, to create

a project number 1, include the statement,

```
DATA "! 1!"
```

as the first data statement in each program associated with project number 1.

Project #0 is the same as the default project. It is the one that is uploaded with a single quick click on the pushbutton. It is not necessary to put the DATA "! 0!" statement in the default programs.

Note that if you already have data statements in your program, be sure that your program adjusts correctly for the additional data. The ascii string ! 1! will be burned into the BS2 at location zero, so that other data will have to move up to location 3. The program can reuse those three bytes at run time if need be.

When you are ready to upload that project from the Stache to a Stamp, hold down the pushbutton on the Stache for about three seconds, and you will see the LED blink green. During or just after the first blink, release the button, and the Stache will upload project #1 to the target Stamp. That includes all the programs associated with project #1. Similarly, if you have a project #2, release the pushbutton on the Stache after you see the second blink of the LED. And so on. The Stache will only attempt to upload projects for which you have assigned a number. For example, if you release the pushbutton after 4 blinks, and there exists no project #4 for the connected Stamp in the Stache memory, then two red blinks will be emitted (*No program for the stamp detected*).

To erase a numbered project, create BS2sx, BS2e or BS2p program consisting of only the statement,

```
DATA "! n!"
```

where n is 0 to 9 or A to E. The project with that number will be erased from the Stache memory. Be sure to target the program for the correct type of stamp (BS2, BS2sx, BS2e or BS2p). All programs associated with that project will be erased.

Operation with multiple projects, mixed types: Your Stache can hold as many as 15 programs. That could be 15 BS2 programs. Or it could be two BS2sx projects (one 8-program and one 7-program project). A Stache may simultaneously contain BS2, BS2sx, BS2e and BS2p projects, in any desired project mix. For instance, the following Stache contents are all valid:

- One BS2 project (=program)
- Seven BS2 projects (=programs), plus one BS2sx project with eight programs
- Four BS2 programs; and one project each for a BS2sx, a BS2e and a BS2p, each consisting of 3 programs.
- Fifteen BS2sx projects each with one program

Project numbers from 0 through 9 and A through E are recognized by the Stache. Other directives will cause the red led to emit 4 flashes ("out of range project directive"). BS2, BS2sx, BS2e and BS2p projects are distinct and may have the same project identifier. For example, a Stache can hold distinct projects #0 for a BS2, a BS2sx, a BS2e and a BS2p. When the pushbutton is activated briefly, the Stache will upload the whichever project #0 is appropriate for the currently connected Stamp.

Be careful, especially when using the Windows software, that you are targeting the program to the appropriate Stamp. The most important safeguard is to save the file, appending the appropriate file extension .bs2, .bsx, .bse or .bsp. The selection of *Stamp mode* under *preferences/editor operation* applies only to programs that have not yet been saved with one of the special Stamp extensions, and to the IDENTIFY option (CTRL-I). The highest priority is given to the \$STAMP directive, and it overrides both the file extension and the preferences setting.

When a program is *RUN* from the editor (downloaded to the Stache) it will replace any previously downloaded program that meets all three of the following criteria:

- (1) The program is targeted at the same type of Stamp (2, 2sx, 2e or 2p) as the one in the Stache.
- (2) The program has the same project number as the one in the Stache. (e.g., DATA "! 1!")
- (3) The program number is the same as the one in the Stache (e.g., program #0 in project #1).

This allows you to create overlays. Here is an example: Let us say you have a BS2sx project that occupies 7 program banks. In the field you must be prepared to install 3 different versions of that program that differ only in program banks 0 and 1. You can create a project that contains all 7 banks, and you can also create 3 other projects, numbered !1!, !2! and !3!, that contain the three versions of only banks 0 and 1. Out in the field, you can choose the whole install, or you can overlay the specific version you need for the location. Banks 0 and 1 will be uploaded without disturbing the contents of banks 2 to 6.

Initialize the Stache:

To erase **ALL** the programs stored in your Stache, download a program of any type containing the statement

```
DATA " * . * "
```

alone. The LED will flash alternating green and red to indicate all 15 program storage areas are logically erased and ready for re-use. This erases ALL programs; there is no retreat!

Error Codes:

The LED will slowly flash red the indicated number of times to indicate the error number, then resume the low-power mode.

error codes (number of red flashes):

1: check connections and power supplies

Check cable connections to pins 2, 3, 4 and 5 of the DB9 connector; or power to stamp or to the Stache.

2: no program for the stamp detected.

There is no project in the Stache that matches both the selected number and the type of Stamp detected.

3: check for loose connections or bad data

Data checksum were bad due to a loose connection or or an unexpected error. Try again.

4: out of range project directive

Only 0 to 9, A to E are allowed.

long red: out of stache memory

Only 14 programs allowed. Erase one or more)

Debug message:

To help you keep track of its current state, the Stache sends a message out through the serial port at the end of a download from the PC. If the program downloaded contains a DEBUG statement, then a debug screen will open. It will display a message of the form shown in the box. In the exampleshown, there are three BS2 programs designated as #0, #1 and #2, and two BS2sx projects, the first designated #0 with program banks 0 to 4, and the second project #1 with program banks 0 and 1. There are also one project each for the BS2e and the BS2p, each of which occupies two program slots. There is room for one more program in this Stache.

```
***_STACHE Storage Status_***
BS2: 0 1 2
2SX: 0. 01234 1. 01
2e: 2. 01
2P: 0. 01
14 of 15 STACHE banks used
** (c)2000 emesystems.com **
* firmware v1.4 by S. Parki s *
```

EME Systems

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Stache, technical Information and circuit description:

The Stache is built around a Scenix SX18AC microcontroller run at 4mhz in the turbo mode.

The pushbutton is connected to pin ra.3 with a pullup resistor to Vdd. Pushing the button brings ra.3 low. A capacitor debounces the switch. A second capacitor couples the pushbutton into the reset circuit, so that processor reset occurs when the pushbutton is pressed. The processor may also be awakened from the sleep state by activity on the *attention* pin, rb.0.

An led is connected between pin rb.6 and rb.7. to signal the operational status of the Stache to the user. This is a bicolor led with red and green in the same package. Green indicates successful operations, and red signals error codes.

Application data is stored in a 32kbyte 24LC256 I2C memory chip. It has two control lines, SDA (serial data) and SCL (serial clock), with pullup resistors as required by the I2C protocol. The memory is organized by the program into 15 banks of data, 2kbytes each, to store BASIC Stamp program data, and one 2k bank reserved for an allocation table.

RS232 serial data is received directly on the SX18 input pins, via 22k resistor for protection, while data for transmission is actively asserted high via the transistors Q1, Q2 and Q3. The DB-9 can function as either DCE or DTE. The operation as DCE or as DTE is determined by the conditions that prevail on the pushbutton (ra.3) and on the ATN (rb.0) and TX (rb.2) pins at reset.

Pins rb.0, rb.2 and rb.4 are always inputs from the DB9, and rb.1, rb.3 and rb.5 are always outputs to drive the PNP transistors Q1, Q2 and Q3. When a transistor is off, the signal from the DB-9 passes through directly to the input pin. When the transistor is on, it drives its output line to a high level. The signal lines have pulldown resistors that pull low when the transistor is off, or they may be pulled below ground by the rx line (through the 3k resistor) when receiving a program from a PC. When downloading data into the Stache, the DCE connections on the DB9 are: pin 2) rx output from rb.5, via Q1; pin 3) tx input to rb.2, pin 4) atn input to rb.0. When uploading data from the Stache to a Stamp, the DTE connections on the DB9 are: pin 2) rx input to rb.4, pin 3) tx output from rb.3 via Q2, pin 4) atn output from rb.1 via Q3.

The pushbutton coupled with feedback from the l.e.d. allow the user to select advanced features. The simplest operation is the single press of the button, which will send the "default" program from the Stache to the target BS2, BS2SX, BS2e or BS2P. Holding the pushbutton down for a longer interval starts the l.e.d. flashing at one second intervals, to allow the user to select alternate programs for upload. Pin ra.2 is unused.

Power is supplied from an external 9 volt battery. Optionally, for OEMs, power can be supplied from from pin 9 of the RS232 connector, if the diode shown shaded is soldered into place. The active current is 8-20 milliamps. Sleep current is 50 microamps.

The Stache is a joint effort of Tracy Allen at EME Systems (hardware/production) and Steve Parkis (firmware).



Revision History of the Stache firmware.

Please visit <http://www.emesystems.com> for information about updates.

Version 1.5 of the Stache firmware:

This is a maintenance upgrade, to make the Stache firmware compatible with the version 1.2 IDE, STAMPW.EXE released by Parallax in September, 2001. This v1.2 IDE tests all available com ports and identifies any stamps attached there. The rapid-fire identification process caused problems for the Stache firmware. Version 1.5 resolves those problems. If you do not want to upgrade your Stache firmware, you can continue to use the Parallax version 1.1 STAMPW.EXE to program the Stache.

Version 1.4 of the Stache firmware:

- 1) The Stache now support the new **BS2p**, both the 24 and 40 pin versions.
- 2) The Stache **uploads faster**, especially small programs, because it sends only blocks that are occupied by program code or data. This is exactly how the Stamp programming software works. Blocks that have no program code or data are untouched in the target Stamp. This is important in certain industrial applications.
- 3) The Stache now has a **BSAVE** feature. If the debug screen is activated at the conclusion of a download from the PC to a Stache, and you put a check in the DTR box, and wait 5 seconds, the Stache will dump the tokenized PBASIC program code as an ascii hex file. This same data can be captured as a file by using any terminal program. (such as Hyperterminal, 9600 baud, DTR high). The file will contains all the program code and data currently stored in the Stache. Each program commences with a ">" character, followed by a designator for the target Stamp ("B" for BS2, "X" for BS2SX, "e" for BS2e or "P" for BS2P), and the project number and the program number. Then comes line after line of program data, including the block addresses and the block checksums. The program data can be compared directly with the memory map display (ALT-M or CTRL-M) provided by the Stamp programming software.
- 4) Version 1.4 improved the handling of low battery conditions. Lengthened the duration of the reset pulse sent by the Stache to the Stamp. Corrected some of the error codes.

Troubleshooting notes:

EME Systems stands by its products. If you have any difficulty using the Stache, please call us so that we can help you resolve the problem.

phone (510) 848-5725 fax:(510)848-5748 email: stache@emesys.com

1) Long Cables: We have had a couple of reports that the Stache will not upload programs to a Stamp over a long cable, even though it will do so when connected directly. First, check your cable. Remember that the reset pin (pin 4 on the DB9) must be connected, and the cable from the Stache to the Stamp must be "straight through" as shown in the diagrams in the Stache documentation. It is true that the Stache/Stamp connection will not be able to drive very long cables. Both the Stamp and the Stache use a pirate power scheme that relies on a pulldown resistor to bring the serial line to its low level. This response can be too slow on a long cable. We do not have an exact figure for how long is too long. We have had no trouble using a 4 foot long cable to our OWL data loggers. If you do need to use a long cable, it may help to install an additional resistor of ~1k ohms from pins 3 to ground (pin 5), on the DB9 connector by the Stache.

2) Stache does not accept a new program: A few early Staches exhibited a problem, wherein they refuse to accept a new program from the PC. This problem occurs when you detach the battery from the Stache for a while, and then reattach it and attempt to download a new program. As a fix, depress the reset button for a few seconds before you reattach the battery. If you discover that you have such a Stache, please return it to EME Systems for a free fix. Revision 1.4 Stache resolves this problem.

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