



QST



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Title: PIC Resources (sidebar to Using PIC Microcontrollers in Amateur Radio Projects)

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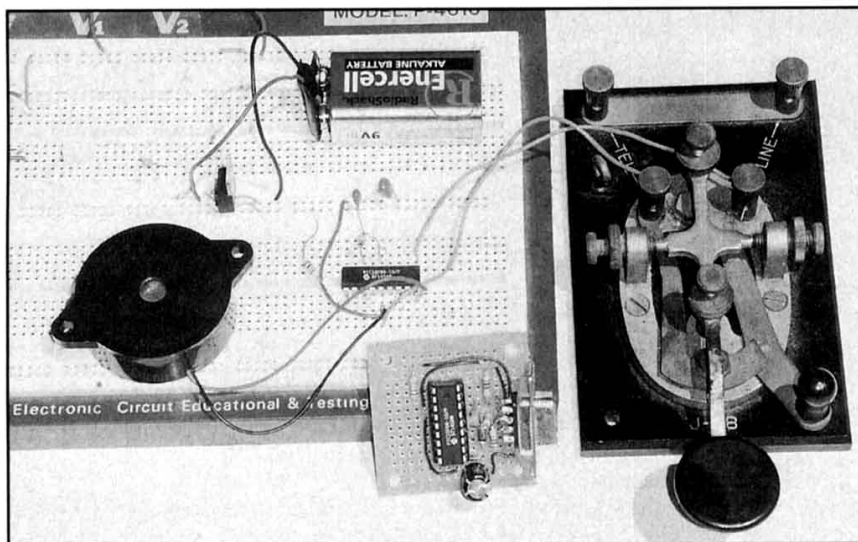
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CPO on a breadboard—keyed by one of the famous J-38s. A perfboard version of the Ludwig Catta (Ludi) PIC programmer is in the foreground.

assembly language files to HEX files is available from Microchip itself. Called *MPASM*, it is easy to use—best of all, it is *free*! You can obtain *MPASM* from Microchip's Web site (see note 14). You can write the assembly language instructions using any editor that handles plain ASCII text (such as *Windows' Notepad* or DOS's *Edit*), then use *MPASM* to compile the code into a HEX file.

You also need software to load the HEX file into the PIC. The best program I've found for doing this is called *PIX* (see note

15). It supposedly is a DOS program, but I've had trouble getting it to run when my computer is booted in MS-DOS! However, *PIX* runs fine when I run it in a DOS box within *Windows* (that's a switch!). To get *PIX* to work with the programmer of Figure 2, first edit the *PIX.CFG* file that comes with the program. Find the two lines that say:

```
Port=LPT1
and
Programmer = Shaer
```

Place a semicolon at the start of each

line. Then find the line that says:

```
;Programmer=Ludi
```

and remove the semicolon. Next, add a line that says:

```
Port=COMx
```

where *x* is the number of the serial port to which your programmer is connected.

It is important to use a *short* serial cable to connect your programmer to your computer. In building the programmer in Figure 2, I simply glued a female DB-9 connector onto the programmer itself and then plugged the programmer directly into the serial port on my computer. In any case, do not use a cable longer than about a foot.

When you run the program with the simple PIC programmer hooked up to your serial port, you will probably see a dialog box that says, **MODEM DETECTED OR NO/BAD HARDWARE. NOT TRUE CONTINUE.** Highlight the answer **YES** and press **ENTER**. The program will then start. This program allows you to read and write code to PICs and erase PICs. It will even disassemble the HEX code to show you the assembly language instructions. Pressing function key **F3** allows you to load your HEX file into the *PIX* program. When you press the **F9** key, the program loads into the PIC.

In summary, you use an ASCII text editor to write your assembly language instructions and save the file with an ASM extension. Then, use *MPASM* to assemble the ASM file into a HEX file. Finally, use *PIX* to load the HEX file into your PIC. To test your program, simply plug the programmed PIC into the completed target circuit and apply power. It should automa-

PIC Resources

Books

Benson, David, *Easy PIC'n: A Beginner's Guide to using PIC 16/17 Microcontrollers* (Kelseyville, California: Square 1 Electronics, 1996). It's a good introduction to PIC chips and assembly programming.

Benson, David, *PIC'n Up the Pace: PIC 16/17 Microcontroller Applications Guide* (Kelseyville, California: Square 1 Electronics, 1997). Essential reading if you are serious about learning assembler. If you plan to use a *C* or *BASIC* compiler, you need not have this book.

Predko, Myke, *Programming and Customizing the PIC Microcontroller* (New York, McGraw-Hill, 1998). Somewhat more advanced, this book contains a good discussion of the PIC architecture and lots of projects.

Peatman, John B., *Design With PIC Microcontrollers* (New York: Prentice Hall, 1997). This is a well written college-level text on PIC microcontrollers.

PIC Programmers

PIC-1A—Parallel-port programmer for all 16x6/16x7/16x8 chips. Available from ITU Technologies, 3704 Cheviot Avenue, Suite 3, Cincinnati, OH 45211, tel 888-448-8832, 513-661-7523, fax 513-661-7534; e-mail sales@itu-tech.com; Web site <http://www.itu-tech.com>. Kit: \$39; wired and tested, \$59. Add \$9 for a ZIF socket. I have found this firm's customer service to be excellent.

For about \$20, you can build more complex programmers that are similar to the ITU unit. See, for example David Tait's Web pages:

<http://www.man.ac.uk/~mbhstdj/files/index.html>
<http://www.man.ac.uk/~mbhstdj/piclinks.html>

Compilers

PCM, a *C* compiler available from Custom Computer Services, Inc, PO Box 2452, Brookfield, WI 53008; tel 414-781-2794 ext 35; <http://www.ccsinfo.com/picc.html>; price, \$99.

Hi-Tech's PIC *C* compiler. Although this compiler is too expensive for most of us (\$850), a working demo is available for free that will compile small projects. Hi-Tech Software, LLC, Suite 105, 7830 Ellis Rd, Melbourne, FL 32904; tel 800-735-5717; <http://www.htsoft.com/>.

PicBasic Compiler, a *BASIC* compiler available from microEngineering Labs, Inc, Box 7532, Colorado Springs, Colorado 80933; tel 719-520-5323; <http://www.melabs.com/mel/>. Price: \$99.95.

PIC Chips and Other Parts

Digi-Key Corporation, 701 Brooks Ave S, Thief River Falls, MN 5601-0677; tel 800-344-4539; <http://www.digikey.com>. Digi-Key also stocks ceramic resonators and ZIF sockets.

ITU Technologies, see information above.

JDR Microdevices, 1850 South 10th St, San Jose, CA 95112-4108; tel 800-538-5000; <http://www.jdr.com>.

[Author's note: This is not an exhaustive list of resources. There is a wide range of resources available for PICs including complete development environments that sell for over \$2000. I have focused here only on those resources that are within the budget of a typical amateur.—John Hansen, W2FSJ]