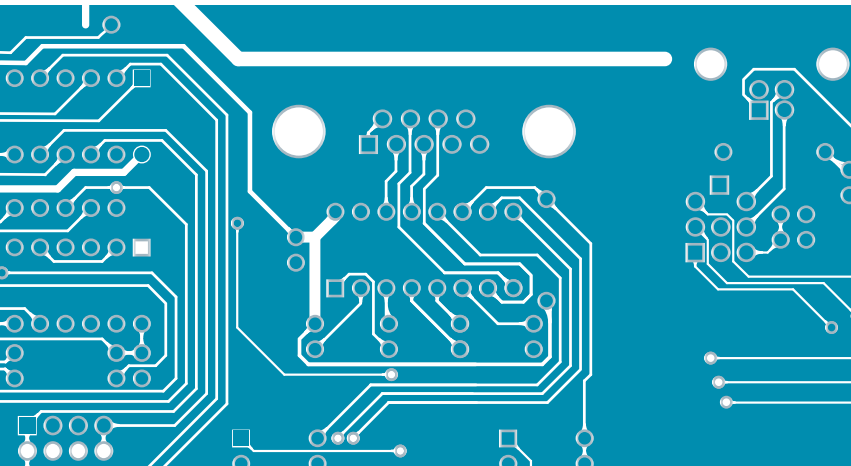
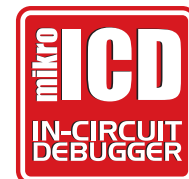
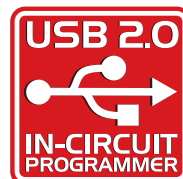


# PICFlash2



PICFlash is a high performance programmer for Microchip flash microcontroller family. It is connected to target device through IDC10 connector and acts as ICSP (In-Circuit Serial Programmer) and as ICD (In-Circuit Debugger) tool.



## TO OUR VALUED CUSTOMERS

*I want to express my thanks to you for being interested in our products and having confidence in MikroElektronika.*

*It is our intention to provide you with the best quality products. Furthermore, we will continue to improve our performance to better suit your needs.*



Nebojša Matić  
General Manager

### DISCLAIMER:

All products are owned by MikroElektronika and protected by copyright law and international copyright treaty. Therefore, you should treat this manual as any other copyright material. The manual and products may not be copied, partially or as a whole without written consent of MikroElektronika. Manual PDF – edition can be printed for private or local use, but not for distribution. Modifying manuals or products is prohibited.

### HIGH RISK ACTIVITIES

The products of MikroElektronika are not fault – tolerant and nor designed, manufactured or intended for use or resale as on – line control equipment in hazardous environments requiring fail – safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines or weapons systems in which the failure of Software could lead directly to death, personal injury or severe physical or environmental damage (“High Risk Activities”). MikroElektronika and its suppliers specifically disclaim any expressed or implied warranty of fitness for High Risk Activities.

### LICENSE AGREEMENT:

By using our products you agree to be bound by all terms of this agreement. Copyright by MikroElektronika 2003 – 2008.

PIC, PICmicro and MPLAB are registered trademarks of Microchip Company. Windows is a registered trademark of Microsoft Corporation. All other trade and/or service marks are the property of the respective owners.

## CONTENTS

|   |    |
|---|----|
| <i>PICflash</i> Programmer                        | 4  |
| mikroICD (Real-Time Hardware In-Circuit Debugger) | 6  |
| Software Installation                             | 7  |
| <i>PICflash</i> Software                          | 9  |
| Keyboard Shortcuts and Command Line Parameters    | 10 |
| Programmer's operation                            | 11 |
| <i>PICflash</i> programmer Connection             | 14 |

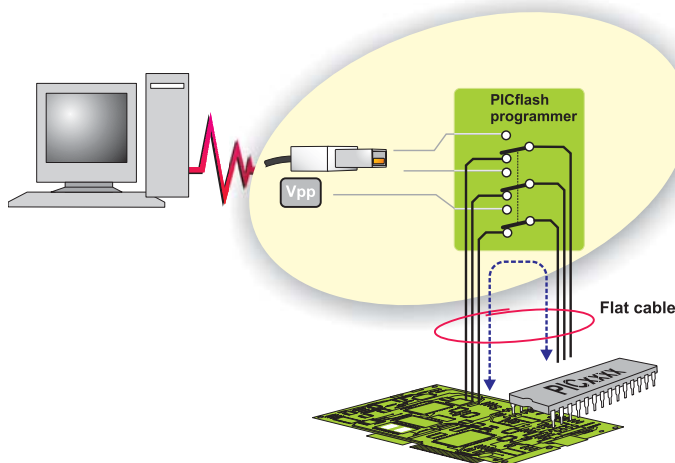
## PICflash PROGRAMMER

Along with complementary software, *PICflash* programmer represents an irreplaceable tool for all those working with PIC microcontrollers. By means of this programmer, it is possible to program almost any PIC microcontroller, including those embedded (soldered) in printed board. The *PICflash* programmer is connected to the microcontroller via five lines. Two of them are +5V and GND, while others are used for signal transmission:

- PGC** (program clock)
- PGD** (program data)
- MCLR** (high voltage necessary for *Flash* memory programming)

These lines are contained within a *flat* cable ending with an IDC10 female connector. When creating a target device, the appropriate 10-pin male connector with 2.54 mm space between pins should be placed on it. Connector pins should be connected to the microcontroller pins. The position of these pins varies depending on the microcontroller's type and package. At the end of this manual, there are exact connection schematics. During operation, *PICflash* programmer may be inactive or active.

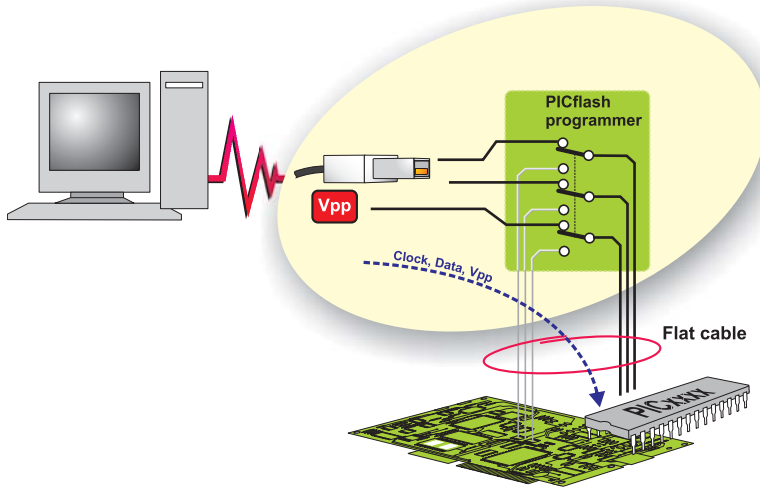
### Programmer is inactive



A multiplexer within the programmer connects the microcontroller pins to peripheral components on the printed board via *flat* cable. In that way, the microcontroller directly controls the operation of device with no impact of the programmer. Accordingly, even the IDC10 connector is connected, the *PICflash* programmer does not affect device operation.



## Programmer is active



By clicking the WRITE option, multiplexer within the programmer disconnects the microcontroller pins from the rest of electronics on the board. It allows programming of the microcontroller by using PGC, PGD and MCLR signals. When programming completed, *PICflash* automatically changes its state and becomes inactive.

If the target board has its own 5V power supply, it can be also used for powering the *PICflash* programmer. In that case, it is necessary to open *PICflash* programmer plastic case and take off the jumper for power supply selection. On the contrary, if the target board does not have its own power supply source, the jumper is on. In that case, the programmer, microcontroller and whole electronics are powered via programmer USB cable which connects programmer to PC. Any other power supply on the target board must be suspended.



This picture illustrates the position of jumper when the target board and programmer are powered via USB cable.



This picture illustrates the programmer with no jumper for power supply selection. In this case the programmer is powered by the target board which has its own power supply.

## mikroICD (Real-Time Hardware In-Circuit Debugger)

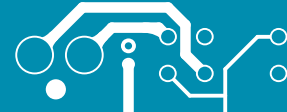
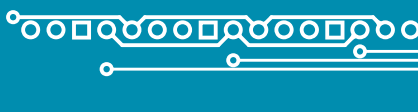
mikroICD is a highly effective tool for real-time debugging on hardware level. It enables you to monitor its all registers and input/output pins while the program is running. mikroICD may be used with any PIC compiler designed by MikroElektronika (*mikroC*, *mikroBasic* or *mikroPascal*). In order to enable this mode, first select *ICD Debug* option within the compiler instead of *Release* option. Compile the program to machine code and program PIC microcontroller thereupon. At last, select the appropriate debugger- *mikroICD* Debugger.

*mikroICD* debugger uses *PICflash* programmer to communicate to the microcontroller and supports common debugger commands:

|                     |           |
|---------------------|-----------|
| Start Debugger      | [F9]      |
| Run/ Pause Debugger | [F6]      |
| Toggle Breakpoints  | [F5]      |
| Run to cursor       | [F4]      |
| Step Into           | [F7]      |
| Step Over           | [F8]      |
| Flush RAM           | [F2]      |
| Stop Debugger       | [Ctrl+F2] |



**Note:** For more information on how to use mikroICD debugger refer to the appropriate documentation. All necessary information may be also found in HELP contained in the specified compilers.



## SOFTWARE INSTALLATION

### Step 1: Start installation

Insert the product CD into your PC drive. After a few seconds, a list with all MikroElektronika products will appear on the screen. To start installation of PICflash software, click on the setup icon:

#### PICFlash2 software for Windows

You can also download *PICFlash\_setup.exe* free of charge from our web site. In that case, start the installation from your hard drive. Afterwards, a welcome window will appear on your screen. To proceed with installation click 'Next'.

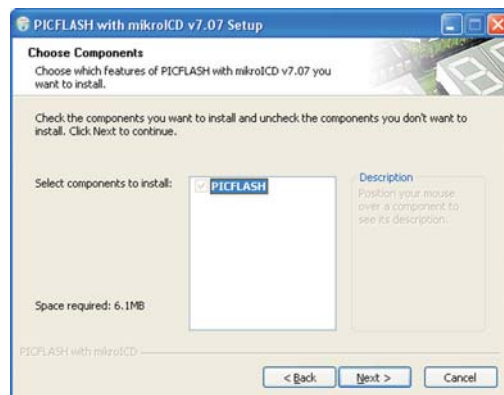
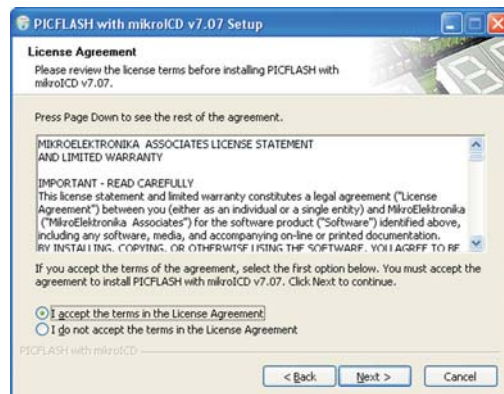
**Note:** Make sure that *PICflash* programmer is not connected to the PC during *PICflash* software installation.

### Step 2: Licence Agreement

Prior to start the installation, please review the licence terms. If you accept the terms in the Licence Agreement, select the option 'I accept the terms in the Licence Agreement' and click 'Next' afterwards.

### Step 3: Choose Components

To make it as simple as possible for you, in this step of the installation, there is only one selectable component on disposal. Click 'Next'.

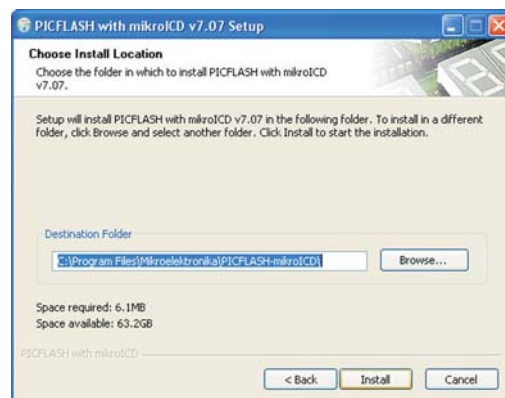




## Step 4: Choose Install Location

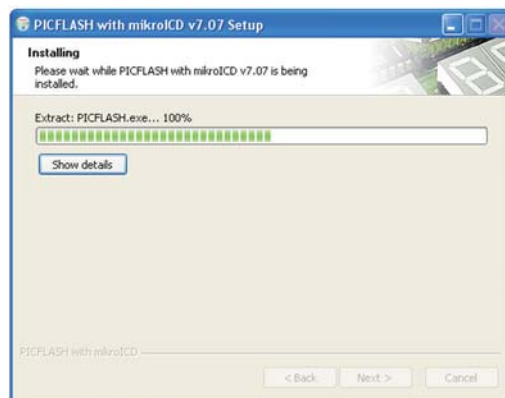
In this step of the installation you should choose destination folder. If you want to install the program to the folder different from default, click 'Browse' and select another folder on hard disc. Click 'Next' afterwards. If you choose folder by default, the program will be installed on the following destination:

C:\Program Files\Mikroelektronika\PICFLASH



## Step 5: Installation Details

*PICflash* installation will start in this step and its progress will be shown on the screen. If you are interested in details of the installation click on the 'Show details' button.

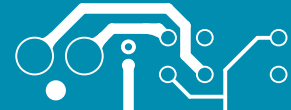


## Step 6: Finish

After Windows has successfully installed *PICflash*, you will be notified by the window shown on the picture on the right. To complete the installation process click 'Finish'.



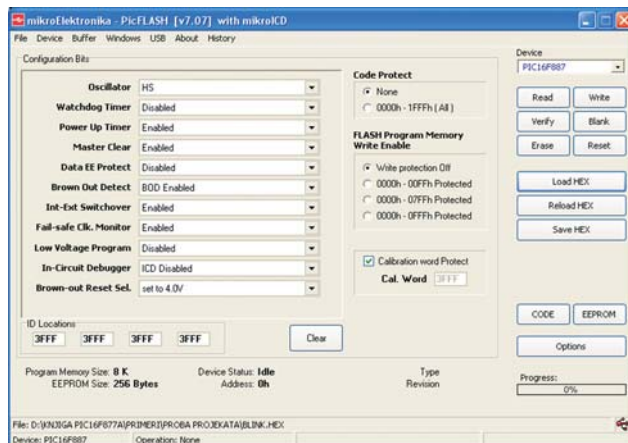




## PICflash SOFTWARE

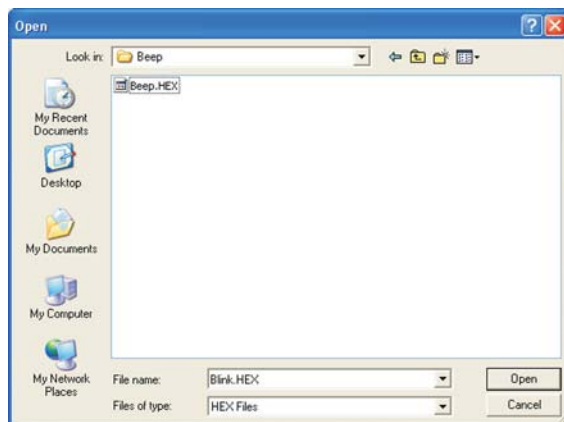
### Step 1: Run PICflash programmer

Run *PICflash* from your PC. Click on the option *Device* and select the appropriate microcontroller to program. *PICflash* will automatically set parameters for working with the specified microcontroller.



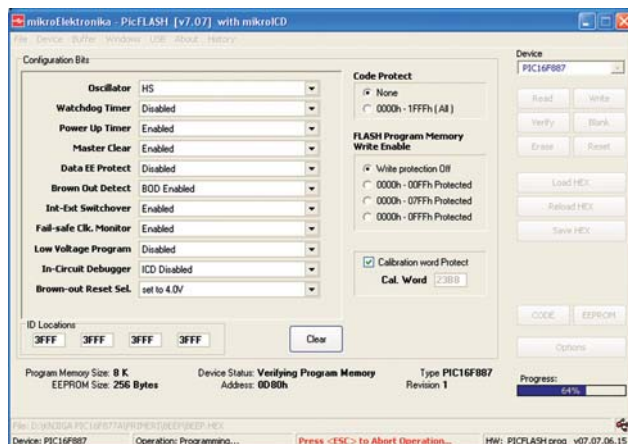
### Step 2: Load HEX file

Click the option 'Load HEX' which opens the window shown on the picture on the right. Select the appropriate executable file (has extension .HEX in its name) and click the option *Open*. In that way, it will be loaded into programmer buffer. On the basis of control bits stored in the HEX file, *PICflash* will do all necessary settings.



### Step 3: Write program

Click the option *Write* in the up-right corner of the working window to start programming the microcontroller. The programming progress will be shown in the right bottom corner of the working window.



## KEYBOARD SHORTCUTS AND COMMAND LINE PARAMETERS

### Keyboard Shortcuts

|               |             |
|---------------|-------------|
| <b>Alt-E</b>  | Erase       |
| <b>Alt-B</b>  | Blank check |
| <b>Alt-W</b>  | Write       |
| <b>Alt-V</b>  | Verify      |
| <b>Alt-R</b>  | Read        |
| <b>Alt-D</b>  | Change MCU  |
| <b>Ctrl-S</b> | Save        |
| <b>Ctrl-O</b> | Open (Load) |
| <b>Ctrl-R</b> | Reload      |

### Command Line

Alternatively, you can use *PICflash* programmer from the command line. It will enable you to use *PICflash* programmer from some other software, compiler etc. Here is the list with the command line parameters:

|           |  |
|-----------|--|
| <b>-w</b> | Write to PIC                                 |
| <b>-v</b> | Verify                                       |
| <b>-e</b> | Erase PIC                                    |
| <b>-r</b> | Read from PIC                                |
| <b>-p</b> | PIC name (for example: P16F877A, P18F452...) |
| <b>-f</b> | File name (must be enclosed with " ")        |
| <b>-b</b> | Blank check                                  |
| <b>-q</b> | Close <i>PICflash</i> after programming      |

**Example 1** `picflash2.exe -w -pPIC16F877A -v -f"C:\somefile.hex"`

This will program the PIC using C:\somefile.hex. Immediately after write, it will verify loaded file.

**Example 2** `picflash2.exe -r -pPIC16F877A`

This will read the PIC program memory.

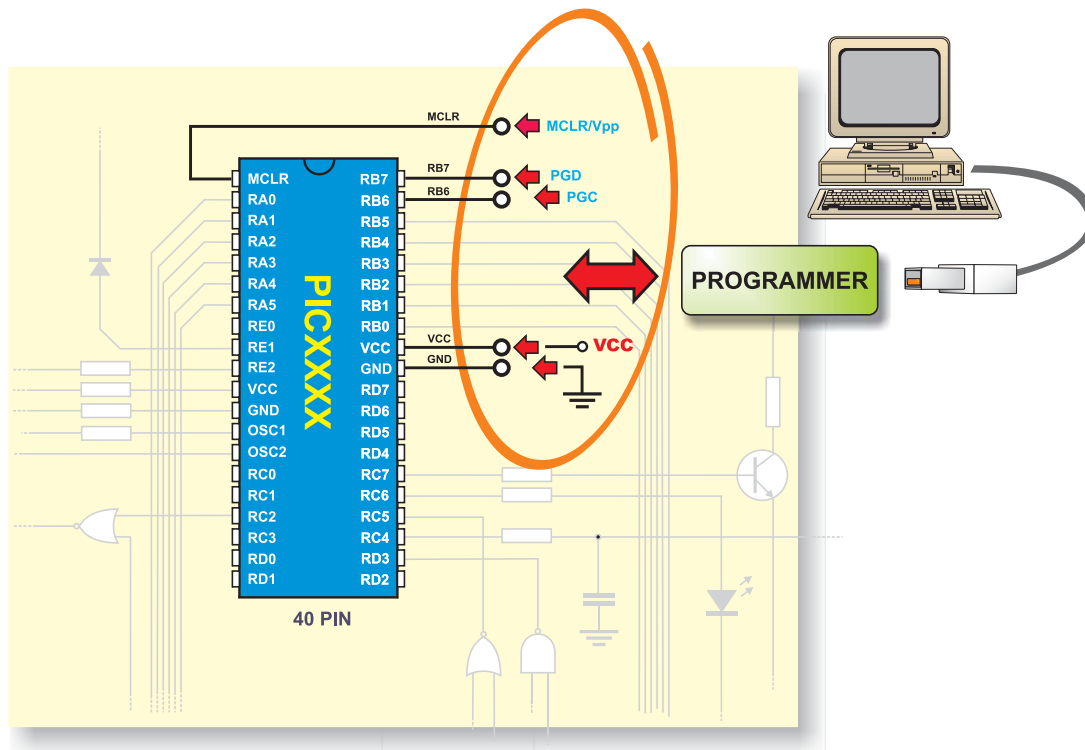
**Example 3** `picflash2.exe -e -pPIC16F877A`

This will erase program from the PIC microcontroller.



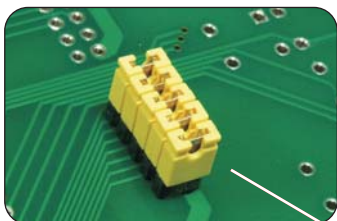
## PROGRAMMER'S OPERATION

Programming a PIC microcontroller is performed by using signals Vpp, PGC and PGD from the *PICflash* programmer. They are brought to the MCLR, RB6 and RB7 pins. Additionally, the microcontroller pins VCC and GND must be supplied with voltage. In order to enable programming to run without errors, make sure that these pins are not connected to other electronic components. Otherwise, during normal operation, these pins must be connected to other components as per project.

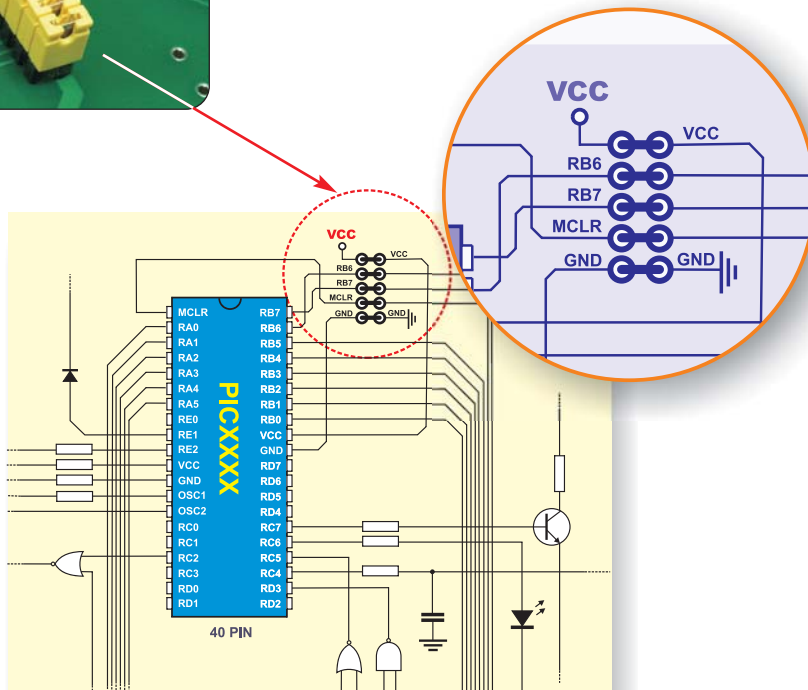


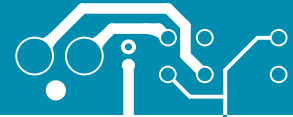
Since the microcontroller is soldered on the printed board (with no use of socket), it is necessary to switch these pins by using jumpers. In consequence of that, on device designing, do not forget to provide space for embedding 5 jumpers. They should be embedded between pins for programming and components connected to these pins.

Instead of five independent jumpers, you should place an IDC10 male connector with 2.54mm space between pins. During normal operation, its pins must be linked as shown in figure below. In that way, the microcontroller pins are connected to the rest of on board electronics.

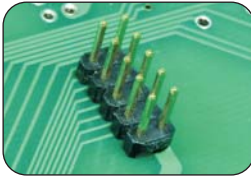


IDC10 connector pins are linked by jumpers. The microcontroller is connected to the rest of on board electronics.

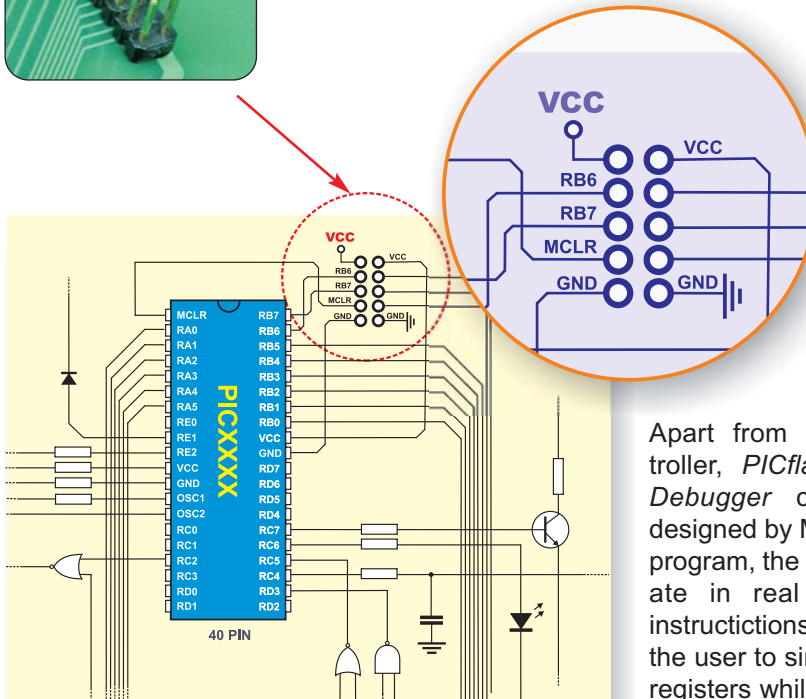




During programming, the same connector is used to bring signal from the programmer. To enable it, you have to remove jumpers from the board. Instead of them, the programmer connector is connected to connector.



IDC10 connector on the target board. Jumpers are removed to enable connection to the *PICflash* programmer.



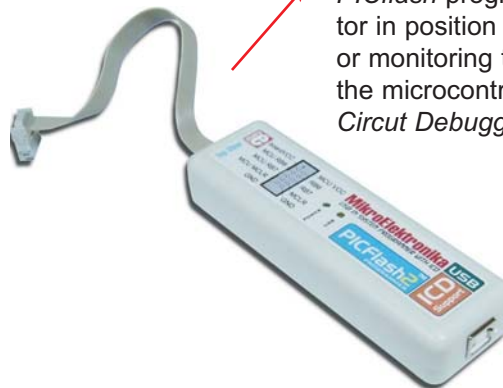
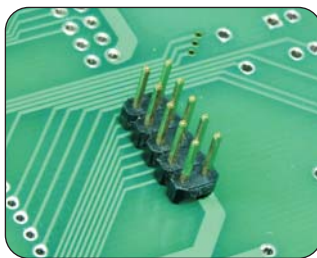
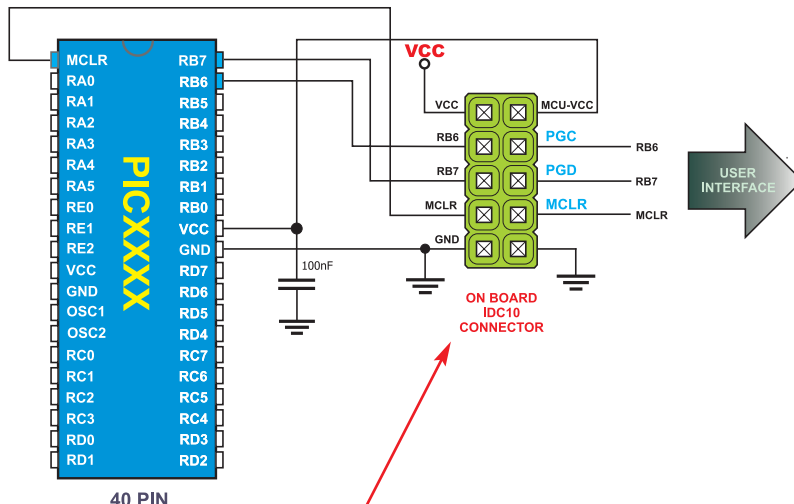
Apart from programming the microcontroller, *PICflash* also enables *In Circuit Debugger* contained in all compilers designed by MikroElektronika. By using this program, the microcontroller is able to operate in real environment and execute instructions step by step. It also enables the user to simultaneously monitor all MCU registers while the program is running.



**Note:** *In Circuit Debugger* cannot monitor state on the pins RB6 and RB7 since these microcontroller pins are used for communication to the programmer.

## PICflash PROGRAMMER CONNECTION

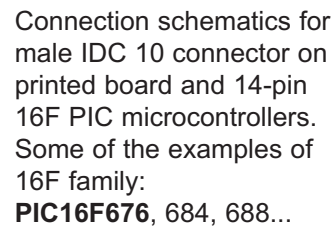
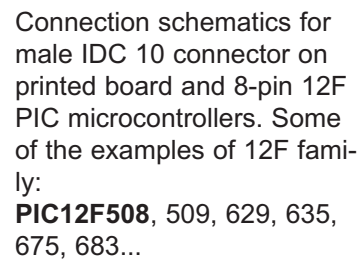
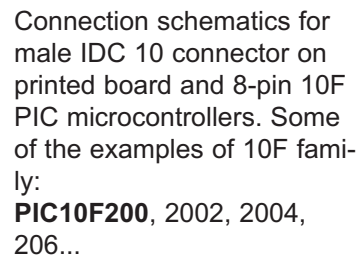
In order to enable programming a PIC microcontroller via *PICflash* programmer it is necessary to connect them. One of the possibilities of such connection is by using an male IDC10 connector. With regard to that, on device designing, do not forget to leave space on printed board for this connector. Pins of this connector are between the microcontroller pins (VCC, GND, MCLR, RB6 and RB7) and components they use. The appropriate schematics is shown on the picture below. Once you plug in the *PICflash connector* you will be able to program the microcontroller. Switching the connector pins by jumpers enables device to operate in real environment as per project.



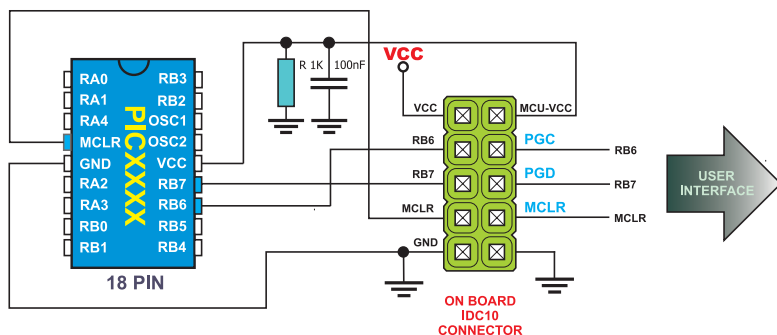
*PICflash* programmer connector in position for programming or monitoring the operation of the microcontroller by using *In Circuit Debugger* program.



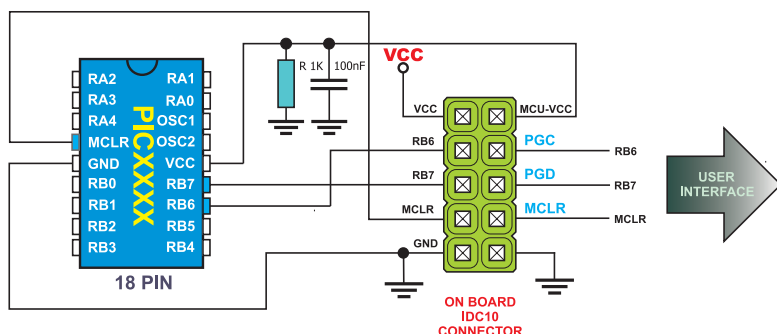
**Note:** Picture above illustrates connection between IDC connector and the microcontroller pins. Pay attention to how the VCC pin for power supply is connected.



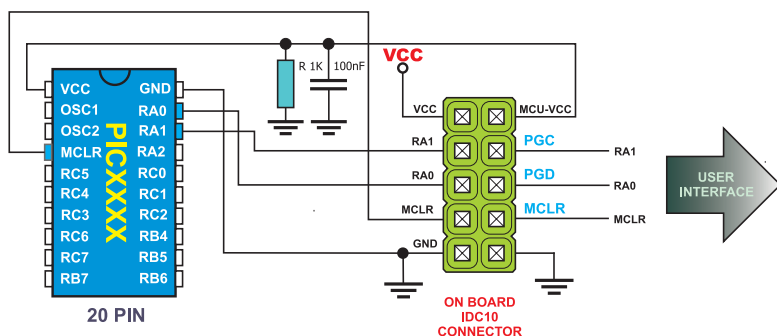




Connection schematics for IDC 10 mail connector on printed board and 18-pin 18F PIC microcontrollers. Some of the examples of 18F family:  
**PIC18F1220,1320 ...**



Connection schematics for IDC 10 mail connector on printed board and 18-pin 16F PIC microcontrollers. Some of the examples of 16F family:  
**PIC16F84A, 88, 628, 716....**



Connection schematics for IDC 10 mail connector on printed board and 20-pin 16F PIC microcontrollers. Some of the examples of 16F family:  
**PIC16F631, 677, 685, 687, 689, 690....**

Connection schematics for male IDC 10 connector on printed board and 28-pin 16F and 18F PIC microcontrollers. Some of the examples are:

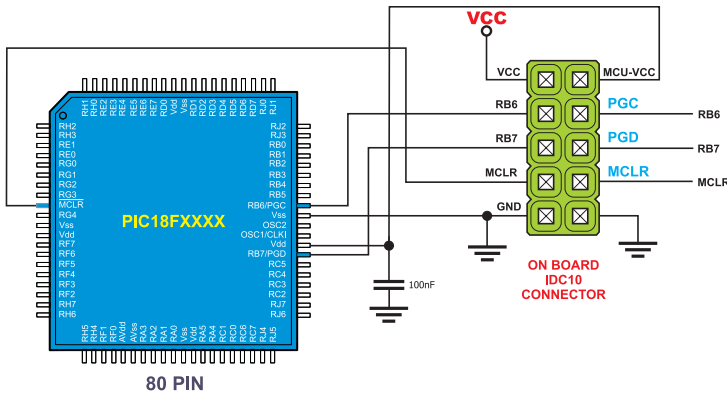
**PIC16F876**, 73...

**PIC18F252**, 248, 2330...

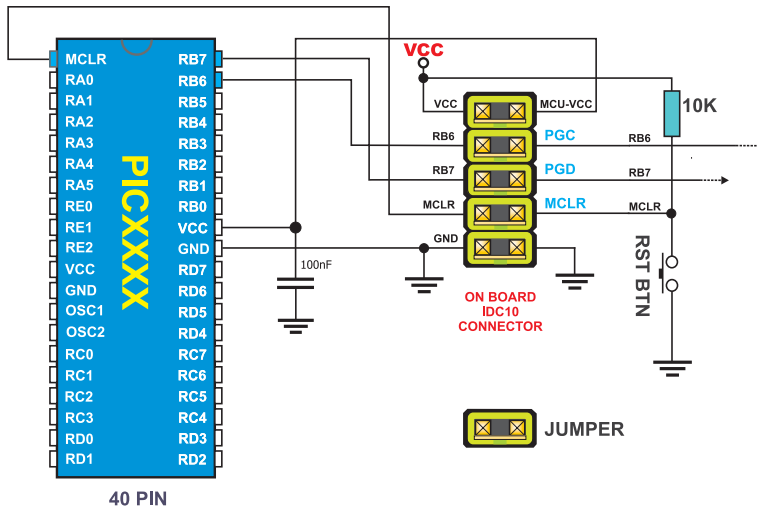
Connection schematics for male IDC 10 connector on printed board and 40-pin 16F and 18F PIC microcontrollers. Some of the examples are:

**PIC16F877A**, 77...  
**PIC18F452**, 448, 4520, 4220...

Connection schematics for male IDC 10 connector on printed board and 64-pin 18F PIC microcontrollers. Some of the examples of 18F family:  
**PIC18F6310**, 6410, 6520, 6620, 6720...



Connection schematics for male IDC 10 connector on printed board and 80-pin 18F PIC microcontrollers. Some of the examples of 18F family:  
**PIC18F8310**, 8410, 8520, 8620, 8720...



After programming and device development are finished, the male IDC10 connector pins must be switched by jumpers. It enables pins MCLR, RB6 and RB7 to be connected to the rest of on board electronics, which further enables device to operate normally without *PICflash* programmer. In case of need, the jumpers can be removed and *PICflash* can be reconnected for reprogramming the chip.

## Note:

Target board must not have electrolytic capacitors between the microcontroller pins and embedded IDC10 connector since the power supply voltage is controlled by the *PICflash* programmer.

## Note:

Resistor R (1Kohm) should be connected to VCC line only in case you work with the following microcontrollers:

**12F629**,635,675,683,

**16F627**,627A,628,628A,630,631,636,639,648A,676, 677,684,685,687,688,689,690,913,914,916,917,946,

**16HV675!**

None of the parts of this manual, including the product and software described in it, may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form or by any means, excepting the documentation kept by the purchaser for backup purposes, without expressed written permission of MikroElektronika Company.

Product warranty or service will not be extended if the product is repaired, modified or altered, unless such repair, modification or alteration is authorized in writing by MikroElektronika.

MikroElektronika provides this manual “as is” without warranty of any kind, either expressed or implied, including, but not limiting to implied warranties or conditions of merchantability or fitness for a particular purpose.

In no event shall MikroElektronika, its directors, officers, employees or distributors be liable for any indirect, specific, incidental or consequential damages whatsoever (including damages for loss of business profits and business information, business interruption or any other pecuniary loss) arising from any defect or error in this manual or product, even if MikroElektronika has been advised of the possibility of such damages.

Specification and information contained in this manual are furnished for internal use only, and are subject to change at any time without notice, and should be construed as a commitment by MikroElektronika.

MikroElektronika assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual, including the product and software described in it.

Product and corporate names appearing in this manual may or may not be registered trademarks or copyrights of their respective companies, and are used only for identification or explanation and to the owners’ benefit, with no intent to infringe.



**MikroElektronika**

**SOFTWARE AND HARDWARE SOLUTIONS**

**FOR EMBEDDED WORLD**

*...making it simple*

If you have any other question, comment or a business proposal, please contact us:

web: [www.mikroe.com](http://www.mikroe.com)

e-mail: [office@mikroe.com](mailto:office@mikroe.com)

If you are experiencing problems with any of our products

or you just want additional information, please let us know.

[www.mikroe.com/en/support](http://www.mikroe.com/en/support)

TECHNICAL SUPPORT:

