easy-PIC 2

Manual

May 2004.

About EasyPIC2: System supports 8,14, 18, 28, and 40-pin microcontrollers Each jumper, element and pin is clearly marked on the board. Most of the industrial applications can be tested on the board: temperature controllers, counters, timers etc. EasyPIC2 also includes practical examples in PASCAL, BASIC, C, and assembly.

Features:

Choose between external or USB power supply. With USB power supply, you don't need external supply.

Very fast and flexible USB programmer on board. The key feature is expandability. By downloading new software, you will be able to program new MCUs in coming years.

Temperature sensor DS1820 allows you to measure temperature with 0.5 C accuracy.

RS232 communication with selectable TX and RX for smaller microcontrollers.

For presentation purposes, RA2 and RA3, are pointed out and can be used for measuring voltage set by potentiometers P2 and P3.

Port A is connected to the resistor network, if switch is not in ON position, the appropriate pin has neither pull-up or pull-down resistor attached. This is very important, because it enables using A port in analog mode as AD converter, and yet it can be used as ordinary digital I/O port.

Setting PORT jumper to the upper position sets the pins of the appropriate port to logical one (pull-up). If jumper is set to the lower postion, pins are set to logical zero (pull-down). It is very inportant to put pin on pull-up if you expect logical zero on input and vice versa.

Prototype area in which you can place your additional components. The back side of the board has pin marks to make the connecting easier.

32 buttons allow you to control every pin on your microcontroller.

You can chose how pressing the button will affect the pin, high state or low state.

See all the signals - each pin has LEDs.

Seven segment digits in multiplex mode for displaying the results.

Turns ON/OFF LEDs on A, B, C, D and E ports. You can chose which port you want LEDs to be connected to. Also, you can choose w h i c h digit you want to be on. In certain applications, it is important to remove all unnecessary connections from pins - DIP switches let you disconnect all LEDs and digits from MCU pins.

Set LCD contrast according to your needs.

CONTENTS

INSTALLATION OF THE SYSTEM

Development System package contains development system, serial cable, USB cable, and two CDs (LCD and a temperature sensor DS1820 are optional when ordering the package). Installing the system takes 6 steps:

Step no.1 Insert the CD-ROM supplied in the drive before connecting the EasyPIC2 development system.

Step no.2 Connect EasyPIC2 with computer via USB cable. EasyPIC2 will use power supply from your PC and start the demo program.

Step no.3 Install USB driver. Please follow the procedure described on the following page.

Step no.4 Copy PICFLASH software from CD to your HDD.

Step no.5 Copy program examples to your HDD.

Step no.6 Install MPLAB or some other compiler.

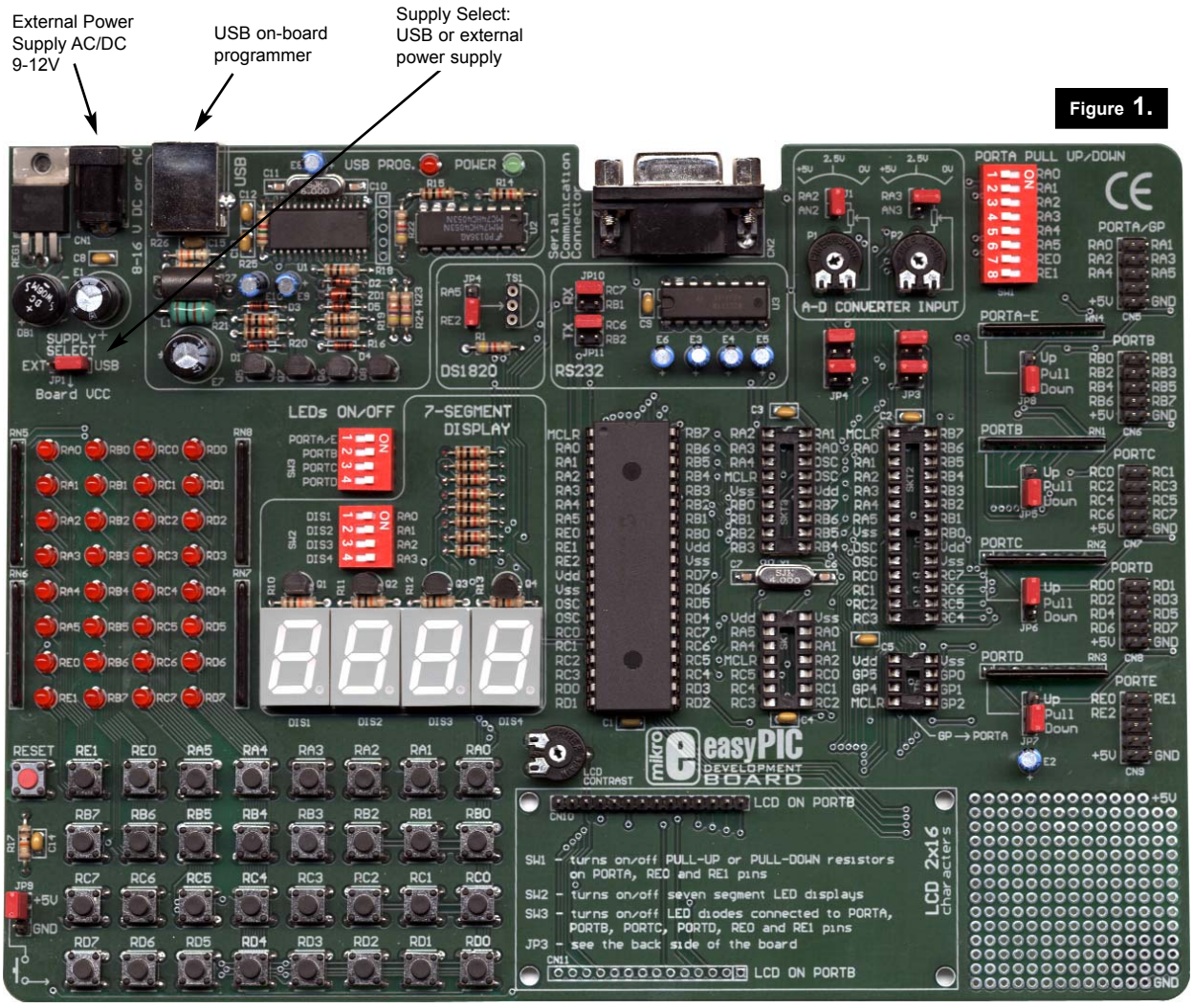


Figure 1.

INSTALLATION OF THE USB DRIVER

Step no.1.
After connecting the EasyPIC2 and PC via USB cable, you will get a message about your new hardware and the New Hardware dialog will be displayed.

Figure 2.

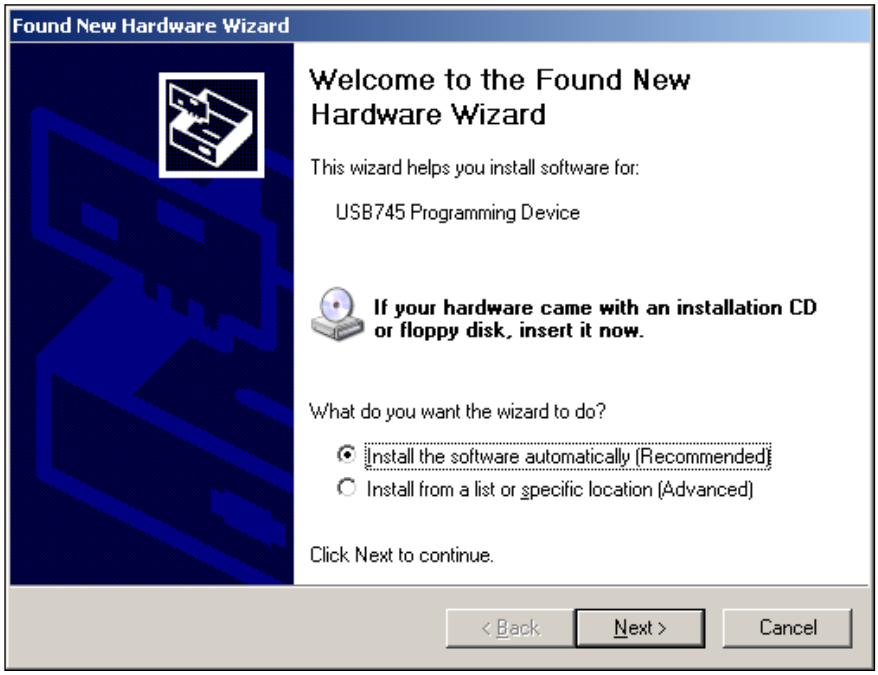


Figure 3.

Step no.2.
Select 'Install from a list or a specific location..' and click on NEXT.

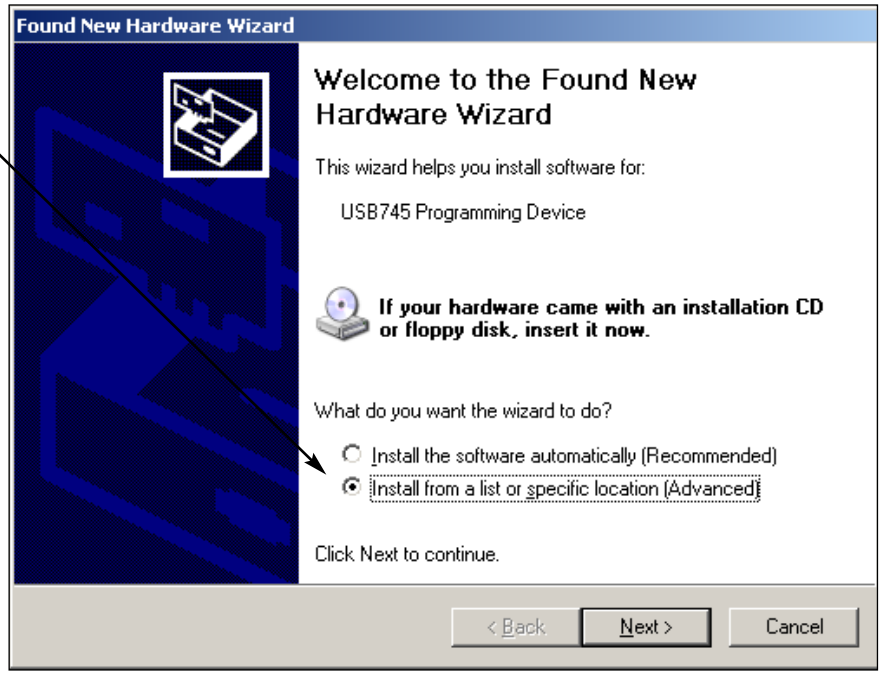


Figure 4.

Step no.3 Browse to the folder 'Driver' on CD, and select the appropriate folder for your operation system. Include the folder in the search, and click on NEXT.

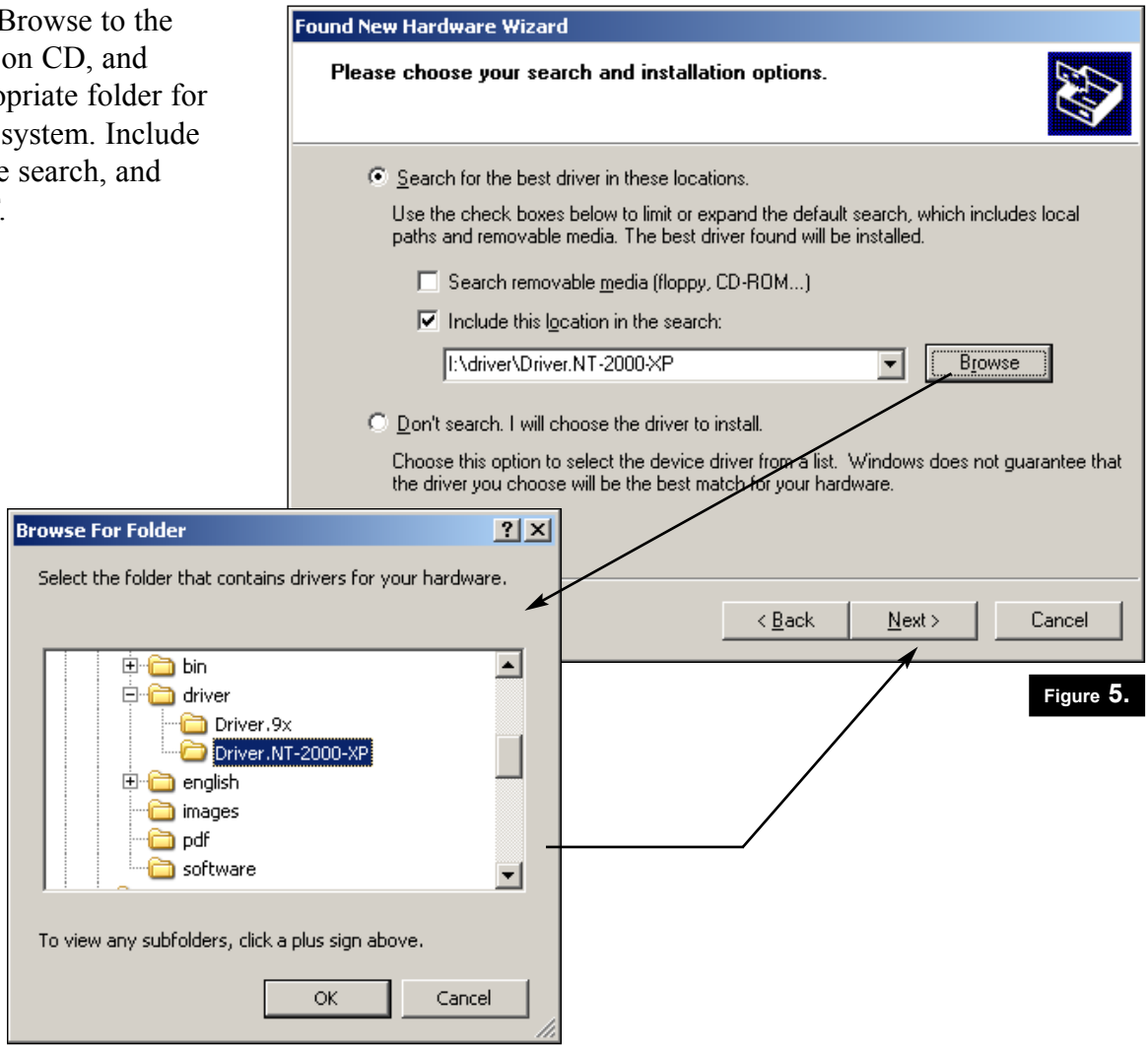


Figure 5.

Step no.4 PC will find USB programmer on board and start to copy driver files to HDD.

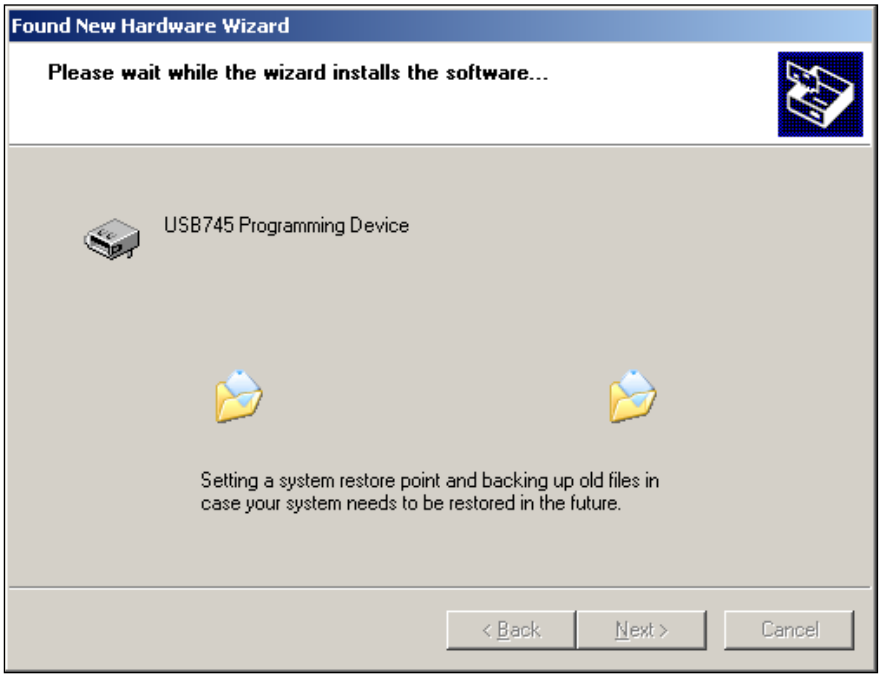


Figure 6.

Step no.4 To complete the installation of USB driver, click on Finish button.

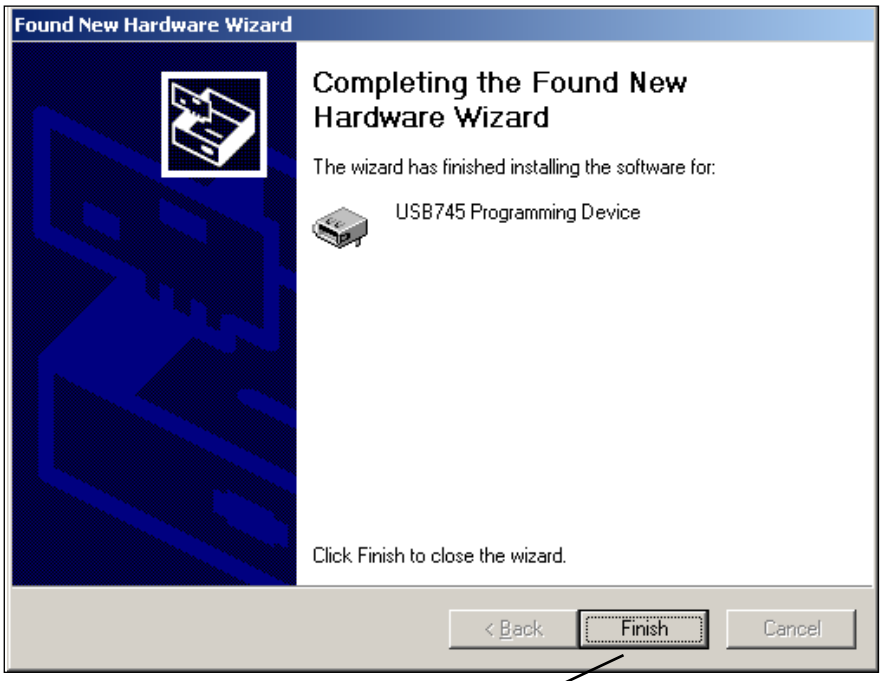


Figure 7.

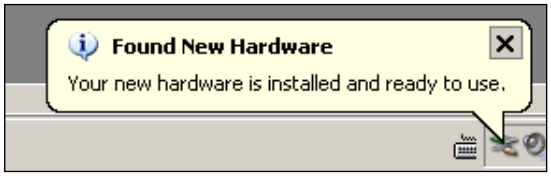
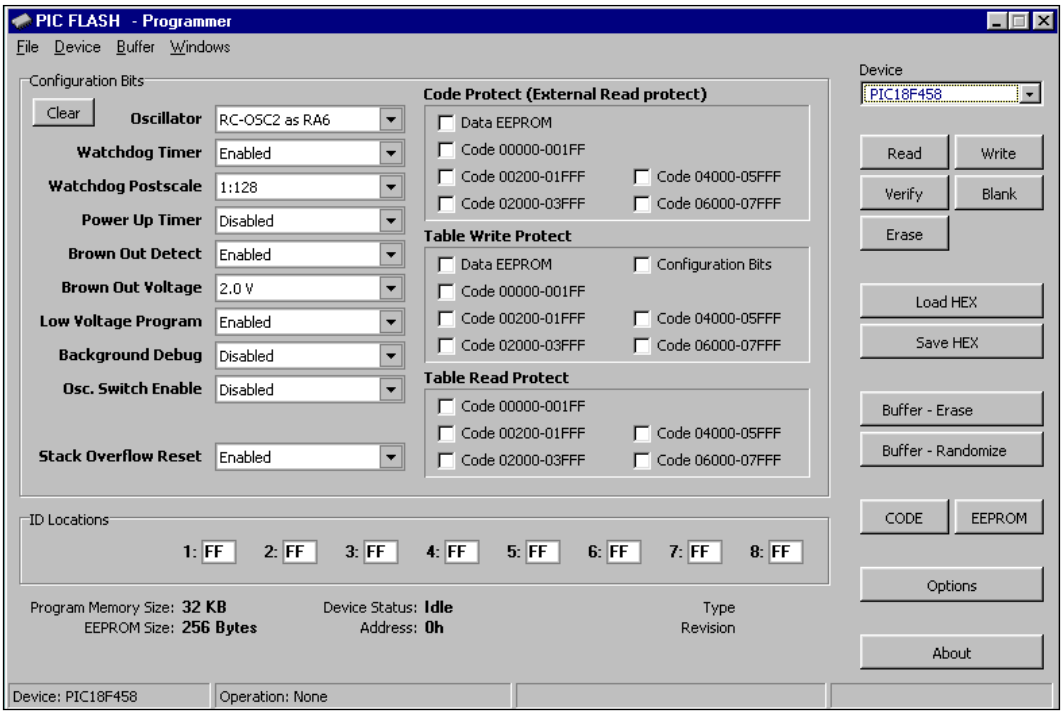


Figure 8.

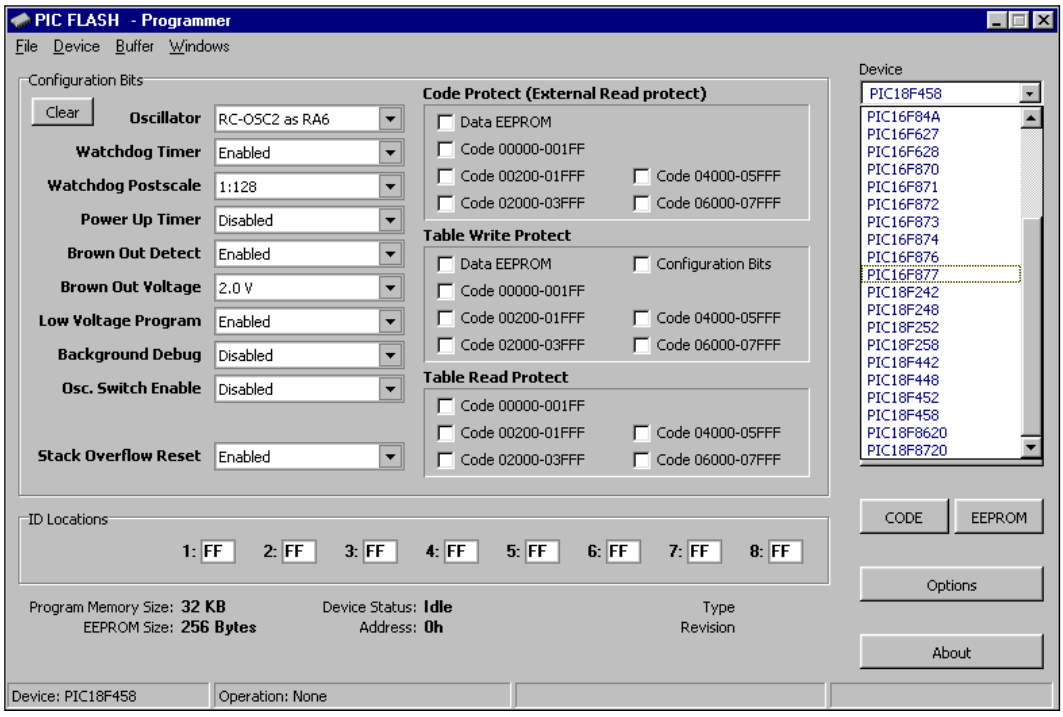
INSTALLATION OF PICFLASH SOFTWARE AND PROGRAMMING THE MICROCONTROLLER

Step no.1 Copy the file PICFLASH.exe from CD to your hard drive. It is recommended to create the folder PIC with subfolder PICFLASH for simplicity's sake (i.e. C:\PIC\PICFLASH). After the program is copied to the mentioned folder, installation is complete. You may want to create shortcut to the program on your desktop if you plan to use it frequently.

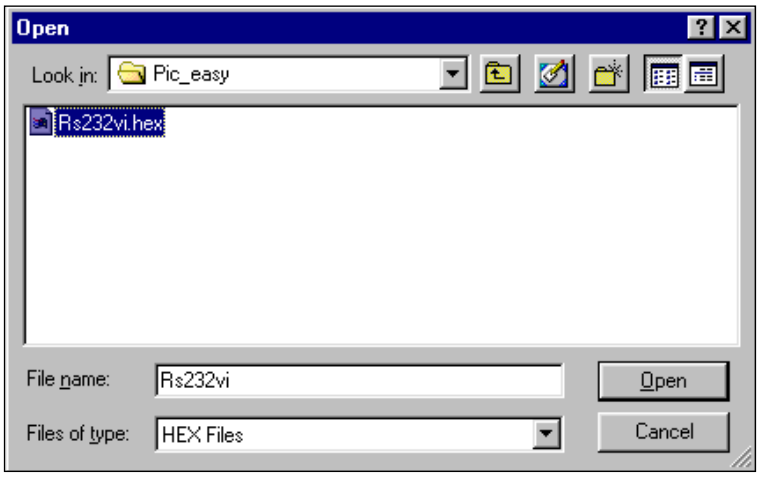
Step no.2. Start PICFLASH by clicking the icon 



Step no.3. Select the appropriate MCU by clicking the option ***Device***. After you select the wanted MCU, PICFLASH will make the necessary adjustments for working with the specified controller.



Step no.4. Click the option LOAD HEX which opens up the browse window from the following figure. By double-clicking the file, appropriate HEX file will be loaded into programmer's buffer.



Step no.5. Click the Write button to start the programming.

DESCRIPTION OF THE DEVELOPMENT SYSTEM

POWER SUPPLY

For all the elements in the development system to work properly, it is required to have stabilized +5V. With EasyPIC2 system, it is achieved by using the power stabilizer LM7805. Also, you can select USB power supply which allows EasyPIC2 to work without external power supply.

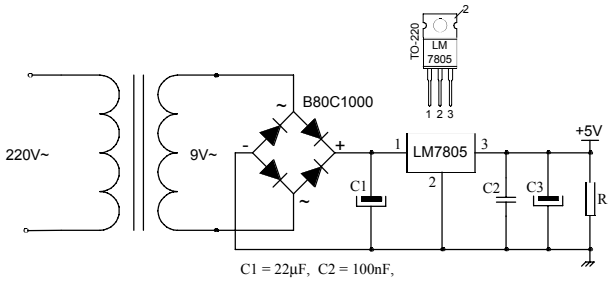
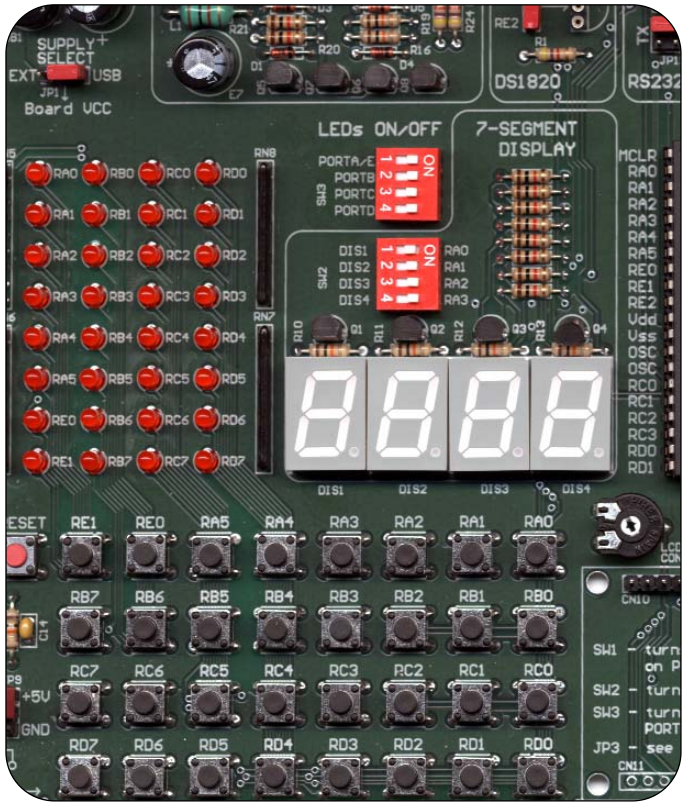


Figure 9.

LED DIODES

The system has 32 diodes, connected to port A, B, C, D and E pins. These diodes are ordinarily used in the first phase of the work, but they are also used for the later indications of the program flow. Each set of the diodes can be turned on and off using the **SW3** switch. The way to connect the LED diodes with a microcontroller is shown on the following figure.

NOTE: LED diodes turn on with a logical one. It means that a microcontroller must have a logical one on a pin for diode to emit light.



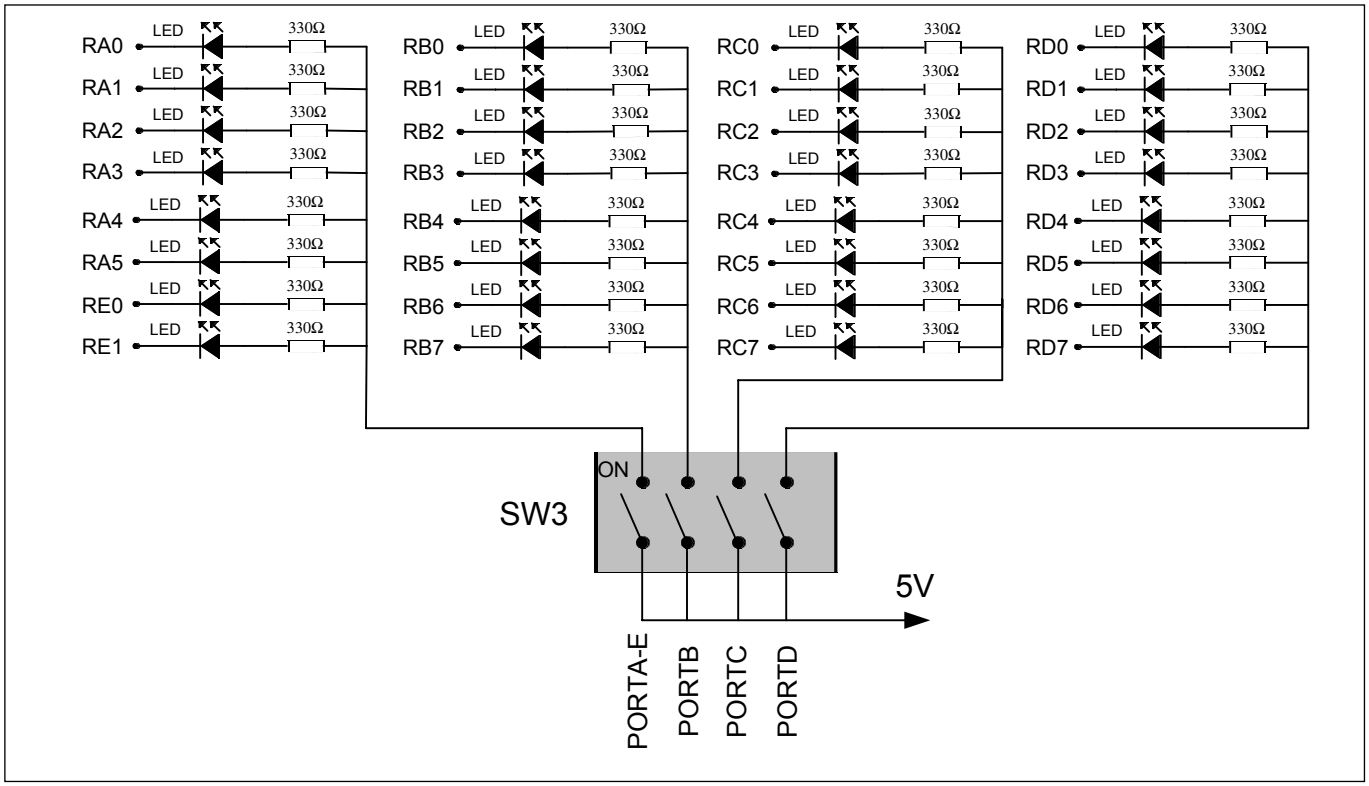


Figure 10.

BUTTONS

System has one RESET button and 32 buttons for simulating the system inputs which are connected to the pins RE0, RE1 and ports A, B, C, and D. Graphic scheme of the buttons-controller connection is shown in the following figure.

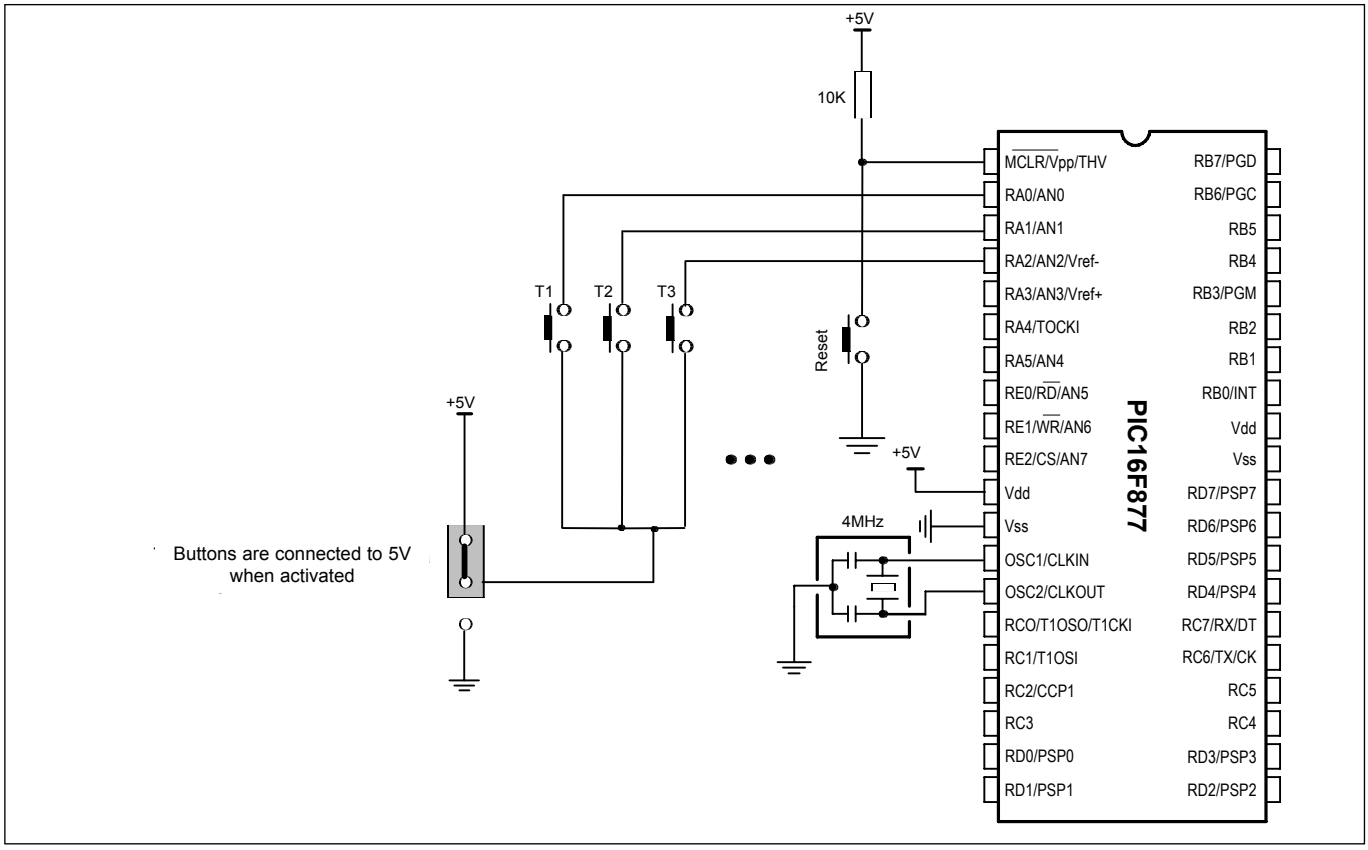
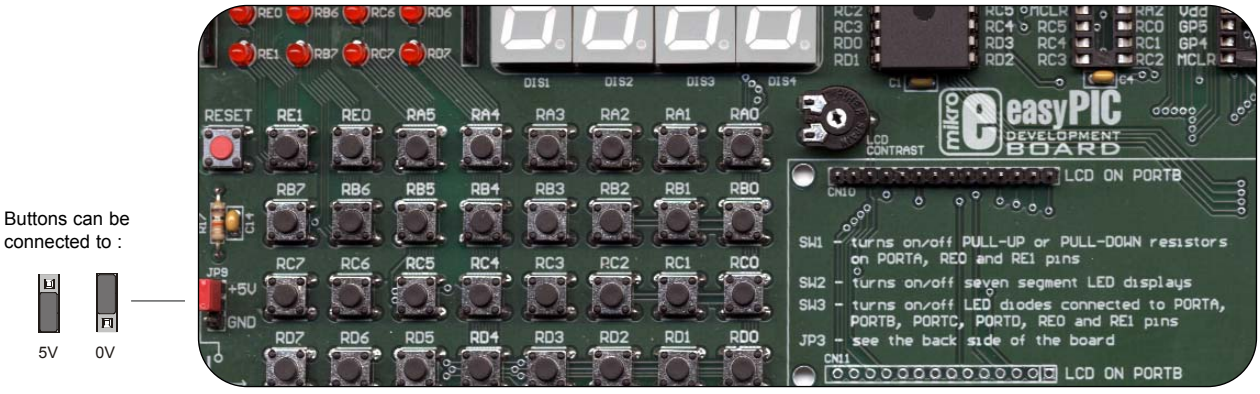


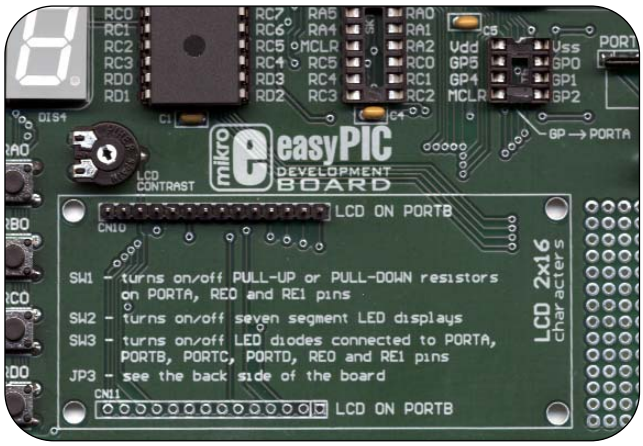
Figure 11.

The mark above every button represents the name of the pin which the button is connected to. In order to use a button, appropriate pin of A, B, C and/or D ports must be designated as input. Jumper in the lower left corner of the development system defines if the active value of a pin is 0 or 5 V. If the jumper is set to "up", then activating a certain button will bring logical one to the pin, while "down" position will bring logical zero.



LCD DISPLAY

Standard LCD display (2x16 characters) is supplied. However, it is not a limitation, because any display having the same type of communication can be used. Display contrast can be adjusted using the potentiometer in the lower left corner of the development system. LCD display connects to the port B. Following figure shows how to connect the LCD to port B of the PIC16F877 Microcontroller.



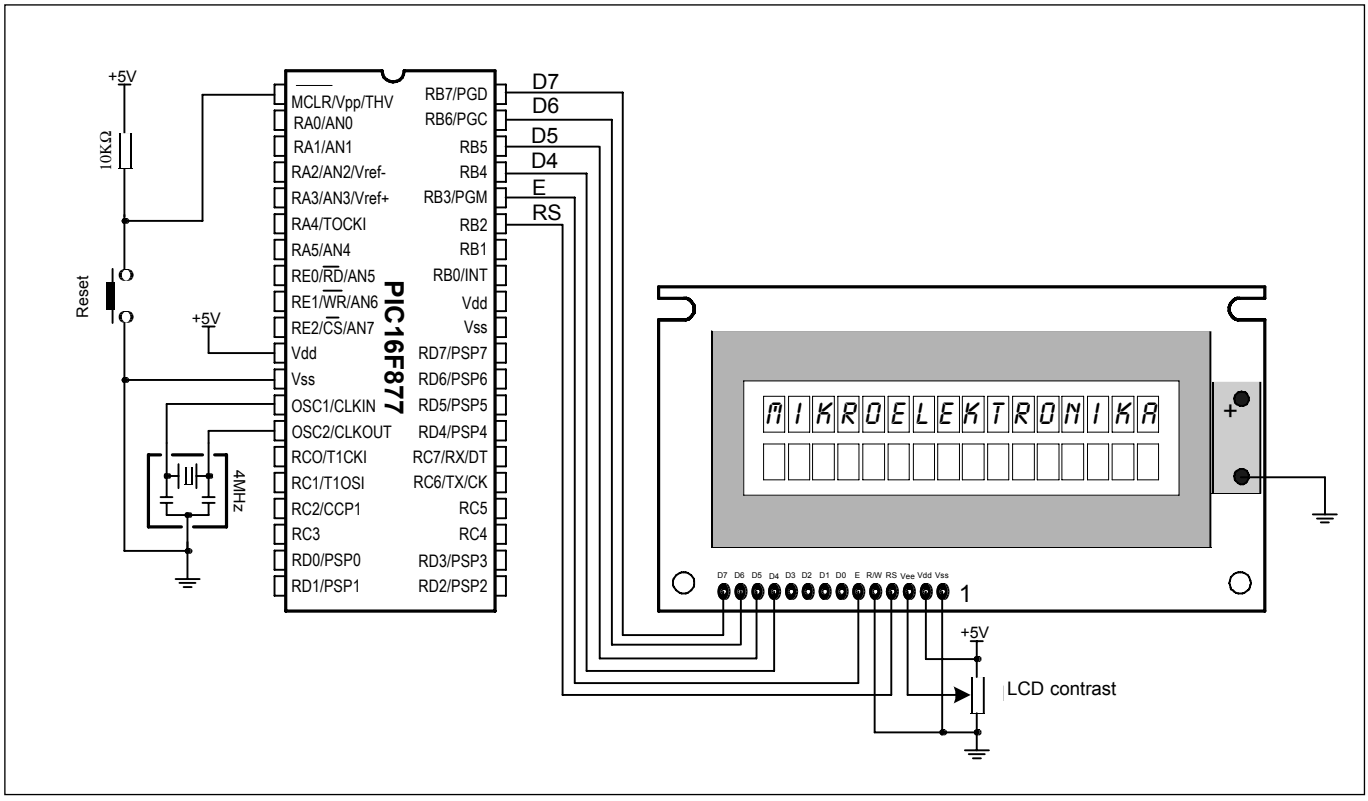
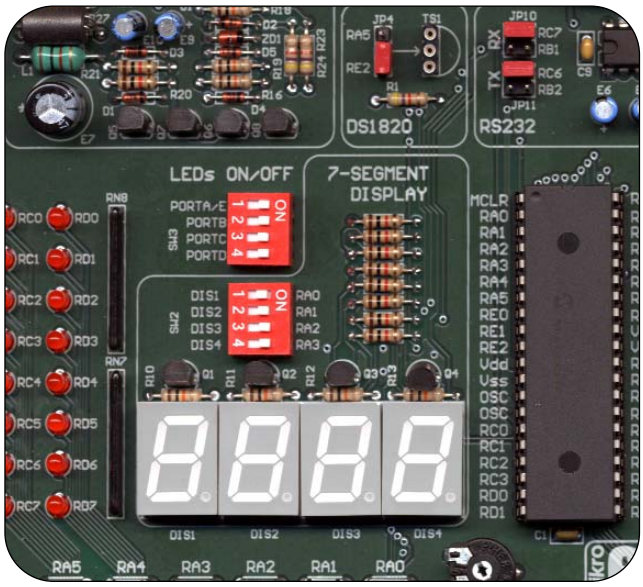


Figure 12.

SEVEN-SEGMENT DISPLAY

Seven-segment display consists of four digits which are refreshed and displayed using port B in combination with port A. Using the DIP switch SW2, you can enable or disable specific digits.

For example, let's assume we need to enable display of the first digit on the left. By turning the fourth switch (SW2) to (ON), digit of the seven-segment display (DIS1, leftmost digit) will be showing value defined by values of port B pins (picture 18). Procedure is similar with digits DIS2, DIS3 and DIS4. The following figure shows how to connect the seven-segment display to the microcontroller.



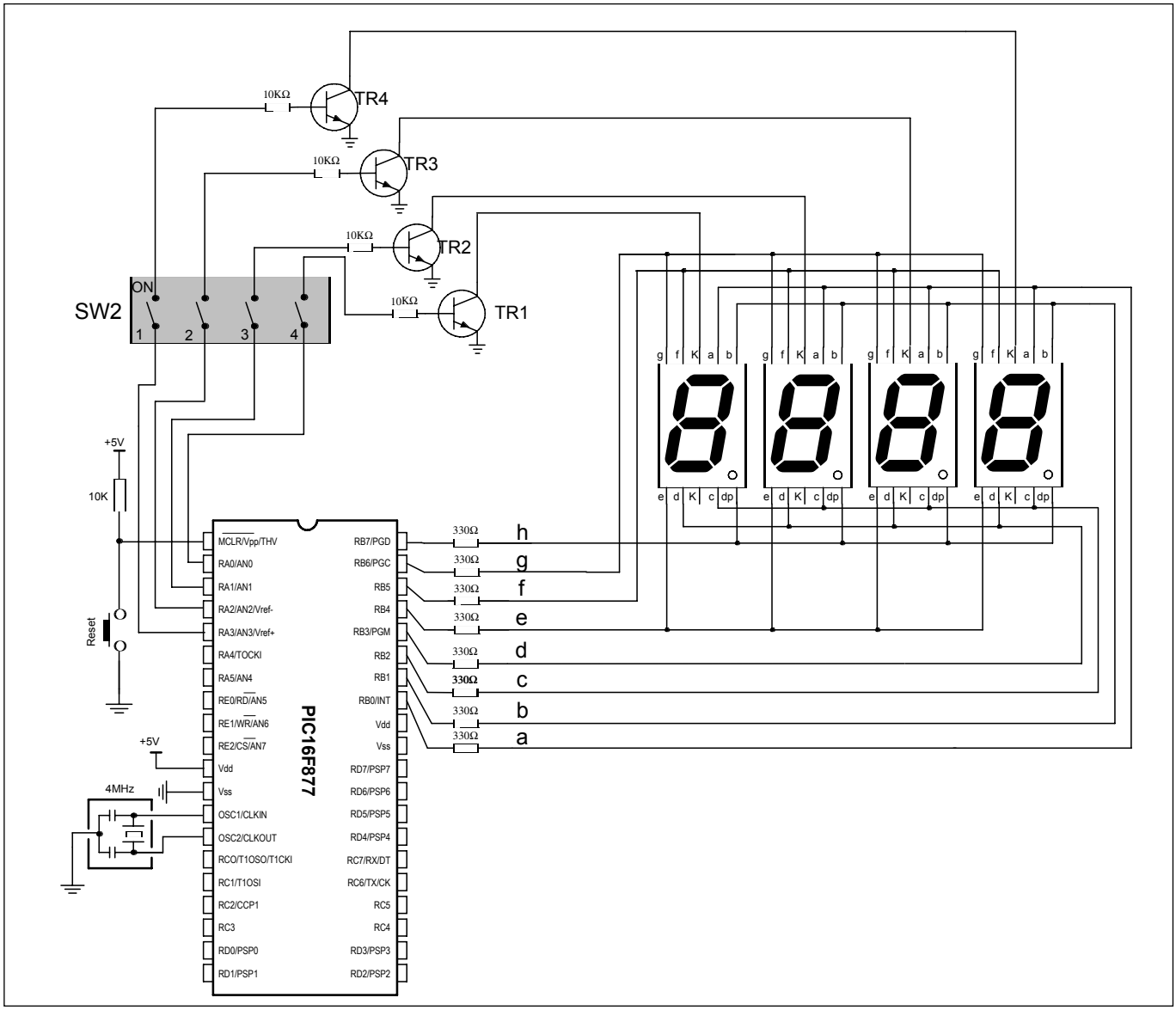
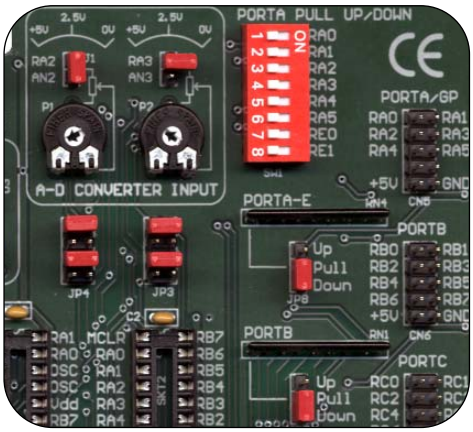


Figure 13.

ANALOG TO DIGITAL CONVERTER

Microcontroller PIC16F877 which is supplied with the system, has implemented 10-bit A/D converter. For presentation purposes, two pins, RA2 and RA3, are pointed out and can be used for measuring voltage set by potentiometers P2 and P3.



If you want to measure values of potentiometer P2, you need to set the jumper accordingly. SW1 switch RA2 must be turned off (lower position). Example from the fig. 20 illustrates measuring voltage of potentiometers P2 and P3, and also shows the position of SW1 switch.

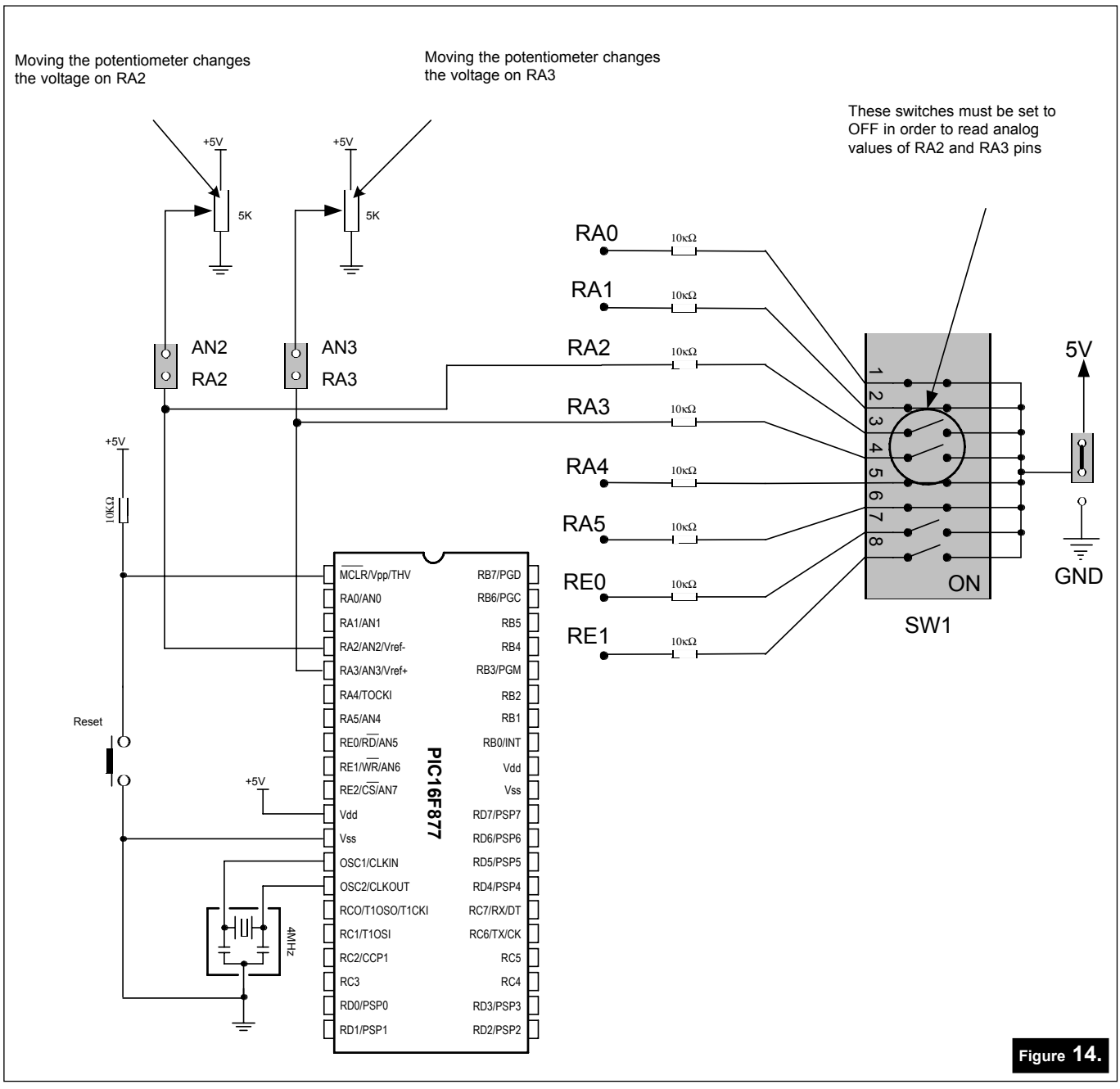


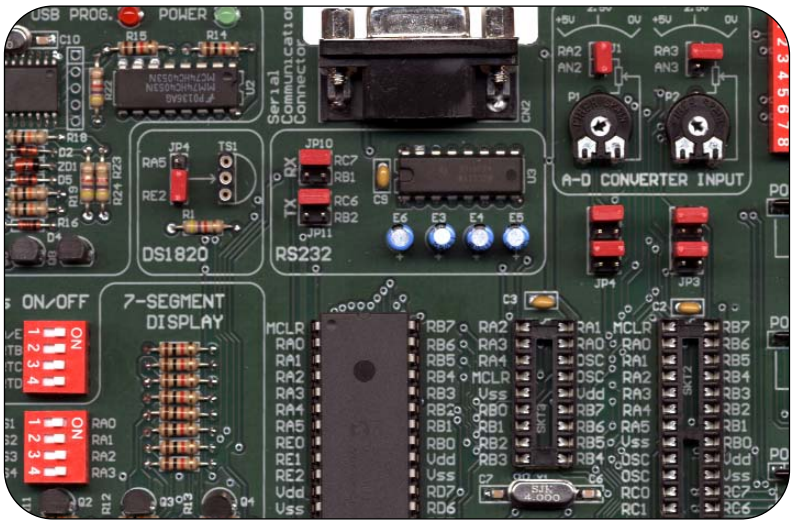
Figure 14.

RS232 COMMUNICATION

RS232 communication is used for communication between two devices within 10m distance. It is commonly used for data transfer with computer.

Jumpers RX and TX select the pin which the communicaton will be attached to. If DIP40 or DIP28 MCUs are used, they should be connected to RC6 and RC7, and in case of DIP18 MCU, use the pins RB1 and RB2.

Figure below shows the connection between computer and the development system.



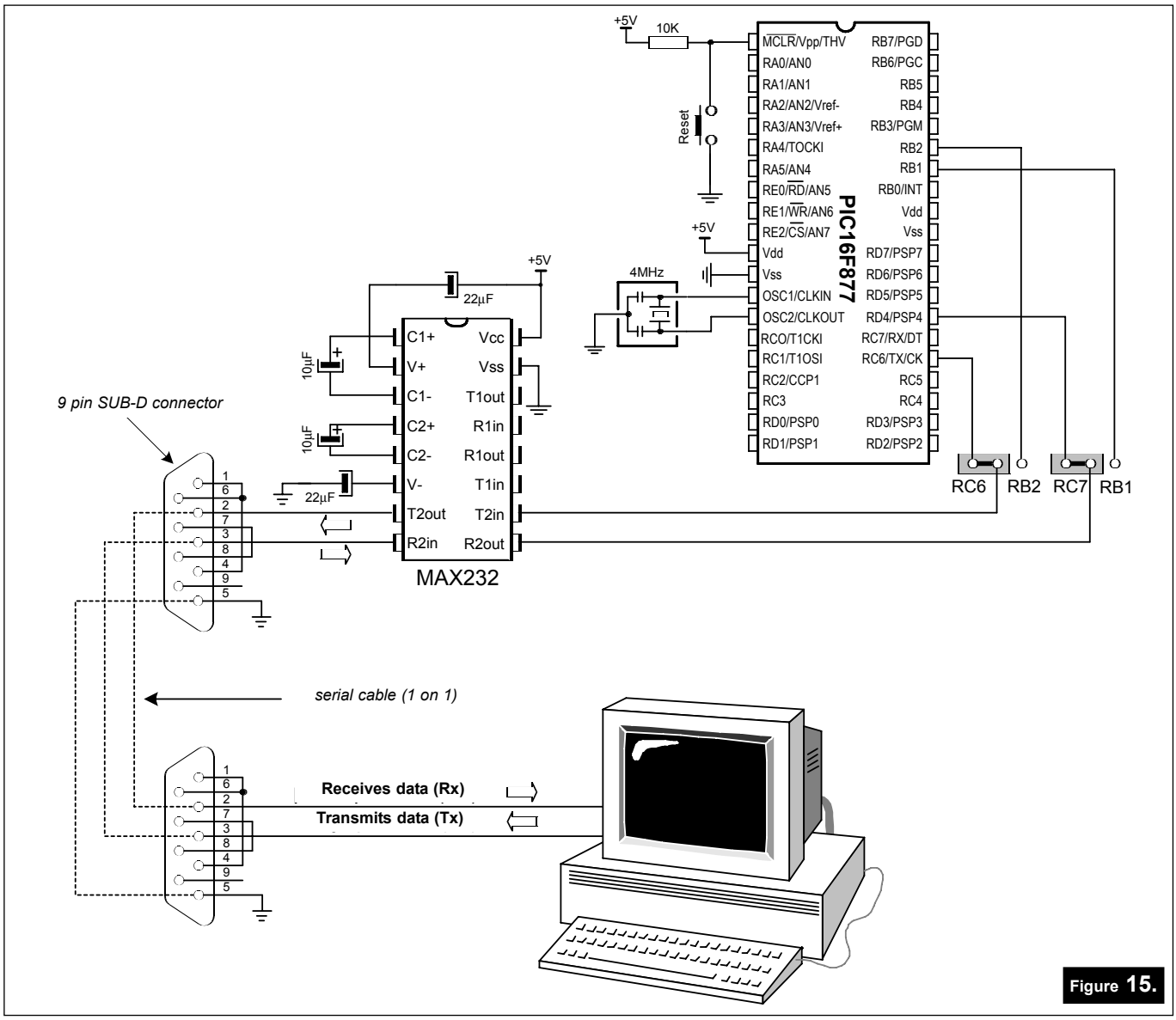
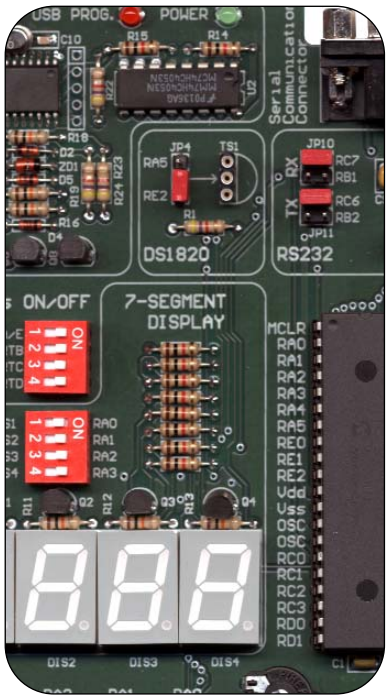


Figure 15.

DIGITAL THERMOMETER DS1820



DS1820 digital thermometer, with temperature range of -55 to 125 C, can be used for measuring enviroment temperature and for experiments. It is very accurate and easy to connect. It plugs in the 3-pin socket, beneath the power connector of the development system. Figure below shows how to connect digital thermometer and the Microcontroller on the development system.

Digital temperature value is sent either to RA5 or RE2 pin, depending on the position of jumper, set above DS1820 chip. Half-circle line drawn on the board marks the orientation of DS1820.

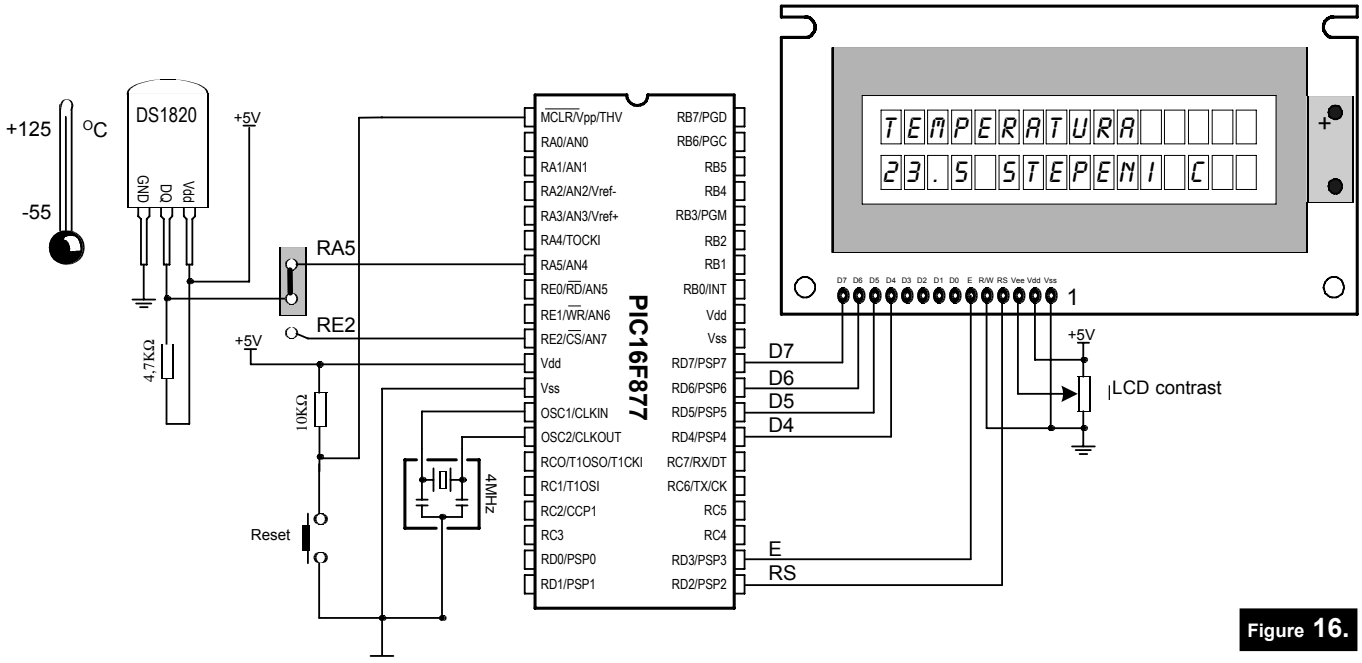
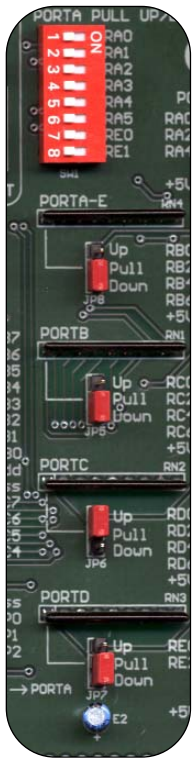


Figure 16.

PULL-UP / PULL-DOWN RESISTORS ON PORTS

Setting jumper to the upper position sets the pins of the appropriate port to logical one (pull-up). If jumper is set to the lower postion, pins are set to logical zero (pull-down).

Figure below illustrates the situation when pins of port A are predefined to logical one and port B to logical zero.



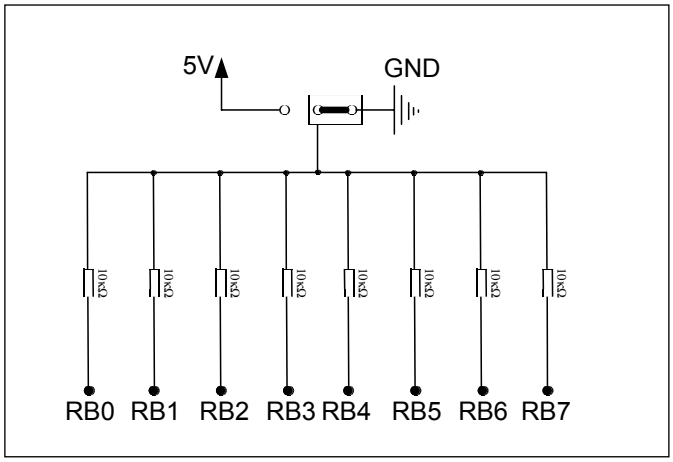
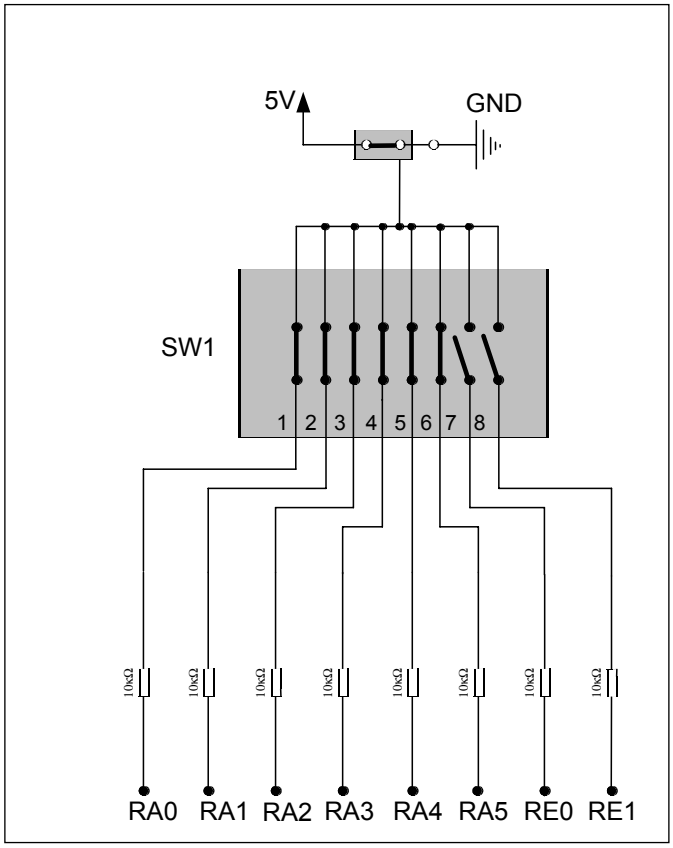


Figure 17.

Port B is on PULL-DOWN resistors, which means that the pins are set to logical zero by default, until we set different values.

Figure 18.



Port A is connected to the resistor network, using SW1. If SW1switch is not in ON position, the appropriate pin has neither pull-up nor pull-down resistor attached. This is very important, because it enables using A port in analog mode as AD converter.

DIP system switches provide great flexibility. Through their use, port pins can be connected to various elements of the system:

SW1- turn on /turn off PULL-UP or PULL-DOWN resistors of A port and RE0 and RE1 pins of E port.

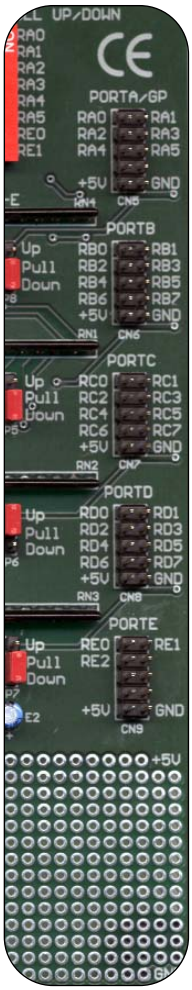
SW2 - turn on /turn off seven-segment displays.

SW3 - turn on /turn off LED diode on A, B, C, D and E ports.

DIRECT ACCESS TO PORTS

All PIC pins can be defined as either input or output.

Port pins can be accessed directly from the right side of the development system by using the flat cable. In this manner, values from external elements can be transferred to ports, both ways.



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