

# THE PROGRAMMING EDITOR SOFTWARE

The Programming Editor software is a very powerful software tool. This datasheet is designed to explain the different software and hardware options for use with the Programming Editor software

## Programming Options

The Programming Editor allows control programs to be generated for microcontrollers. Programs can be created in three ways - drawn as flowcharts, written in a simple textual BASIC language, or written in the much more advanced assembler code language.

When programs are created as flowcharts, the flowchart is automatically converted into a BASIC listing for downloading. Therefore the rest of this explanation sheet refers to 'BASIC' as the generic term for both 'flowchart drawing' and direct 'BASIC command' programming.

## Hardware Options

There are four main ways the Programming Editor software can be used to download a program into a microcontroller system:

1. Program a Stamp in BASIC via a direct cable link.
2. Program a PICAXE in BASIC via a direct cable link.
3. Program a microcontroller in BASIC using a PIC programmer.
4. Program a microcontroller in assembler code using a PIC programmer.

### 1) Stamp System

The BASIC Stamp system was developed by a company called Parallax in the USA in the early 1990's. The system uses two chips – a pre-programmed microcontroller and a separate memory chip (EEPROM). This means that programs can be downloaded (via a direct cable link) to the Stamp without the need for a programmer, because the program is actually downloaded into the external memory chip rather than into the microcontroller itself. The system is widely used for 'classroom modules' (e.g. the Stamp Controller system used in Scotland). However the system is relatively expensive as any board built with the system needs the two pre-programmed chips, and you also need a fairly complex pcb joining the two chips together!

There are two software modes for programming the Stamp – the original Parallax PBASIC, and an extended instruction set called Extended PBASIC. Extended PBASIC includes all the original PBASIC commands but with several extra 'pseudo' commands (e.g. 'wait' instead of 'pause' and 'switch on' instead of 'high') to make the language more accessible to younger students.

*Select View>Options>Mode>Stamp – PBASIC or Stamp - Extended PBASIC*

## 2) PICAXE System

The PICAXE system uses a more modern style of microcontroller that can be re-programmed without a programmer. This means you have a simple 'single' chip solution (without the extra memory chip) that can be reprogrammed by a direct cable connection to the computer – no PIC programmer required. This makes the system much cheaper than the Stamp, and makes the electronic board (pcb) design much easier. However the BASIC language uses the same commands, and the PICAXE also supports additional commands such as 'readadc' to make use of the additional analogue inputs not found on the Stamp.

The PICAXE system is the cheapest, and most versatile, system for student project work. There are two variations – an 18 pin microcontroller called the PICAXE-18 and a 28 pin microcontroller called the PICAXE-28. The 28 pin version has more input/output pins and a larger memory than the 18 pin version, but they both use the same BASIC language and download cable.

*Select View>Options>Mode>PICAXE-18 or PICAXE-28*

## 3) Program microcontroller in BASIC with a PIC programmer

An alternate programming option is to program blank microcontrollers directly with the BASIC program. The microcontroller (PIC16F84A or PIC16F627) is placed in a PIC programmer, and then the 'Program PIC' menu option is used to program the chip.

This option is a more traditional approach to PIC programming, but requires the purchase of a PIC programmer. As the microcontroller is moved back and forth from the project board to the programmer each time it is used, it is also more likely to become damaged (bent legs etc).

*Select View>Options>Mode>Stamp - Extended PBASIC*

## 4) Program microcontroller in assembler code with a PIC programmer

The traditional (and industrial) way of programming microcontrollers is to write your program in assembler code. This is a much more complex language than BASIC, but also allows far more complicated and powerful programs to be developed.

For those new to assembler code, the Programming Editor software allows BASIC programs to be automatically converted into assembler code. This allows students to learn assembler code by 'disassembly' of the generated program. The conversion process has specifically been designed to be 'sequential' so that each BASIC command becomes a recognisable 'block' of assembler code to make this process easier.

To program microcontrollers with an assembler code program you require a PIC programmer. The BASIC to Assembler conversion function will also not operate unless a PIC programmer is attached to the computer.

*Select View>Options>Mode>PICmicro - Assembler*