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avr mikrocontroller in bascom programmieren teil 1 epub

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In the world of embedded systems, the AVR family of microcontrollers remains a popular choice for hobbyists and professionals alike. Their low power consumption, robust performance, and extensive community support make them ideal for projects ranging from simple LED blinkers to complex sensor networks. When it comes to programming these devices, **Bascom AVR**offers a straightforward, BASIC like language that lowers the learning curve while still providing access to the full range of AVR features.

This comprehensive guide, designed as the first part of an ePub series, will walk you through every step of getting started with AVR microcontrollers in Bascom. From setting up your development environment to writing and uploading your first program, we'll cover the essential concepts and practical tips that will set you on the path to becoming a confident AVR developer.

Why Choose AVR with Bascom?

Before diving into the technical details, it's helpful to understand why AVR and Bascom are a powerful combination.

- Accessibility: Bascom's BASIC like syntax is approachable for beginners while still offering advanced features for seasoned programmers.
- Rapid Prototyping: The integrated development environment (IDE) includes a code editor, compiler, and simulator, enabling quick iteration.
- Community Resources: A wealth of libraries, tutorials, and forums exist for AVR and Bascom, making troubleshooting easier.
- Hardware Flexibility: AVR chips come in a variety of packages, pin counts, and peripherals, allowing you to choose the right microcontroller for your project.

Prerequisites for Success

To get the most out of this tutorial, you'll need the following:

1. Hardware: An AVR microcontroller board (e.g., Arduino Uno, ATmega328P, or ATmega2560).
2. Software: Bascom AVR (free download) and a suitable programmer (USBasp, AVRISP mkII, or an Arduino as ISP).
3. Basic Electronics Knowledge: Understanding of digital logic, resistors, LEDs, and breadboarding.
4. Computer: Windows or Linux machine with USB ports.

Step 1: Installing Bascom AVR

Bascom AVR is available for free and runs on both Windows and Linux. Follow these steps to install it on your system.

For Windows Users

1. Download the latest Bascom AVR installer from the official website.
2. Run the installer and accept the default settings.
3. During installation, ensure the option to add Bascom to your system PATH is selected.
4. Once installed, launch the Bascom IDE from the Start menu.

For Linux Users

1. Open a terminal and install the necessary packages:\n sudo apt-get update && sudo apt-get install build-essential libgtk2.0-dev\n
2. Download the Bascom source archive:\n wget https://bascom-avr.de/bascomavr.tar.gz\n
3. Extract the archive:\n tar -xzvf bascomavr.tar.gz\n
4. Navigate to the extracted folder and run the installer:\n cd bascomavr && ./install.sh\n
5. Follow the on-screen prompts to complete the installation.

Step 2: Connecting Your AVR Microcontroller

Before writing code, you need to establish a physical connection between your computer and the AVR chip.

- Arduino as ISP: If you're using an Arduino board, you can program any AVR chip via the Arduino as an In System Programmer (ISP). Connect the Arduino's ICSP pins to the target AVR as follows:\n \n Arduino PB5 (SCK) !' AVR PB5 (SCK)
- Arduino PB4 (MISO) !' AVR PB4 (MISO)
- Arduino PB3 (MOSI) !' AVR PB3 (MOSI)
- Arduino 13 (Reset) !' AVR Reset
- Power: 5V and GND connections.

Step 3: Configuring Bascom for Your Target Device

Once Bascom is running, you need to specify which AVR microcontroller you're targeting.

1. Open Bascom and click File !' New Project.
2. In the Device dropdown, select the appropriate AVR model (e.g., ATmega328P).
3. Choose the correct Clock Frequency (e.g., 16 /MHz for Arduino Uno). This setting influences timing calculations.
4. Set the Programmer to the device you're using (USBasp, AVRISP, or Arduino ISP).
5. Click OK to create the project.

Understanding the Project Structure

Bascom will generate a simple project skeleton:

- Project File (.bas) – The main code file.
- Configuration File (.cfg) – Settings for the compiler.
- Makefile – Optional, for advanced users who prefer command line builds.

Open the *Project.bas* file to begin writing code.

Step 4: Writing Your First Bascom Program

Let's create a simple "Hello World" program that blinks an LED connected to pin PB0 on the AVR.

Code Overview

' Blink an LED on PB0\n$regfile = "m328pdef.dat"\n$crystal = 16000000\n\n' Set PB0 as output\nDDRB.0 = 1\n\nDo\n PORTB.0 = 1 ' LED on\n pause 500 ' 500 ms delay\n PORTB.0 = 0 ' LED off\n pause 500 ' 500 ms delay\nLoop\n\n\nLet's break down each part of the code.

1. Device Definition

```$regfile = "m328pdef.dat"``` tells Bascom which microcontroller you're using. The *m328pdef.dat*file contains
```

register definitions for the ATmega328P.

2. Clock Frequency

```$crystal = 16000000``` sets the crystal oscillator frequency. This value is critical for timing functions such as *pause* and delay loops.

3. Setting the Pin Direction

```DDRB.0 = 1``` configures pin PB0 as an output. In AVR terminology, the *Data Direction Register*(DDR) determines whether a pin is an input or output.

4. Main Loop

The *Do…Loop* structure creates an infinite loop that toggles the LED on and off with a 500 millisecond delay between each state. The *pause* command uses the system clock to generate precise delays.

Step 5: Compiling and Uploading the Code

With your code ready, it's time to compile and flash it onto the AVR.

1. Click Build !' Compile or press F9. Bascom will generate a hex file (e.g., Project.hex).
2. Connect the programmer and ensure the AVR is powered.
3. Click Build !' Upload or press F10. Bascom will transfer the hex file to the microcontroller.
4. Once the upload completes, the LED on PB0 should begin blinking.

If the LED does not blink, double check your wiring, power supply, and programmer connections. Use the Bascom console output for error messages.

Step 6: Debugging Common Issues

Even with a simple program, a few pitfalls can arise. Here are common problems and how to resolve them.

- LED Not Blinking – Verify that the LED is connected correctly (anode to PB0, cathode to ground through a resistor). Ensure the resistor value is within the acceptable range (typically 220 /:' Fò ö³©).
- Wrong Clock Frequency – If the pause command produces incorrect timing, double check the $crystal setting. A mismatch can lead to extremely fast or slow delays.
- Programming Errors – If Bascom reports an error during compilation, read the console carefully. Common issues include missing semicolons, incorrect register names, or unsupported syntax.
- Power Supply Issues – Some AVR chips require a stable 5 /V supply. Using a USB port alone may not provide enough current for peripherals.

Step 7: Expanding Your Program

Now that you've mastered the basics, you can extend the program to include more features. Below are a few ideas to explore.

1. Button Controlled LED

Add a push button on pin PD2 (INT0) to toggle the LED state.

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