

Temperature and Humidity Measurement

Using the DHT22 sensor and this embedded C module you can measure both humidity and temperature.

This CSub provides an exact replacement for the HUMID command that was built into version 5.3 of MMBasic and earlier. Existing programs should run unchanged with this module installed on both the Micromite and Micromite+.

The only change is that the variables used for getting the humidity and temperature must be declared beforehand as floats (using DIM).

HUMID CSub

To add the HUMID command to MMBasic you need to insert the following code somewhere in your BASIC program (you can use copy and paste from this document). The exact spot is not important but at the end of the program is normal.

```
CSub HUMID integer, float, float
0000002B 27BDFFF8 AFBF0004 00852023 03E42021 ACC40000 8FBF0004 03E00008
27BD0008 27BDFFE0 AFBF001C 00002021 3C059D00 24A50040 27A60010 0411FFF1
00000000 8FA30010 3C029D00 8C4200BC 3C049D00 24840414 0040F809 00832021
8FBF001C 03E00008 27BD0020 00041080 000419C0 00621823 00642021 000418C0
3C029D00 8C420000 3C047735 34849400 8C420000 0082001B 004001F4 00002012
0064001B 008001F4 03E00008 00001012
27BDFFB8 AFBF0044 AFBE0040 AFB7003C AFB60038 AFB50034 AFB40030 AFB3002C
AFB20028 AFB10024 AFB00020 00808821 00A0A821 3C029D00 8C420000 8C430000
3C020098 34429680 0062102B 10400003 00C0B021 0411FFC7 00000000 3C109D00
8E02001C 8E240000 0040F809 24050006 8E020010 8E240000 24050009 0040F809
00003021 8E02001C 8E240000 0040F809 2405000E 8E02001C 8E240000 0040F809
24050005 8E020004 0040F809 240403E8 8E02001C 8E240000 0040F809 24050006
8E020080 240403E8 0040F809 00002821 AEC20000 AEA20000 0411FFB8 24040190
00409821 0000A021 40944800 00008021 10000005 3C129D00 40104800 0270102B
1440008E 8FBF0044 8E420020 0040F809 8E240000 1440FFF8 00000000 10000007
3C129D00 40104800 0270102B 50400004 8E420020 10000081 8FBF0044 8E420020
0040F809 8E240000 1040FFF6 00000000 10000007 3C129D00 40104800 0270102B
50400004 8E420020 10000074 8FBF0044 8E420020 0040F809 8E240000 1440FFF6
00001021 00001821 AFA20010 AFA30014 0000B821 10000005 3C129D00 40104800
0270102B 14400065 8FBF0044 8E420020 0040F809 8E240000 1040FFF8 00000000
40944800 10000006 8E420020 40104800 0270102B 14400059 8FBF0044 8E420020
0040F809 8E240000 1440FFF8 8FA30010 000317C2 8FA50014 0005F040 005EF025
00031040 AFA20018 0411FF6C 24040032 0050102B 8FA30018 00431025 AFA20010
26F70001 24050028 16E5FFE0 AFBE0014 001E1600 8FA50010 00052202 00442025
001E1200 00058E02 00518825 7CA33C00 308200FF 00621821 322200FF 00621821
93A50014 30A200FF 00621021 8FA30010 00431026 304200FF 1440002F 001EA603
3C109D00 8E130064 8E020080 30847FFF 0040F809 00002821 00409021 8E020080
2404000A 0040F809 00002821 02402021 0260F809 00402821 00408021 AEA20000
3C020080 8FA50010 00451024 5040000C 3C109D00 3C029D00 8C520058 8C420080
2404FFFF 0040F809 2405FFFF 02002021 0240F809 00402821 AEA20000 3C109D00
8E120064 8E020080 02202021 0040F809 02802821 00408821 8E020080 2404000A
0040F809 00002821 02202021 0240F809 00402821 AEC20000 8FBF0044 8FBE0040
8FB7003C 8FB60038 8FB50034 8FB40030 8FB3002C 8FB20028 8FB10024 8FB00020
03E00008 27BD0048 20555043 65657073 6F742064 6F6C206F 000A0D77
End CSub
```

Usage

The HUMID command will read the humidity and temperature from a DHT22 humidity and temperature sensor. This device is also sold as the RHT03 or AM2302 but all are compatible and can be purchased on eBay for under \$5.

The DHT22 can be powered from 3.3V or 5V (5V is recommended) and it should have a pullup resistor on the data line as shown. This is suitable for long cable runs (up to 20 meters) but for short runs the resistor can be omitted as the Micromite also provides an internal weak pullup.

To get the temperature or humidity you use the HUMID command with three arguments as follows:

```
HUMID pin, tVar, hVar
```

Where 'pin' is the I/O pin to which the sensor is connected. You can use any I/O pin but if the DHT22 is powered from 5V it must be 5V capable. The I/O pin will be automatically configured by MMBasic.

'tVar' is a floating point variable in which the temperature is returned and 'hVar' is a second variable for the humidity. Both of these variables **must** be declared beforehand as floats (using DIM).

The temperature is returned as degrees C with a resolution of one decimal place (eg, 23.4) and the humidity is returned as a percentage relative humidity (eg, 54.3).

For example:

```
DIM FLOAT temp, humidity
HUMID pin, temp, humidity
PRINT "The temperature is" temp " and the humidity is" humidity
```

Note that accessing the sensor triggers a reading and the reading returned is the reading triggered by the previous access. This means that if you want the current reading you need to use the HUMID command twice, the first to trigger a reading and the second to get the actual reading. The datasheet recommends a two second interval between each access and a one second delay after first powered up.

The CPU speed must be 10MHz or higher and the measurement will take 6ms to complete. If there is an error (eg, the sensor is not connected or communicating incorrectly) the command will return 1000 for both the temperature and humidity.

Adding the HUMID command to the Library

If you add this CSub to the MMBasic library it will act exactly the same as a built in command and you will not have to add the above code to any program that uses this command. It will take up a minimum of memory and it will not be erased when you use NEW or load a new program. To do this you can follow these steps:

- Load the CSub code listed above into the Micromite using either AUTOSAVE, XMODEM or the MMEDIT program. Do not include any other program lines unless you also want them stored in the library.
- Enter the command LIBRARY SAVE

This will transfer the CSub code to the library area and delete it from the main memory. You can now use the command in your programs exactly the same as if it was a built in command. The only way it can be removed is by using the command LIBRARY DELETE or by reprogramming the chip with the Micromite firmware.

