Microchip WebSeminar

MPLAB® Starter Kit for Serial Memory Products

Powerful, Easy-to-use, Inexpensive

Welcome to this web seminar on Microchip's MPLAB® Starter Kit for Serial Memory Products.

My name is Aditya Rao, product marketing engineer for Microchip's Memory Products Division. This 20-minute seminar will introduce you to our new EEPROM development tool.

The new Memory Starter Kit now uses the familiar MPLAB Integrated-Development-Environment and is designed to work on Microchips I2C, SPI, Microwire as well as the newly launched UNI/O™ Serial EEPROM. It now features a more compact design and is powered up by a simple USB connection from your laptop allowing for quicker integration.

Microchip designed and developed the MPLAB Serial Memory Starter Kit for our customers to assist them in their product development efforts. The Starter Kit is a very powerful programmer and debugger and displays the entire contents of the memory array on screen for quick verification and faster evaluation as you will see during this seminar. It is also very easy to use, set-up, and update. Finally, it is inexpensive at about 80 US dollars a piece.

The purpose of this web seminar is to introduce you to this tool, to show you how easy it is to use, and to show you some of its functionality to help you in your design, test, verification and validation efforts.

The MPLAB® starter kit for Serial Memory Products replaces our previous SEEVAL® 32 EEPROM development kit.

Do You Need….

- **Fast, easy product development?**
- **Quick, on-site production debugging?**
- **Prototype code verification?**
- **Low-volume programmability?**
- **Endurance testing?**

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So, who would find an EEPROM development tool to be useful? And, who might find this web seminar useful?

Here are a few scenarios to think about:
•Do you develop new products?
•Would it decrease time spent de-bugging a board if you could read the actual contents of the serial EEPROM?
•Need a simple way to develop oscilloscope plots of memory devices?
Or
•Do you do in-circuit emulation of EEPROM boards?
If so, the MPLAB® Starter Kit for Serial Memory Products can help cut your development time.

Do you work at a production site? Have you ever needed to de-bug production boards? Having an MPLAB® Memory Starter Kit tool on site at production facilities can help to quickly identify the root cause of manufacturing issues and get a production line back on track.

Want to quickly verify codes in a number of prototype EEPROM devices? Microchip's Memory starter kit can handle that chore.

Do you need an inexpensive method to perform low-volume programming? Many of our customers use this tool as a programmer.

Finally, is endurance important in your application? The Memory Starter Kit tool has a built-in endurance utility, and it comes with Microchip's Total EnduranceTM modeling software.

In summary, Microchip developed the MPLAB® Starter Kit tool because our customers were looking for an easy, inexpensive way to design with our products.

Agenda

- **Hardware**
- **Software and GUI**
- **"Live" Demonstration**
- **Finish Up With…**
  - **Other Features**
  - **How to Order**
  - **For Further Information…**

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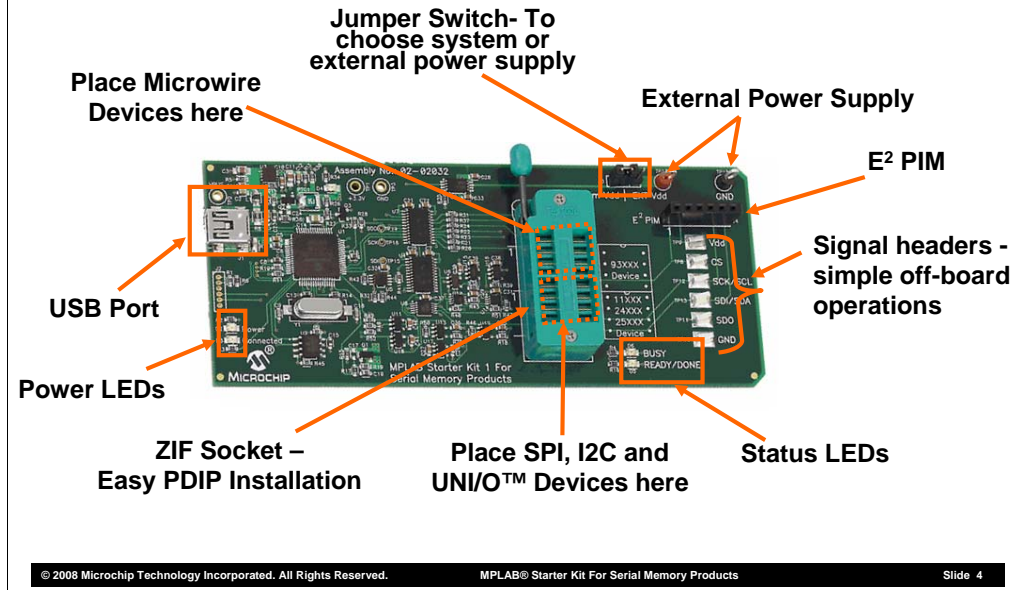
Let's take a look at today's agenda:

First, we'll look at the Starter Kit board's physical layout and discuss some of the hardware features.

Then, we'll look at the tool's software features and user interface.

We'll then go "live" to a demonstration of the Serial Memory Starter Kit, and I'll give you a brief tutorial on how the tool works using my own laptop computer.

After that, we'll come back to the regular presentation and finish up with a discussion of some other features of the tool, how to order one, and where to go on Microchip's web site for more information.

Hardware Features

Jumper Switch- To choose system or external power supply

Place Microwire Devices here

External Power Supply

E² PIM

USB Port

Signal headers - simple off-board operations

Power LEDs

ZIF Socket – Easy PDIP Installation

Place SPI, I2C and UNI/O™ Devices here

Status LEDs

So, let's now look at the Memory Starter Kit board layout using this photograph.

First, you'll notice that the board is small - only 12 cm by 5 cm.

The Starter Kit board is very easy to use. The first step is to hook this up to your PC using the USB cable provided. The USB also helps power-up the device. This will be a good time to point out that this USB capability didn't exist in the previous SEEVAL32® kit where the board had to be connected to the PC via the RS-232 serial port and a separate external power source.

Additionally, because the kit derives power over USB, its operation is fast. No additional power-supply connections are needed thereby enhancing the kit's portability and enabling the highest performance at lowest cost.

Once the board is connected to a PC you should see the power LED on the left side of the board turn green to indicate that the board is powered up and connected properly. The Status LEDs near the bottom right of the board indicate the current status of the EEPROM. During read, write and verify operations you will observe that this LED glows red to indicate that the device is busy.

The board itself has a row of signal headers that simplify in-circuit evaluation by providing easy access to signal lines. This is a great place to hook up an oscilloscope to see what is actually happening to the various signals.

The board accepts PDIP devices in an easy-in, easy-out ZIF socket. The kit ships with 4 EEPROM samples in PDIP packages so you can get started right away. If you are using a different package, package adapters are available from 3rd-party vendors. We also have provision for you to test other packages by mounting them onto the PIM socket.

This board provides dual internal or external voltage support to suit your need. The jumper switch helps select between the two modes. External Voltage allows for 1.8V to 5.5V Vdd operation while you can operate at either 3.3V or 5.0V Vdd if you choose to use the internal, on-board USB powered voltage option.

Now, let's take a look at the user interface that you would see when running the MPLAB® Serial Memory starter kit tool on your computer.

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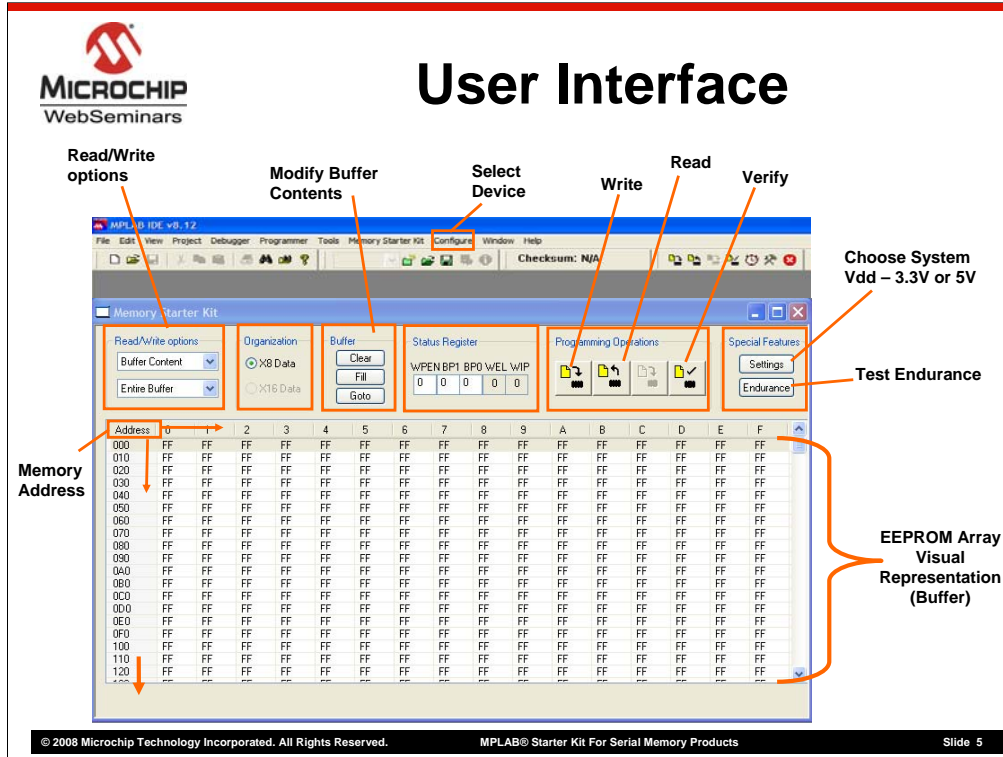
As I mentioned earlier, the Serial Memory Starter kit runs through a standard PC. The starter kit works with Windows NT, 2000, XP and windows Vista (32-bit).

This screen shot of the user interface highlights some of the tool's functionality.

First, the tool supports all Microchip serial EEPROMs in all four buses: I²C™, Microwire, SPI and the new UNI/O™ bus. This includes over 50 device families. Whenever we release a new device, we also update the tool's database. These software updates are available from our website.

The tool has 3 major functions – Read, write and Verify. I'll go over them in more detail in the demo section of this presentation.

Before we go there, notice the large buffer, which is the visual representation of the actual EEPROM array, the data is represented in hex to make it convenient for designers to visualize what's happening within the device.

Now I'm going to switch from the presentation to an actual demonstration of the MPLAB® Serial Memory Starter Kit.
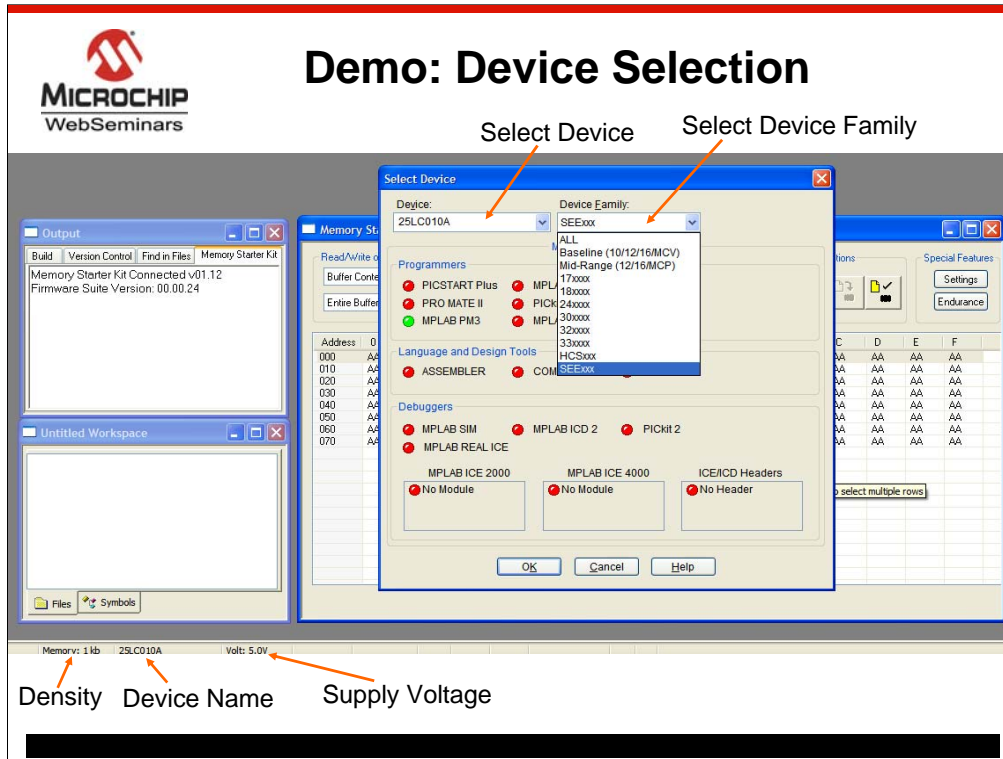
So, now I'm running a live demonstration of MPLAB® Starter Kit for Serial Memory Products. I have a Memory Starter Kit board hooked up to my laptop using the USB port. Here is the MPLAB IDE start-up screen.

The first thing to do is to select the memory starter kit and the correct EEPROM device within the IDE interface.

To select the memory starter kit click on **Tools-> Memory Starter Kit from the main menu**. You should see the user interface we just saw from the previous slide with the array.
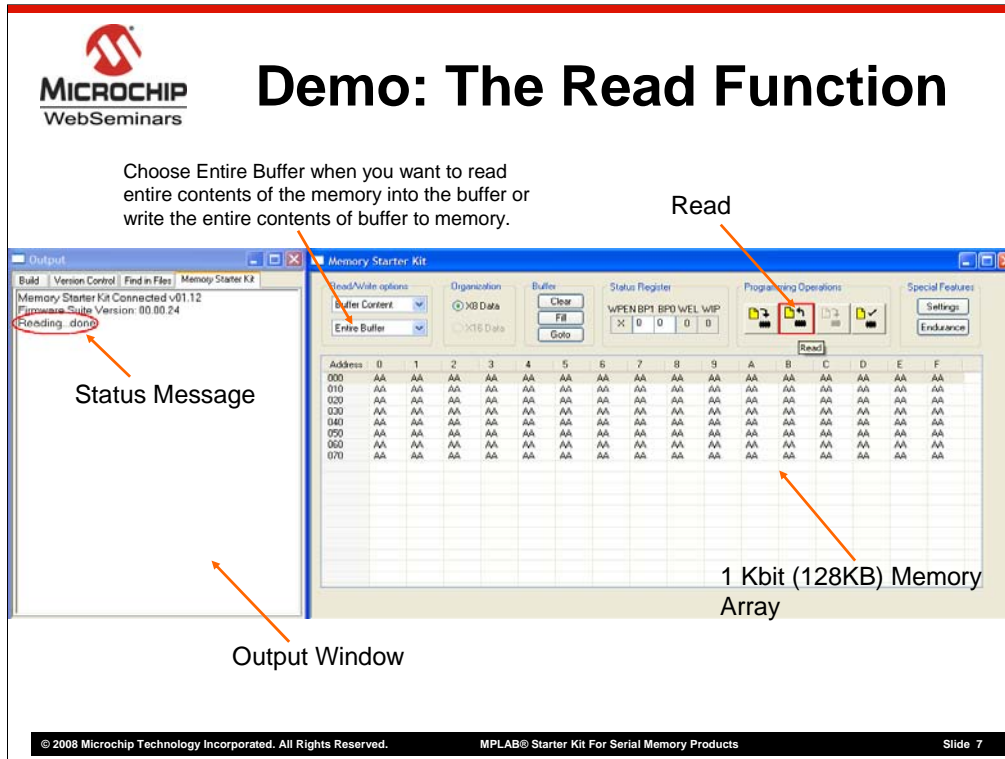
The next step is to select the memory device. I have hooked up a 1Kbit SPI device on my starter kit board. To select this device click **Configure-> Select Device** from the main menu**.** Then choose the "**SEExxx"** device family which represents the Serial EEPROMs family on the pull down menu on the right. Finally, choose the device by selecting the "**25LC010A"** memory part from the left pull-down menu and click ok. You should see your selection on the bottom of the screen showing device name and density.

Note: The size of the array or the buffer contents changes proportionally based on the memory density chosen.

Now that you are set-up, let's go over the three major functions of the starter kit - Read, Write and Verify.

Demo: The Read Function

Choose Entire Buffer when you want to read entire contents of the memory into the buffer or write the entire contents of buffer to memory.

Read

Status Message

Output Window

1 Kbit (128KB) Memory Array

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Let's first start with the "Read" function:

You can choose to Read either the entire contents of the memory or a specific user-defined set of locations. The latter is particularly helpful if you are only interested in checking the contents of a few key bytes within a large EEPROM. Let's first read the entire contents of the memory into the buffer.

To do this: Make sure the **"Buffer Contents" and "Entire Buffer" drop-down options** are selected from the read/write options section. Then, by clicking the **read icon** under programming operations the contents of the memory array is loaded on to the buffer that you see on the screen. You should also see the "**Reading… done" status message** displayed on the output window. In this case, the EE is programmed with all F's, the normal way we ship EEPROMs.

We will look at reading specific locations later in the demo.

Demo: The Write Function
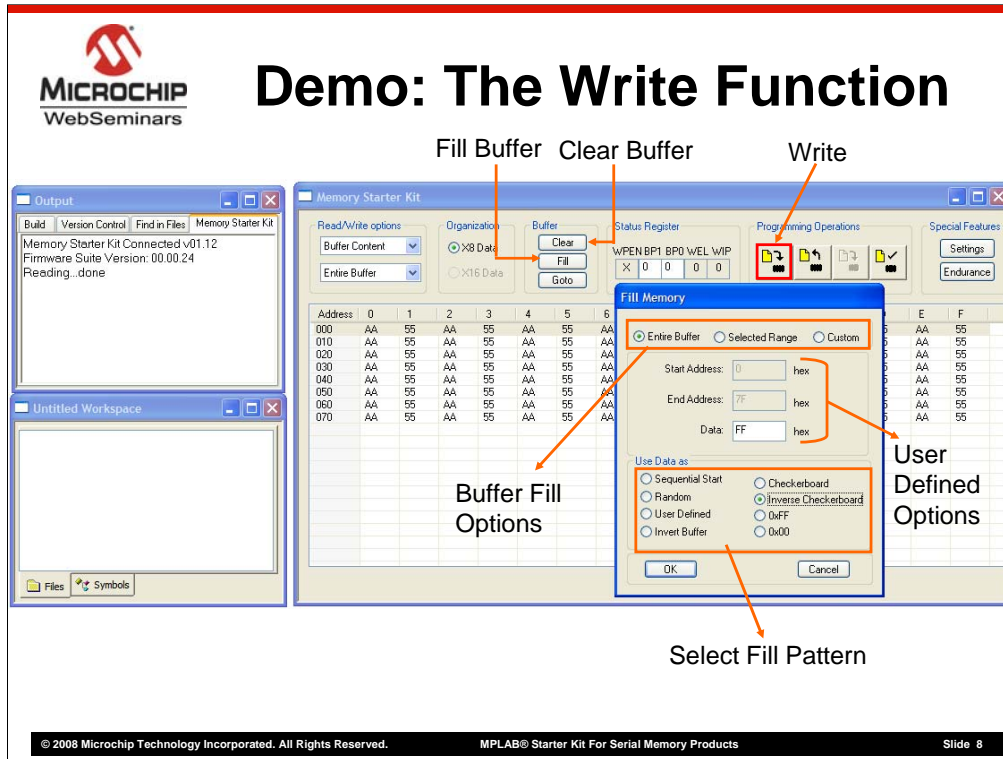
Now, let's look at programming the memory, or the WRITE operation - the tool's 2nd major function. Here you can choose to copy the contents of the buffer directly to the EEPROM or choose to write a specific user pattern over a selected range of cells.

The buffer is a special storage space that is the same size as the memory array and uses the computer's memory to store data. It is a useful scratch pad area for testing and verification before you write anything into the memory.

To fill the contents of the entire buffer: Make sure the **"Buffer Contents" and "Entire Buffer" drop-down options** are selected from the read/write options section.

Then, **click on the Fill button** under the buffer tab and click-on one of the many options available to fill the buffer. I will fill the buffer with an inverse checkerboard pattern. To do so**, click the inverse checkerboard radio button and hit ok.** Now, to write this pattern onto the memory just **click the "write" icon** in the programming operations section and the contents of the buffer is written onto the memory. You should see the output window display the "Writing… Done" status message.

You can now verify whether the write was done correctly by reading back the contents of the memory using the read icon as we saw earlier. I will first clear the contents of the buffer by **clicking the clear button in the buffer tab**. This fills the buffer with FF's. Now, I **click the read icon in the programming operations section** and I should see the inverse checkerboard pattern on my buffer indicating that the memory was written to correctly. This is a simple way to verify. We will see how to use the system verify feature in the next part of this demo.

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Demo: Write Over User Defined Range
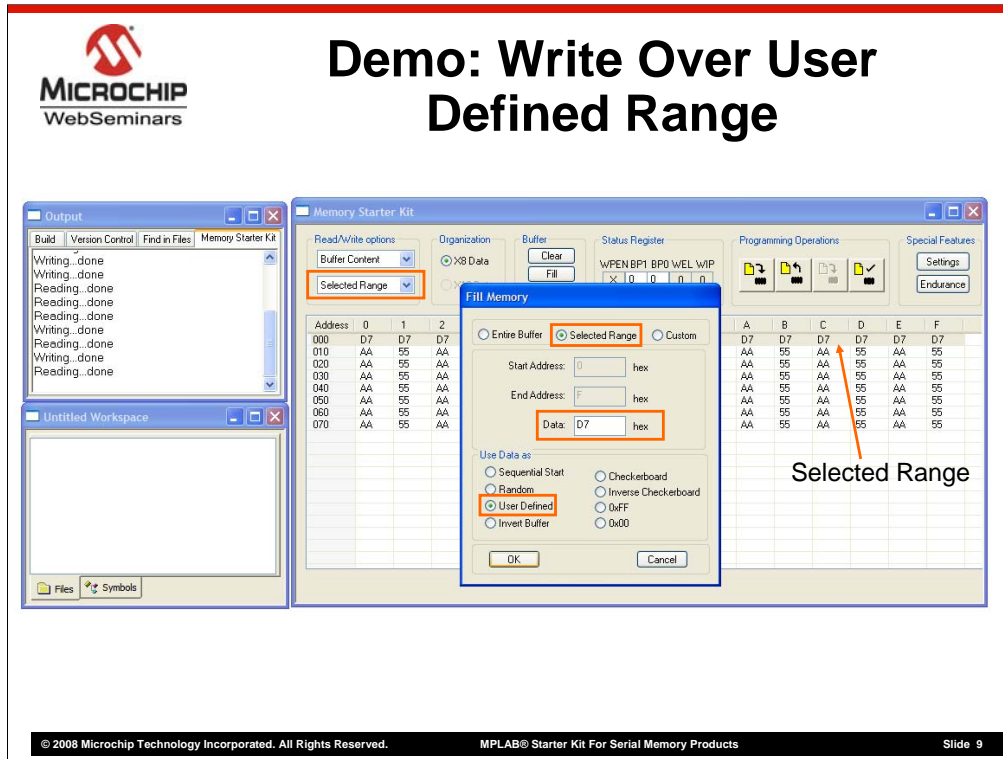
But first, let's see how to program and then read a selected range of cells within the EE with a specific user defined pattern. As is a good practice, let's first clear the buffer as before **by clicking the clear button**. Next, let's program the first 16 bytes i.e. the first row of bytes in the buffer with D7. To do this, first **right click on the first row** in the buffer. Then, **click the fill button under the buffer section**. Here, choose the **"selected range" radio button** on the top. **Enter "D7" in the data field** and choose the **"user defined" radio button** in the "use data as" field and finally **click ok**. You should see the first row of the buffer filled with the user defined "D7".

Next, to write contents of only this row into the memory, reselect **the first row if not already highlighted** by right clicking on it**. Change the drop down in the read/write options from "Entire Buffer" to "Selected Range"** this helps the tool know that we wish to do read or write operations over the selected range only. Finally, **click on the write icon** in the programming operations section and you should see the "Writing … done" status message on the output window.

Remember we wrote only the first row of the buffer into the memory. So the remaining rows must still contain the inverse checkerboard pattern. We can check this by reading the contents of the entire memory again. Make sure that the drop down in the read/write options is changed back from "Selected Range" to "Entire Buffer" as we wish to read the entire buffer. Next, click the read icon. We should see that all bytes in the first row contain "D7" with the inverse checker board pattern for the remaining rows.

Note: To read a selected range, choose the selected range of cells to be read and hit the read programming icon taking care to ensure that the "selected range" option is selected in the read/write options section.

Demo: The Verify Function
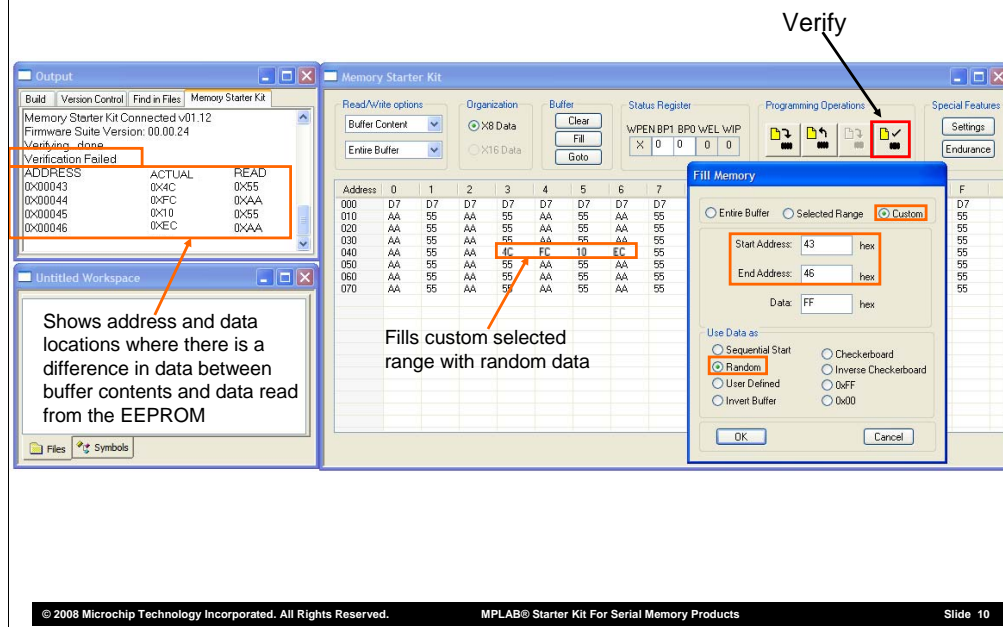
Now let's look at how the Verify can be useful to you.

The verify function provided by the starter kit is extremely useful during verification and testing. Quite simply, the verify checks the contents of the memory array with the contents of the buffer. In the event that there is a difference in data between any cell in the buffer and the memory array, the verify function not only indicates an error but also displays on the output window all locations where there is a mismatch in data.

To see this, let's deliberately introduce differences by changing data of few individual cells in the buffer. To do this, **click on fill button in the buffer tab** and then **click on the "custom" radio button** on the top row. **Enter the start address as "43" and end address as "46"**. Then **click on the random radio button** and hit ok. You should see random data populated at these contiguous address locations.

Now **hit the verify button** in the programming ops section and observe the output screen. You get a "verification failed" message as expected, followed by all the address locations where there is a difference in data between the actual buffer and the read memory array.

This little test shows how the MPLAB® Memory starter kit can be used to quickly check known good code in the buffer against the EEPROM device contents.

Demo: Import/Export Files
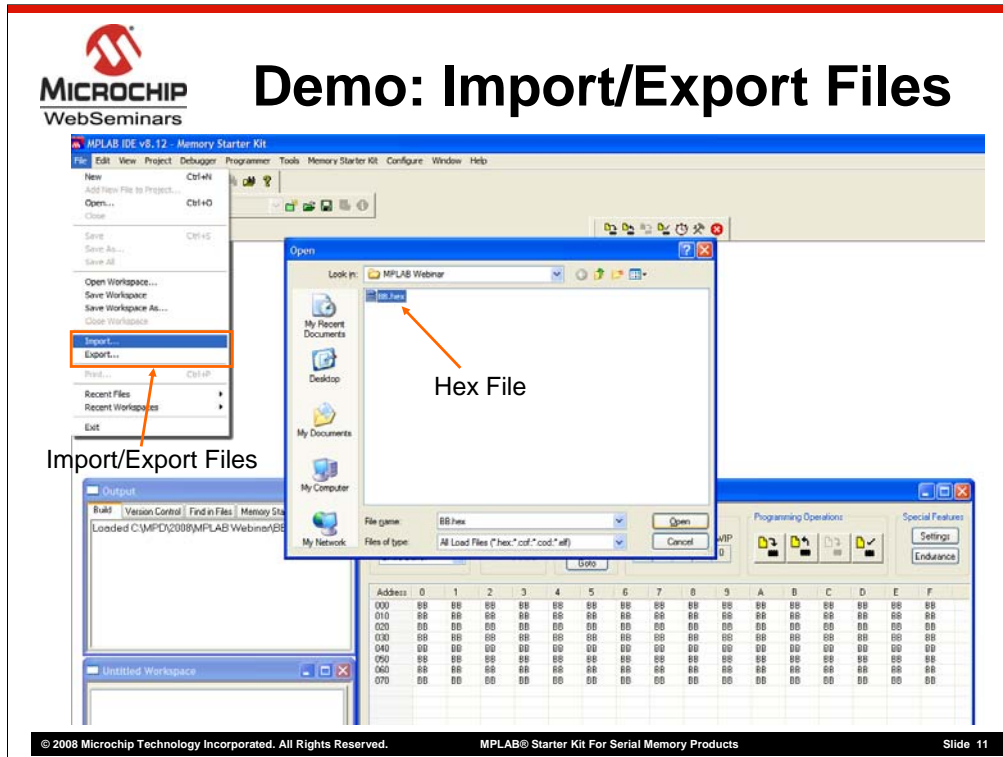
You can also use the buffer to import or export binary hex files. To show you how easy this is, I will import a binary hex file – with all 0xBB's - that I've already created.

All I do is go to the top level menu and select **File->Import->then I choose my pre-made hex file->click open**. In a real application, this file could be data that I need to program to several EEPROMs.

Now all the contents (0xBB) are only in the buffer. Depending on my needs, I could either verify the buffer contents against the actual array contents or write the buffer contents to the EEPROM.

And that's how easy it is to use this tool.

You can export hex files for either analysis or archiving with your own custom data or data obtained from the EEPPROM using the **File>export>** option.

Demo: Endurance

So now we have seen how to perform read, write and verify operations.

Before we go back to the presentation, I want to show you one more feature of the tool – the endurance utility. Many of our customers use Microchip EEPROMs because of their ability to be re-written millions of times. This MPLAB® starter kit tool offers a built-in endurance utility that lets you run these tests yourself. To get to the utility, **click on the endurance button** in the "Special Features" tab.

In the endurance utility window there are many options one can use. Note that all the read, write and verify options are continuous which means the tool continuously performs these functions in an infinite loop.

I will click on the **continuous write radio button and check the alternate write pattern**. Next, specify a pattern to be written from the many options available and click start. You will observe the tool continuously writes to the device displaying the no. of cycles completed and the failure count. You can run this for as long as you want. However, note that this is obviously a destructive test. Later on, I'll talk about a non-destructive, predictive model: our Total Endurance™ software that comes with each starter kit.

This concludes the short demo. Now, we'll get back to the presentation.

Other Features

NEW

- **Compatible with UNI/O™ Serial EEPROM**
- **Total Endurance™ Modeling software**
- **Selectable Internal Vdd** NEW
- **Selectable bus clock frequency**
- **Selectable SPI clock mode** NEW
- **Improved help menus**
- **Web-based upgrades**

Now, let's look at some of the other features available in the MPLAB® Serial Memory Starter Kit that we didn't have a chance to look at during the demo.

A new feature that has been added is dual internal voltage selection that allows 3.3V or 5.0V system operation to help duplicate specific applications. Alternatively, you also have the option of using an external voltage source. Finally, You can also select bus speeds and SPI clock modes to help configure your set-up closer to the real application.

We have upgraded the help menus with hyperlinks and examples. And, we have made it very simple to get firmware updates from the web. This is an easy way to keep your tool current as Microchip releases new products.

Finally, the tool has 2 endurance features. I already talked about the built-in endurance utility that can test actual parts. But, the memory starter kit also includes our Total Endurance(tm) software. This software package is a modeling tool that predicts the number of erase/write cycles you can expect from an EEPROM in a specific application. You can enter your own application's operating conditions, and the Total Endurance Model will calculate predicted failure rates. It is a good way to measure the impact of design trade-offs. The Total Endurance software is also available for free on our web site.

We are proud of our industry-leading endurance and are happy to give you the tools to do your own tests.

Finally, the kit also contains a Quick Start Guide, a CD ROM with all the required software (the software is also available on the web), and several sample files to help you get started right away.

What Next?

- **To order SEEVAL® 32 Dev. Kit:**
  - **www.microchipDIRECT.com**
  - **Microchip distribution partners**
    - **Part number DV243003**
- **www.microchip.com**
  - **EEPROM data sheets**
  - **Application notes with source code**
  - **Other WebSeminars –Recommended usage on I^{2}C/SPI , Packages, Endurance**

There are 2 ways to order this Starter Kit: you can go to our on-line store – www.microchipdirect.com - search for the memory starter kit, and purchase on line with a credit card.

Or, many of our distributors and catalog house partners keep these tools in stock. In either case, search the respective web site or just google for "MPLAB® Memory Starter Kit" or for "DV243003" – that's the tool's official part number.

I'll also recommend some other on-line resources for more information on serial EEPROMs. Our data sheets are excellent resources to explain how serial EEPROMs work. We also offer several application notes that describe how to connect an EEPROM with PIC® microcontrollers.

Also, I'd recommend our other web seminars on serial EEPROM devices that are not only an excellent primer to our memory product lines but also provide tips and tricks and other additional information to help get you designed in faster and create more robust designs. To view all of these visit us on the world-wide-web at www.microchip.com/memory

MPLAB® Starter Kit for Serial Memory Products:

- **1. Powerful Features**
  - **Serial EEPROM programmer & debugger**
  - **MPLAB IDE Interface**
  - **Endurance Testing, Memory Buffer**
- **2. Simple to Use**
  - **Runs through a PC**
  - **Plug & Play USB connectivity**
  - **Easy install web updates and help menus**
- **3. Inexpensive**
  - **$79.98 USD**

Well, that just about completes this web seminar.

Our MPLAB® Memory Starter Kit tool was designed by the Microchip engineers who work with EEPROMs all the time. It is not just another 3rd-party programmer, but a dedicated design tool that customers use to help them develop Real serial EEPROM applications.

Quickly, summarizing the three primary attributes:

First, it is specifically designed to be an EEPROM de-bugger and a programmer as you've already seen in the demo. Its programming and reading capabilities, its MPLAB® IDE user interface, and its visual representation of the array along with additional features like the endurance utility make the tool very powerful.

Second, the tool is easy to use - it runs on virtually any PC and can be hooked up easily with a simple USB connector. It has excellent help menus as well as easy web updates.

Finally, it comes at a reasonable price of just 80 USD.

I hope you've learned something about our MPLAB® Memory Starter Kit for Serial EEPROM devices and have come up with some ideas of how to use this in your own applications.

Thanks very much for your time.