uTile PLC Program Installation Guide

Revision 0

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1 Introduction

This Program Installation Guide describes one method of programming the uTile PLC application program binary image to the flash memory of the ATMega328 microcontroller. The flash memory programming is a one-time-only operation that permanently installs the uTile PLC program in the microcontroller.

The target controller board is the Arduino Nano but any compatible controller board using the ATMega328 controller device running at 16 Mhz clock speed may be used.

The programming method uses the AVRdude programmer software to flash the Atmega328 device using a USB programmer connected to the Nano board's ISP programming port via the 6 pin header. The factory boot-loader that comes with the Nano is not used. During the programming procedure, power is supplied to the controller via the +5 V Vcc supplied by the ISP programmer.

The flashing operation to program uTile to Atmega328 program memory is a one-time only requirement.

The full source code for uTile is available on the github repository: https://github.com/lynf/ATmega328-uTile-PLC

Download the executable binary program file m328-nano-utile.hex from the /software directory.

1.1 Prequisites

You need the following components and software:

- Arduino Nano controller board with the ATmega328P micro-controller.
- USBASP programmer for AVR controllers, including ribbon cable and connector and 10 pin socket to 6 pin header adapter. https://www.fischl.de/usbasp/
- AVRDude Programmer available from:

http://savannah.nongnu.org/projects/avrdude

- The AVRdudess GUI interface for Windows is recommended if you prefer the convenience of a GUI. Check out the github repository: https://github.com/zkemble/AVRDUDESS

1.2 Programming the microcontroller

Download and install on your PC the AVRDude software. There are numerous excellent articles on the web describing how to install and configure AVRdude so we'll skip repeating the same thing here.

The USB programmer is recognized by AVRDude as programmer type usbasp.

We'll assume you are running in a Windows environment and that you placed the m328-nano-utile.hex program image file in a subdirectory such as:

c:\Users\yourname\My Documents\utile\m328-nano-utile.hex

When you invoke AVRDude be sure to specify the full path to the directory where avrdude.exe and associated avrdude.conf and avrdude.rc files reside. We'll assume for this discussion that the avrdude files are located in subdirectory:

c:\opt\avr\

Open a command line terminal and change directory to the c:\Users\yourname\My Documents\utile\ subdirectory containing the m328-nano-utile.hex file.

Plug one end of the ribbon cable into the USBASP programmer. Plug the other end of the ribbon cable into the 10 pin end of the 10-to-6 pin adapter . Plug the 6 pin end of the adapter to the 6-pin ISP programming header on the Nano controller board. Make sure you connect the adapter the right way round (adapter socket 1 connected to ISP header pin 1).

Plug the USBISP programmer into the host PC usb port. The programmer will supply 5 V power to the controller board and the Nano power

indicator LED will light up if all the connections from the programmer to the Nano board are correct.

On the Windows command line type the following command:

”c:\opt\avr\avrdude.exe” -C”c:\opt\avr\avrdude.conf” -p m328 -c

usbasp -u -U flash:w:m328-nano-utile.hex:i

AVRDude will perform a number of programming steps and print some messages on the console screen while it uploads the m328-nano-utile.hex file to the controller's flash memory. If the programming is successful, you'll see the program verification step completed. Disconnect the USBASP programmer from the PC and Nano.

2 Nano check-out

Please refer to the uTile Demo PuTTY Manual and install and configure the PuTTY communications parameters for establishing a terminal user interface to uTile.

Connect the Nano board USB port to a USB on the host PC and start PuTTY. If the uTile sign-on screen appears on the PuTTY terminal, uTile is running correctly.

Please refer to the comprehensive m328-uTile-Manual for a full description of the theory, operation and programming of the uTile PLC controller.

3 License

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