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Topic

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Beginner's Guide to Embedded C Programming - Vol 3

The final cover is done. The text is written. The first proof is being printed. I have run into delays before but none as frustrating as what's happened over the last 3 months. I have been pulled away from writing so many times for personal and professional reasons. All this did was delay my newsletter release (I obviously missed March) and also the release of my latest book. Once the proof is approved (assuming no corrections are required) the book will hit the market within weeks.

Beginner's Guide to
Embedded C Programming
Volume 3
Creating the SimpleC Library of Functions
PIC16F886
PICkit 3
Using the PIC® microcontroller and the HI-TECH C® Pro Lite Compiler
Chuck Hellebuyck

Volume 3 Book Cover

HI-TECH Version 9.81
Microchip recently updated the HI-TECH C compiler for 10F, 12F and 16 parts to version 9.81 and in this update they made a change that affects all the code in my Beginner's Guide to Embedded C books. They made a change to the register names to match the data sheet exactly. These definitions are contained in the various header files for the different microchip PICs. This is a good move overall but for those using programs written for the previous versions, 9.80 and earlier, this causes many errors to appear when the project is compiled. This has resulted in many emails back to me regarding this exact issue as my books were written to use 9.80 or earlier. There is a simple fix thankfully. By adding the one line below at the top of the program (it has to be the first line) all the original header files are used instead of the new definition files. If you have experienced this issue, this is the fix.

```
#define _LEGACY_HEADERS
```

For example here is how its used in a program from my book Beginner's Guide to Embedded C.

```
#define _LEGACY_HEADERS               // Define required for compiler version 9.81 and later
#include <htc.h>                    // Include HITECH CC header file

//Internal clock, Watchdog off, MCLR off, Code Unprotected
__CONFIG (INTIO & WDTDIS & PWRTDIS & MCLRDIS & BORDIS & UNPROTECT & IESODIS
& FCMDIS );

main()
{
ANSEL =     0;                      // Intialize A/D ports off
CM1CON0 = 0;                        // Initialize Comparator 1 off
CM2CON0 = 0;                        // Initialize Comparator 2 off
PORTC = 0x00;                       //Clear PortC port
TRISC = 0x00;                       //All PortC I/O outputs
while(1==1)                         //loop forever
{
                RC0 = 1;                        // Turn on RC0 LED
}                //End while
}                //end main
```

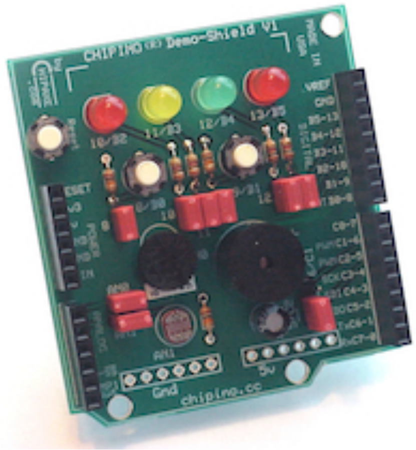
If you don't like this method, there are other options to fix this as well using MPLAB setup screens spelled out in the readme file included with the HI-TECH installation. Some have chose these alternative methods. One person even re-wrote the header files back to the original names. It's been interesting how different this was approached by my readers. It also shows there isn't one right way to solve a software issue.

MPLAB 8.66

Microchip recently released MPLAB 8.66 which offers to automatically install HI-TECH version 9.81. Therefore I will be recommending that earlier versions of MPLAB be used with my existing books. Thankfully Microchip offers an archive site so I will be posting the link on my website to MPLAB 8.63 which is the latest MPLAB release that offers to the install HI-TECH 9.80. I have to do this to support all the books sold that I cannot change. Any future books will use the 9.81 version. Volume 3 will rely on the #define mentioned above. The link to MPLAB 8.63 is below:
http://ww1.microchip.com/downloads/en/DeviceDoc/MPLAB_IDE_v8_63.zip

Demo-Shield Released

A new shield for CHIPINO and Arduino style modules was released by chipaxe.com called the demo shield. I really like this one because it gives me the basics any beginner project could need. It includes four LEDs with different colors so you can reproduce a traffic light. Two momentary switches with one connected to the interrupt pin on the CHIPINO. A thumbwheel potentiometer and also a photoresistor both connected to ADC pins on the CHIPINO/Arduino analog header. Finally a piezo speaker connected to the PWM pins so creating an audible warning or feedback from pushing a switch can be created. Driving these fundamental items allows a user to learn digital input/output along with analog input and output from a microcontroller. This will definitely be used in some of my future books on programming.



CHIPINO Demo-Shield

One nice feature is each item has its own jumper that allows you to disconnect it from the I/I header. If you need an LED on pin 10 and 11 but have other functions running another shield on 12 and 13, you can pull the jumpers from 12 and 13 so there is no interference.

CCS Free Compiler

Any time I can find a free version of a compiler, I like to recommend it. It's a great way to try out the compiler before buying it. It also gives me a great base to create a book from. If someone can learn to program from one of my books without having to spend a lot of extra money on software, parts or programmers, then I like it. The CCS C compiler (ccsinfo.com) is the latest one I would like to recommend you check out. Here is how you can get a free demo version.

If you have a PICkit 2 programmer from Microchip then load up the CD included with it. On the CD are all the support files for the PICkit 2 Starter Kits including the PICkit 2 debug starter kit that uses a board with a PIC16F887 soldered in place. To help support this board a sample version of the CCS compiler is included on the CD to supports the PIC16F887 only with a 2k code limit. This isn't a lot of space but enough to allow you to do many simple projects to see how you like the compiler. The PIC16F887 is a 40 pin part so you'll have to find a demo board that supports that part or purchase the PICkit 2 Debug Express demo board it was intended for.

MPLAB also includes a free version of the CCS baseline compiler that is installed with MPLAB. This is a full version not a sample version as I understand it. It only supports the baseline (12bit address core) PICs which includes many of the 10F, 12F and some 16F parts. Microchip designates these as baseline parts as they are very basic microcontrollers and none of them have program space larger than 2k. Many of these don't have interrupt capability and also don't have a lot of hardware peripherals but these are great parts for many small projects. This means they rely heavily on what you can do in software and that is where CCS is very handy. They have all kinds of software functions that can create serial communication, and other I/O control in software. I haven't worked with this compiler enough to give you a great feature summary but I know many software developers who love this compiler. The 16F57 is a 28 pin part that should plug directly into the CHIPINO module so I plan to create a mini book for that in the future. If you have MPLAB installed, the CCS compiler can be found in the Third Party folder (c:\program files\microchip\third party). You can get more info on the CCS compiler at ccsinfo.com.

The full list of baseline PICs are below.

PIC10F200

PIC10F202

PIC10F204

PIC10F206

PIC10F220

PIC10F222

PIC12F508

PIC12F509

PIC12F510

PIC12F519

PIC16F505

PIC16F506

PIC16F526

PIC16F54

PIC16F57

PIC16F59

PIC32 BASIC Compiler
Speaking of compilers, Mikroelectronica has released one of the first commercial BASIC compilers for the PIC32 processor. Their website is mikroe.com. I have downloaded the sample version but haven't had any time to use it yet. If you are interested in this compiler I suggest you check it out and email me what you find. It's on my ever increasing list of things I want to try. They also make a C and Pascal compiler for this and the PIC24/dsPIC33 along with 8-bit (10F,12F,16F and 18F) support. Their claim is their compilers all work on the same structure and format so moving from 8-bit to 32 bit is easy. I have not tested it but if that is true that is a real advantage to someone who develops code professionally that needs to work with all the various PICs.

Conclusion

I get people asking for back issues of this newsletter. This newsletter software that I use is great for managing the sign-up and distribution but offers no easy way to offers back issues for members to download. I'm working on compiling them into a single pdf file in a members only area. I'll let you know more about this in the near future. Keep the emails coming. I've also had requests for specific projects and also new topics like analog parts and circuits outside of the microcontroller world. These are great ideas and I'm working on including that type of content but my original intent for the newsletter was to update readers on all the cool stuff I find for the home hacker/hobbyist who likes to build microcontroller based projects and help them get started. I had a column in Nuts & Volts magazine that had that same type of focus but when they decided to cancel the column I had to find a way to get my message out. Unfortunately projects take a lot of time and I don't spend a lot of time searching for analog parts so these will show up when I can fit them in. Since the newsletter is free, it often get shoved aside so I can assist those who've bought my books or get to work on writing my next volume. I do appreciate my members though and I am sorry for the missing March but I should have more helpful stuff to share in May. Email me any feedback at chuck@elproducts.com.

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