

**CHIPS Newsletter Vol 1**

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# CHIPS newsletter

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**Official Newsletter of**  
**Chuck Hellebuyck's Electronic Products**  
[www.elproducts.com](http://www.elproducts.com)

**New Book Coming Soon:**

My latest book to be released is a compilation of my 2007 Nuts & Volts magazine articles. This book picks up where my previous book Getting Started with PICs - 2006 left off. If you missed my past articles in Nuts and Volts or want copies of them, this book is a great way to get them in a bound form. Watch for its release sometime in November 2009.

**Getting Started with PICs - Volume 2**  
**A collection of 2007 Nuts & Volts Magazine Articles**

The index is below:

**Introduction****January 2007 - PIC12F675 Replaces the 555 Timer****February 2007 - Quick and Dirty Hockey Scoreboard****March 2007 - In-Circuit Serial Programming****April 2007 - PIC vs PIC Speed Test****May 2007 - 8/14/20-Pin PIC<sup>®</sup> Microcontroller Family****June 2007 - C Language Introduction****July 2007 - Hot Wheels Drag Race Finish Gate****August 2007 - BasicATOM In-Circuit Debugger****September 2007 - Large Digits on a 4x20 LCD****October 2007 - PICKit 2 Starter Kit vs. PICKit 2 Debug Express****November 2007 - PICBASIC PRO, EXCEL and the BEGINNER****December 2007 - Stocking Your Lab****Conclusion**

## Update on PICkit:

In my book "Beginner's Guide to Embedded C Programming" books I use the Microchip PICkit 2 Starter Kit as the hardware. This starter kit is still sold by many sources but recently Microchip released a new programmer called the PICkit 3. As new parts are released by Microchip, I'm told PICkit 3 will support those parts but PICkit 2 may not. So far a PICkit 3 version of the starter kit using the same board as the PICkit 2 starter kit is not released so I continue to recommend the PICkit 2 Starter Kit for use with my book. I have received email asking if the PICkit 3 will work in the place of the PICkit 2 and the answer is yes. The operation is the same for both programmers. The only limitation is the PICkit 2 has a standalone application that allows you to use the programmer outside of the MPLAB environment. The standalone application has a UART tool built in which I use in one of the projects in Volume 2. If you use the PICkit 3 you cannot complete that project as written. That is the only limitation I'm aware of.



## PICBASIC PRO Basic Compiler:

microEngineering Labs recently updated their PICBASIC PRO compiler that I use in many of my Nuts & Volts Magazine articles. The update does two things:

1) They added the capability to run within the latest MPLAB environment from Microchip. The previous version was limited to MPLAB version 8.15 or earlier but now you can run with the latest MPLAB (version 8.36 as I write this). The special setup requirements are detailed at the link [www.melabs.com/support/mplab.htm](http://www.melabs.com/support/mplab.htm).

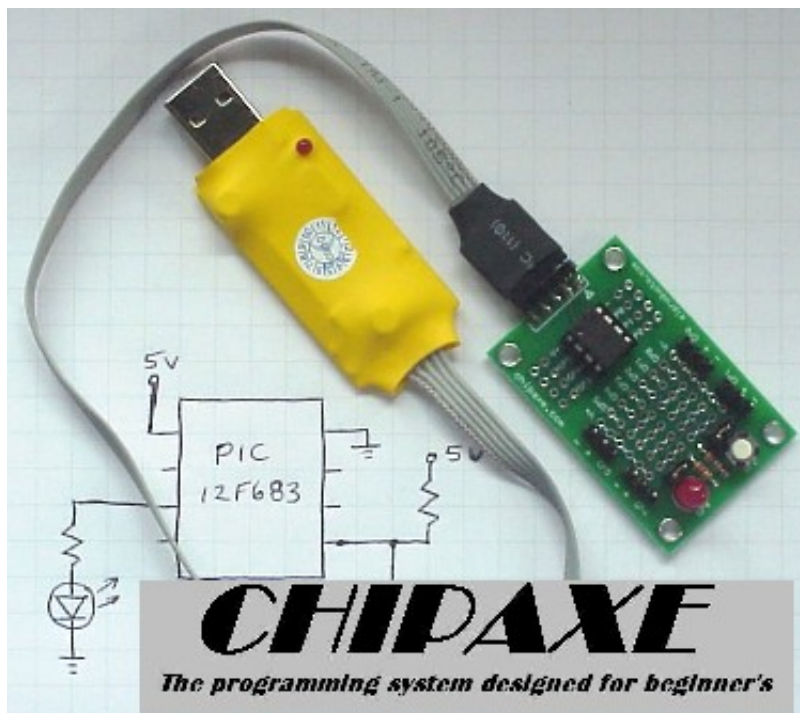
2) The other update involved the 31 command line demo version of the PICBASIC PRO compiler. microEngineering Labs added the 16F88x family of parts to the supported list. This is a great addition as these parts have an internal oscillator and internal MCLR option. They are the upgrade family to the 16F87xA parts I often use. With the internal oscillator and internal MCLR you only need to supply power and ground to the micro to get your application running. This is a great step up for those learning to program with the sample version.

I'm also working on a new book dedicated to PICBASIC PRO so watch for that in early 2010.

## CHIPAXE Programming System

I was asked to write some project books for a new entry level development platform called the CHIPAXE Programming System. If you want to get started programming PIC microcontrollers and want to start simple then the CHIPAXE system is perfect. They use the sample version of the PICBASIC PRO compiler, a small PICkit 2 programmer clone and a series of small breadboard modules to create a low cost starter kit. The great advantage to this when compared to systems such as PICAXE, Basic Stamp or Arduino is this setup can be used with any BASIC compiler, C compiler or even Assembly program written for the Microchip PIC parts. CHIPAXE isn't a

custom part with special bootloader installed, its just a special programming adapter and low cost programmer/cable that programs off the shelf PIC parts. By using the PICKit 2 clone programmer gives you a lot more options for a very little added cost. Look for more of the CHIPAXE boards in my future books. You can get more information at [chipaxe.com](http://chipaxe.com) but beware; they are just getting started so their website is evolving.



## HI-TECH C Compiler

The HI-TECH company was recently purchased by Microchip so the HI-TECH PIC10F,12F,16F compiler I use in my books "Beginner's Guide to Embedded C Programming" Vol 1 and 2 is now a Microchip compiler. The compiler comes in three versions: Lite, 45 day eval and the full purchased version. The lite version works with all the various 10F, 12F and 16F parts without any code size limitations other than the size of the memory in the part you are using. The only limitation is the lite version doesn't have the optimization feature that the full version does. This means your code will probably take up more space than if you purchased the full compiler. If you want to test out the full version with optimization before you buy it, then the 45 day version will allow you to do that.

The HI-TECH PIC10F,12F, 16F C Compiler will install automatically when you install the Microchip MPLAB design environment which you can download for free from [Microchip.com/mplab](http://Microchip.com/mplab).

## Basic Atom

BasicMicro.com continues to offer the Basic Atom microcontrollers that I used in my book "Programming the Basic Atom Microcontroller". The new Nano chips offer you a lower cost option to use the Atom software. You can download the Atom programming software which

includes the Basic Atom compiler so for the cost of the chip and a few external parts you can get started with it rather quickly. To make it easier I designed a development board for the book that is now sold through my friends at [www.BeginnerElectronics.com](http://www.BeginnerElectronics.com).



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## In-Circuit Serial Programming (ICSP)

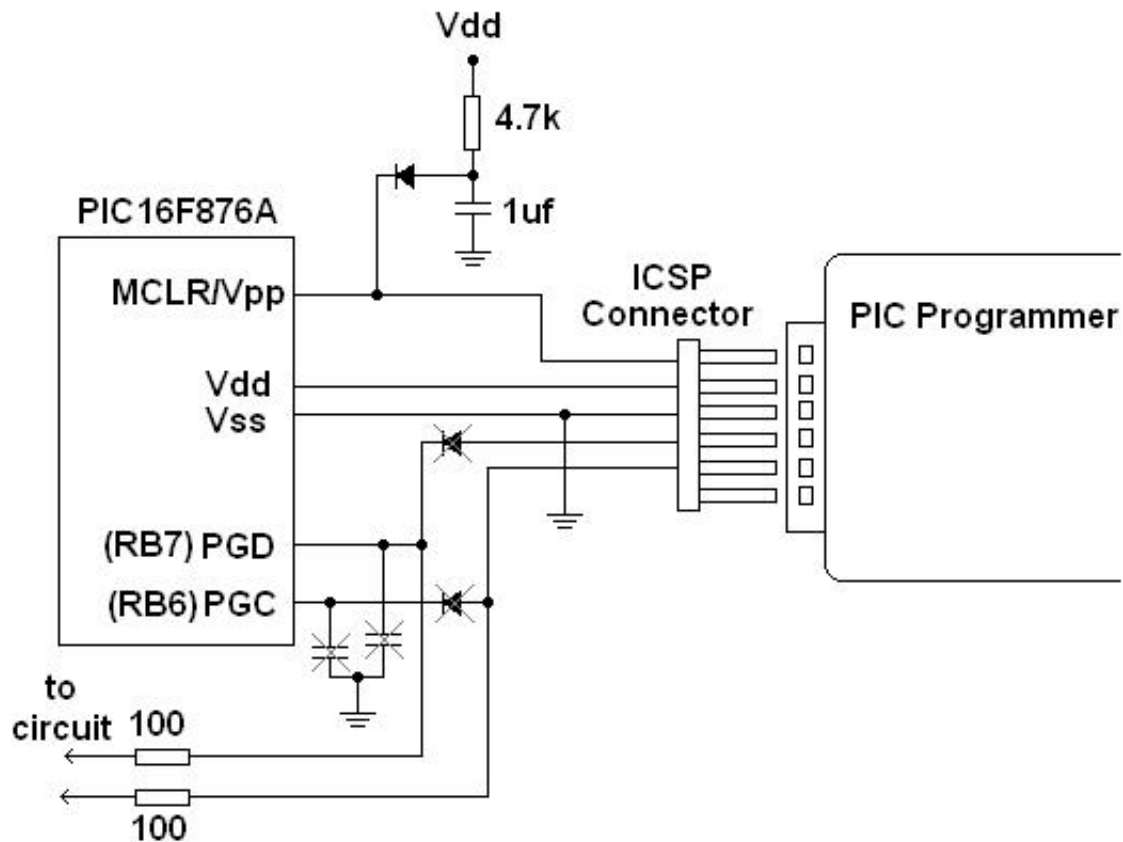
I've had a few people ask me what ICSP is. It's the In Circuit Serial Programming (ICSP) method that most PIC programmers, including the PICkit 2, use to load the program into a Microchip PIC microcontroller. Let me explain how the connections work.

The PICkit 2 has only five or six connections to the development board for powering the board and for programming the PIC microcontroller. Two of the connections are power and ground. Some programmers like some clone PICkit 2's only have 5 connections. For those that have six, the extra pin is for calibrating the internal oscillator on some PIC's. This is rarely needed so many clones leave it off. This leaves three connections that all programmers have and are specifically for programming the code into the microcontroller. All of these programmers use these three pins in a serial method of programming called In-Circuit Serial Programming (ICSP). Having only a few connections to your circuit board can be very handy so I wanted to explain how to use the ICSP feature.

The main advantage to ICSP is the ability to program the PIC in-circuit. The biggest hang-up you may have with ICSP is the serial communication signal can get affected by the circuitry connected to the PIC I/O. For example, the three connections used to program a PIC in-circuit are: Vpp (MCLR pin), Data (PGD pin) and Clock (PGC pin). If the Clock or Data signals are not able to send the correct signal, the PIC will not program properly and you will get a verify error. If you build your own development board or connect circuitry to the programming pins of the PIC then you may affect these signals. There are recommended connection methods from Microchip so let me explain those.

### ICSP Hardware Interface

The schematic in the figure below shows the ICSP connections and all the possible connection issues to watch out for in your design. Because of the way the ICSP feature works, you don't want to add any capacitance to the programming connections since this can delay the signals. Even the capacitance on the Vdd line should be monitored per the PIC programming specification. The PIC programmer actually cycles the Vdd line off and on while sending the Vpp signal to the MCLR pin. This is done to put the PIC in programming mode. If there is too much capacitance, it may slow the signal down and not meet the programming specs. You can get the programming specs for any PIC microcontroller at the [Microchip.com](http://Microchip.com) website.



You also don't want to load down the clock or data signal. The components that are crossed out show what could affect the signal. The diodes on the Data and Clock lines are a mistake because two-way communication occurs when programming and verifying the part. These are pretty easy to see why they should not be included in your design.

What isn't quite so clear is the diode between the MCLR reset circuit and the MCLR/Vpp pin. This is recommended because the PIC programmer sends a high voltage, low current signal to the Vpp line of around 12v -13.5v for a short period of time. You don't want that signal feeding into your Vdd regulator so the diode helps protect for that. This is actually just an extra safety precaution though because the current entering the MCLR pin is extremely small and the MCLR pull-up resistor will knock it down to prevent any damage. In most cases you can get by without the diode.

Another recommendation which is often missed is the series resistors on the PGD and PGC lines between the PIC and the rest of the circuit. These isolate your circuit from the PGD and PGC signals so your circuit doesn't load down the PIC programmer. This is usually where a problem may occur with ICSP. One hundred ohm resistors should not affect your circuit function but it should be plenty of resistance to isolate the programmer.

What is interesting is the development board included with the PICkit 2 Starter Kit only includes some of these protections. You have to make sure you don't add circuitry to the data and clock lines that might affect the programming operation. Therefore it is best to add the 100 ohm resistors to your circuit if you use those I/O pins in your design.

I cover more on this topic in the April 2007 chapter of my soon to be released book "Getting Started with PICs - Volume 2"

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## Conclusion

That's it for Volume 1 of the CHIPs newsletter. I hope I passed on some useful information. Email your ideas for other topics you'd like covered in future newsletters to [chuck@elproducts.com](mailto:chuck@elproducts.com). Thanks for subscribing.

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