



## USB PIC Programmer User Guide

---

BelMag USB PIC Programmer is based on open-source 'usbpicprog' programmer which is released under GNU General Public License version 2.0 (GPLv2)  
(<https://sourceforge.net/projects/usbpicprog/>)

Belgrade/Novi Sad, 2016.

## Table of Contents

Introduction.....	3
PIC Programmer Characteristics.....	3
Installation.....	4
USB PIC Programming Stick.....	4
USB Connector.....	5
ICSP (In Circuit Serial Programming) Port.....	5
Self Programming Port.....	6
LED Indicators.....	7
UsbPicProg Programming Software.....	8
USB Driver.....	9

# Introduction

BelMag USB PIC Programmer is small and reliable programmer for wide range of Microchip PIC microcontrollers based on open-source programmer 'usbpicprog' (<http://usbpicprog.org/>). It is developed and assembled by BelMag team (<http://www.belmag.rs/>). Advanced PCB design and SMD technology allowed packing of original programmer into small USB stick package. Connection to microcontrollers that are programmed is based on five pin ICSP (Inter Chip Serial Programming) port.



Figure 1. USB ICSP PIC Programmer

Programmer is extremely easy to use and with much better performances compared to all RS232 based programmers and some versions of USB programmers.

## PIC Programmer Characteristics

There are wide range of Microchip devices from all families 10F, 12F, 16F, 18F, 24F, 30F that can be used with this programmer, but device is fully tested with following microcontrollers:

PIC12F629 PIC12F635 PIC12F675 PIC12F683 PIC16F1824 PIC16F1826 PIC16F628 PIC16F628A PIC16F630  
PIC16F676 PIC16F648A PIC16F684 PIC16F687 PIC16F818 PIC16F819 PIC16F84A PIC16F870 PIC16F873A  
PIC16F874A PIC16F876A PIC16F877A PIC16F882 PIC16F883 PIC16F886 PIC16F887 PIC18F252 PIC18F452  
PIC18F13K22 PIC18F14K22 PIC18F24J10 PIC18F2455 PIC18F25J10 PIC18F2550 PIC18F2553 PIC18F26K22  
PIC18F44J10 PIC18F4455 PIC18F45J10 PIC18F4520 PIC18F4550 PIC18F8525

Full list of partially tested or untested potentially supported devices can be found at [http://usbpicprog.org/?page\\_id=402](http://usbpicprog.org/?page_id=402)

# Installation

All you need to use BelMag PIC Programmer is USB stick with ICSP cable and 'usbpicprog' PC software that can be downloaded from original open-source project ( [http://usbpicprog.org/?page\\_id=193](http://usbpicprog.org/?page_id=193)) or from BelMag portal <http://www.belmag.rs/>.

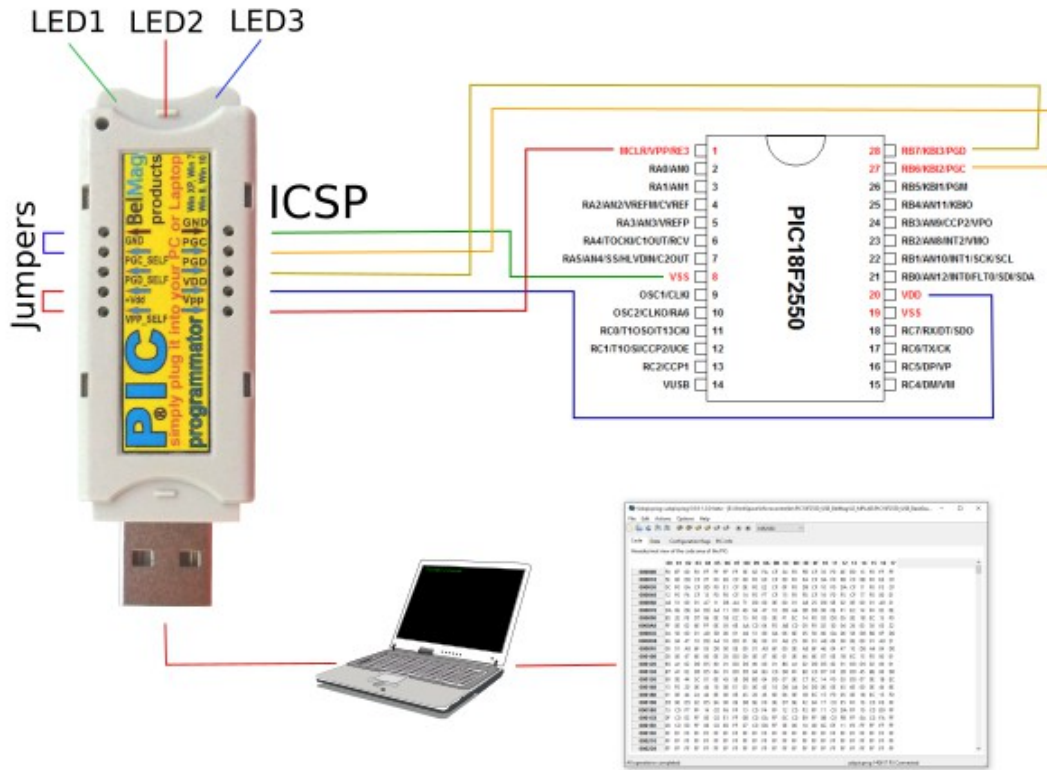


Figure 2. Connection Diagram for BelMag USB PIC Programmer

## USB PIC Programming Stick

USB PIC Programming Stick has four main parts:

- USB Connector
- ICSP (Inter Chip Serial Programming) port
- Jumpers port
- LED Indicator diodes

## **USB Connector**

USB connector is standard part of all USB devices and it is using to connect programmer to personal computer (PC). This programmer is based on USB 2.0 technology.

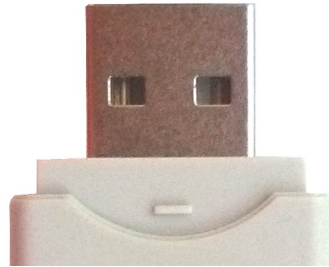


Figure 3. USB Connector.

## **ICSP (In Circuit Serial Programming) Port**

PIC microcontroller which is programmed connect directly to ICSP port by five pins. In-Circuit Serial Programming (ICSP), is the ability of microcontrollers to be programmed while installed in a complete system, rather than requiring the chip to be programmed prior to installing it into the system.

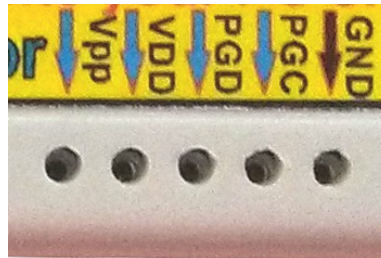


Figure 4. ICSP Port.

Connection pins are:

- PGC – Programming Clock
- PGD – Programming Data
- VDD – Voltage Supply
- VPP – Programming Voltage (12V)
- GND – Earth

For most Microchip microcontrollers, ICSP programming is performed using two pins, clock (PGC) and data (PGD), while a high voltage (12 V) is present on the Vpp/MCLR pin. Low voltage programming (5 V or 3.3 V) dispenses with the high voltage, but reserves exclusive use of an I/O pin. However, for newer microcontrollers, specifically PIC18F6XJXX/8XJXX microcontrollers families,

entering into ICSP modes is a bit different. Entering ICSP Program/Verify mode requires the following three steps:

- Voltage is briefly applied to the MCLR (master clear) pin.
- A 32-bit key sequence is presented on PGD.
- Voltage is reapplied to MCLR.

### Self Programming Port

Self programming port is advanced option which is not used in everyday use of programmer. In regular mode it is short-circuited with two jumpers and it should not be removed. Its purpose is loading of boot-loader and firmware to USB PIC Programmer device.

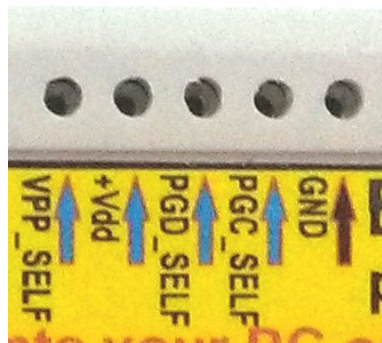


Figure 5. Self Programming Port.

There are three regimes of programmer that can be set using different jumper configuration.

**Bootloader programming mode.** Loading boot loader firmware to programmer. This is done by other pic programmer connecting its ICSP port directly to self-programming port.

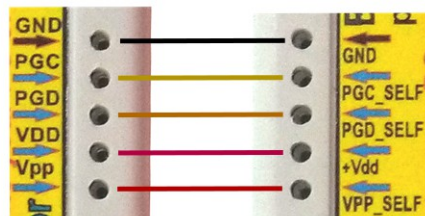


Figure 6. Bootloader programming mode configuration.

**Firmware loading/upgrading mode.** Loading firmware to programmer.



Figure 7. Firmware loading/upgrading mode configuration.

**Standard Programming Mode.** Regular programming regime is used when USB PIC Programmer is configured (bootloader is loaded and firmware is loaded). This regime allows programmer to connect to target Microchip device and load program to it.

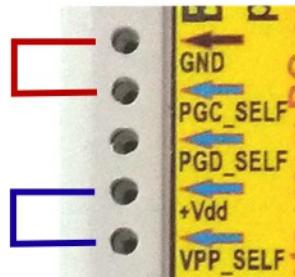


Figure 8. Standard programming mode configuration.

### ***LED Indicators***

At the bottom of USB stick under the housing there are three LED indicators with different colors – blue, red, and green.



Figure 9. LED Indicators.

Meaning of signal LED diodes are:

- Blue            - Write
- Red             - Read
- Green           - Connected, blinking while in standby

## UsbPicProg Programming Software

BelMag USB PIC Programmer should be used with open-source 'usbpicprog' software which can be downloaded from [http://usbpicprog.org/?page\\_id=193](http://usbpicprog.org/?page_id=193)) or <http://www.belmag.rs/>.

Before one can use programmer device this software should be installed at target PC. Full help is available with software distribution.

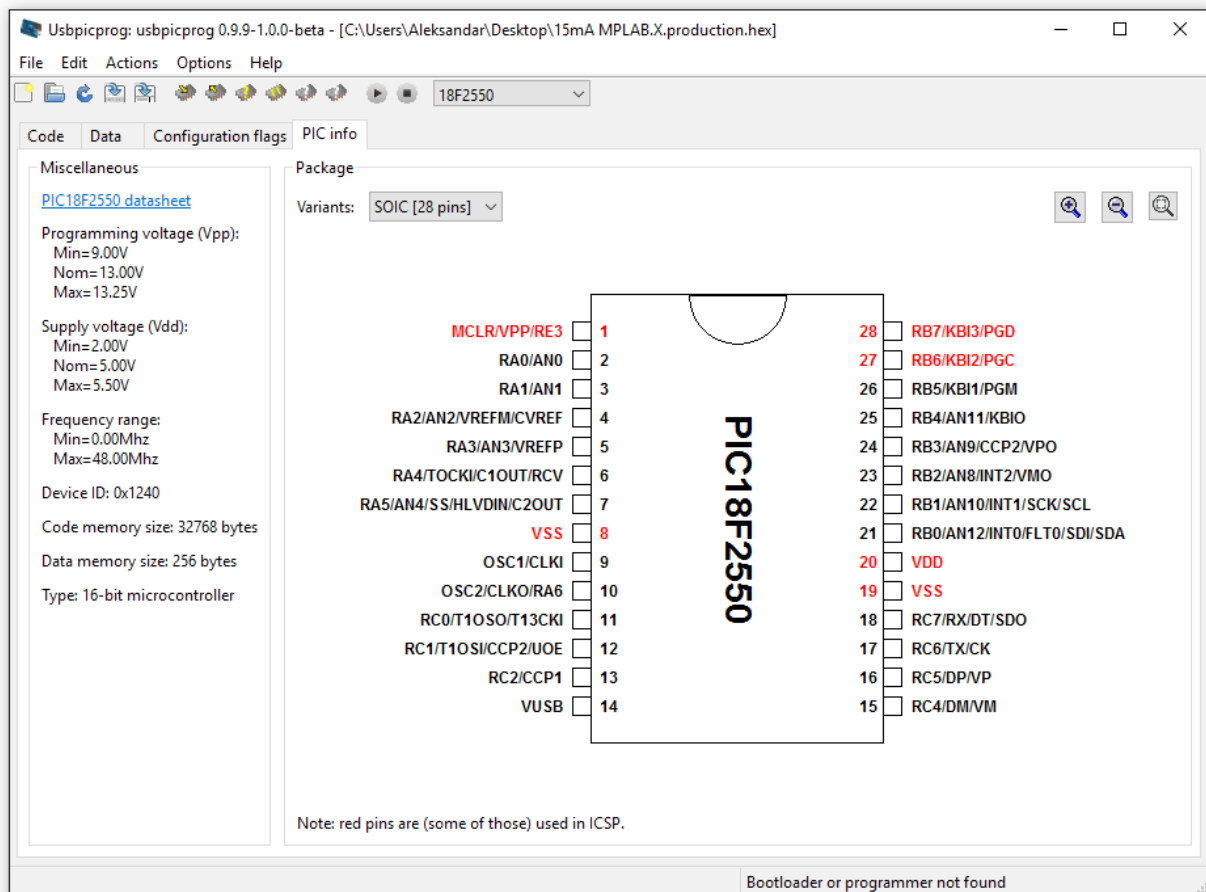


Figure 10. usbpicprog programming software.



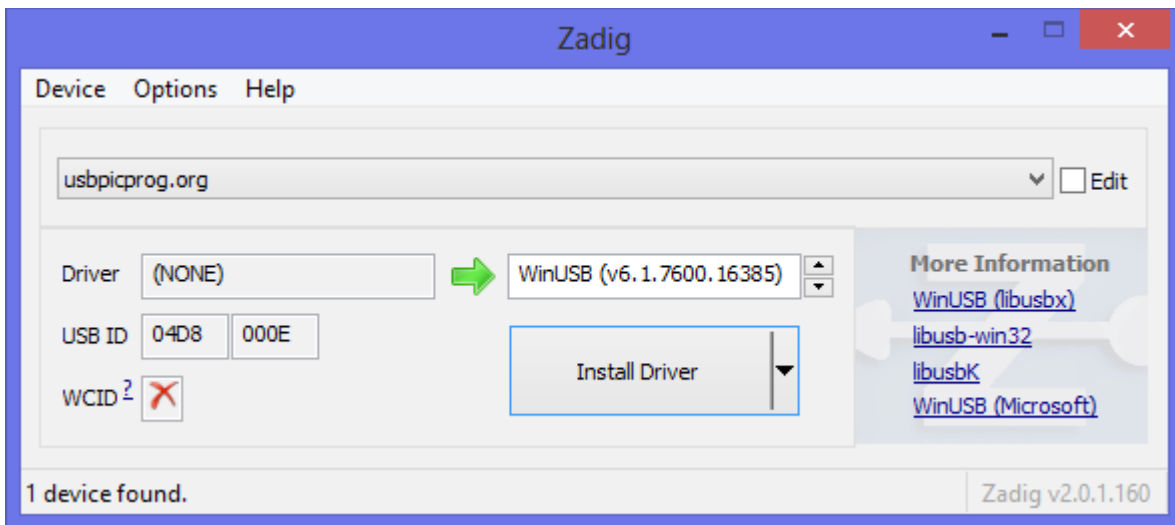
## USB Driver

Proper configuration needs installation of usb drivers which can be found at the [http://usbpicprog.org/?page\\_id=486](http://usbpicprog.org/?page_id=486) or <http://www.belmag.rs/>.

In Windows 8, usbpicprog has some trouble with the driver installation. This is caused by the fact that Windows 8 now requires not only a signed binary driver, but also a signed inf file with the driver.

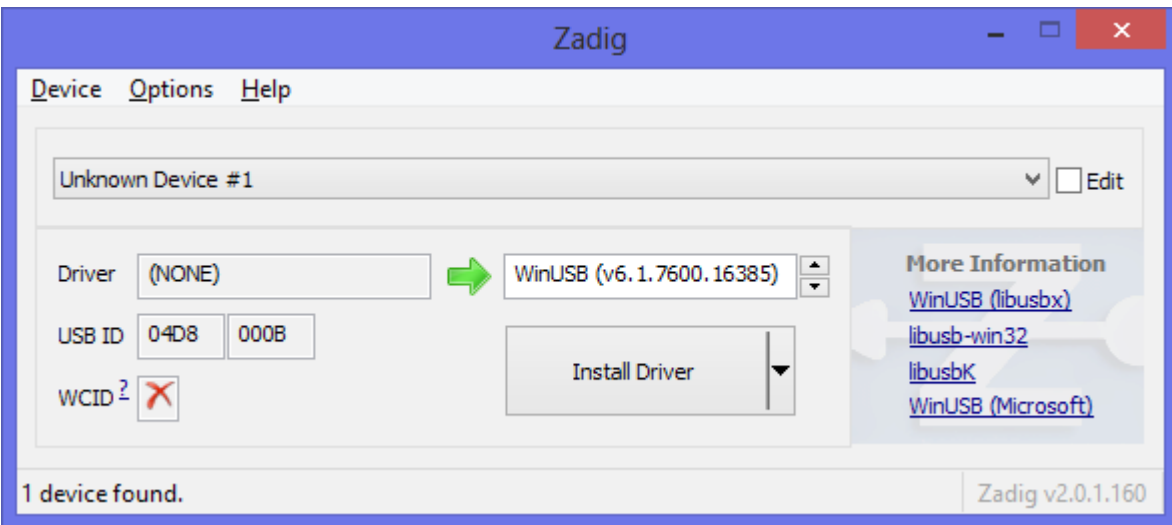
Usbpicprog 0.6.0 comes with a driver installer for windows 8, but it does need some special attention to install it.

1. If you have usbpicprog 0.5.0 installed, the driver is incompatible and must be uninstalled. To do this, go to the device manager, locate usbpicprog.org and click properties. Then click uninstall driver. Make sure that “Delete the driver software for this device” is checked.
2. Download and install usbpicprog 0.6.0. Then reboot your system.
3. If usbpicprog still doesn't detect the programmer, you can download [libwdi-zadig-driver-installer.exe](#) and run it without usbpicprog plugged in. Now plug in usbpicprog, the dialog should look like this:



Click “Install driver” and the usbpicprog driver should work.

4. For the bootloader to work, a second driver has to be installed. Unplug usbpicprog, remove the “Select” jumper from the programmer and plug it in again. The Zadig dialog should look like this. If you don't like the name “Unknown Device #1” you can edit it, then click “Install driver”.



5. Check and verify that usbpicprog can now connect to the hardware.