

Using pic32prog and an Arduino NANO to Program PIC32 Devices

(c) Robert Rozée, 2015

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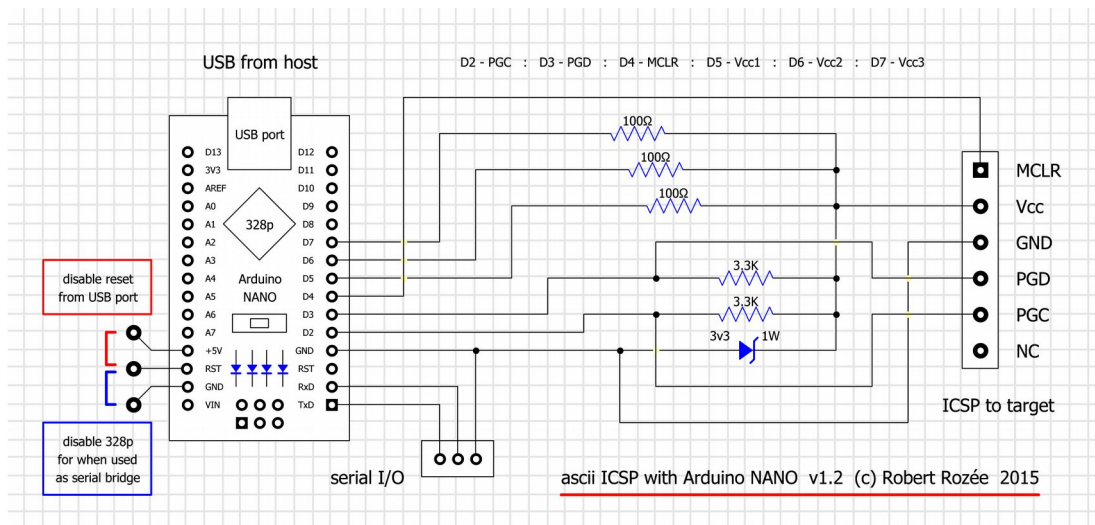
This constructor guide details the hardware and software needed to upload firmware to a PIC32 device, such as the PIC32MX170, through the device's ICSP port. An Arduino NANO (plus 5 resistors and a 3v3 zener diode) is used as the programming hardware, with the necessary Arduino firmware already embedded within the command line programming application - pic32prog. A copy of pic32prog can be downloaded from [GitHub](#):

<https://github.com/sergev/pic32prog>

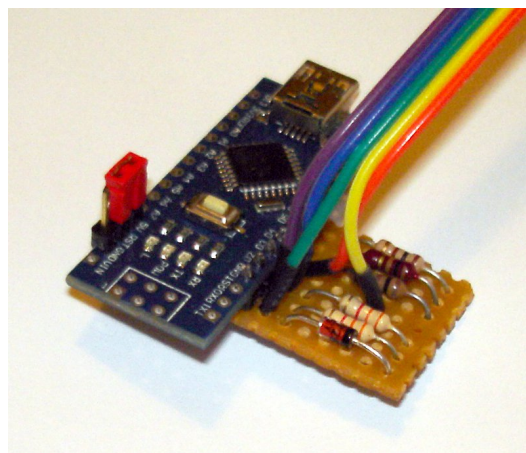
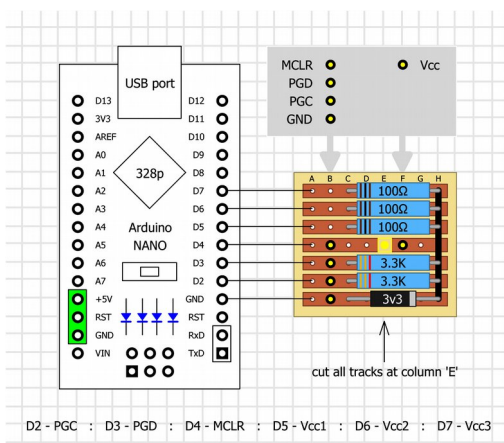
<https://github.com/sergev/pic32prog/blob/master/pic32prog.exe?raw=true>

(direct link to Win32 executable. Mac OS X and Linux versions are also available)

Below is the schematic of the required programming hardware:



and here is a suitable veroboard layout and photo of actual construction:



The three 100 Ω resistors and 3v3 zener diode form a simple switchable power supply for the target processor that is capable of delivering about 50mA. This is sufficient for most PIC32 devices while being programmed. The two 3k3 resistors provide pullups on the programming pins, PGD and PGC, while MCLR should already have a 10k pullup at the device being programmed. The 5-way ribbon cable runs off to a suitable 0.1" 6-pin ICSP connector that matches the target PIC32 system. Note that the jumper shown (red in photo) should not at this stage be installed.

The cheapest source of parts is eBay China, where an Arduino NANO clone can be found for less than us\$2.50 (delivered) and the other parts bought for next to nothing. The Chinese NANOs generally use a CH340G USB to serial bridge chip instead of the more traditional FTDI device. It is important that the NANO selected has a 328p processor (not a 168p), 5v supply, and 16MHz clock. This is by far the most common variant.

Configuration and Usage:

First thing, once assembled, is to plug the Arduino NANO into your PC and install drivers. If running Windows 7 or later the drivers for the NANO should be found automatically by Windows. For Windows XP the drivers can be found here:

http://www.wch.cn/download/CH341SER_ZIP.html

If necessary, you can test the operation of drivers + serial bridge chip alone using the following steps:

- place a jumper between RST and GND to disable the 328p processor,
- jumper (or short) between TxD and RxD to loop back data, then,
- use Teraterm or HyperTerminal to verify characters typed at the keyboard are echoed back.

Once correct operation has been verified, remove both jumpers.

Next, run pic32prog and upload the 'ascii ICSP' firmware to the NANO using the following command:

```
pic32prog -d ascii:com5 -b3
```

where com5 is the serial port assigned to the NANO and -b3 indicates the NANO's bootloader baud rate. If -b3 does not work try the less common baud rates using -b1, -b2, or -b4. In some cases it may be necessary to press the reset button on the NANO while pic32prog is trying to detect the bootloader.

Successful upload of the 'ascii ICSP' firmware to the NANO looks something like:

```
C>pic32prog -d ascii:com5 -b3
Programmer for Microchip PIC32 microcontrollers, Version 2.0.174
  Copyright: (C) 2011-2015 Serge Vakulenko
    (ascii ICSP coded by Robert Rozee)

57600 baud ... synchronized
Signature = 1e950f   Device = ATmega328P
#####
Firmware uploaded to 'ascii ICSP' adapter OK
```

With the 'ascii ICSP' firmware now in place, install a jumper between Vcc and RST on the NANO to prevent the bootloader from being triggered during normal use. After this jumper is installed, do not press the reset button on the NANO as it will short Vusb to ground.

Finally, to program your PIC32 device attach the ICSP cable to the target device and use the following command:

```
pic32prog -d ascii:com5 filename.hex
```

where filename.hex is the PIC32 firmware you wish to upload.