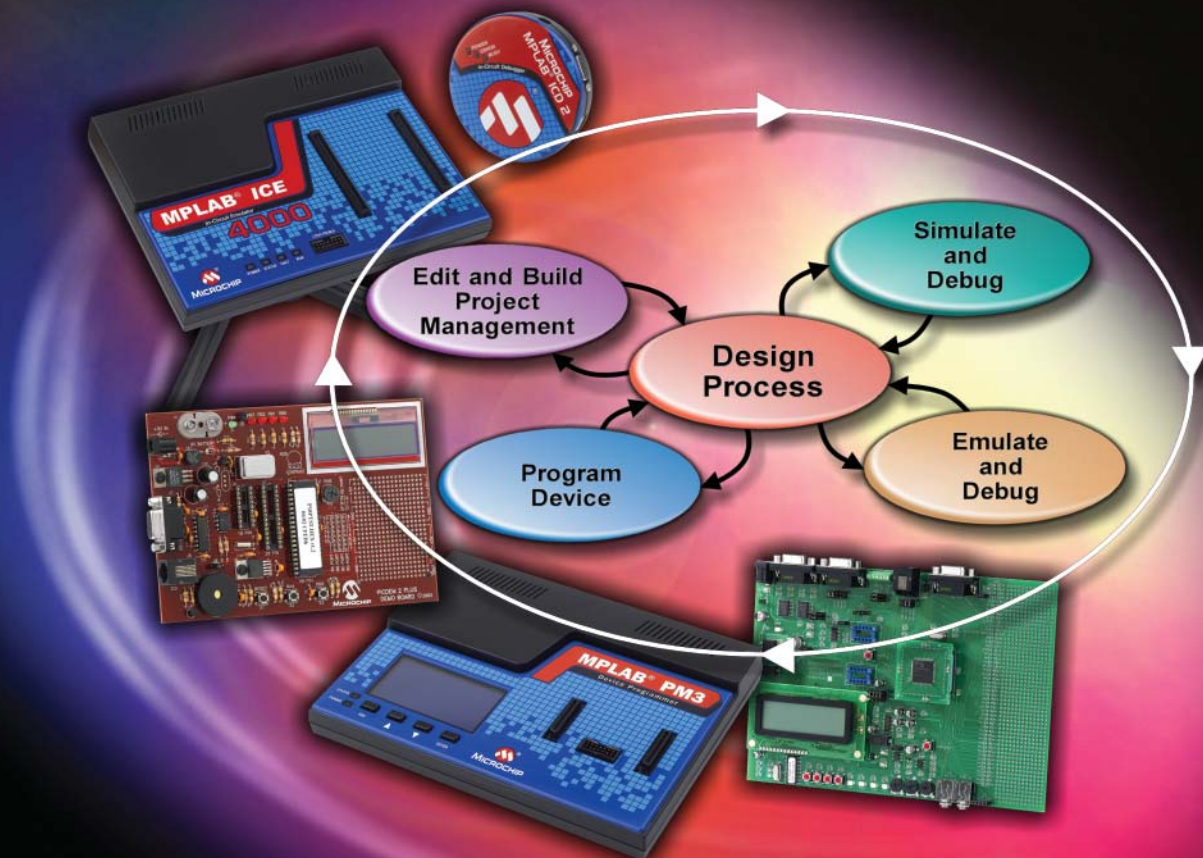




Integrated Development Environment

Transforming Ideas Into Realities ...

The typical product development life cycle is comprised of smaller cycles – each representing an iterative process toward designing and refining an embedded system application. MPLAB® IDE is designed to get through all these cycles with an integrated application. From the conceptual design, through coding, debugging and programming, MPLAB IDE helps engineers focus on important details, and correlate information from the design phase through the debugging, optimization and programming phases.



Integrated Development Environment Software Tools

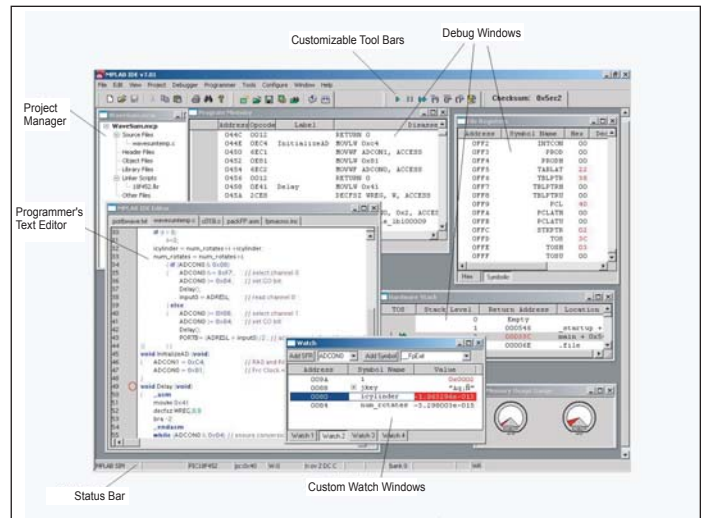
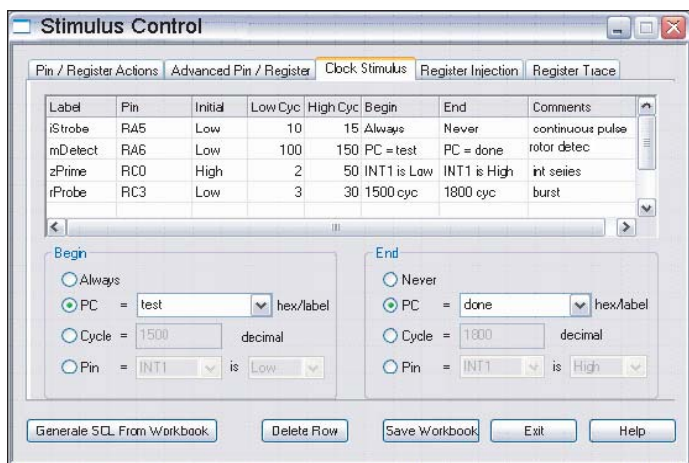
Microchip Technology has established a reputation for its comprehensive set of world-class, low-cost, easy-to-use application development tools. The MPLAB® certified tools help system designers quickly design, debug and program PIC® and dsPIC® microcontrollers for specific applications. To date, Microchip has shipped nearly half a million development systems.

MPLAB® IDE

Design – Implementation – Test – Production

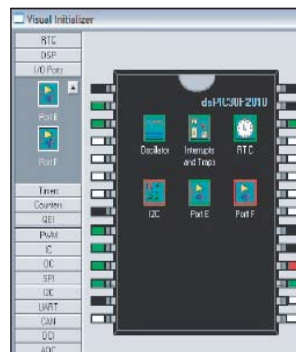
MPLAB Integrated Development Environment (IDE) is Microchip's free, integrated toolset for the development of PIC microcontroller and dsPIC digital signal controller embedded applications. MPLAB IDE runs as a 32-bit application on MS Windows®, is easy to use and includes a host of free software components for fast application development and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software/hardware development tools. Moving between tools is easy, and upgrading from the free simulator to MPLAB In-Circuit Debugger (ICD) 2 or the MPLAB In-Circuit Emulator (ICE) is effortless, since MPLAB IDE has the same user interface for all tools.

Download MPLAB IDE and use the MPLAB IDE Quick Start manual to discover how easy it is to create an application. Write assembly code, build and assemble your project with MPLAB's wizards, then test your code with the built-in simulator and debugger. Explore the capabilities of all Microchip microcontrollers. When you are ready to test your application, use MPLAB ICD 2 to program a device and analyze your hardware, or choose the PICSTART® Plus or MPLAB PM3 programmers to program your code. For the ultimate in analysis, rely upon the MPLAB ICE 2000 in-circuit emulator to help find the toughest bugs and fine tune your application.



Free Software Components of MPLAB IDE

- **MPLAB SIM** – High speed software simulator features peripheral simulation, complex stimulus injection and register logging. MPLAB SIM executes your code and can be exercised with stimulus signals from files, from mouse clicks, and from easily set up waveforms. The contents of variables and special function registers can be logged to a file for analysis.
- **PROGRAMMER'S TEXT EDITOR** – Color coded context easily shows typos and incorrect assembler and C statements. Full debugging is performed while in the editor window, including setting breakpoint, displaying variable values with mouse over and setting trace ranges.
- **VISUAL DEVICE INITIALIZER (VDI)** – Tedious initialization code that previously required digging through data books and doing calculations is eliminated with this graphical tool.
- **FULL FEATURED DEBUGGER** – Watch windows show C structures and arrays, as well as all variables from C and assembler source. Step-over, step-into, step-out, and run to cursor allows quick inspection of code operations.
- **VERSION CONTROL SUPPORT** for MS Source Safe, CVS, PVCS and Subversion
- **MPASM™** macro assembler with MPLINK™ linker and MPLIB™ librarian
- **MPLAB ASM30** assembler, **MPLAB LINK30** and Utilities for 16-bit PIC microcontrollers and dsPIC digital signal controllers
- **GRAPHICAL PROJECT MANAGER** – Source files can be instantly opened and edited, different optimizations can be applied to different source files and all project files are displayed in the project window.



MPLAB® C18

Highly Optimized Code for PIC18 Microcontrollers

```

demo.c demo.h motor.h ProMPT_c18.h
110 if (ADCSamples > 16) { //Take 16 samples per channel and average them
111     ADCData[ADCChannel] = ADCData[ADCChannel] + (RawADCValue >> 4);
112     ADCData[ADCChannel] = ADCData[ADCChannel] >> 1;
113     RawADCValue = 0;
114     switch (ADCChannel) {
115     case CONTROL:
116         // The control pot has some hysteresis at the low end
117         if (ADCData[CONTROL] < OFFTHRESHOLD) { // check if drive shc
118             SetFrequency = 0; // turn drive off
119         }
120     else if (ADCData[CONTROL] > ONTHRESHOLD) {
121         // calculate SetFrequency which is a ratio of Max/Min frequency
122         I = (ADCData[CONTROL] - ONTHRESHOLD) * (MAXFREQUENCY - MINF
123         SetFrequency = MINFREQUENCY + (unsigned char) I;
124     }
125     break;
126
127     case VSENSE:
128         // Right now, we just pass the VSENSE value via a parameter to DashDrive
129         ProMPT_SetParameter(0, (ADCData[VSENSE] >> 2));
130     break;
131
132     case TEMPERATURE:
133         // Right now, we just pass the TEMPERATURE value via a parameter to DashDrive
134     break;
135     }
136 }
    
```

The MPLAB C18 compiler is a full-featured ANSI compliant C compiler for high-performance PIC18 8-bit microcontrollers. The 32-bit Windows console application is a fully integrated component of Microchip's MPLAB IDE, allowing source level debugging with the MPLAB ICE, the MPLAB ICD 2 and the MPLAB SIM Projects. Compiler switches and linker customizations can be done completely within MPLAB IDE to provide a full graphical front end to this powerful compiler. Editing errors and breakpoints instantly switch to corresponding lines in source code. Watch windows show data structures with defined data types, including floating point.

Features:

- ANSI '89 compatibility
- Integration with the MPLAB IDE for easy-to-use project management and source-level debugging
- Generation of relocatable object modules for enhanced code reuse
- Compatibility with object modules generated by the MPASM assembler, allowing complete freedom in mixing assembly and C programming in a single project
- Transparent read/write access to external memory
- Strong support for inline assembly when total control is absolutely necessary
- Efficient code generator engine with multi-level optimization
- Extensive library support, including PWM, SPI, I²C™, UART, USART, string manipulation and math libraries
- Full user-level control over data and code memory allocation
- Supports both a small (16-bit pointers) and a large (24-bit pointers) memory model for efficient use of memory
- MPLIB library allows easy use of included libraries and for user created libraries.
- Use the free MPLAB C18 student edition (available at www.microchip.com) to develop C code programs for PIC18 devices

MPLAB® C30

Highly Optimized Code for Microchip's 16-bit Microcontrollers

The MPLAB C30 compiler is a full-featured ANSI compliant C compiler for the dsPIC DSC family and PIC 16-bit microcontrollers. MPLAB C30 is fully compatible with Microchip's MPLAB IDE, allowing source level debugging with the MPLAB ICE, MPLAB ICD 2 and MPLAB SIM.

```

SR_demo.c SR_config.c SR_Lib.h SR_demo.h SR_demo_utils.h
67 if (SKW_flag == 1 && // if (display KW prompt AND
68     SR_STATUSbits.state == 1 && // wait keyword state AND
69     SR_STATUSbits.pause == 1 && // pause between words AND
70     SR_mode < 2) // keyword activation enabled)
71 {
72     Display_Speak_KW0; // display keyword prompt on LCD
73     SKW_flag = 0; // doesn't display KW prompt
74 }
75 switch (word)
76 {
77     case SRL_NONE: // doesn't require reaction
78     break;
79     case 1 ... SRL_UNKNOWN:
80     if (word == 1) SNR_flag = 1; // check keyword
81     if (SNR_flag || (SR_mode > 1))
82         Display_SNR0; // display SNR on LCD
83     SendWord(word, SR_MaxMagnitude,
84     SR_STATUSbits.clipping); // send recognized word to LCD and P
85     SKW_flag = 1; // display KW prompt
86     break;
87     default:
88     Display_No_KeyWord0; // display "This isn't a Key Word" on LC
89     SNR_flag = 0; // doesn't display SNR
90     SKW_flag = 1; // display KW prompt
91     break;
92 }
    
```

Features:

- ANSI compliant with standard, math, memory, data conversion and math libraries
- Generates relocatable object modules for enhanced code reuse
- Optimized to generate as much as 30% less code than other 16-bit MCU compilers
- Strong support for in-line assembly when total control is absolutely necessary
- Allows code and data to be located at absolute addresses
- Extensive libraries
- Multiple optimization levels
- Download free MPLAB IDE development tools at www.microchip.com
- Use the free MPLAB C30 student edition (available at www.microchip.com) to develop C code programs for dsPIC digital signal controllers and PIC 16-bit microcontrollers

Real-Time Debugging and Universal Programming

Microchip's debuggers and programmers work seamlessly from the MPLAB IDE desktop, providing high-value tools across a price range that can be suited to your development studio. Microchip's fast Service and Repair Policy ensures that downtime will be minimal in the case of failure, and the various support avenues yield quick answers to most questions.

MPLAB® ICD 2 Debugger/Programmer



The MPLAB ICD 2 is a low-cost, all-in-one real-time debugger/programmer solution for selected PIC microcontrollers. Programs can be downloaded, executed in real time and examined in detail using the proprietary debug functions of MPLAB IDE. Watch variables and

breakpoints can be set from symbolic labels in C or assembly source code, and single stepping can be done through C source line, assembly code level, or from a mixed C source and generated assembly level listing. MPLAB ICD 2 can also be used as a development programmer for supported devices.

MPLAB® ICE 2000 Emulator

MPLAB ICE 2000 is a lightweight, portable full-featured emulator system providing full speed (up to 25 MHz) emulation, low voltage operation, 32K by 128-bit trace, and up to 65,535 breakpoints. Interchangeable processor modules allow the system to be easily configured to emulate different processors. Complex triggering provides sophisticated trace analysis and precision breakpoints. The MPLAB ICE 2000 analyzer is fully transparent and does not require halting the processor to view the trace.



MPLAB® REAL ICE™ Emulator



MPLAB REAL ICE In-Circuit Emulator System is Microchip's next generation high speed emulator for Microchip Flash DSC® and MCU devices. It debugs and programs PIC® and dsPIC® Flash microcontrollers with the easy-to-use but powerful graphical user interface of

the MPLAB Integrated Development Environment (IDE), included with each kit. MPLAB REAL ICE features low cost, full-speed emulation, debugging and programming. High speed USB 2.0 communications allows high speed uploads of trace and monitor of variables in real-time.

PICSTART® Plus Programmer

The PICSTART Plus low-cost, development programmer connects via the serial RS-232 port to your PC and operates under MPLAB IDE. PICSTART Plus supports most DIP-packaged PIC microcontrollers.



MPLAB® PM3 Programmer



The easy to use MPLAB PM3 Universal Device Programmer operates with a PC or as a stand-alone unit, and programs the entire PIC microcontroller series as well as current dsPIC30F DSCs. Features include: Serialized Quick Turn Programming and alternate DOS

command line interface for batch control. MPLAB PM3 accepts PRO MATE® II socket modules via adapter (sold separately), large easy-to-read display, field upgradable firmware for quick new device support, and Secure Digital (SD) and Multimedia Card (MMC).

Learning Technology and Quick Prototyping

Explorer 16 Development Board



The Explorer 16 is a low cost, efficient development board to evaluate the features and performance of Microchip's new PIC24 Microcontroller and dsPIC33 Digital Signal Controller (DSC) families. Coupled with the MPLAB ICD 2 In Circuit Debugger, real-time emulation and debug facilities speed evaluation and prototyping of application circuitry. The Explorer 16 features two interchangeable Plug-In Modules (PIMs), one each for the PIC24FJ128GA010 and the dsPIC33FJ256GP710 DSC.

PICKIT™ 2 Starter Kit



The PICKIT 2 Starter Kit is a low-cost development kit with an easy to use interface for programming many of Microchip's baseline, midrange and PIC18F families of Flash memory microcontrollers. This starter kit is designed to help you get up to speed quickly using PIC®

microcontrollers. The kit provides everything needed to program, evaluate and develop applications using Microchip's powerful midrange Flash memory family of microcontrollers.

PICDEM™ 2 Plus Demonstration Board

The PICDEM 2 Plus is a simple board that demonstrates the capabilities of the 18-, 28- and 40-pin PIC16XXX and PIC18XXX devices. It can be used stand-alone with a programmed part, with MPLAB ICE or with MPLAB ICD 2.



PICDEM™ HPC Explorer Board



The low-cost PICDEM HPC board is used to evaluate the performance of high-end 8-bit PIC18F series microcontrollers. The board features a PIC18F8722 MCU, which is the superset of the entire 64- and 80-pin PIC18FXXX general purpose family.

A daughter board is also part of the kit and allows different processors sharing the same pin out to be mounted and tested on the explorer board. A serial bootloader firmware example is provided to demonstrate application note AN851.

PICDEM™ FS-USB Demonstration/Evaluation Board



The PICDEM FS USB is a demonstration and evaluation board for the PIC18F4550 family of Flash microcontrollers with full speed USB 2.0 interface. The board contains a PIC18F4550 microcontroller in a 44-pin TQFP package, representing the superset of the entire family of devices.

START NOW – MICROCHIP TOOLS INFORMATION

The integration of development tools within the MPLAB IDE means that the single learning curve of mastering MPLAB IDE is all you need to undergo to enjoy swift project development. To assist in learning how to use MPLAB IDE, most of the user guides for MPLAB IDE and its components have “Getting Started” sections as well as an introductory tutorial on using the tool.

These and other “Getting Started” information is also available on the Microchip web site, www.microchip.com/tools. Additionally there are a series of webinars that cover applications and device-specific information, including these Development Tool webinars:

- An Introduction to MPLAB
- Microchip Development Tools
- Getting Started with MPLAB SIM
- What's New in MPLAB
 - MPLAB's Visual Device Initializer
- dsPIC Development Tools
- Choosing a Debug Tool

Also on Microchip's web site are a series of forums which can be used to communicate with other engineers doing similar development work and with Microchip Development Tools engineers, who monitor the forums, answer questions, and provide technical and support tips.



There is also a “Start Now” section on the Microchip web site that has two main sections, one for PIC® microcontrollers and one for Development Tools. Go to the Development Tools page and click on “Start Now” or go directly to www.microchip.com/developmenttools.

For in-depth assistance from Microchip Corporate Application Engineers, please register at: www.microchip.support.com

IMPORTANT QUESTIONS

Do you know the answers? (Check at the bottom of this page)

1. Can I drag and drop variables from the source window to a watch window?
2. When will MPLAB ICE 2000 have a stopwatch?
3. Why do we use a header for some parts on MPLAB ICD 2?
4. How can I be notified when a new MPLAB IDE version is released?
5. Can I use the Component Install to install the full MPLAB IDE (instead of downloading the 30 Mb full install)?
6. I'm new to Microchip and embedded systems design. Where can I go to get a “quick start” on tools and Microchip?
7. Which ICE and MPLAB PM3 accessories do I need to support my device?
8. What's this message from MPASM assembler: "Register in operand not in bank 0."
9. My project won't build because the assembler is saying that my paths are too long – how do I fix this?
10. I don't see my third party language suite showing up on MPLAB. What happened?

Development Tools Made Easy <ul style="list-style-type: none">○ Overview○ Step 1 An Overview of Embedded Systems○ Step 2 Start Now with Microchip Development Tools○ Step 3 Implementing an Embedded System Design with MPLAB® IDE○ Step 4 The Development Cycle○ Step 5 MPLAB® Project Manager○ Step 6 Language Tools○ Step 7 Targeting Debugging○ Step 8 Programming○ Step 9 MPLAB® IDE: For More Information	Start Now with De  PICSTART® Microchip Developme applications using M
Tools: A Closer Look <ul style="list-style-type: none">○ Start Now with MPLAB Editor○ Start Now with MPASM™/MPLINK™○ Start Now with MPLAB SIM○ Start Now with MPLAB ICD 2	In order to guide yo introduction to the s resources that are p Easy." You can go t of the power that M
FREE Webinars <ul style="list-style-type: none">○ Intro to Development Tools○ Intro to MPLAB® IDE○ Intro to Visual Device Initializer○ Tips and Tricks on MPLAB IDE○ Intro to MPLAB SIM Software Simulator○ dsPIC® Development Tools	Below that in the left covering MPLAB Proj
Manuals <ul style="list-style-type: none">○ MPLAB® IDE User's Guide○ MPLAB® IDE Quick Chart○ Development Tools Ordering Guide	In lower panes, links Development Tool S devices to the appro
Other Important Links <ul style="list-style-type: none">○ MPLAB® Download Page○ Online Discussion Groups○ Development Tool Selector○ Available Books○ Third Party Tools	Finally, other links o avenues of learning books, on-line discus
Feature <ul style="list-style-type: none">○ Pick your MCU 	Next Step 1

Answers: 1. Of course. 2. MPLAB ICE 2000 has the time stamp feature – it does not have a separate stopwatch like MPLAB ICE 4000. 3. So the user doesn't lose 2 pins when using ICD. 4. Sign up for Customer Change Notification on Microchip web site. 5. Yes. 6. Go to Start Now, www.microchip.com/tools. 7. Use Development Tool Selector on web. 8. Just a warning to remind users of banking issues – can be suppressed. Go to first error and double click. 9. Use linker and /w option to suppress. 10. MPLAB IDE now uses plug-ins provided by the vendor of the various third party language tools. Check with the third party for the latest plug-in.

Support

Microchip is committed to supporting its customers in developing products faster and more efficiently. We maintain a worldwide network of field applications engineers and technical support ready to provide product and system assistance. In addition, the following service areas are available at www.microchip.com:

- **Support** link provides a way to get questions answered fast: <http://support.microchip.com>
- **Sample** link offers free evaluation samples of any Microchip device: <http://sample.microchip.com>
- **Training** link offers webinars, registration for local seminars/workshops and information on annual MASTERS events held throughout the world: www.microchip.com/training

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