

Change log for Micromite MMBasic Ver 4.6

- **IMPORTANT:** Ver 4.6 (and later versions) will only work with the PIC32MX170F256 or PIC32MX270F256 series of chips (see the Micromite MkII manual for the details). This is different from the previous version which ran on the PIC32MX150 series of chips.
- **IMPORTANT: Only one hex file is supplied.** The Micromite MkII hex file will work with either the 28 or 44-pin versions of the MX170 chip and will automatically configure itself to deal with the different pin outs. This is unlike previous versions that required a different hex file for each chip.
- Compared to version 4.5 on the PIC32MX150 series of chips the free flash memory for program storage is now 60K (up from 20K). The free RAM available for variables and buffers is now 52K (up from 22K).
- The extra flash memory in the Micromite MkII has also been used to optimise MMBasic for speed (rather than size as with previous versions). As a result a typical BASIC program will now run about 40% faster at the same CPU speed.
- An additional data type (64-bit integers) is now available. These can be used to store and manipulate numbers as large as 19 digits or ± 9223372036854775807 without loss of accuracy (as against floating point which has a limit of 6 to 7 significant digits). Integer arithmetic is also about 25% faster than floating point. Integers can be specified by adding the suffix "%" to a variable's name (eg, count%, j%, etc) and by using constants without a decimal point. See the section "Defining and Using Variables" in the User Manual for more details.
- Implemented the full SELECT...CASE structure according to the ANSI Standard for Full BASIC (X3.113-1987) or ISO/IEC 10279:1991 (also used by Microsoft in Visual Basic). This provides for tests like: CASE -11 TO 4, 8 TO 12, 51, 23, IS > MaxNbr
It also allows an unlimited number of CASE statements and unlimited nesting of SELECT...CASE structures within other SELECT...CASE statements.
- Implemented the ability to embed a compiled C or assembler program (called a CFunction) into a BASIC program. This provides the ability to perform particular high speed processing or gain access to the specialised features of the PIC32 chip using an efficient compiled language. A tutorial produced by G8JCF (Peter Carnegie) describes how to produce CFunctions.
- Implemented the DHT22 command to read the temperature and humidity from a DHT22 temperature/humidity sensor. This device is also known as the RHT03 or AM2302. See the section "Measuring Temperature and Humidity" and the DHT22 command in the User Manual for details.
- Added a new command OPTION EXPLICIT. This will prevent MMBasic from automatically creating a variable when first referenced. Placing this command at the start of a program will require that every variable be explicitly declared using DIM or LOCAL which in turn will draw attention to misspelt variables (a common programming error).
- The default type for a variable which is not explicitly defined can be set with OPTION DEFAULT type where 'type' can be either FLOAT, INTEGER, STRING or NONE. See the "OPTION DEFAULT" entry in the manual.
- Floating point variables can now be specified with the suffix "!". ie, float! = 2.34
- The DIM command has been extended to allow the variable's type to be set without needing a suffix. ie, DIM STRING str1, str2, name, etc. It will also allow the Microsoft convention of: DIM str AS STRING, nbr AS INTEGER, etc

- The DIM command can also initialise a variable when it is created. For example:
DIM STRING str = "Hello World".
- Arrays can also be initialised when declared using the DIM command. The syntax is:
DIM var(d1, d2, etc) = (init1, init2, init3, init 4, etc)
See the DIM command for more details and examples.
- Added the CONST command to define a constant. This will act like a variable but cannot be changed. For example: CONST TestPin = 5.
- Implemented OPTION CLOCKTRIM to fine tune the frequency of the internal oscillator which is used as the basis for all timing (date, time, PWM, serial I/O, etc).
- Added the >> and << operators to shift right and shift left the bits in an integer by a certain number of bits. See the section "Operators and Precedence" in the User Manual.
- Added the ability for the CPU SLEEP command to put the processor to sleep for a specified number of seconds (from one second to 10 days) without any external circuitry.
- The SETPIN command has been enhanced with an option to specify the gate time to be used when making frequency measurements. Now the gate time can be any number from 10mS to 100 seconds. See the SETPIN command for more details.
- The SETPIN command and PIN() function have been enhanced to allow the period measurement function (PIN) to return the average period over a number of cycles.
- The SETPIN command now has an option to select an internal pull up or pull down resistor on an I/O pin when configured as a digital input. If the option is not selected the input will float (as before). See the SETPIN command for more details.
- Added the option "OC" to the SETPIN x, DOUT command. This option will set the output to open collector. The old SETPIN x OOUT command will still be recognised for backwards compatibility.
- The PIN() function will now return the value on the output of a pin configured as a standard digital output. This is in addition to its previous ability to read the output of a pin configured as open collector.
- When used to read pin 0 the PIN() function will measure the voltage of the internal voltage reference (nominally 1.2V). Note that pin 0 does not have to be configured via SETPIN. Because the reading will vary with the supply voltage on the Analog Power pin this measurement can be used to infer the supply voltage to the Micromite which in turn can be used to adjust readings made on the standard analog inputs to compensate for voltage variations (eg, when running on battery power). See the section "Analog Inputs" in the manual for a full description.
- The echoing of characters received at the console can be turned off and on. This is useful when the console is used as a third general purpose serial port. See the command OPTION CONSOLE ECHO.
- The polarity of the console transmit and receive lines can be inverted with the OPTION CONSOLE INVERT command. The OPTION CONSOLE AUTO command will specify that the console serial input/output is to be automatically inverted if the console Rx pin is low at power up. These commands allows the console to be used with RS232 signals without a converter and allows the use of a PICAXE style programming cable.
- CFUNCTION, I2C, PEEK and POKE will accept arrays specified by a pair of empty of brackets. eg: arg(). For backwards compatibility the old standard of specifying the first element (ie, arg(0)) is still supported.

- Extended the POKE command and PEEK() function to use 64-bit integer addresses. Also, the PEEK() function can now return the address of a variable in memory in addition to the contents of that address.
- PEEK and POKE now validate the memory address to reduce the chance of the operation causing a MIPS memory exception.
- You can now pass arrays to subroutines or functions. In the argument supplied and in the parameter list the array is represented by an empty pair of brackets. eg: arg(). The array will be passed by reference so any changes to it in the subroutine or function will change the array passed. See the section "Passing Arrays" in the User Manual.
- END IF and ELSE IF can be used as alternatives to ENDIF and ELSEIF respectively
- The TIMER function will now count up for over 200 million years before rolling over to zero (it is now a 64-bit counter).
- Extended the HEX\$(), OCT\$() and BIN\$() functions to take an optional second argument which specifies the minimum number of characters in the returned string. Numbers with less than this number of digits will be padded with zero as the leading character(s).
- The SPI function can now send/receive data in 32 bit blocks (in addition to 8 and 16 bits).
- Added the SPI WRITE and SPI READ commands for high speed transfer of bulk data over a SPI communications channel.
- The DS18B20() function will now return a temperature of 1000 (obviously invalid) if the sensor does not respond or shows an error. Previously the program would abort with an error message.
- Using the break key (normally Ctrl-C) in the editor will now prompt the user and ask if they want to abandon their edits (ie, will act the same as the escape key).
- Changed OPTION PIN to use eight digits and also introduced a three second delay after a PIN has been entered. This makes it much harder for a brute force attack on the PIN to succeed. Also, the PIN can be set to 99999999 which will permanently lock the console and cannot be removed.
- The MEMORY command will now only show details of the memory used by saved variables and CFunctions if these features have been used. This is to reduce screen clutter.
- Increased the maximum allowable number of sub/functions (combined) from 32 to 100.
- The type of a user defined function can be specified by adding AS <type> to the end of the function's definition. For example:

```
FUNCTION FUNNAME(arg1, arg2) AS INTEGER
```
- The type of an argument to a user defined function or subroutine can be specified by adding AS <type> to the end of the argument's definition. For example:

```
SUB FUNNAME arg1 AS INTEGER, arg2 AS STRING
```
- To prevent a common type of programming error variables with the same name but different types are no longer supported. ie, var = 123 : var\$ = "abc" will now cause an error.
- The space allocated to the VAR SAVE command is now 2KB.
- Added CPU RESTART command to force a restart of the processor.
- Changed the string returned by the automatic variable MM.DEVICE\$ to "Micromite MkII". This is because V4.6 and later will only run on the Micromite MkII (ie, PIC32MX170F256).
- A suitable message will be displayed (rather than the normal power on banner) if the watchdog timer caused a restart.

- When turning a pin off using the SETPIN command you must use either the command SETPIN x, OFF -or- SETPIN x, 0. Previously you could use a variable set to zero but this facility caused difficult to locate errors when the mode for a pin was accidentally misspelt.
- Before starting I²C communications the I2C OPEN command will first check for a stuck slave and will try to clear it by pulsing the clock line.
- The I²C commands will now accept integers for send data, receive data and receive data length.
- SAVE VAR without any arguments will erase the saved variable space.
- The NEW command will now also erase any saved variables.
- Fixed an issue with the I²C slave receive buffer not being cleared when the I2C slave was restarted after previous activity.
See: http://www.thebackshed.com/forum/forum_posts.asp?TID=6599&PN=1
and http://www.thebackshed.com/forum/forum_posts.asp?TID=6527&PN=1&TPN=2
Note that CTRL-C does not close a communications channel because CONTINUE might be used to resume running the program. When RUN or NEW is used all communications and I²C activity will be stopped.
- Fixed a bug in the KEYPAD command which prevented the editor from being run after the KEYPAD command reported an invalid pin error.
- Fixed a bug which caused the PWM command to not correctly configure the relevant PWM pins as outputs.
- Fixed two bugs which caused strange results when functions were nested in the command line of a function. Functions can now be used in the arguments provided to a subroutine or function and can be nested within each argument to an unlimited level.
- Fixed a bug which prevented the use of expressions in the arguments to PEEK().
- Updated the manual to describe the new features. The manual now includes a full bookmark listing which can be displayed in most PDF viewers and used to jump to a particular topic.

Change log for Micromite MMBasic Ver 4.5D

- Added the PULSEIN function to measure the width of an input pulse.
- The DS18B20() function now always generates an error if the sensor is disconnected (previously it could return a reading of -127.938 in some cases).
- The XMODEM receive function will now wait for the sender to stop sending data before reporting an out of memory error. This means that the error message will be visible in the terminal emulator window.
- Fixed a bug in the DS18B20() function that caused erroneous negative readings.
- Fixed a bug which caused the processor to reboot when the EOF() function was used.
- Corrected a bug which could cause a strange behaviour of MMBasic when SETPIN was used on pin 11 or greater. The effect was intermittent and rare.
- Fixed an error where the PORT() function returned the input pins in reverse order.
- Updated the manual to describe the PULESIN function.

Change log for Micromite MMBasic Ver 4.5C

- Corrected a bug which allowed the RND() function to return the number 1 (the specifications state that it must return a number from zero to less than 1).
- Fixed a bug that caused an error when the LENGTH keyword was used when defining a string array using the LOCAL command.
- Fixed a bug that kept resetting the variable used in the KEYPAD command to -1.
- Corrected a rare issue caused by some low cost USB-serial adapters that could cause V4.5 of the firmware to partially erase itself when there was a glitch in the power during start up. In that case the only solution was to re program the chip using a PIC32 programmer.

Note: V4.5 was the first release of MMBasic specifically for the Micromite