Flash program is used to transfer a .hex file from a PC to the microcontroller memory by means of the appropriate hardware. Every flash program includes numerous options used for setting the microcontroller’s configuration bits.
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Nebojša Matic
General Manager

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General Information

The PICflash™ programmer is a great tool used for programming PIC microcontrollers. Its unique design and ease of use make it a very popular tool among beginners and professional users alike. The PICflash programmer communicates to a PC through a USB cable which is also used for powering the programmer. In addition, it is a low power consumption device, which makes it ideal for working with notebooks. In order to use this programmer, it is necessary to have the appropriate software mikroProg Suite for PIC™, provided on the product CD, installed on your PC. The latest version of this software with updated list of supported microcontrollers can be downloaded free of charge from our website at www.mikroe.com. Use any of Mikroelektronika’s compilers to write a code as they provide an easy way of debugging/simulating the operation of the target device. The mikroICD debugger is part of the programmer that enables you to run a program step by step while monitoring the state of all registers within the microcontroller. It may be used with all Mikroelektronika’s compilers such as mikroC PRO for PIC, mikroBASIC PRO for PIC and mikroPASCAL PRO for PIC.

Package contains:

<table>
<thead>
<tr>
<th>Package contains:</th>
<th></th>
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<tbody>
<tr>
<td>Programmer:</td>
<td>PICflash</td>
</tr>
<tr>
<td>CD:</td>
<td>product CD with the relevant software</td>
</tr>
<tr>
<td>Cables:</td>
<td>USB cable</td>
</tr>
<tr>
<td>Documentation:</td>
<td>PICflash programmer, mikroProg Suite for PIC, mikroICD and Installing USB Drivers manuals</td>
</tr>
</tbody>
</table>

System specifications:

<table>
<thead>
<tr>
<th>System specifications:</th>
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</thead>
<tbody>
<tr>
<td>Power supply: via a USB cable (5V DC)</td>
</tr>
<tr>
<td>Power consumption: 10mA</td>
</tr>
<tr>
<td>Dimensions: 13 x 4 x 2.4 cm (5.1 x 1.57 x 0.94 inch)</td>
</tr>
<tr>
<td>Weight: ~180g (0.4lbs)</td>
</tr>
</tbody>
</table>
1.0. Connecting the Programmer

The PICflash programmer is connected to the microcontroller via a flat cable ending with an IDC10 connector. The microcontroller may be soldered on the target device or plugged into the socket on the board intended for the microcontroller’s programming. In both cases, it is necessary to connect the microcontroller pins used for programming to a 2x5 connector. The PICflash programmer’s plastic case provides the IDC10 connector’s pinout on the basis of which you should establish connection between the microcontroller on the target device and this connector. Refer to Figure 1-3.

![Figure 1-1: Connecting PICflash programmer](image)

When designing a target device to install the microcontroller on, it is important to be familiar with the pinout of IDC connector provided on the PICflash programmer. A small notch on the upper side of this connector makes its plugging into the on-board 2x5 connector easy. Figure 1.3 shows pinouts of both connectors.

![Figure 1-3: Microcontroller and 2x5 connector connection](image)

The PICflash programmer is normally powered from the PC through a USB port. However, it is also possible to provide power supply from the target device the PICflash programmer is connected to. In this case it is necessary to open the PICflash programmer’s plastic case and remove jumper J1. The 5V power supply voltage provided in this way should be stabilized.

![Figure 1-4: The PICflash programmer is powered from the PC through a USB port (standard position of jumper)](image)

![Figure 1-5: The PICflash programmer is powered from the target device supplied with the microcontroller.](image)
2.0. Programmer’s Operation

The PICflash programmer employs five pins to access the microcontroller. Two pins are used to provide power supply and ground from the PICflash programmer through. The other three pins are used for data transfer as well as for entering the microcontroller into the programming mode. These five pins are marked as follows:

- **MCU-VCC**: It is used to provide power supply from the PICflash programmer through;
- **MCU-PGC**: In-Circuit Debugger and ICSP programming clock pin;
- **MCU-PGD**: In-Circuit Debugger and ICSP programming data pin;
- **MCU-MCLR/Vpp**: Master Clear (for MCU reset) or programming voltage Vpp; and
- **GND**: GND pin.

Before the programming process starts, it is necessary to write a code in one of PIC compilers and generate a hex. file to be loaded into the microcontroller using the PICflash programmer. The programming process starts by clicking on the **Write** button within the mikroProg Suite for PIC software. The programmer will automatically provide the MCU-MCLR/Vpp pin with a high level voltage signal, thus enabling the microcontroller to enter the programming mode. The hex. file is then loaded into the microcontroller using MCU-PGC and MCU-PGD pins. When the programming process is complete, the programmer sets the microcontroller back into the operating mode.

The programmer’s mode of operation changes using a multiplexer. Due to it, the PICflash programmer may be connected to the microcontroller all the time without affecting its operation. It is a part of the programmer that serves as a switch enabling the programmer to be connected/disconnected from the microcontroller pins used for programming.

---

**Figure 2-1**: The multiplexer in the programming mode. During programming, the multiplexer disconnects the microcontroller pins used for programming from the target device. This enables the programming process to be safely performed without affecting the operation of the device itself. It also prevents external signals from affecting the programming process. When the programming process has been completed, the multiplexer releases the microcontroller pins used for programming so that they can be used as I/O pins.

**Figure 2-2**: The multiplexer in the operating mode. When the programming process has been completed, the multiplexer releases the microcontroller pins used for programming, thus enabling them to be used as I/O pins. This also enables the programmer to remain connected to the target device without affecting its operation.
3.0. Connecting Microcontroller and 2x5 Connector

The following examples show various ways of connecting microcontrollers to the 2x5 connector. It is highly recommended to check which microcontroller pins are used for programming no matter which type of PIC microcontroller is in use.

The connection schematic for 2x5 connector and 8-pin 10F PIC microcontrollers such as PIC10F200, 202, 204, 206 etc.

The connection schematic for 2x5 male connector and 8-pin 12F PIC microcontrollers such as PIC12F508, 509, 629, 635, 675, 683 etc.

The connection schematic for 2x5 connector and 14-pin 16F PIC microcontrollers such as PIC16F676, 684, 688 etc.

The connection schematic for 2x5 connector and 18-pin 18F PIC microcontrollers such as PIC18F1220, 1320 etc.
The connection schematic for 2x5 connector and 18-pin 16F PIC microcontrollers such as PIC16F84A, 88, 628, 716 etc.

The connection schematic for 2x5 connector and 20-pin 16F PIC microcontrollers such as PIC16F631, 677, 685, 687, 689, 690 etc.

The connection schematic for 2x5 connector and 40-pin 16F and 18F PIC microcontrollers such as PIC16F877A, 77 etc. as well as PIC18F452, 448, 4520, 4220 etc.
The connection schematic for 2x5 connector and 28-pin 16F and 18F PIC microcontrollers such as PIC16F876, 73 etc. as well as PIC18F252, 248, 2330 etc.

The connection schematic for 2x5 connector and 64-pin 18F PIC microcontrollers such as PIC18F6310, 6410, 6520, 6620, 6720 etc.

The connection schematic for 2x5 connector and 80-pin 18F PIC microcontrollers such as PIC18F8310, 8410, 8520, 8620, 8720 etc.
4.0. Microcontroller’s Operation after Programming

When the programming process is completed, you can remove IDC connector of the PICflash programmer from the on-board 2x5 connector. This causes the microcontroller pins used for programming (RB6, RB7 and MCLR) to be disconnected from the rest of on-board electronics. In order to use these pins as inputs/outputs, it is necessary to place jumpers over the on-board 2x5 connector, as shown in Figure 4-1.

NOTE: A resistor R (1Kohm) should be connected to the VCC pin only when working with one of the following microcontrollers: 12F629, 635, 675 and 683; 16F627, 627A, 628, 628A, 630, 631, 636, 639, 648A, 676, 677, 684, 685, 687, 688, 689, 690, 913, 914, 916, 917 and 946; and 16HV675.
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PICFlash™

User manual

Flash program is used to transfer a .hex file from a PC to the microcontroller memory by means of the appropriate hardware. Every flash program includes numerous options used for setting the microcontroller's configuration bits.