

## Text Script for “Development Tools Overview”

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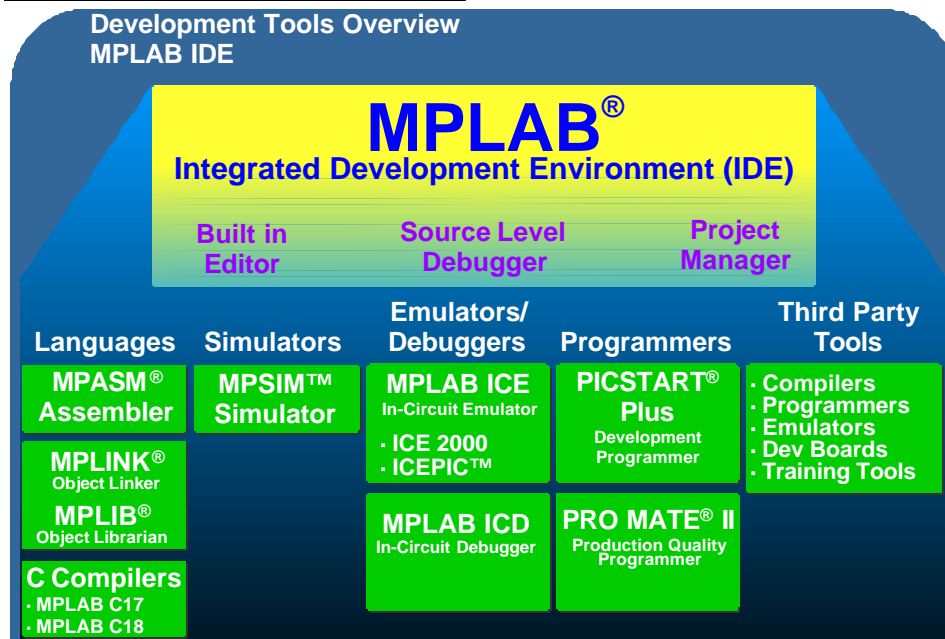
**Slide 1: Title Slide**



Thank you for joining Microchip's Development Tools Overview course.

This session gives an overview of the development tools that support Microchip's complete portfolio of products.

## Slide 2: Architecture Overview



The MPLAB® Integrated Development Environment, or IDE, can be looked at as the foundation of many of Microchip's other PIC® microcontroller development tools. MPLAB IDE contains a built-in editor, source level debugger, and project manager and also acts as the interface for the included built-in MPASM™ Assembler, and Linker / Librarian facilities. The IDE is also the front-end for Microchip C compilers and integrated Third Party C compilers.

The IDE contains a built-in software instruction simulator and it implements most of the PIC MCU peripherals. The IDE is also the front-end for the real-time in-circuit emulators including Microchip's MPLAB ICE 2000 and the Third Party ICEPIC™ Emulator.

Also running under the IDE is the real-time In-Circuit Debugger (ICD) and Microchip's programmers including the PICSTART® Plus Development Programmer and the PRO MATE® II Production Quality Programmer.

The beauty of MPLAB, which contains the assembler, simulator, editor, and debugger, is that its available free. It is not licensed software, and you can always go to [www.microchip.com](http://www.microchip.com) and download the latest version.

### **Slide 3: MPSIM™ Simulator**

#### **Development Tools Overview MPSIM - Simulator**

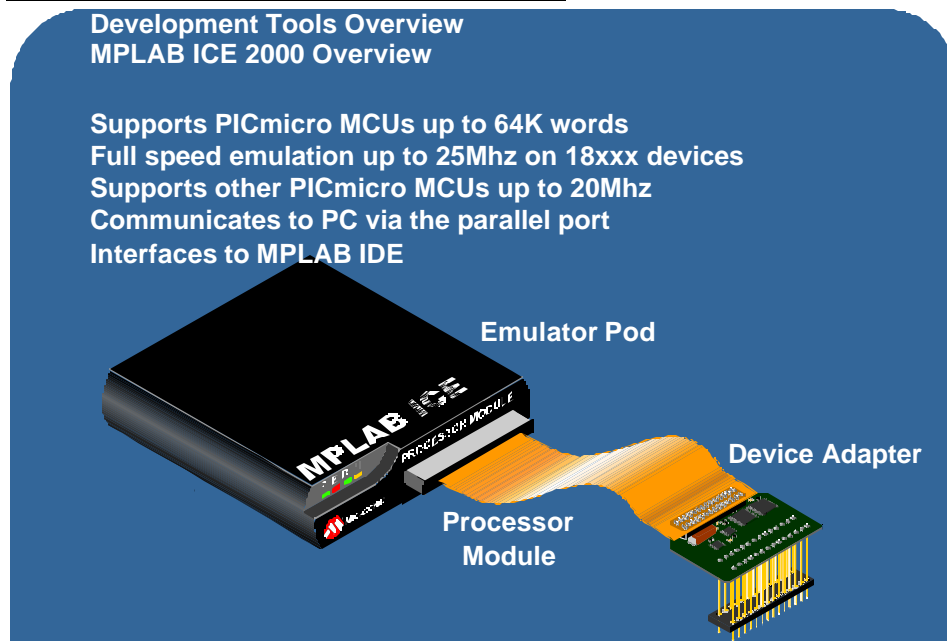
##### **Microchip's MPSIM simulator - Its free!**

- Single Step through code
- Unlimited breakpoints
- Unlimited trace capability
- Examine/Modify all registers
- Stopwatch feature that calculates time and instruction cycles for a section of code
- Use pin/register stimulus functions to test code, including A/D functions

Included in the MPLAB IDE is the discrete event instruction MPSIM™ simulator. The simulator let's you single step through source code, while providing unlimited breakpoint capability, unlimited trace capability and the ability to modify and examine all of the internal variables and watch registers. The simulator also provides real-time time stamping so you can see how long your code takes to execute and it also supports stimulus injection so you can inject I/O pin stimulus or A/D register stimulus files. These stimulus features allow you to run your code and test an algorithm based on a certain input signal waveform.

Register stimulus files enable you to specify a waveform that can be generated by tools like Microsoft Excel. Your code, when executed, can then be validated using a particular register stimulus file. This is particularly valuable when simulating an A/D converter, allowing you to simulate analog waveforms.

## Slide 4: MPLAB® ICE 2000 Overview



The MPLAB In-Circuit Emulator, the ICE 2000, supports most of the PIC MCUs with up to 64K words of program memory space. It provides full speed emulation of PIC18 devices up to 25MHz and supports other devices up to 20 MHz. The ICE 2000 communicates to the PC through the parallel port interface while the user is running MPLAB IDE. The ICE consists of three standard elements: an emulator pod, a processor module, and a device adapter. In addition, transition sockets are available for designs using surface mount devices.

The emulator pod is a universal system and remains the same regardless of the device you are using. The pod contains the trace memory, breakpoint logic, complex trigger and trace logic, and RAM in place of program memory. The processor module for the device you are using slides into a slot in the pod.

The processor module will support a number of different devices depending on which microcontroller family you select. The device adapter then plugs into the processor module via a flex cable.

The device adapter is pin-out specific and available in configurations from 8 pins up to 84 pins. If your microcontroller is a surface mount device and uses an SO or a TQFP package, an SOIC transition socket is available which will solder down on your board in place of the actual device. The device adapter then plugs directly into the surface mount transition socket. Since the ICE 2000 is universal, you can purchase the pod, processor module and device adapter for a specific microcontroller and easily migrate to a device within the same family by just purchasing a new device adapter. For emulation of another family of PICmicro MCUs, a processor module and device adapter will be required.

The ICE 2000 supports low-voltage emulation from 2.5 volts to 5.5 volts using the voltage level from the actual target board. The user can select the oscillator from the target board or use an internal software programmable clock that can generate frequencies anywhere from 32 kHz up to the maximum operating frequency of the device. The internal clock is a PLL that can be set in fine increments thus enabling the user to test various target frequencies to optimize software execution speed, power consumption and crystal selection.

## **Slide 5: MPLAB ICE Features**

### **Development Tools Overview MPLAB ICE Features**

#### **Extensive Trace Capabilities**

- 32K trace buffer
- Traces all registers
- Time Stamping
- Set breakpoints on register access

#### **Four level conditional break/trace/trigger**

- Pass counter triggers after n events
- Trigger conditions can be ANDed together
- Trigger order can be specified
- Trigger conditions can be ORed together

#### **Measure time between events**

#### **Code coverage to find untested code**

The ICE 2000 has extensive trace capabilities, featuring a 32 Kb trace buffer which can trace 8-bits of logic analyzer input. The trace buffer not only traces program memory, instruction and its address, but also includes access to internal registers including general purpose file registers and peripheral registers.

The ICE2000 can set breakpoints when any internal register is written to or read from. A breakpoint can also be set to trigger when writing a specific value, a specific bit, or a set of bits. The trace buffer contains a timestamp with a real-time instruction execution clock. The timestamp feature displays when each instruction is executed in instruction cycles or in actual time. This feature can be used to find out how often an interrupt service routine (ISR) is entered by setting up a filter criteria that only traces the entry to the interrupt service routine. The trace buffer would then only contain ISR entry points. Comparing the relative time stamps of successive entries would show the timing between interrupts.

There are four levels of triggers which can be specified as an execution of a specific instruction, or a read or write to an internal register. The user can also enable a pass counter. A pass counter allows the user to specify how many times an event occurs before the trigger condition is satisfied.

The four trigger conditions can be "ANDed" together, requiring that all four conditions occur simultaneously before the trigger condition is met. The user may also specify an order for these conditions. For example, the first condition needs to be satisfied before the second condition is monitored, and so on. Lastly, these trigger conditions can be "ORed" together where only one of the four conditions needs to be true for the trigger condition to be satisfied.

The ICE 2000 can directly measure time between events. This allows the user to specify a start and stop events and it will measure the amount of time that has elapsed between the two events.

The ICE 2000 offers code coverage that shows instructions that have and have not executed. This can be extremely useful before releasing your code to manufacturing, since you can validate that all code paths have been tested, and potentially locate unused code.

### **Slide 6: Knowledge Check #1**

The free MPLAB Integrated Development Environment requires you to acquire your own:

- a) Editor
- b) Project manager software
- c) **Nothing**
- d) Debugger software

### **Slide 7: MPLAB C17/C18 Compilers**



Development Tools Overview  
MPLAB C17/C18 C Compilers

**MPLAB C17** Supports PIC17XXX devices

**MPLAB C18** Supports PIC18XXX devices

- ANSI compliant
- Compatible with MPASM and MPLINK
- Trial copy available from [www.microchip.com](http://www.microchip.com)

MPLAB C17 and MPLAB C18 are Microchip's own C compilers which support the PIC17 and PIC18 series of devices. They are ANSI compliant, and are compatible with Microchip's MPASM Assembler and MPLINK™ linker.

One nice feature these compilers have, is when you have written relocatable assembly code, you can generate an object file and then link that into your project and call those assembly routines from C modules.

You can download a free trial copy of either of these compilers from [www.microchip.com](http://www.microchip.com).

## Slide 8: Third Party Compilers

### Development Tools Overview Third Party Compilers



- ANSI compliant
- Source level debuggin within MPLAB
- Supports all PICmicro families



- Supports PIC12 and PIC16 series
- Small C implementation - not ANSI compliant
- Low cost



- Support for PIC16, PIC17 and PIC18 series
- Interfaces to ICE2000
- Future support for ICD is planned

If you are looking for a more universal compiler that supports the mid-range family of PIC12 series, PIC16 series, PIC17 and high end PIC18 series, take a look at the Hi-Tech, CCS or IAR compilers.

The Hi-Tech compiler is ANSI C compliant and also implements all the necessary debug files to provide source level debugging within MPLAB. It supports all PICmicro MCUs, including the PIC12, PIC16, PIC17 and PIC18 series. This is very efficient and robust compiler that has been available for some time now. There is a free demo offered as well.

There is a much smaller compiler available from CCS which currently supports the PIC12 and PIC16 series. This is a small C implementation and is not ANSI C compliant but there is some very good library support available and also this compiler is typically lower cost than compilers from Hi-Tech or IAR.

IAR Systems is another worldwide supplier of C compilers and they are currently supporting the PIC16 and PIC17 series. They have just released a PIC18 series compiler as well to offer a complete suite of compiler tools.

IAR Systems provides their own custom integrated development environment which interfaces with the MPLAB ICE 2000 and they plan to support the in-circuit debugger in the future as well.

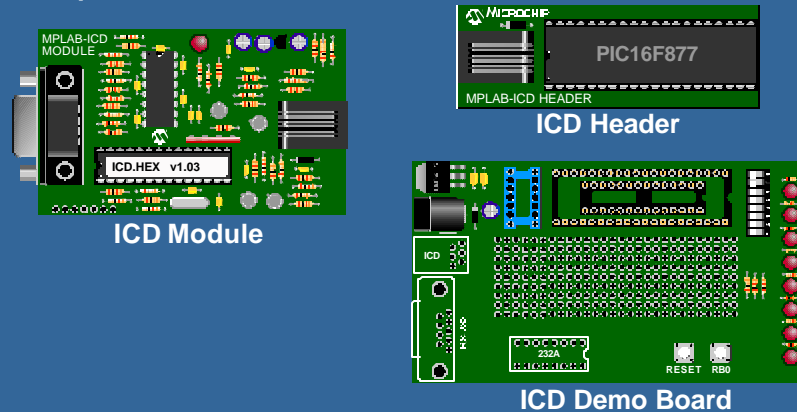


## **Slide 9: In-Circuit Debugger (ICD)**

### **Development Tools Overview In-Circuit Debugger (ICD)**

#### **Utilizes In-Circuit debugging capabilities of the PIC16F87X**

- Provides low cost In-circuit debugging and programming
- Supports frequencies from 32Khz to 20Mhz
- Operates from 3V to 5.5V



One of Microchip's most innovative tools is the low-cost real-time In-Circuit Debugger called the MPLAB ICD. The ICD utilizes the In-Circuit Debugging capability of the PIC16F87X. This feature, along with Microchip's In-Circuit Serial Programming® (ICSP®) protocol, offers cost effective in-circuit FLASH programming and debugging from the MPLAB IDE interface. A designer can develop and debug source code by watching variables, setting breakpoints and single stepping. MPLAB ICD can support target board oscillators varying from 32 kHz up to 20 MHz and will operate at voltages from 3 volts to 5.5 volts

The modular design of the In-Circuit Debugger consists of the three basic components: the ICD module, the ICD header and the ICD demo board. All of these components are included in the ICD Evaluation Kit.

The ICD module plugs into the serial port on your PC. When instructed by MPLAB IDE, the ICD module programs and issues debug commands to the target PIC16F87X using the ICSP protocol.

A 9-inch 6-conductor cable connects the ICD module to the ICD header. The header contains a target PIC16F87X, a modular jack, and 28-pin and 40-pin male DIP headers. The DIP headers can be plugged into a target circuit board or the ICD demo board. The demo board offers LEDs, DIP switches, a potentiometer and a prototyping area. A modular jack can be designed into the target circuit board to accept direct connection to the ICD module.

The ICD uses the true target oscillator and target peripherals so you will see complete parallelism of the debugger's behavior and the real device because it is the real device that is providing that information. There is one real-time hardware breakpoint available, which can be set at any program memory space location. The user can also watch, examine or modify, all of the internal file registers including general purpose registers and special function registers. You can also download a new program to your target device.

The interface used by the ICD requires connections to only 5 pins: power, ground, MCLR and two general purpose I/O pins, RB6 and RB7. Access to RB6 and RB7 is only required during debugging, however, you can regain access to those pins after you are finished debugging by reprogramming the device and disabling the debugger.

It should be noted that the PIC16F87X devices are pin and functionally compatible with many ROM and OTP devices. So it is possible, with care, to debug code for a ROM or OTP PIC MCU using the appropriate PIC16F87X device.

The MPLAB ICD complete hardware development system along with the free MPLAB IDE software provides a powerful, affordable run-time development tool.

### **Slide 10: Knowledge Check #2**

To write a C program for PIC18FXXX microcontrollers, all you need is:

- a) Borland C++
- b) MPLAB C18**
- c) Visual C++
- d) MPLAB ICD

### **Slide 11: PICSTART® Plus**

Development Tools Overview  
PICSTART Plus Programmer

- Supports all devices except 16C432/433
- Interfaces to MPLAB
- Adapter sockets for PLCC packages
- Connects to PC via RS-232 port
- Firmware upgrades available from [www.microchip.com](http://www.microchip.com)



Once you have code up and running through either the emulator, the debugger or simulator, you will need to program your devices. The PICSTART Plus is a very convenient universal desktop development programmer that supports all devices except the 16C432/433 devices, and also runs under the MPLAB IDE.

It has a 40-pin ZIF socket which supports DIP packages up to 40 pins directly. Microchip also offers 84- and 68-pin PLCC adapters for those larger pin count surface mount devices. The PICSTART Plus connects to a PC through a standard RS-232 serial cable.

Firmware upgrades are available [www.microchip.com](http://www.microchip.com). The PICSTART Plus firmware is upgraded by first of all, obtaining a PIC17C44 windowed device (available for purchase from your local Microchip distributor), plugging it into the ZIF socket and then programming the latest firmware into that device. Simply replacing the existing PIC17C44 with the newly programmed device enables you to do future firmware upgrades for free at the cost of your first PIC17C44 windowed device.

## **Slide 12: PRO MATE® II**

**Development Tools Overview**  
**PRO MATE® II Production Programmer**

- Operates in Stand-Alone mode or with MPLAB
- Interchangeable device sockets
- Supports surface mount packages
- Supports Serialized Quick Turn Programming (SQTP™)
- Environment Save and Restore
- Supports Serial EEPROMs and Keeloq security devices



The PRO MATE II is a production quality programmer which can operate in a standalone mode or under the MPLAB IDE.

Unlike the PICSTART Plus which is designed for DIP devices, the PRO MATE II has interchangeable socket modules and supports all surface mount devices.

PRO MATE II also supports an In-Circuit Serial Programming module which enables you to program a PICmicro device on your circuit board through 5 pins. Conveniently, these pins are the same as those used for the in-circuit debugger.

In-Circuit Serial Programming is convenient for late manufacturing programming or reprogramming of devices prior to shipment. PRO MATE II has environmental save and restore capability which allows you to save target or test voltages along with other user environment variables. PRO MATE II supports the minimum and maximum VDD verification required by OTP devices.

Serialized Quick Turn Programming, SQTP<sup>SM</sup>, is supported which means that the programmer can automatically create and maintain a unique serial number that is stored in program memory space for every device programmed. This feature allows you to program a unique serial number in every device for applications such as remote keyless entry (RKE).

PRO MATE II also provides the capability to program Microchip's Serial EEPROM and KEELOQ® security devices.

### **Slide 13: Knowledge Check #3**

The MPLAB ICD allows the user to:

- a) Program FLASH-based PICmicro microcontrollers
- b) Perform Real time debug at maximum speed
- c) Debug at lowest specified operating voltage
- d) **All of the above**

## **Slide 14: PICDEM™ Evaluation Boards**

### **Development Tools Overview PICDEM™ Evaluation Boards**

#### **PICDEM-1**

- Supports 18 pin devices, 16C5x family and 17C family

#### **PICDEM-2**

- All x14 architecture devices in 28/40 pin DIP

#### **PICDEM-3**

- Supports PIC16C9XX LCD control devices

#### **PICDEM-14A**

- Supports PIC14000

#### **PICDEM-17**

- Supports PIC17C756/766

A good way to familiarize yourself with the new PICmicro MCUs is by using one of the PICDEM evaluation boards.

The PICDEM boards differ based on the devices supported. The boards feature LEDs to indicate the state of an I/O port pin, pushbutton switches connected to some of the I/O pins to simulate an input pin changing, and potentiometers to test A/D features. There is a 9-pin RS-232 port connector, which allows you to use the hardware UART featured on most PICmicro MCUs. An oscillator socket and integrated RC oscillator support enables users to test various oscillator frequencies.

The demo boards typically contain a programmed PIC MCU with demo firmware that customers can use to validate that the PICDEM board is working.

The PICDEM-1 supports Microchip's 18-pin devices, the PIC16C5X family and the PIC17 family of devices.

The PICDEM-2 supports all of the x14 architecture devices, including 28- and 40-pin DIP packages.

The PICDEM-3 includes an on-board LCD display to demonstrate Microchip's PIC16C9XX LCD control devices.

The PICDEM-14A demonstrates the PIC14000 capabilities.

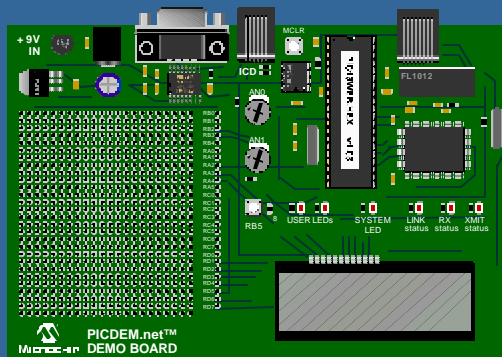
The PICDEM-17 supports PIC17C756 & PIC17C766 devices.

In addition to PICDEM boards that support specific device families, Microchip offers evaluation kits that support various peripherals and application-specific devices, such as the PICDEM.net™.

## Slide 15: PICDEM.net™

### Development Tools Overview PICDEM.net™ Demo Kit

#### Internet and Ethernet Connectivity Design Kit Kit includes Dev board and book



The PICDEM.net™ is an Internet and Ethernet demonstration kit that is designed to show internet connectivity capability using PIC MCUs. The complete kit includes a demonstration board with TCP/IP stack and a book written by Jeremy Bentham which explains the basics of small TCP/IP Internet connectivity and web servers, along with the basics on how to implement those on a 8-bit embedded systems.

The PICDEM.net board contains a PIC16F877, a MAC and PHY (from a company called Realtech). The networking connection is standard RJ45 10 baseT.

The PICmicro contains TCP/IP stack software and a web server called, ChipWeb, both implemented by Iosoft Ltd. This allows you to directly access the server and look at the current state of on-board potentiometers from a remote networked PC. You can also click on buttons on a web page to turn LEDs on and off, depicting both interactive inputs and outputs to web pages.

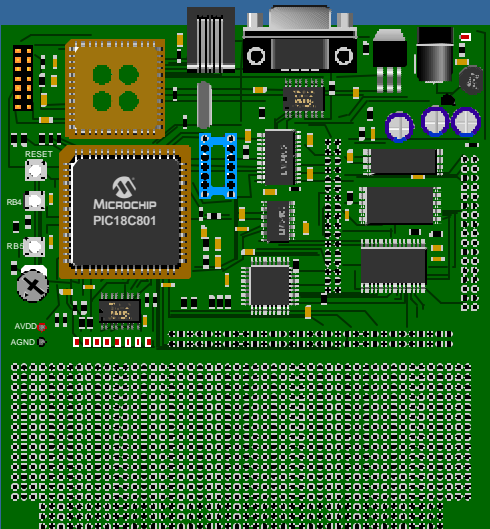
The PICDEM.net board supports In-Circuit Serial Programming and the ICD connector. This allows you to update the firmware by plugging the ICD into the ICSP port and debugging the TCP/IP stack through this port.

The board includes a prototype area for you to add some of your own circuitry.

Although PICDEM.net uses the TCP/IP stack from Iosoft Ltd., there are other stacks which are available for PIC microcontrollers that offer various protocols including SMTP and DHCP. You can visit the Connectivity Design Center on Microchip's website for more information.

## **Slide 16: ROMless Development Board**

**Development Tools Overview**  
**ROMless Development Board**



**Supports PIC18C601/801 ROMless MCUs**

- Multiplexed and de-multiplexed memory interfaces
- Supports 16-bit word select and byte select memory interfaces
- 2M bytes of JEDEC FLASH memory
- 128 KB of external static RAM
- 64K I2C Serial EEPROM

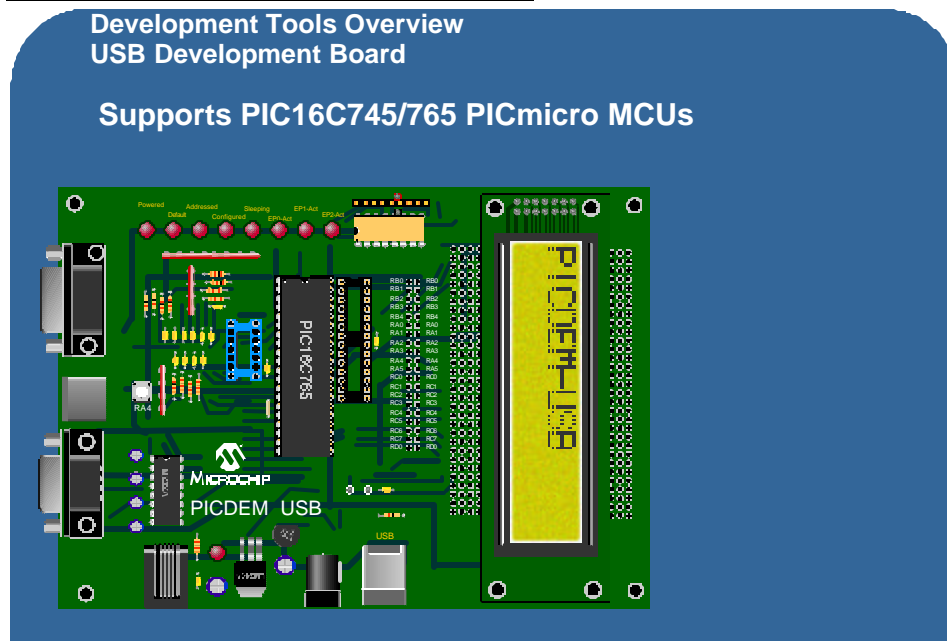
The ROMless Demonstration Board supports the PIC18C601 and PIC18C801 ROMLESS microcontrollers.

This board has both multiplexed and de-multiplexed memory interfaces and supports both 16-bit word select and byte select memory interfaces. It contains two megabytes of JEDEC compliant flash memory, 128 KB of external JEDEC compliant static RAM and a 64 KB I<sup>2</sup>C serial EEPROM. There are 8 LEDs, some pushbutton switches and a potentiometer input for testing the various I/O capabilities for these devices.

There is code included for the PC which allows you to download new hex files into static RAM and then execute them. The user programmable PC downloader allows you to download a new hex file to the external FLASH program area.



## **Slide 17: USB Development Board**

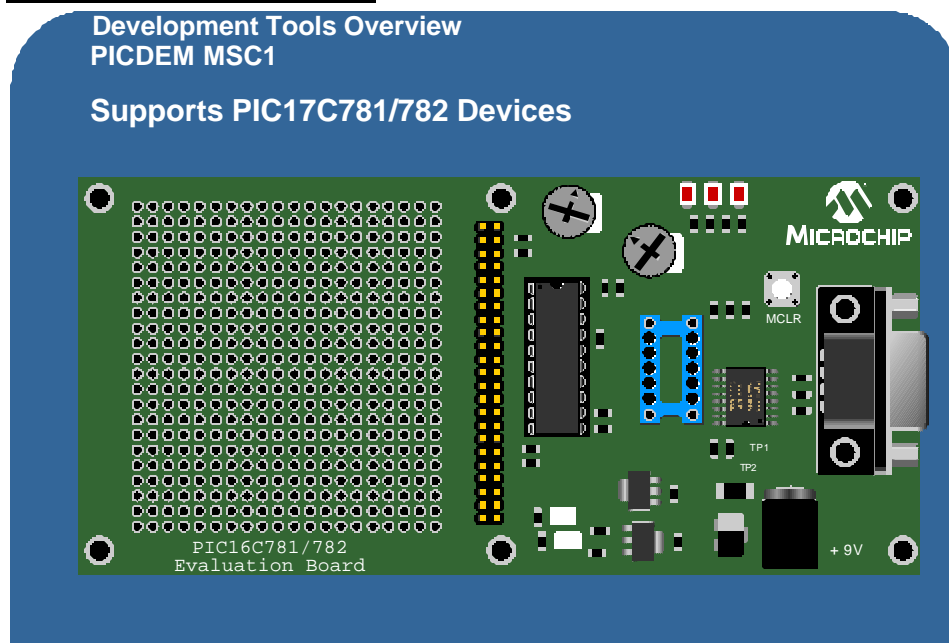


The USB Development Board supports Microchip's PIC16C745/765 USB PIC microcontrollers.

It contains a standard USB connector which integrates the necessary 3.3 volt power supply regulator. It also has an RS-232 serial port which connects to the PIC16C745/765 hardware UART. A PS-2 port connects to the PICmicro MCUs general purpose I/O pins and a game port which connects to the PICmicro's A/D and a few general purpose I/O pins.

A prototype area and 8 LEDs are included for diagnostic purposes. There is also an LCD module interface on the board that accepts an industry standard 2 line by 20 character LCD display.

## Slide 18: PICDEM MSC1



The PICDEM MSC1 is Microchip's first mixed signal analog configurable demonstration board which supports the PIC16C781/782 microcontrollers. This board comes with Windows based software that allows the user to visually examine and modify all of the analog configuration special function registers.

This will enable you to test out the switch mode power supply controller, D/A, A/D and Op Amp features of this device without writing any PICmicro code. This is accomplished through a software serial interface which interfaces to the PC configuration software.

As with other PICDEM boards, there is also a generous prototyping area for building additional circuitry.

## Slide 19: Knowledge Check #4

What tool does Microchip offer to assist specifically in development of real time web pages using a PICmicro microcontroller?

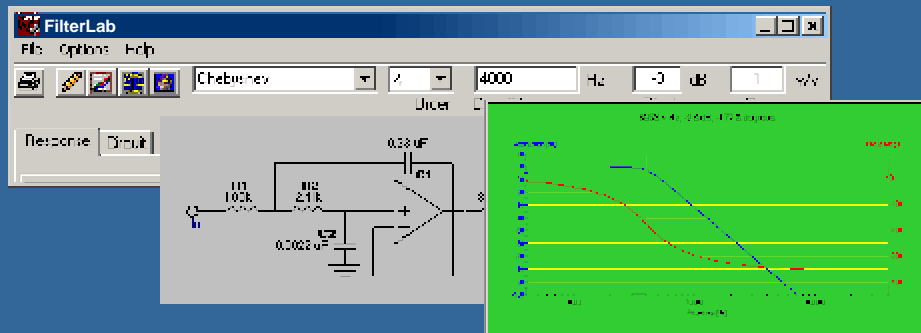
- a) MPLAB ICE2000
- b) PICDEM.net**
- c) PICSTART Plus
- d) MPLAB ICD

## Slide 20: MXLAB™ Mixed Signal Development Tool

### Development Tools Overview FilterLab™ Software

Windows® based software makes the design and analysis of active low pass filters a snap!

- Shows frequency and phase response of a filter
- Shows circuit diagram
- Allows the user to choose different filter parameters and observe the change in the filter response



The Mixed Signal Development Tool provides support for Microchip's standalone MCP A/D devices and digital potentiometers. This tool consists of contains Windows based software, a main controller board and device specific daughter boards.

The software allows you to collect A/D results and display the data in several formats, including histogram, real time scope plot and FFT. The FFT can be useful when you want to characterize a moderate sample rate analog sub-system, collect that data and then look at an FFT of that data to see if you've got 60 or 50 Hz noise. Noise of other various primary and secondary harmonics also show up after collecting this data and running an FFT.

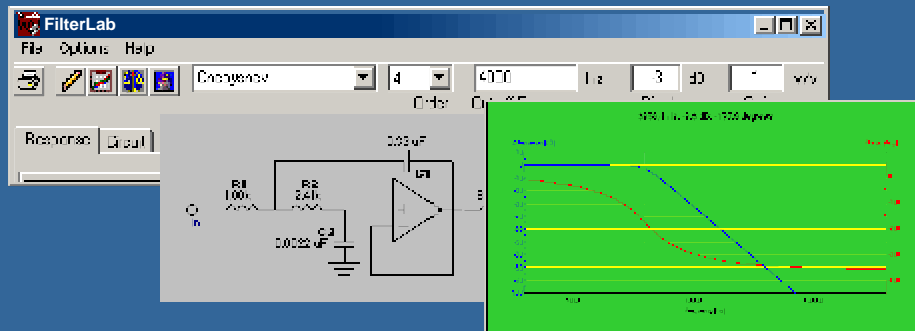
In addition to the software, the main controller/display board provides the means for acquiring data and transmitting to a PC via a serial port. This board can also show acquired data at slow sample rates on an LCD display. Daughter boards available separately plug into the main board and are device specific. These include boards for A/Ds, digital pots and Op Amps. These boards all contain a general prototyping area to enable connections to your application specific circuitry.

## Slide 21: FilterLab™ Software

### Development Tools Overview FilterLab™ Software

Windows® based software makes the design and analysis of active low pass filters a snap!

- Shows frequency and phase response of a filter
- Shows circuit diagram
- Allows the user to choose different filter parameters and observe the change in the filter response



FilterLab is an active filter design tool, which greatly simplifies the job of designing low-pass filters which are required for anti-aliasing in nearly all analog sampling systems.

The program allows the user to specify the type of filter that you want to use, such as Chebyshev, Bessel or Butterworth, and then specify the order of the filter, desired cut-off frequency, ripple and gain. FilterLab will then generate a schematic and show you all of the R and C values for the low-pass filter that was generated. It will also show the frequency and phase response of the filter, and can even generate a spice model.

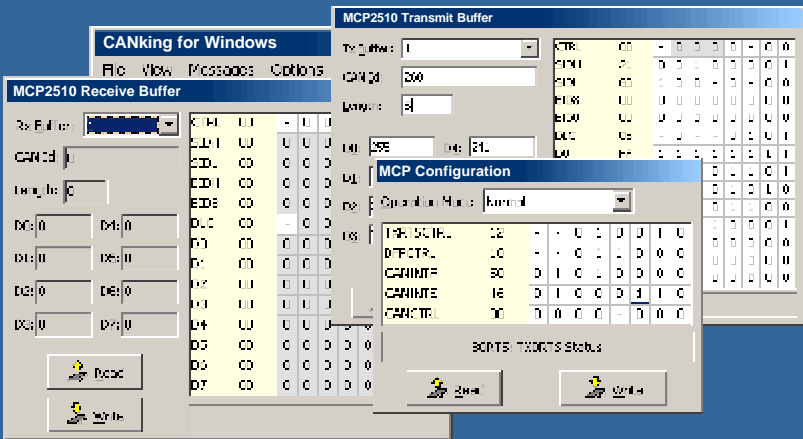
This tool is available free and can greatly reduce the amount of time required to design active low pass filters.

## Slide 22: CAN Developer's Kit

**Development Tools Overview**  
**CAN Developer's Kit**

**Supports the MCP2510 Stand-alone CAN controller**

- Windows based software to watch/modify CAN registers
- Demo board provides access to two complete CAN nodes



The screenshot displays the 'CANKing for Windows' software interface. It features several windows: 'MCP2510 Receive Buffer' showing a table of received messages with fields like CAN ID, Data, and Status; 'MCP2510 Transmit Buffer' showing a table of transmitted messages with similar fields; and 'MCP Configuration' showing various CAN controller registers like CANINTF, CANINTS, and CANCTL. The interface includes a menu bar (File, View, Messages, Options) and a toolbar with buttons for 'Read' and 'Write'.

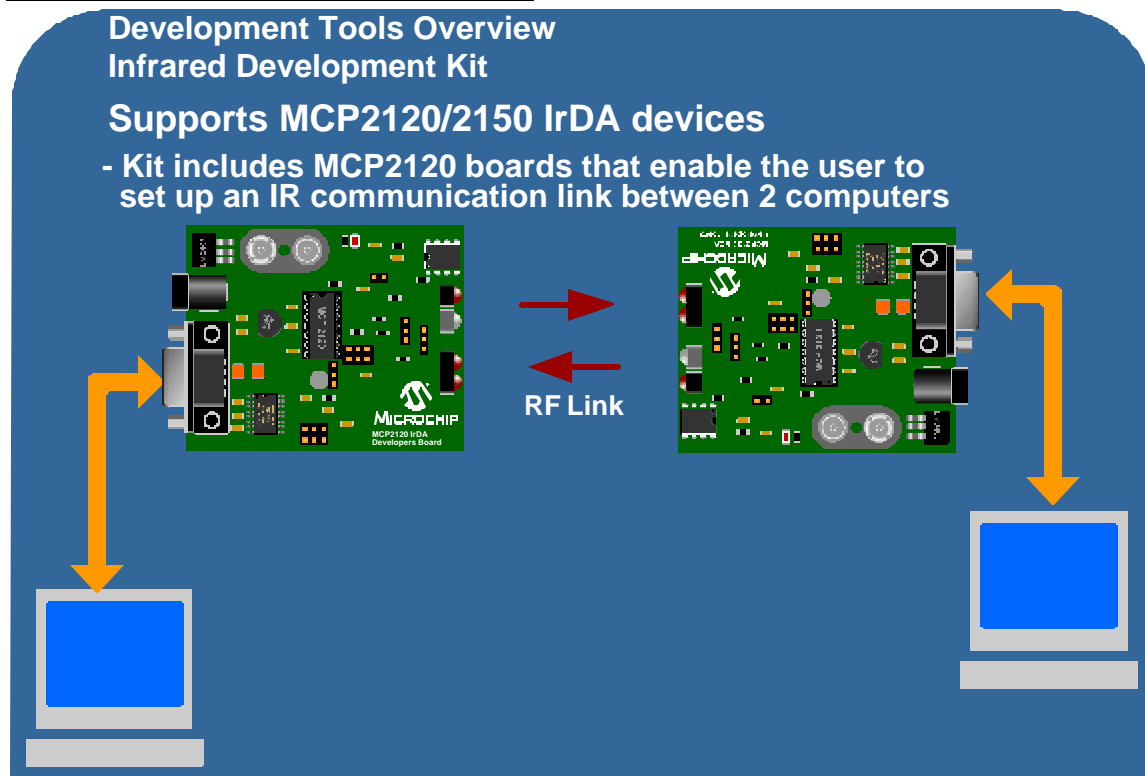
The MCP2510 CAN Developer's Kit enables a user to evaluate and test systems that implement the MCP2510 standalone CAN controller.

The kit comes with an evaluation board that communicates to a PC via the parallel port. Windows based software allows you to set up and read all of the MCP2510 CAN registers. This kit also contains a high level protocol called CAN Kingdom that enables you to send and receive messages and validate the operation of a CAN enabled system.

There is a second node on the CAN bus which consists of another MCP2510 and a PIC16F876 that are connected together via the SPI port. This enables the user to write PICmicro firmware which communicates to the MCP2510 in order to send and receive CAN messages.

This board effectively creates a 2-node CAN bus that can be used to develop and troubleshoot CAN communication firmware and hardware. The board also contains a prototype area for experimenting with additional circuits or adding additional nodes to the bus.

## **Slide 23: Infrared Development Kit**



Microchip's MCP2120 and MCP2150 Infrared Development Kit can be used to experiment with data communication via an infrared link. This kit contains two MCP2120 developer's boards and one MCP2150 developer's board.

The MCP2120 developer's boards contain both integrated and discrete solutions of the IR transceiver interface logic, which is selectable by the user.

The host controller interface on the board connects both to a serial port and a header connector. When connected to a PC serial port, the MCP2120 board converts RS-232 data to IR and vice versa. Two boards are included so 2 PCs can be used to communicate to one another via IR.

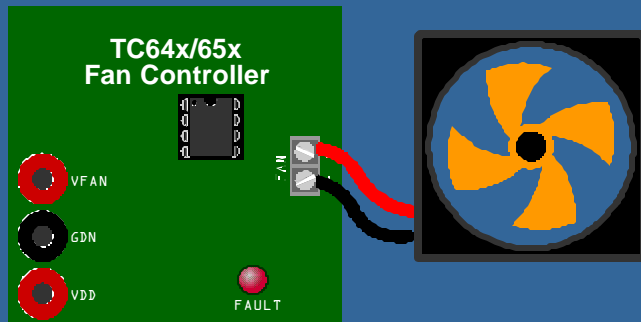
The MCP2150 developer's board implements an IrDA stack for IRCOMM, 9-wire "cooked" service class applications. This enables the MCP2150 to communicate with a PDA or PC. The PC requires an IR driver set up as a virtual serial port that a terminal emulation program can connect to. A PDA requires IrDA standard interface which a terminal emulation program can connect to. The MCP2150 replaces a wired serial connection with an IR serial connection which allows data to be sent back and forth.

## **Slide 24: Fan Controller Development Boards**

### Development Tools Overview Fan Controller Development Boards

#### Support for TC64x and TC65x Devices

- Controllers for DC brushless fans
- Locked rotor detection
- Set On/Off trigger points



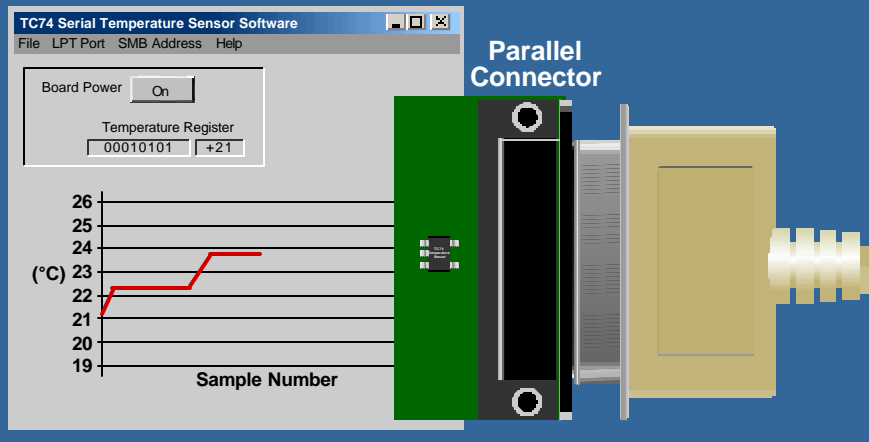
There are also development boards available for Microchip's TC64x and TC65x PWM Fan Controller devices. These boards allow the connection of a DC brushless fan to test the automatic locked rotor detection, and also to trigger the fan to turn on and off at various temperature threshold points.

## **Slide 25: Thermal Sensor Demo Board**

### **Development Tools Overview TC74 Thermal Sensor Demo Board**

**Connects to PC via a standard Parallel cable**

**Easy to use Windows™ based software allows user to track temperature and display in different formats**



The TC74 demo board demonstrates the simple to use TC74 Temperature sensor IC. This is a very small demo board that connects directly to the parallel port on a PC. Software included allows the user to acquire temperature data in time increments ranging from seconds to hours. Data acquired can be displayed in a number of different ways depending on the application.

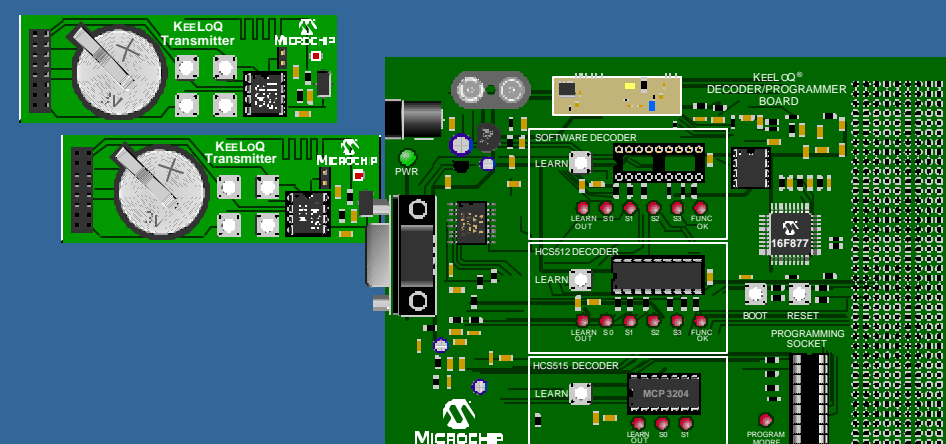


## **Slide 26: The KEELOQ® Evaluation Kit**

**Development Tools Overview**  
**KEELOQ® Evaluation Kit**

**Supports HCS 500/512/515 Decoders and HCS300 Encoders**

- Kit includes 2 transmitters and decoder/programmer board
- Allows demonstration/evaluation of RF code hopping technology

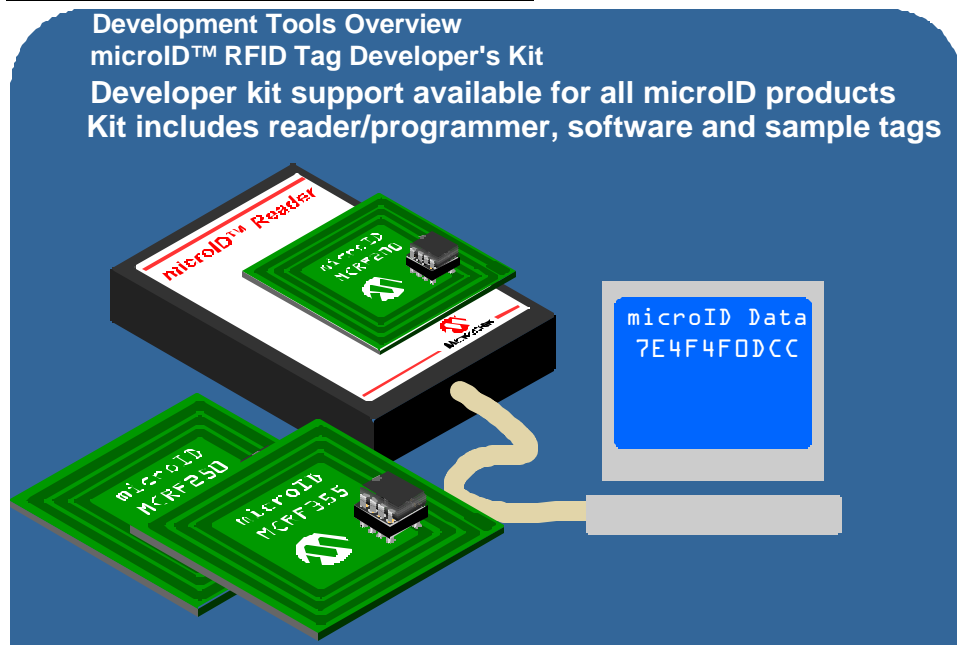


The image displays the components of the KEELOQ Evaluation Kit. On the left, two small green PCBs are shown, each labeled 'KEELOQ Transmitter' and featuring a Microchip logo. On the right is a larger green PCB labeled 'KEELOQ® DECODER/PROGRAMMER BOARD'. This board includes several sections: a 'SOFTWARE DECODER' with a 'LEARN' button and status LEDs; an 'HCS512 DECODER' with a 'LEARN' button and status LEDs; and an 'HCS515 DECODER' with a 'LEARN' button and status LEDs. It also features a 'PIC16F877' microcontroller, a 'PROGRAMMING SOCKET', and various other components like resistors, capacitors, and a power jack labeled 'PWR'. The Microchip logo is visible at the bottom left of the board.

The KEELOQ Evaluation Kit demonstrates the HCS515 and HCS500 decoders. It also contains a PIC16F877 which can be used to program any of the KEELOQ encoders and decoders such as HCS300 and HCS500 series devices. There are also sockets for an RF receiver which can also be used to demonstrate wireless transmission.

The kit comes with two independent RF transmitters which use HCS300 series encoders. These transmitters can demonstrate wireless code hopping capabilities. This kit can be used as a universal KEELOQ programmer, as well as a demonstration tool for transponder and standard encoder wireless operation.

## **Slide 27: microID™ Developer's Kit**



The microID Developer's Kit includes a RFID reader and writer which supports the MCRF200, MCRF250 and MCRF355 anti-collision devices.

The complete design for these RF readers is included, along with schematics, source code and various reference design material. This kit enables an engineer who is new to RFID technology to investigate a working design, and evaluate it's performance.

These kits also contain a wireless RFID device programmer to support some of the latest contactless programmable RFID products.

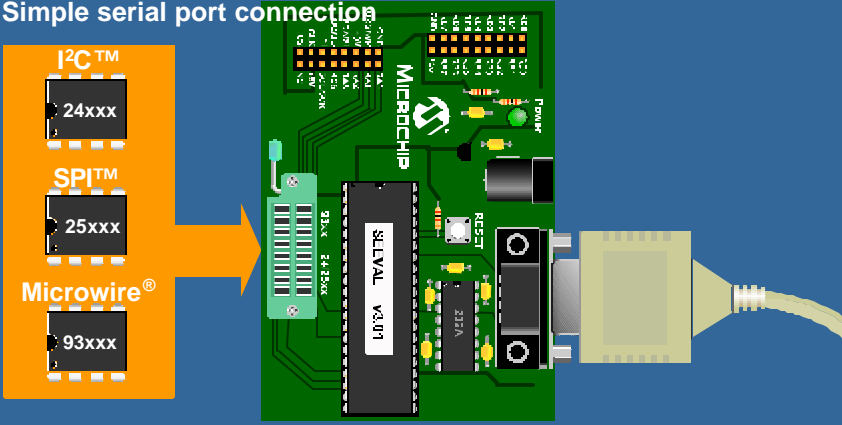
## **Slide 28: Serial EEPROM Designer's Kit**

Development Tools Overview  
Serial EEPROM Designer's Kit (SEEVAL)

Reads and writes to any Microchip serial EEPROM

Windows based software

- Endurance testing
- Simple serial port connection



The diagram illustrates the SEEVAL kit. On the left, an orange box lists supported protocols and device sizes: I<sup>2</sup>C™ (24xxx), SPI™ (25xxx), and Microwire® (93xxx). An orange arrow points from this box to a green circuit board. The board features a Microchip logo, a ZIF socket labeled 'SLVAL V3.0T', and various electronic components including a 227A capacitor, a 100MΩ resistor, and a 5V regulator. A yellow cable is connected to the board's serial port.

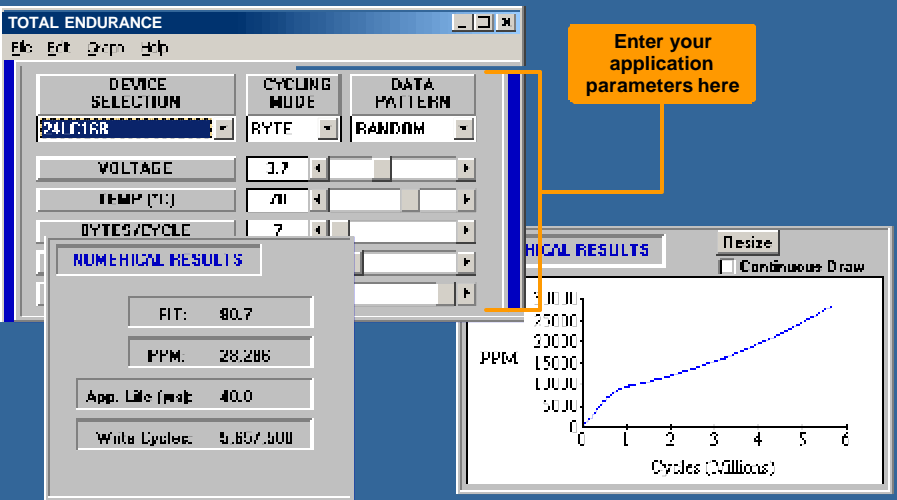
The Serial EEPROM Designer's Kit can be used to read or program any of our serial EEPROM devices. It can also be used to test the endurance of a device by executing a loop where it continually writes data to the device and then validates the data after each cycle in the loop.

This kit comes with Windows based software and connects to the PC via the serial port. A ZIF socket on the board allows support for I<sup>2</sup>C™, SPI™ and Microwire® Serial EEPROM devices.

## Slide 29: *Total Endurance*™ Software

Development Tools Overview  
**Total Endurance™ Software**

Windows based software will predict the life of an EEPROM product based on system parameters given by the user



The screenshot shows the 'TOTAL ENDURANCE' software window. It has a menu bar with 'File', 'Edit', 'Graph', and 'Help'. The main area is divided into three sections: 'DEVICE SELECTION' with a dropdown menu showing '24C16B', 'CYCLING MODE' with a dropdown menu showing 'BYTE', and 'DATA PATTERN' with a dropdown menu showing 'RANDOM'. Below these are input fields for 'VOLTAGE' (set to 3.7), 'TEMP (°C)' (set to 70), and 'BYTES/CYCLE' (set to 7). A 'NUMERICAL RESULTS' window is overlaid on the left, showing 'FIT: 80.7', 'PPM: 28.286', 'App. Life (m/a): 40.0', and 'Write Cycles: 5.657,500'. On the right, a 'GRAPHICAL RESULTS' window shows a graph of 'PPM' (Y-axis, 0 to 30000) versus 'Cycles (Millions)' (X-axis, 0 to 6). The graph shows a blue curve that starts at (0,0) and rises to approximately (6, 25000). An orange callout box with the text 'Enter your application parameters here' points to the input fields for Voltage, Temp, and Bytes/Cycle.

Enter your application parameters here

The *Total Endurance* software can be used to predict serial EEPROM endurance based on application specific requirements. This software allows the user to enter application details such as voltage, operating temperature, number of erase write cycles per day. The software will then predict the EEPROM endurance throughout the expected application lifetime.

The *Total Endurance* software is Windows based and can be downloaded free from [www.microchip.com](http://www.microchip.com).

### **Slide 30: Third Party Development Tools**

#### Development Tools Overview Third Party Development Tools

##### Third Party Partners provide

- C Compilers
- Programmers
- Assemblers
- Gang programmers
- Cross Assemblers
- Educational tools
- Development boards
- Assemblers
- Project Consulting

Download the Third Party Guide from [www.microchip.com](http://www.microchip.com)

There are many Third Parties who support the popular PICmicro<sup>®</sup> architecture. These Third Party companies offer everything from assemblers, linkers, programmers, C compilers, real time operating systems, TCP/IP stacks and other development tools.

You can visit the Microchip website and download the Third Party reference guide which offers a variety of interconnect and gang programmer solutions.

This guide also contains a listing of more than 250 worldwide design consultants who are very familiar with the PICmicro architecture and can provide consulting resources for both hardware and software implementations using PICmicro devices.

### **Slide 31: Knowledge Check #5**

Which of the following development tools provides the means for acquiring data from an A/D and displaying the data as an FFT?

- a) FilterLab
- b) USB Developer Kit
- c) FTTLab
- d) **MXLAB**

## **Slide 32: Closing Slide**

Development Tools Overview  
Closing Slide



# MICROCHIP

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## Development Tools Overview

This concludes the Development Tools Overview course. We hope you found this presentation interesting and worthwhile. If you have comments about this presentation or any other topic concerning Microchip's eLearning Program, you can send your comments by clicking on the "Feedback" link on the left side of this screen.