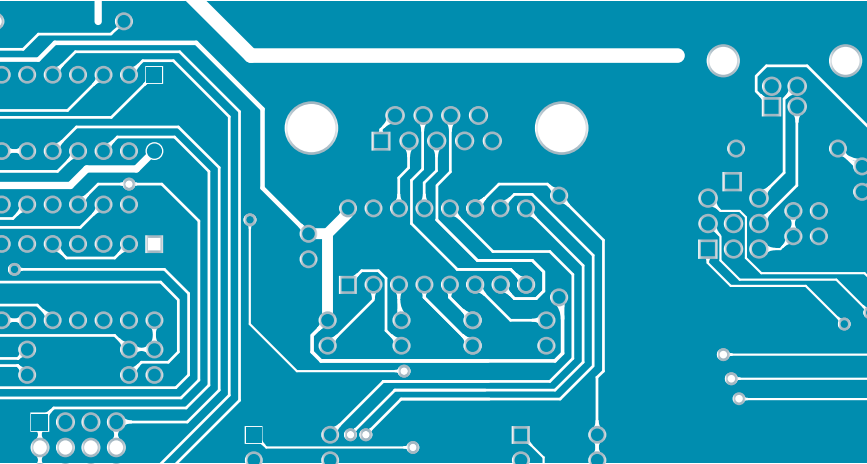
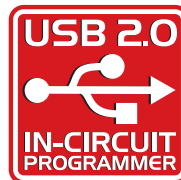


AVRprog



AVRprog is a high performance programmer for Atmel's microcontroller family. It is connected to target device through IDC10 connector and acts as ICSP (In-Circuit Serial Programmer). This manual contains a detailed description of this device. It also guides you through the AVRflash programmer software installation.



CONTENTS

<i>AVRprog</i> Programmer	4
<i>AVRflash</i> Software Installation	6
<i>AVRflash</i> Software	8
Keyboard Shortcuts and Command Line Parameters	9
Programmer's Operation	10
<i>AVRprog</i> Programmer Connection Schematics	13

AVRprog PROGRAMMER

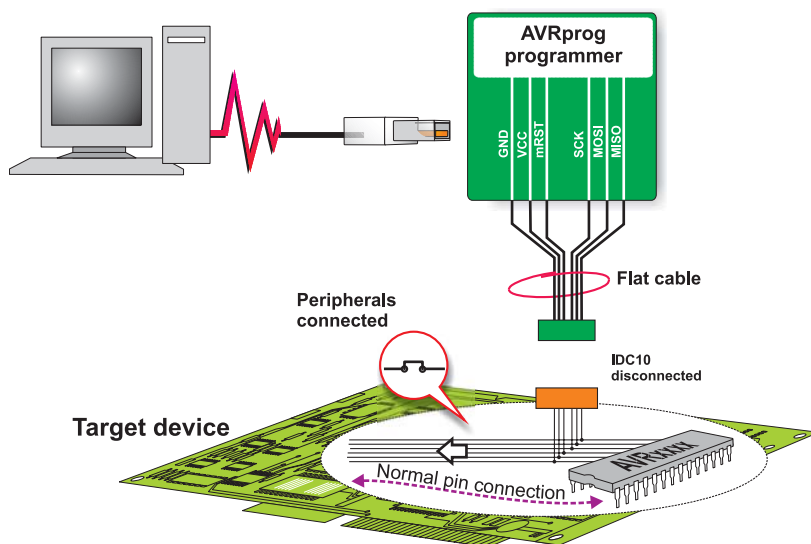
Along with complementary software, *AVRprog* programmer represents an irreplaceable tool for all those working with AVR microcontrollers. By means of this programmer, it is possible to program almost any AVR microcontroller, including those embedded (soldered) in printed circuit board. The *AVRprog*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

- MISO** (Master In - Slave Out)
- MOSI** (Master Out - Slave In)
- SCK** (Serial Clock)
- mRST** (Reset)

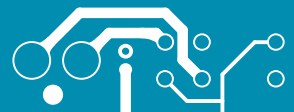
These lines are contained within a *flat* cable ending with an IDC10 female connector. When creating a target device, the appropriate 10-pin male connector with 2.54 mm space between pins should be placed on it. Connector pins should be connected to the microcontroller pins. Their position varies depending on the microcontroller's type and package. Exact connection schematics are provided at the end of this manual.

Note: If your target device uses MCU programming pins for the operation of some other peripherals, then it should be enabled to these peripherals to be disconnected during programming. Jumpers are commonly used for disconnecting the MISO, MOSI, SCK and mRST programming pins.

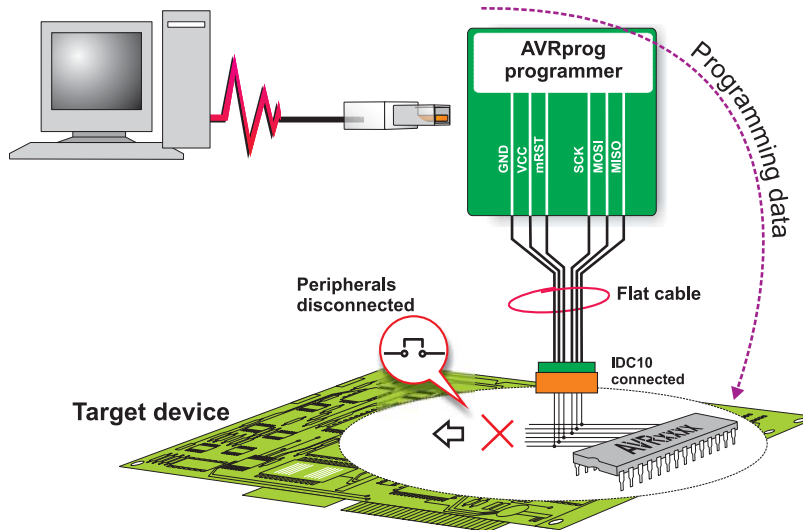
Programmer is inactive



During normal operation of the target device, the programmer should be disconnected, while peripherals should be normally connected to the MCU pins as per project. Connection is made by means of four jumpers.

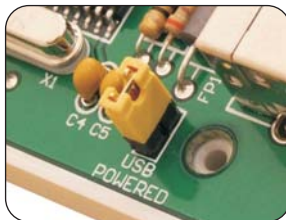


Programmer is active



During programming a device with built-in AVR microcontroller, the programmer should be connected to the MCU programming pins via IDC10 connector. At the same time, any peripheral using the same pins should be disconnected by means of jumpers.

If the target board has its own 5V power supply, then it can be also used for powering the *AVRprog* programmer. In that case, it is necessary to open programmer plastic case and remove the jumper for power supply selection. Otherwise, if the target board does not have its own power supply source, then the jumper should not be removed. In that case, the programmer, the microcontroller and the whole electronics are powered via programmer's USB cable which connects the programmer to a PC. Any other power supply on the target board must be suspended.



This picture illustrates the position of jumper when the target board and the 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.

AVRflash PROGRAMMER SOFTWARE INSTALLATION

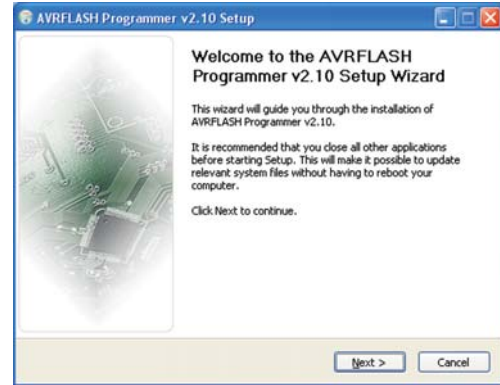
In order to enable programming microcontrollers using AVRprog programmer, it is necessary to install the *AVRflash programmer* program (“AVRflash”) on your PC. The same program is used for programming AVR microcontrollers using EasyAVR development board.

Step 1: Start installation

Insert the product CD into a PC drive. A list with all MikroElektronika’s products appears. Click the setup icon to start software installation:

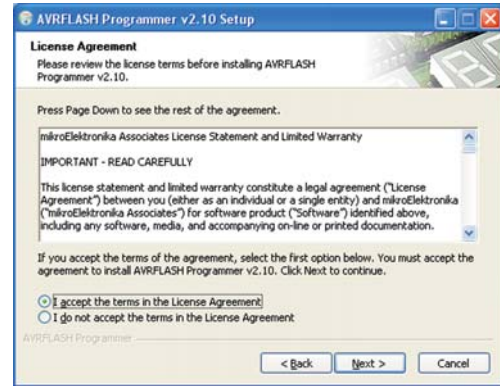
AVRflash software for Windows

AVRflash_setup.exe may be also downloaded free of charge from our web site. Then you have to start the installation from your hard drive. A welcome window appears. Click ‘Next’.



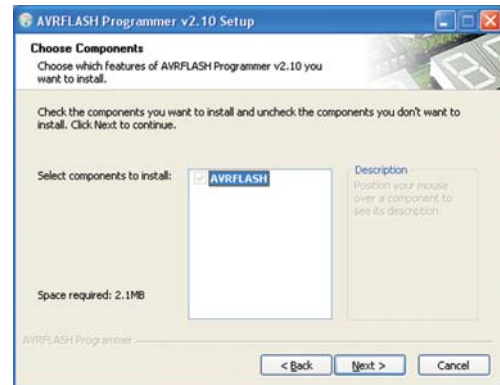
Step 2: Licence Agreement

Prior to start the installation, please review the License terms. If you accept them, select the option ‘I accept the terms in the License Agreement’ and click ‘Next’ afterwards.

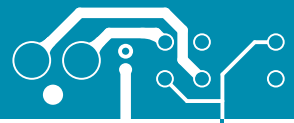
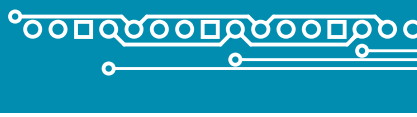


Step 3: Choose Components

To make it as simple as possible, this step does not requires you to choose components to install. Click ‘Next’ to continue.



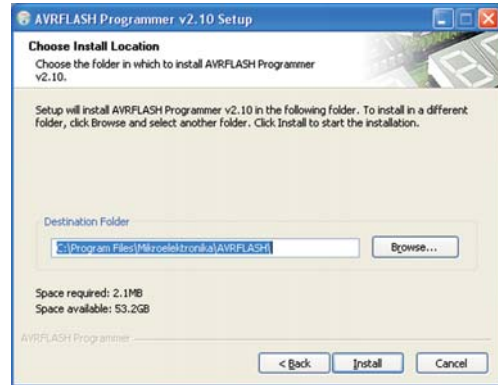
Note: Make sure that *AVRprog* programmer is not connected to the PC during software installation.



Step 4: Installation Location

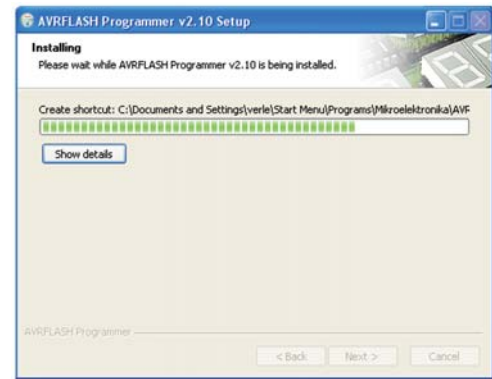
This step is intended for choosing destination folder. If you want to install the program to the folder different from default, click 'Browse' and select another folder on hard disc. Then click 'Next'. If you choose default folder, the program will be installed on the following destination:

C:\Program Files\Mikroelektronika\AVRflash



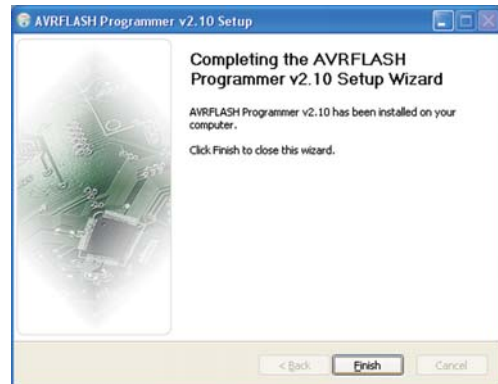
Step 5: Installation Details

AVRflash installation starts here and its progress will be shown on the screen. If you are interested in details of the installation click the 'Show details' button.



Step 6: Finish

Windows will notify you of successful installation of AVRflash, by showing the window from the picture on the right. To complete the installation process click 'Finish'.



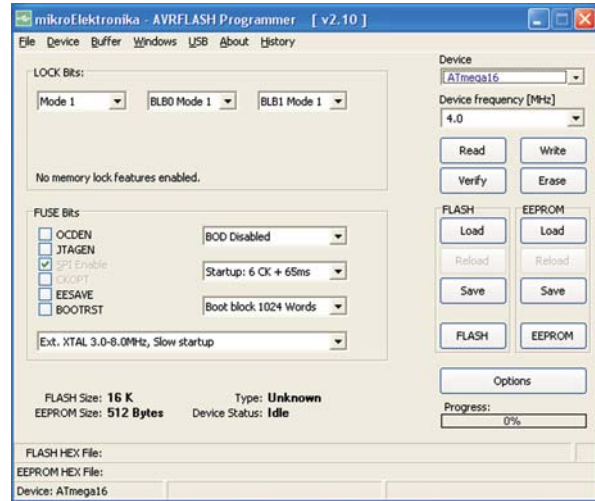
Driver installation

After installing AVRflash, it is necessary to install the appropriate drivers on your PC. They enable programmer's hardware to operate properly. For information on their installation, please refer to 'Installing USB drivers' manual.

AVRflash SOFTWARE

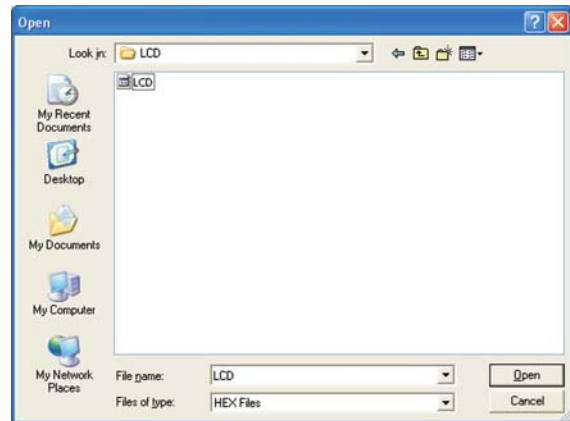
Step 1: Run AVRflash programmer

Run *AVRflash* from your PC. Click the *Device* option and select the appropriate microcontroller to program. *AVRflash* will automatically set parameters to work with the specified microcontroller.



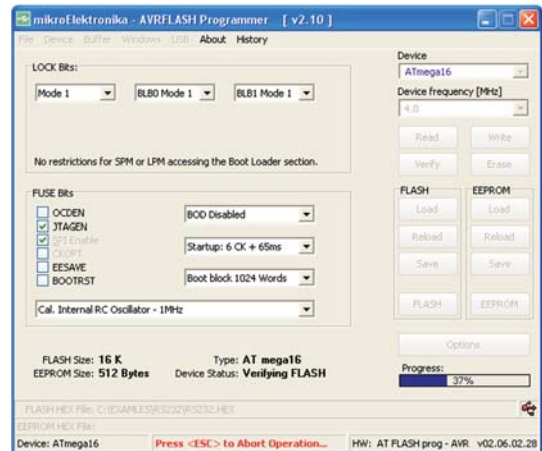
Step 2: Load HEX file

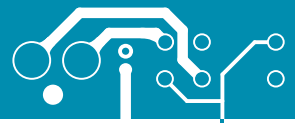
Click the 'Load' option which opens the window shown on picture on the right. Select the appropriate executable file (having extension .HEX in its name) and click the *Open* option. *AVRflash* will do all necessary settings on the basis of control bits stored in the HEX file.



Step 3: Write program

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





KEYBOARD SHORTCUTS AND COMMAND LINE PARAMETERS

Keyboard Shortcuts

Alt-E	Erase
Alt-W	Write
Alt-V	Verify
Alt-R	Read
Alt-D	Change MCU
Ctrl-S	Save
Ctrl-O	Open (Load)
Ctrl-R	Reload

Command Line

Alternatively, you can activate the *AVRflash* from the command line. It also enables you to use *AVRflash* from some other software, compiler etc. Here is the list with the command line parameters:

-w	Write to AVR
-v	Verify
-e	Erase AVR
-r	Read from AVR
-p	AVR name (for example ATMEGA16, ATMEGA8535s...)
-f	File name (must be enclosed with " ")

Example 1 `avrprog.exe -w -pATMEGA16 -v -f"C:\somefile.hex"`

This command programs the AVR using C:\somefile.hex and verifies written data.

Example 2 `avrprog.exe -r -pATMEGA16`

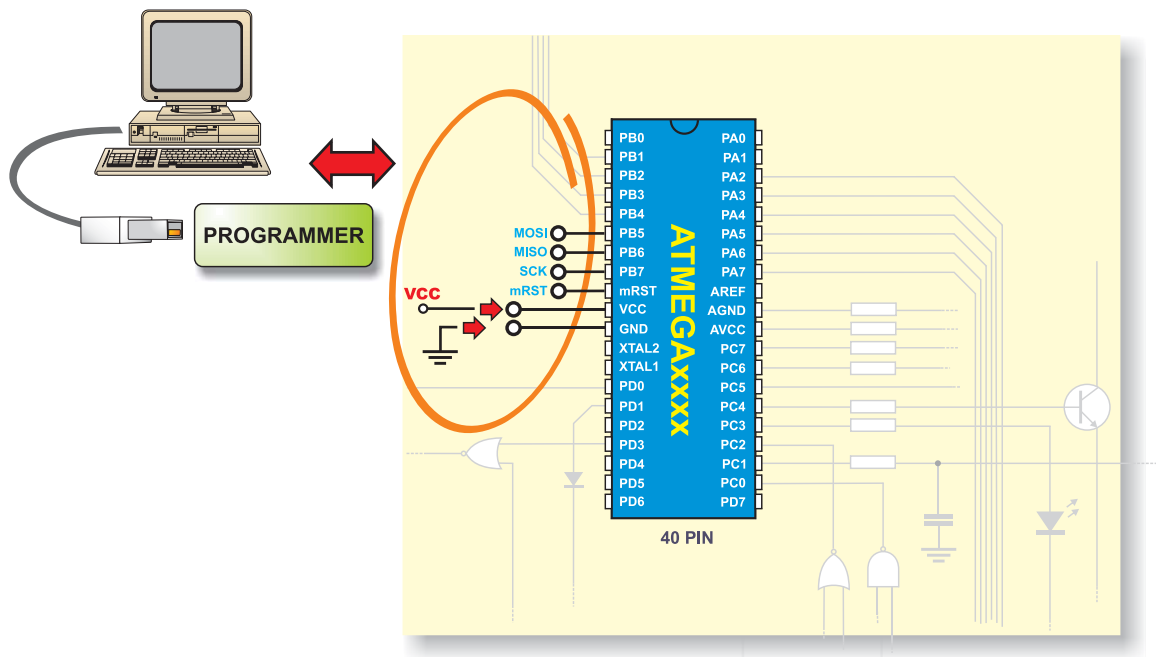
This command reads the AVR contents.

Example 3 `avrprog.exe -e -pATMEGA16`

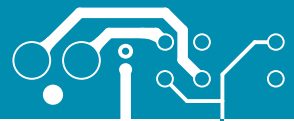
This command erases the AVR.

PROGRAMMER'S OPERATION

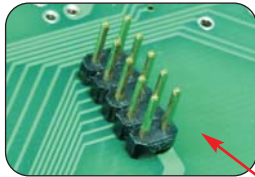
Programming an AVR microcontroller is performed by using signals mRST, MISO, MOSI and SCK from the *AVRprog* programmer. They are brought to the appropriate reset and SPI communication pins. In order to enable programming to run without errors, make sure that these pins are not connected to other electronic components. Otherwise, during normal operation, these pins must be connected to other components as per project.



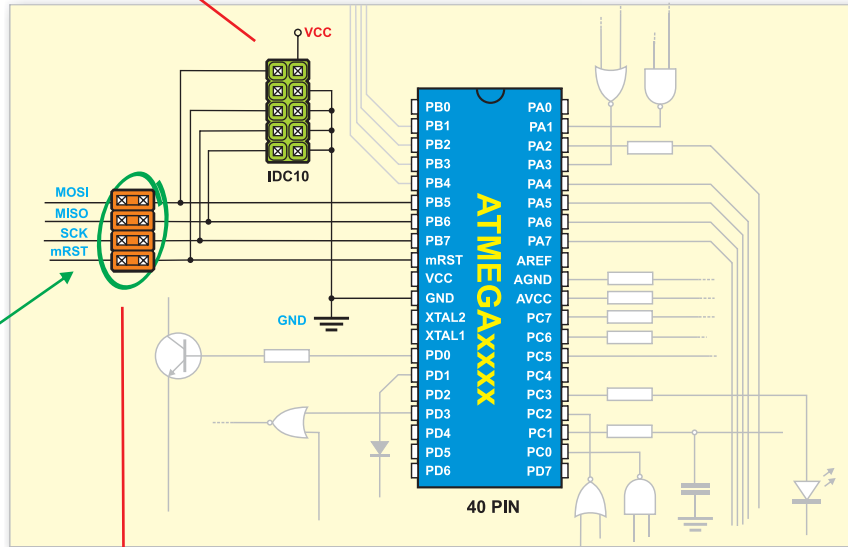
Since the microcontroller is soldered on the printed circuit board (with no use of socket), it is necessary to enable these pins to be connected to/disconnected from the rest of electronics by using jumpers. Because of that, do not forget to embed 4 jumpers when designing a device.



At the end of the programmer's flat cable, there is an IDC 10 female connector which fits to on-board IDC10 male connector with 2.54mm space between pins. During normal operation of the target device, it should be left disconnected as shown in figure below. In that way, the microcontroller pins will be connected to the rest of on-board electronics via four jumpers.



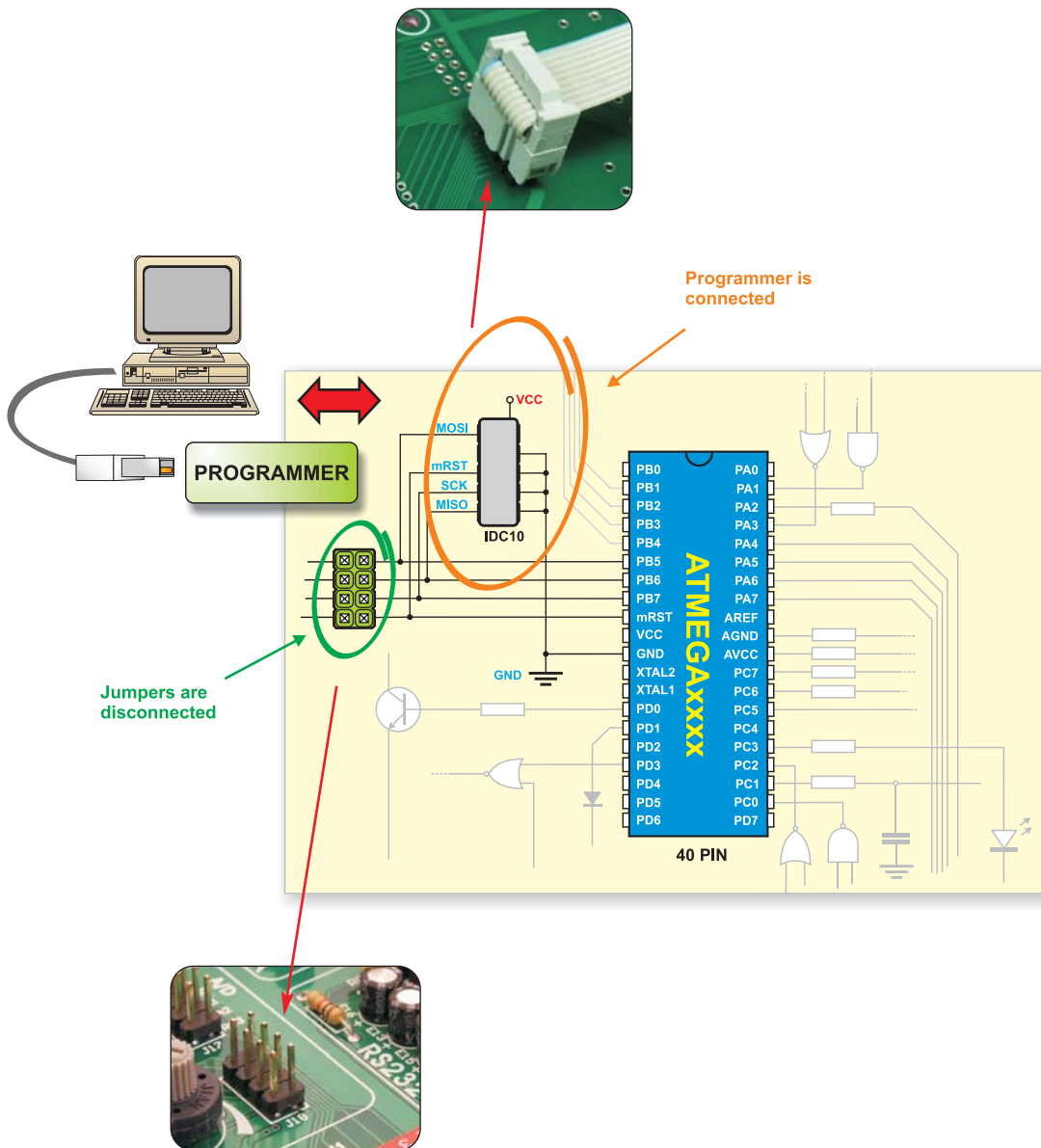
On-board IDC10 male connector

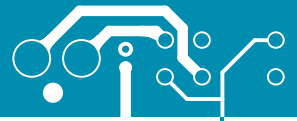


Jumpers are connected

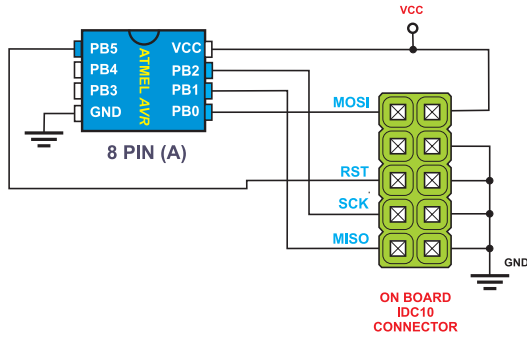


During programming, the IDC 10 male connector is used to bring signal from the programmer. To enable it, it is necessary to remove jumpers and plug the programmer's connector into the on-board connector.



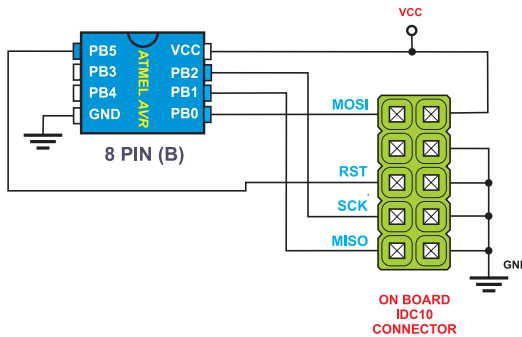


AVR programmer CONNECTION SCHEMATICS



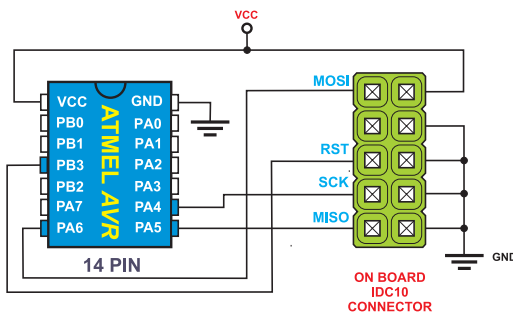
Connection between on-board male IDC 10 connector and 8-pin AVR microcontrollers such as:

ATtiny15



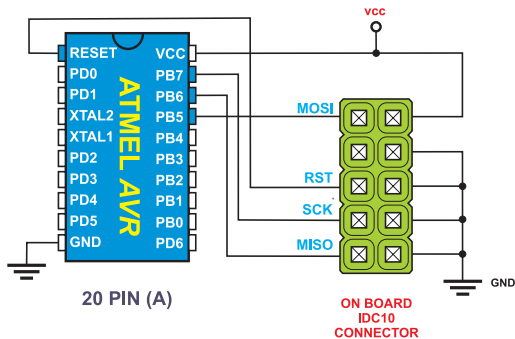
Connection between on-board male IDC 10 connector and 8-pin AVR microcontrollers such as:

AT90S2323, 2343...
ATtiny12, 13, 25, 45, 85...



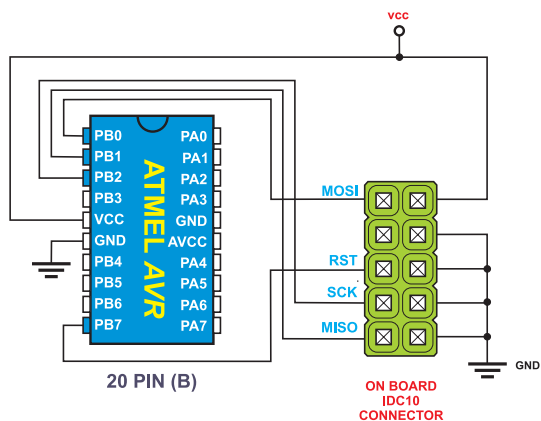
Connection between on-board male IDC 10 connector and 14-pin AVR microcontrollers such as:

ATtiny24, 44, 84...



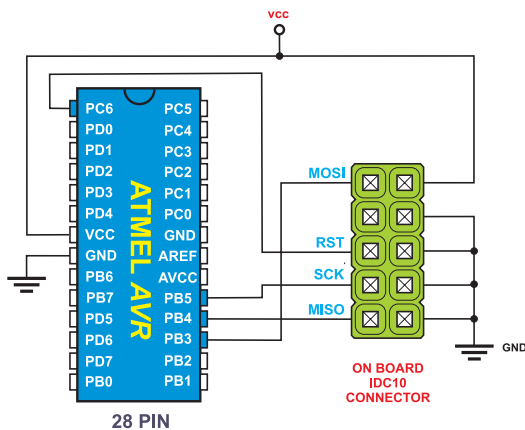
Connection between on-board male IDC 10 connector and 20-pin AVR microcontrollers such as:

90S1200, 2313...
ATtiny2312...



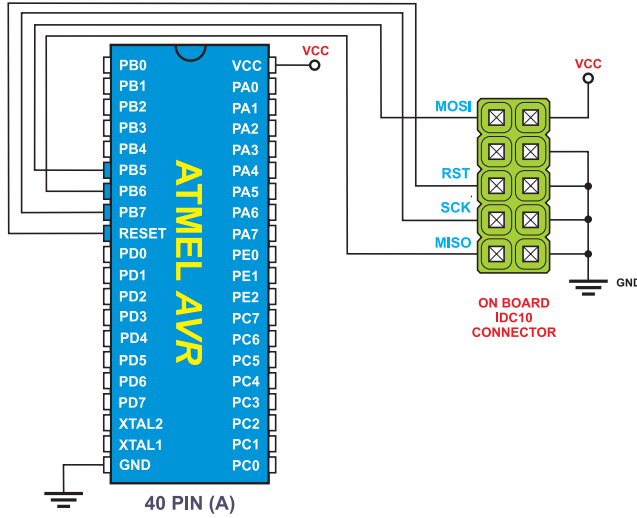
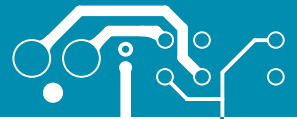
Connection between on-board male IDC 10 connector and 20-pin AVR microcontrollers such as:

ATtiny26...



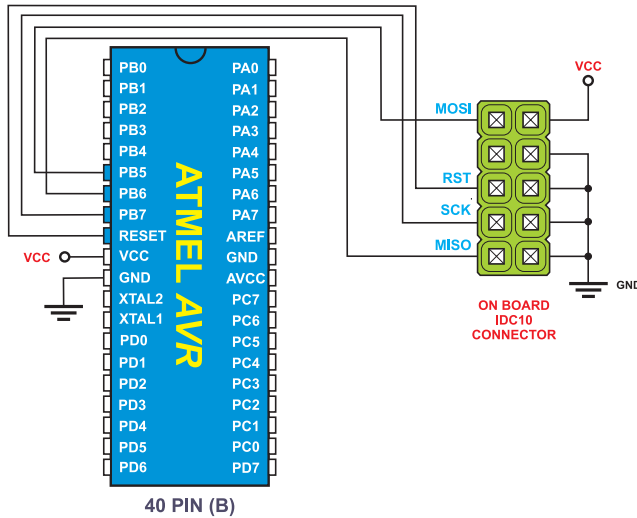
Connection between on-board male IDC 10 connector and 28-pin AVR microcontrollers such as:

AT90S4433...
ATmega8, 48, 88, 168...



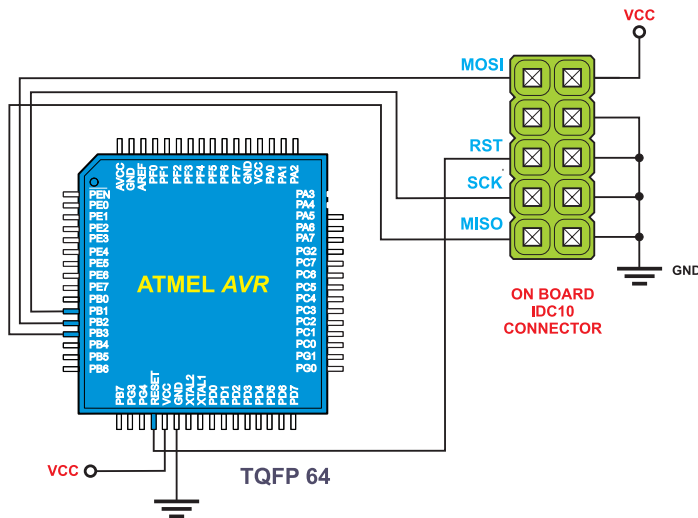
Connection between on-board male IDC 10 connector and 40-pin AVR microcontrollers such as:

AT90S8515...
ATmega161, 162, 8515...



Connection between on-board male IDC 10 connector and 40-pin AVR microcontrollers such as:

AT90S8535...
ATmega16, 32, 163, 323, 8535



Connection between on-board male IDC 10 connector and 64-pin AVR microcontrollers such as:

ATmega103, 128, 1280, 128, 165, 169, 2560, 2561, 325, 3250, 329, 3290, 64, 640, 644, 645, 6450, 649, 6490...

After programming, the programmer's IDC10 female connector must be unplugged and jumpers must be put on. It enables the MCLR, MISO, MOSI and SCK pins to be connected to the rest of on board electronics, which further enables device to operate normally without being affected by the *AVRprog* programmer. If needed, the jumpers can be removed and *AVRprog* can be reconnected in order to reprogram the chip.



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



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