

# 3

## PIC microcontroller project development

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In this chapter, we will look at the hardware and software tools required to develop PIC microcontroller-based projects. We begin by looking at the minimum hardware tools required and explain the function of each tool.

### 3.1 Required hardware tools

A PIC microcontroller is an integrated circuit and as such it is useless unless it is programmed and used properly in an electronic circuit to carry out a certain task. The following hardware tools are normally required before a microcontroller-based project can be developed:

- A desktop or a laptop PC
- PIC microcontroller programmer device
- A solderless breadboard or a similar circuit development board
- PIC microcontroller chip(s) and support components
- Power supply

We shall look at each of these tools in detail now.

#### 3.1.1 PC

One of the most important and perhaps the most expensive tools we need is a PC. This can be a desktop PC or a laptop PC. A laptop PC is preferred as it can be carried around and it provides greater flexibility. The PC must be running one of the current Windows operating systems (e.g. Windows 2000 or Windows XP) and it should be equipped with:

- Hard disk with several Giga-byte free space
- CDROM reader
- Floppy drive
- USB port (see notes in later sections)
- Parallel port (see notes in later sections)

Among other things, such as perhaps the *Microsoft Office*, *Internet Explorer*, *Games*, etc., the hard disk will be required to store:

- A text editor software to develop our programs with
- The PicBasic compiler software

- PIC microcontroller programmer software
- The programs that we develop

Most of the commercial software is nowadays distributed on CDROMs and this is why you will need a CDROM reader on your PC. You will find that some small software may still be distributed on floppies and this is why you may also need a floppy drive.

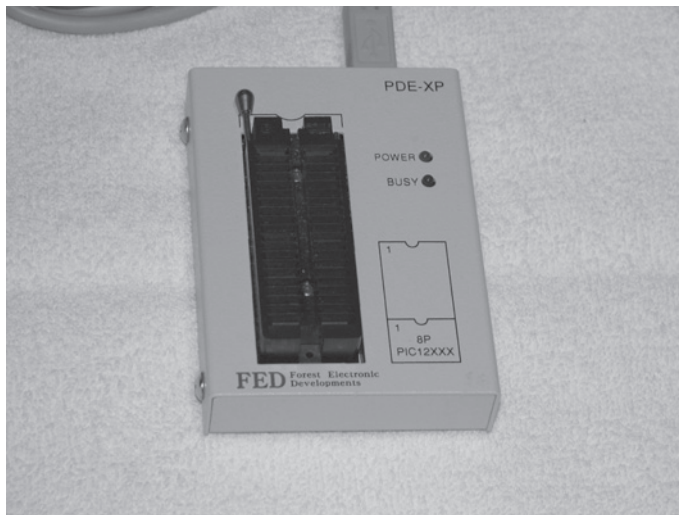
As we shall see in later sections of this chapter, some microcontroller programmer devices are designed to be interfaced to the parallel port (or the printer port) of the PC, while some newer ones are designed for the USB interface. Depending on the type of programmer device you have, you will need either a parallel port or a USB port on your PC. Most laptop PCs are nowadays equipped with only USB ports. If your programmer requires a serial or a parallel port, you can purchase a device to convert between a serial or a parallel interface and the USB.

### 3.1.2 *PIC microcontroller programmer device*

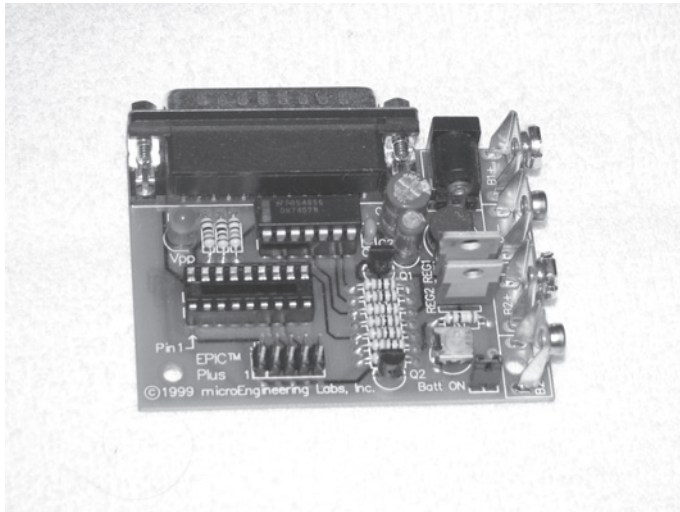
A microcontroller programmer device is a stand-alone unit usually with one or more ZIF (zero-insertion-force) type sockets mounted on it. The device is connected to the PC using either a parallel (or sometimes a serial) cable or by the USB interface. The new programmer devices with the USB interface do not require any external power supply as they are powered from the USB port of the PC they are connected to. The older devices with serial or parallel interfaces require an external mains adaptor for their operation. The size of the ZIF socket determines the types of chips that can be programmed by the device. Some sockets are 40-pin which can be used to program microcontrollers with 40, 24, 20, 18, and 8 pins. Some programmer devices have sockets with only 18 pins and they are designed to program smaller microcontrollers with 18 or less pins.

Figure 3.1 shows a typical PIC microcontroller programmer device based on a USB-type interface. This device is distributed by Forest Electronics Ltd. in UK (website [www.fored.co.uk](http://www.fored.co.uk)) and is known as the *FED Programmer*. The programmer has a single 40-pin ZIF socket mounted on it. Microcontrollers with 40-pins (e.g. PIC16F877) can be programmed by placing them directly on the socket and closing the handle. Devices with less number of pins (e.g. PIC16F84) are normally placed at the far end of the socket near the handle. The Programmer in Figure 3.1 has the advantage that it can program a very large variety of PIC microcontroller chips. The programmer device is sold for around £99 in UK and includes a USB cable.

A PIC microcontroller programmer device designed to operate with the parallel port is shown in Figure 3.2. This particular device is known as the *EPIC Plus* programmer and it can be purchased from the developers of the PicBasic/Pro compilers (microEngineering Labs Inc.) or from many other electronic component distributors. *EPIC Plus* is a low-cost programmer with an 18-pin socket on the device. There is no ZIF socket on the device and a standard DIL (dual-in-line) socket is provided. The programmer is connected to the parallel port (the printer port) of a PC using a 25-way DB25 type cable. If the parallel port of your PC is connected to the printer, the



**Figure 3.1** USB port-based PIC microcontroller programmer device



**Figure 3.2** Parallel port-based PIC microcontroller programmer device

printer must be disconnected while you are using the programmer. *EPIC Plus* is powered from a 12–15 V DC mains adaptor.

Some microcontroller programmer devices have multiple ZIF sockets, also called gang programmers. These programmers are usually used to copy the same program to a number of devices at

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