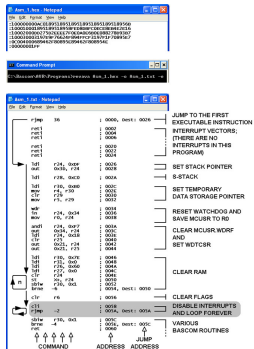


# Let's explore Bascom-AVR

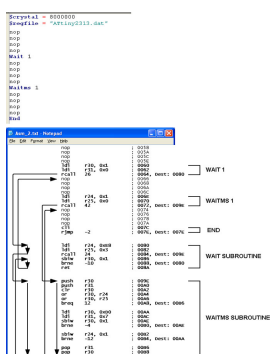
Written by Vladimir Mitrović - Last Updated Wednesday, 01 August 2012 14:45

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Have you ever wondered what your program looks like when Bascom-AVR translates it into a form understandable to a microcontroller? Well, it's not difficult to find out - just open the .hex file of your program and look at these sequences of hexadecimal numbers. They seem quite obscure, don't they? It is hard to believe that these "random strings of numbers" could mean anything to anybody... But no, they are not random, and yes, they make a microcontroller act in just the way you have foreseen in your program!

here is a simple tool that can convert such incomprehensible object code into a more understandable symbolic language, namely assembly language or assembler. That tool is called a disassembler: it is a computer program that reads in a .hex file containing the AVR program code and outputs assembly code which can be fed into an AVR assembler. It is not our intention here to actually re-assemble the code; we will instead use the disassembled program to analyze Bascom-AVR statements, as its mnemonics are easier to understand than a series of numbers.



I usually use the Revava disassembler for this purpose. It has been released under the GNU Public License (freeware), so you can download it free of charge from various internet sites, either as C++ source code or as an executable (.exe) file. No installation is necessary: just copy

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revava.exe to the folder where your .hex files are located and it's ready for use. You can use other similar programs for this purpose, but their output can differ from the examples presented here.

Figure 1 shows an example of disassembling the object code in the Asm\_1.hex file into assembler source code. This object code is the result of the compilation of an "empty" Bascom-AVR program, containing only the End statement. Despite this, Bascom-AVR has generated some code.

Revava is executed from a DOS prompt:

```
>revava Asm_1.hex -o Asm_1.txt -e
```

Asm\_1.hex: the name of input .hex file

-o: set output file name

Asm\_1.txt: the name of output file

-e: use Intel byte order

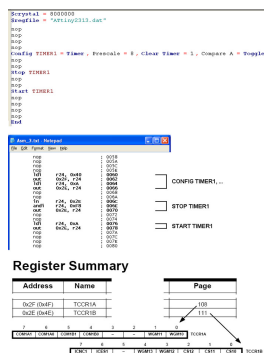
The most common options are -o and -e, but you can get a listing of all possibilities if you execute Revava without any option. The generated

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assembler code is shown in the lower part of Figure 1 (it's slightly modified "by hand" to make it easier to read). To understand it, you will need an elementary knowledge of programming in assembler and a familiarity with AVR assembler mnemonics. Some information can be found in Bascom-AVR's Help topics "Assembler mnemonics" and "Mixing ASM and BASIC". It's also useful to study the "Language Fundamentals" chapter.



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example, its address is "0026" hexadecimal. The interrupt vectors have fixed locations between this jump and the first "real" instruction. Each interrupt vector is a jump to the associated interrupt service routine. Since there are no interrupts in this program, all interrupt vectors are merely returns (reti). The number of interrupt vectors depends upon which microcontroller is configured in the original Bascom-AVR program. The ATtiny2313 has been used in this example; it has 18 interrupt vectors in total, only 6 of which are shown in Figure 1, to make the listing shorter.

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