CodeWarriors & Processor Expert Seminar

AMF-GEN-T0011

CodeWarriors IDE and Processor Expert In-depth Training
Presented by Hy Mai and Ruth Rhoades

- How to position and sales Processor Expert
- LAB1 -- Blinking LED (Timer and I/O)
- LAB2 – KBI & Analog Compartor
- LAB3 -- ADC and PWM
- LAB4 – SCI (Uart) Communication with PC
- LAB5 – SPI Serial Peripheral Comm neighbor's board
- LAB6 – I2C Comm with neighbor's board
- LAB7 – Input Capture to measure Pulsewidth (Optional)
- LAB8 – Make check payable to He My FAE

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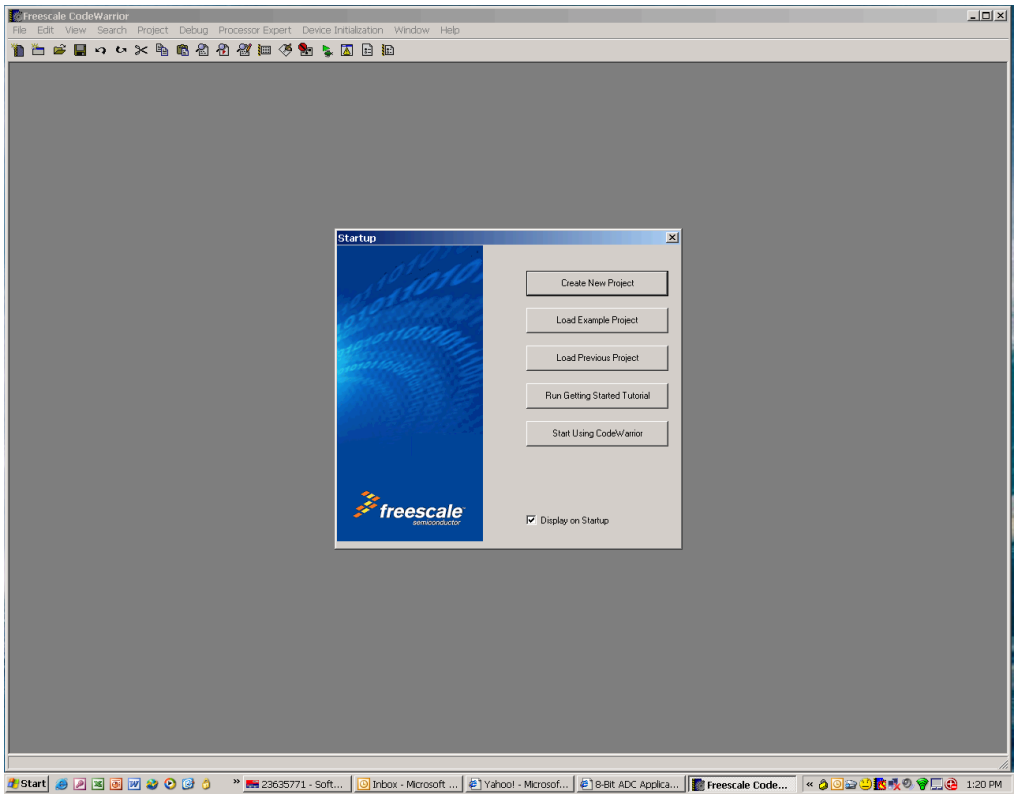
LAB1 -- Blinking LED

- Configure Bus Clock to 8Mhz
- Set Timer to generate an interrupt every 250ms
- Configure output on LED2 (PORTB7)
- Toggle LED at every Timer Interrupt

LAB1 -- Blinking LED

- Click “Create New Project”



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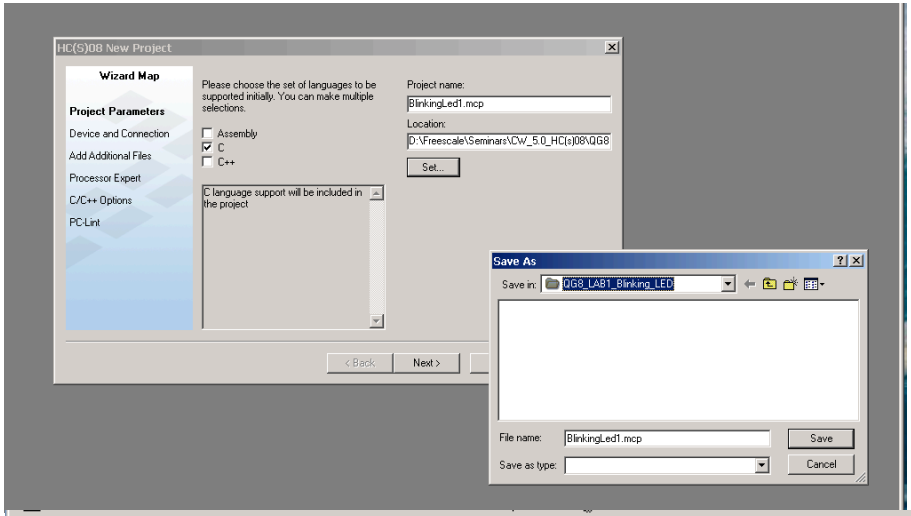
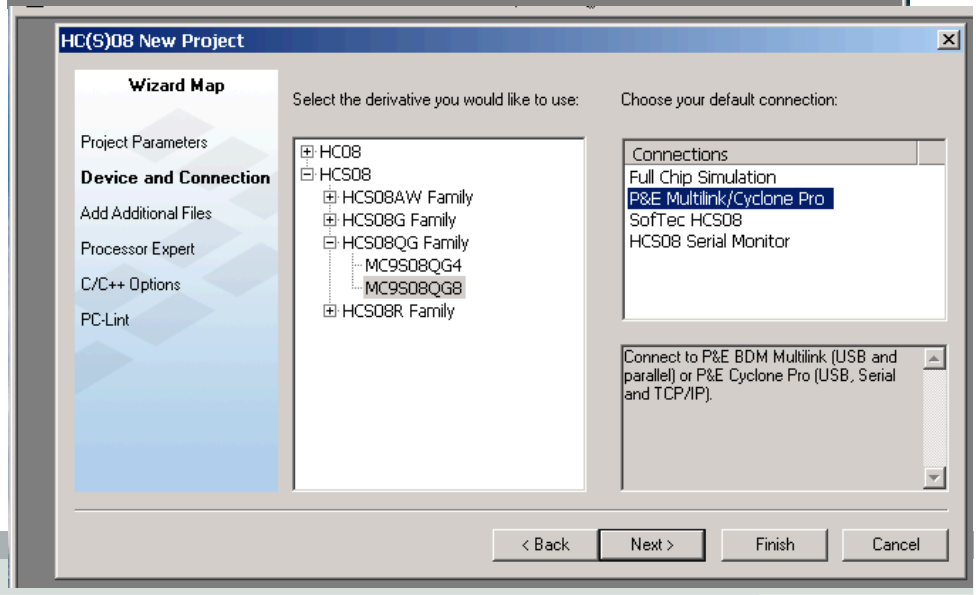
LAB1 -- Blinking LED

►Click on the “Set” button to set the directory
►Give the project a name and hit “Save” and then hit “Next”



•Expand the “HCS08” directory structure to and find the “MC9S08QG8” device
•Select “P&E Multilink/Cyclone Pro” under the Connections box, then hit “Next”



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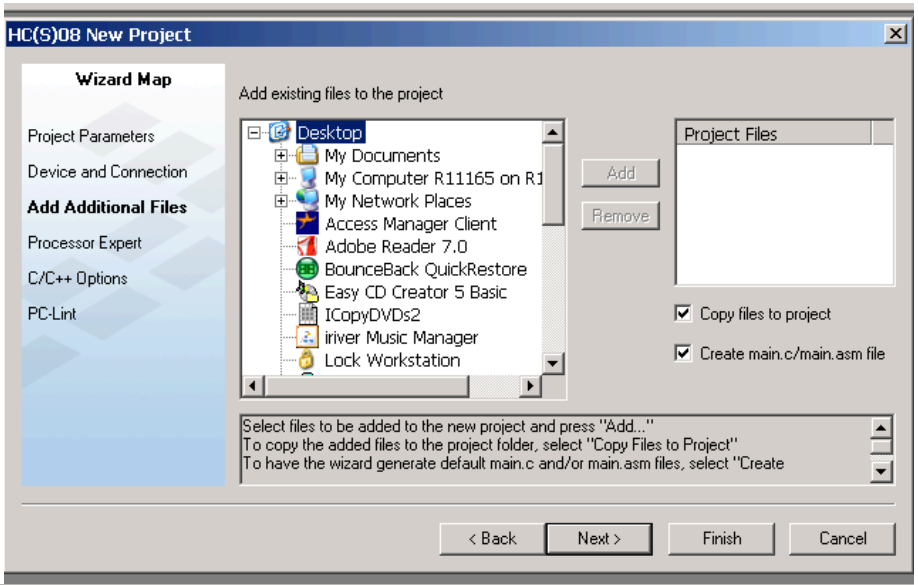
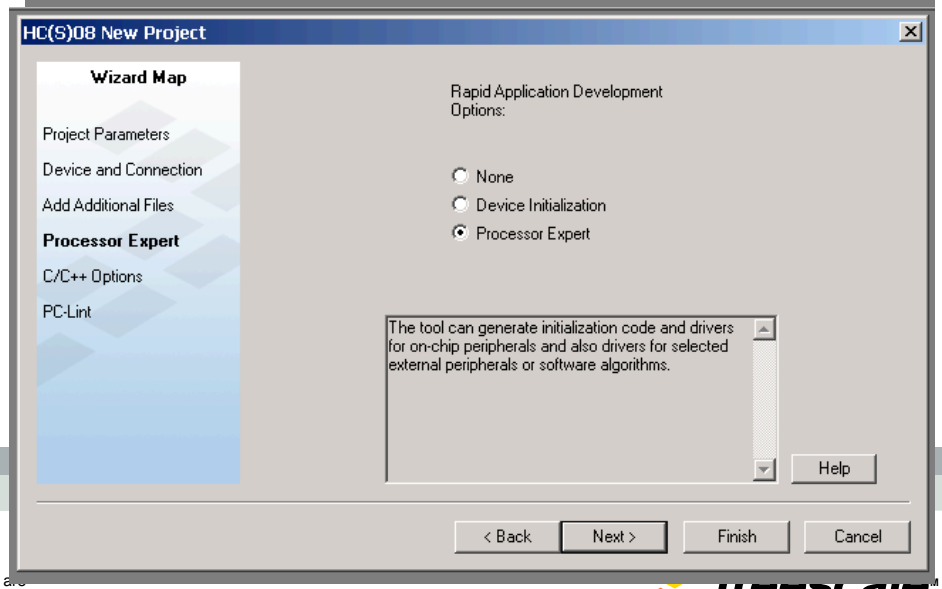
LAB1 -- Blinking LED

►Since we are not importing any existing files just hit “Next”



►Select “Processor Expert” and hit “Next”



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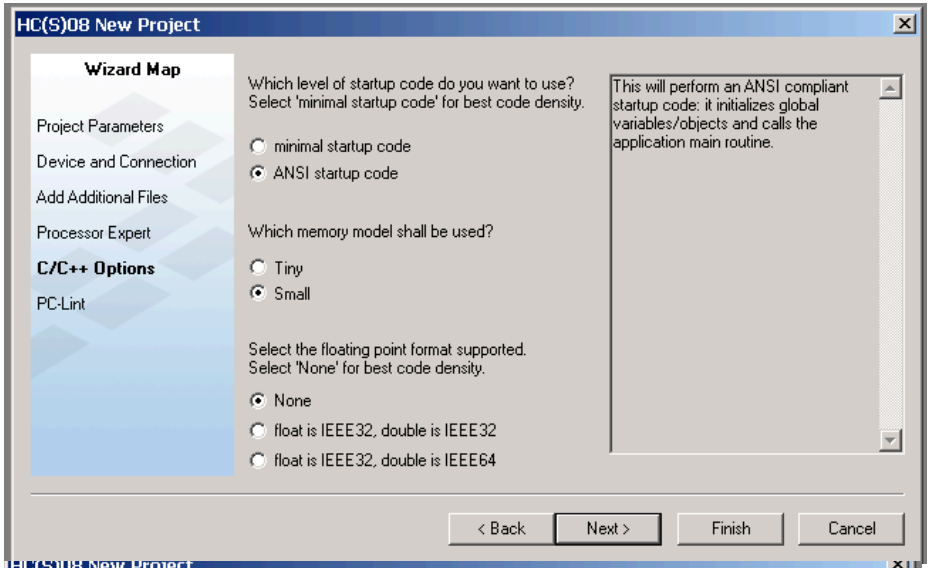
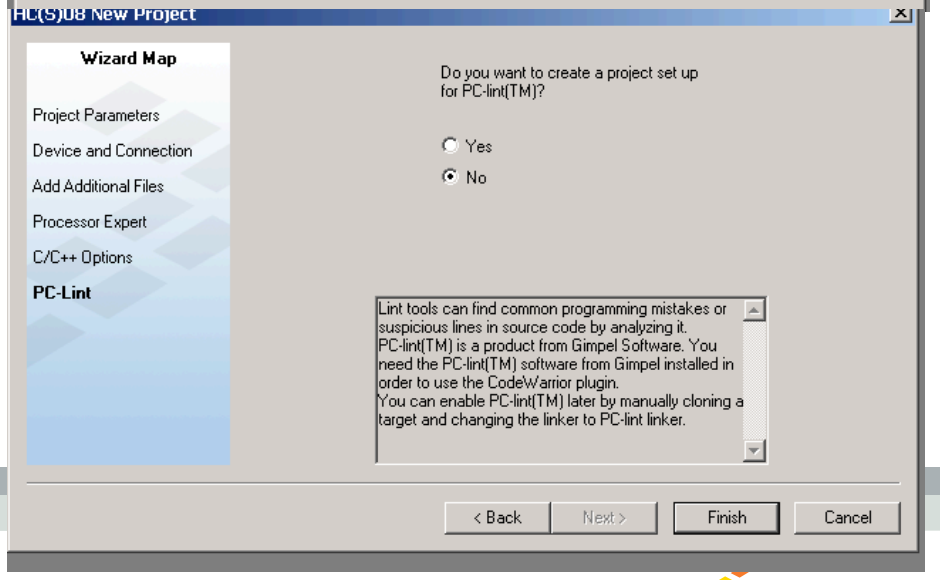
LAB1 -- Blinking LED

►Leave everything as default and click "Next"



►Leave everything as default and click "Finish"



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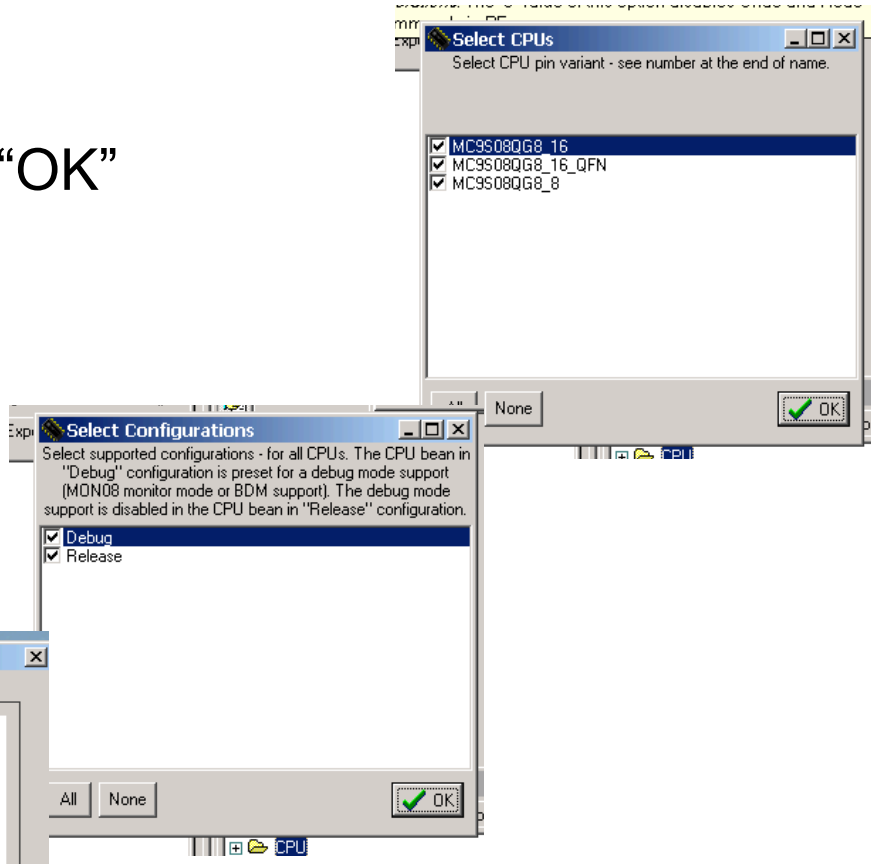
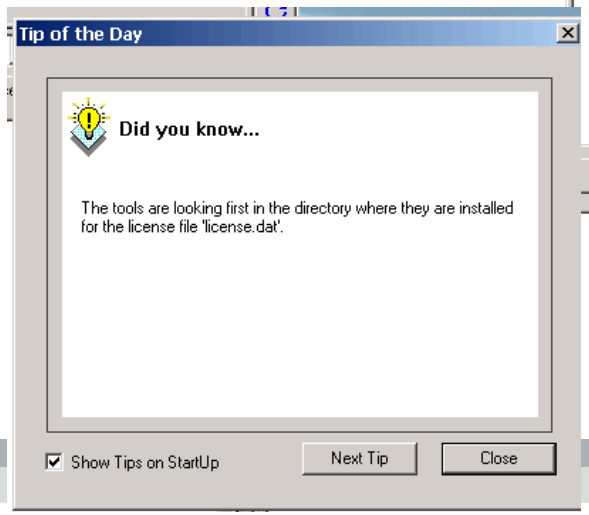
LAB1 -- Blinking LED

►Click “OK”

►Click “OK”



►Click “Close”



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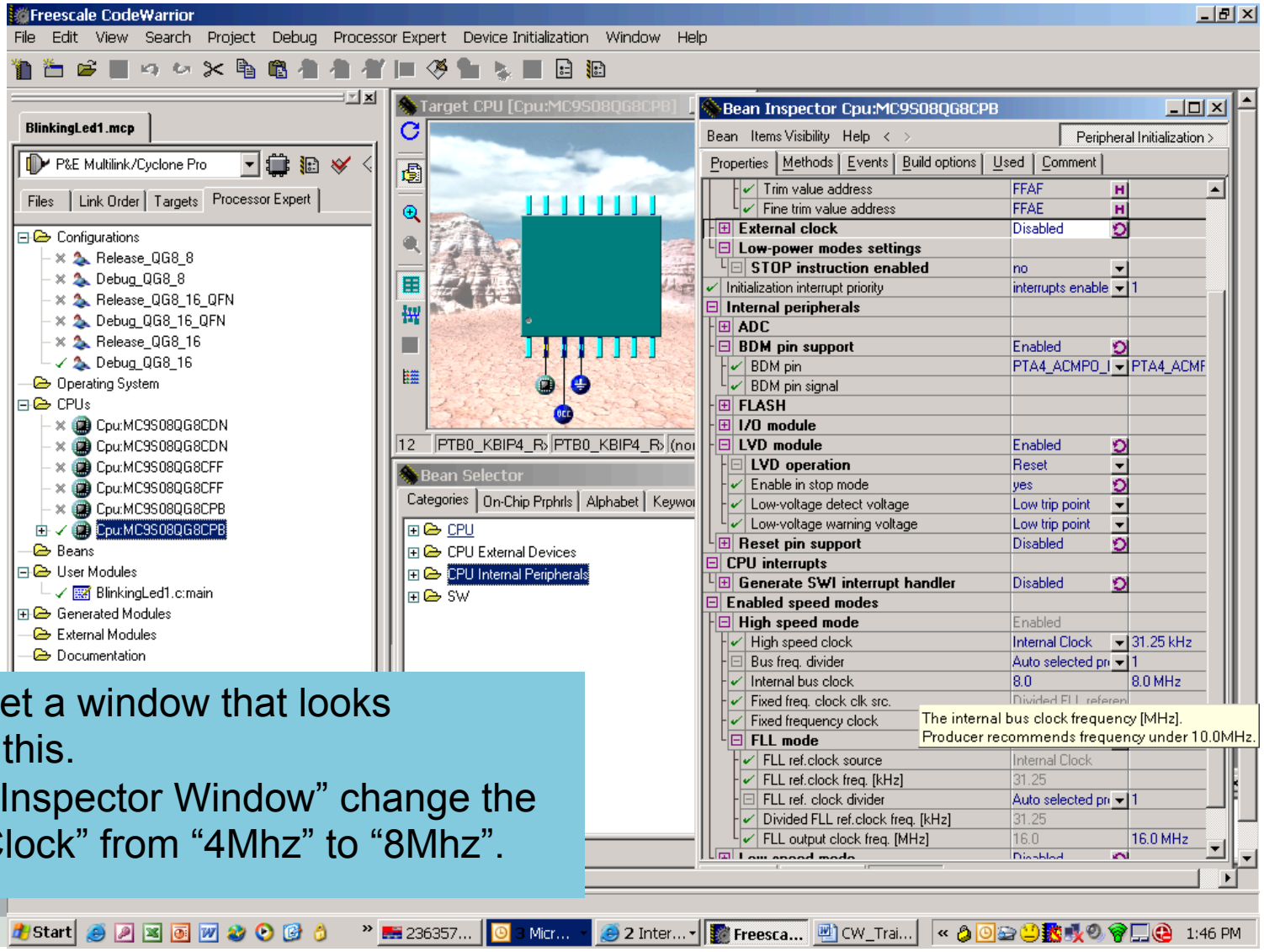
LAB1 -- Blinking LED



►You should get a window that looks somewhat like this.

►In the “Bean Inspector Window” change the “Internal Bus Clock” from “4Mhz” to “8Mhz”.

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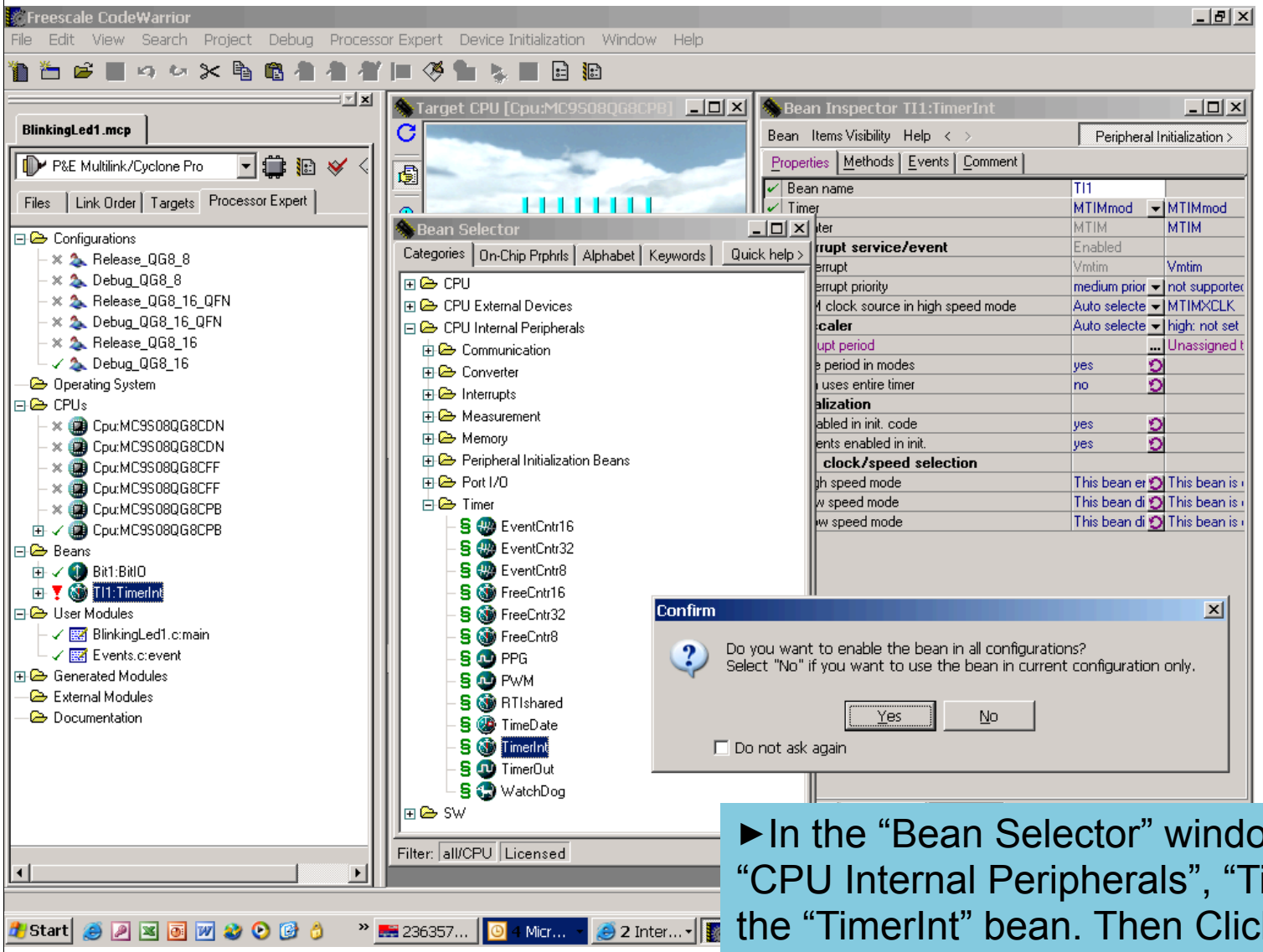
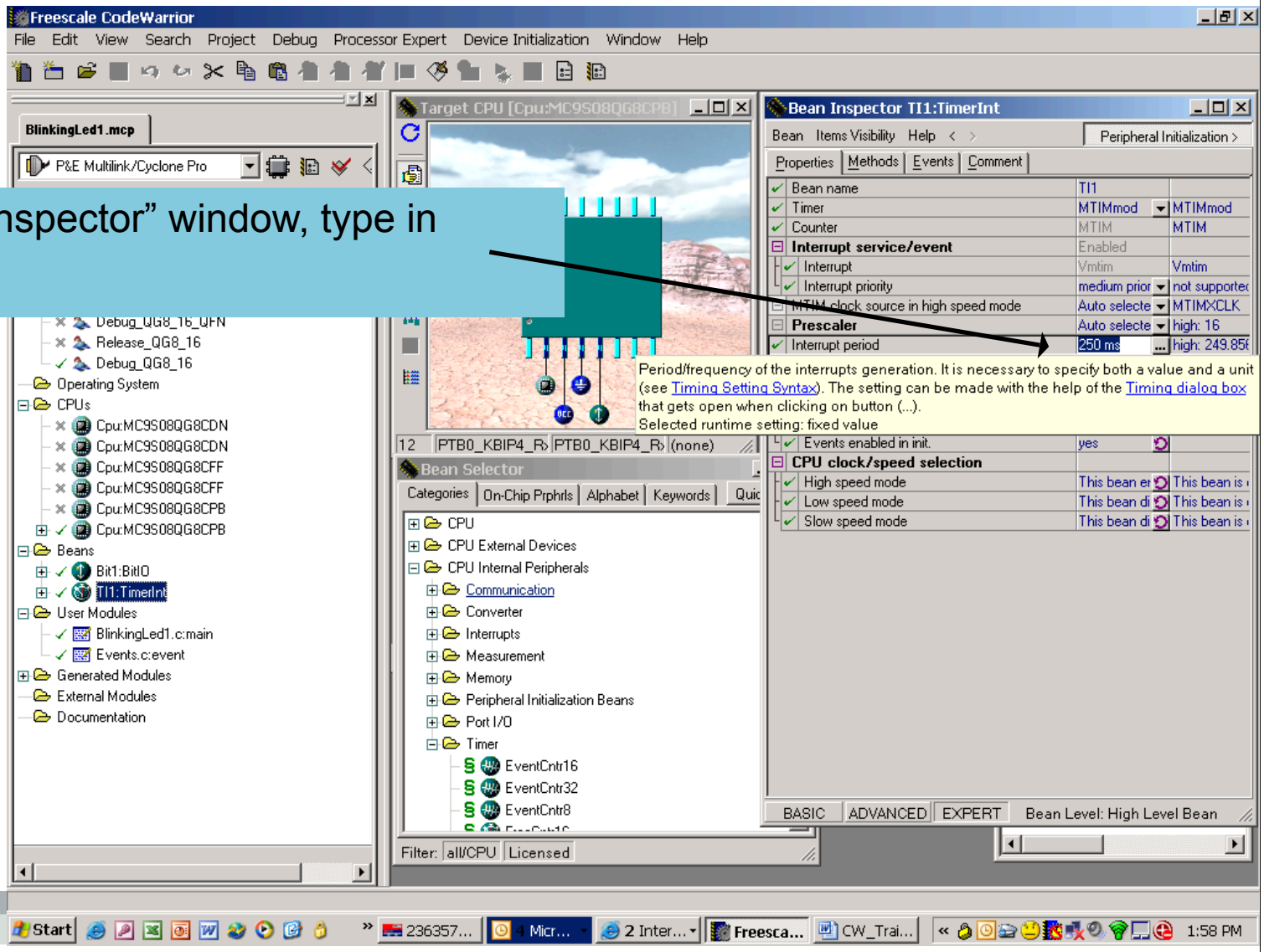
LAB1 -- Blinking LED



►In the “Bean Selector” window, expand the “CPU Internal Peripherals”, “Timer”, and select the “TimerInt” bean. Then Click “Yes” to confirm.

LAB1 -- Blinking LED

►In the “Bean Inspector” window, type in “250”(mSec)



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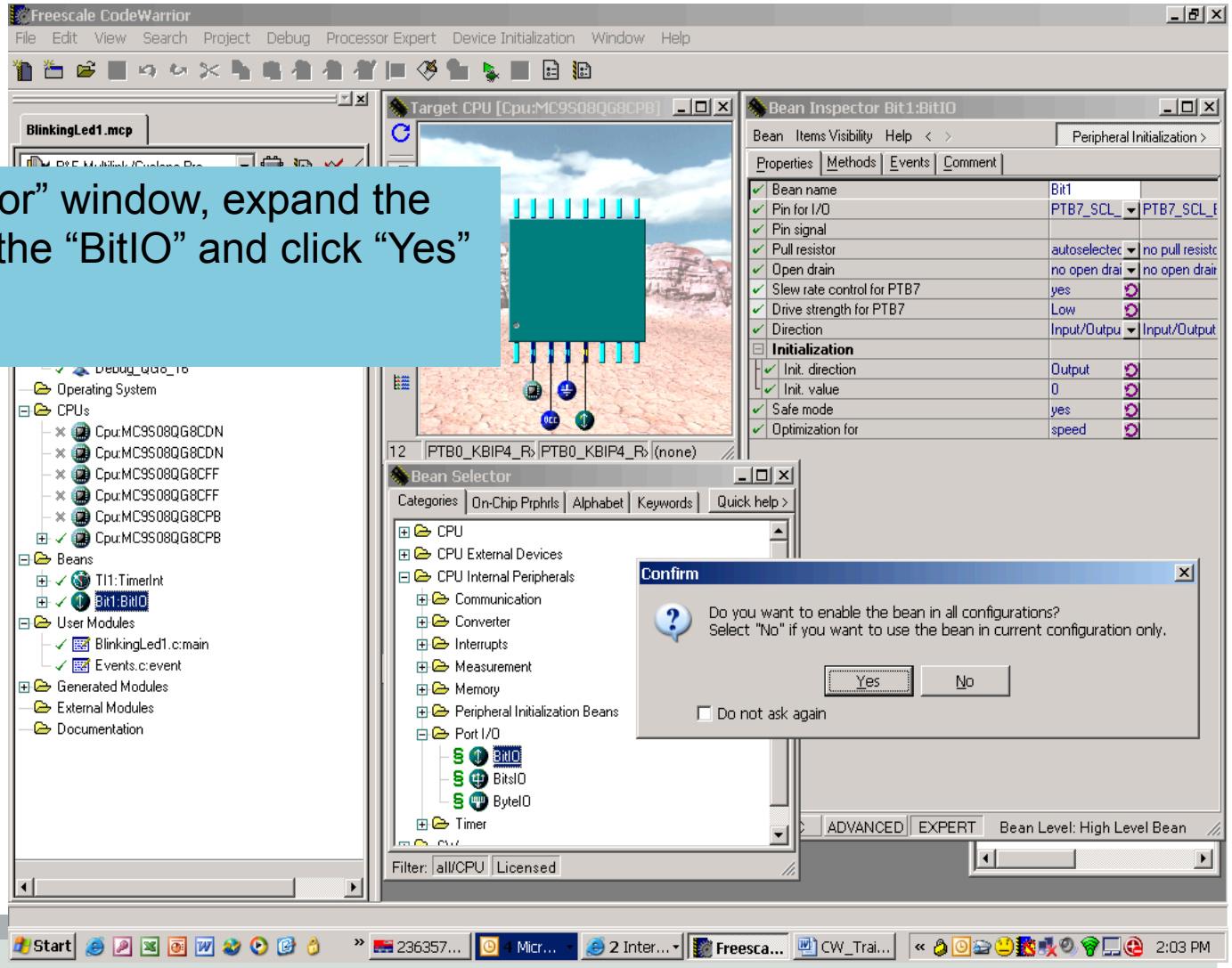
LAB1 -- Blinking LED

►In the “Bean Selector” window, expand the “Port I/O” and select the “BitIO” and click “Yes” to confirm.



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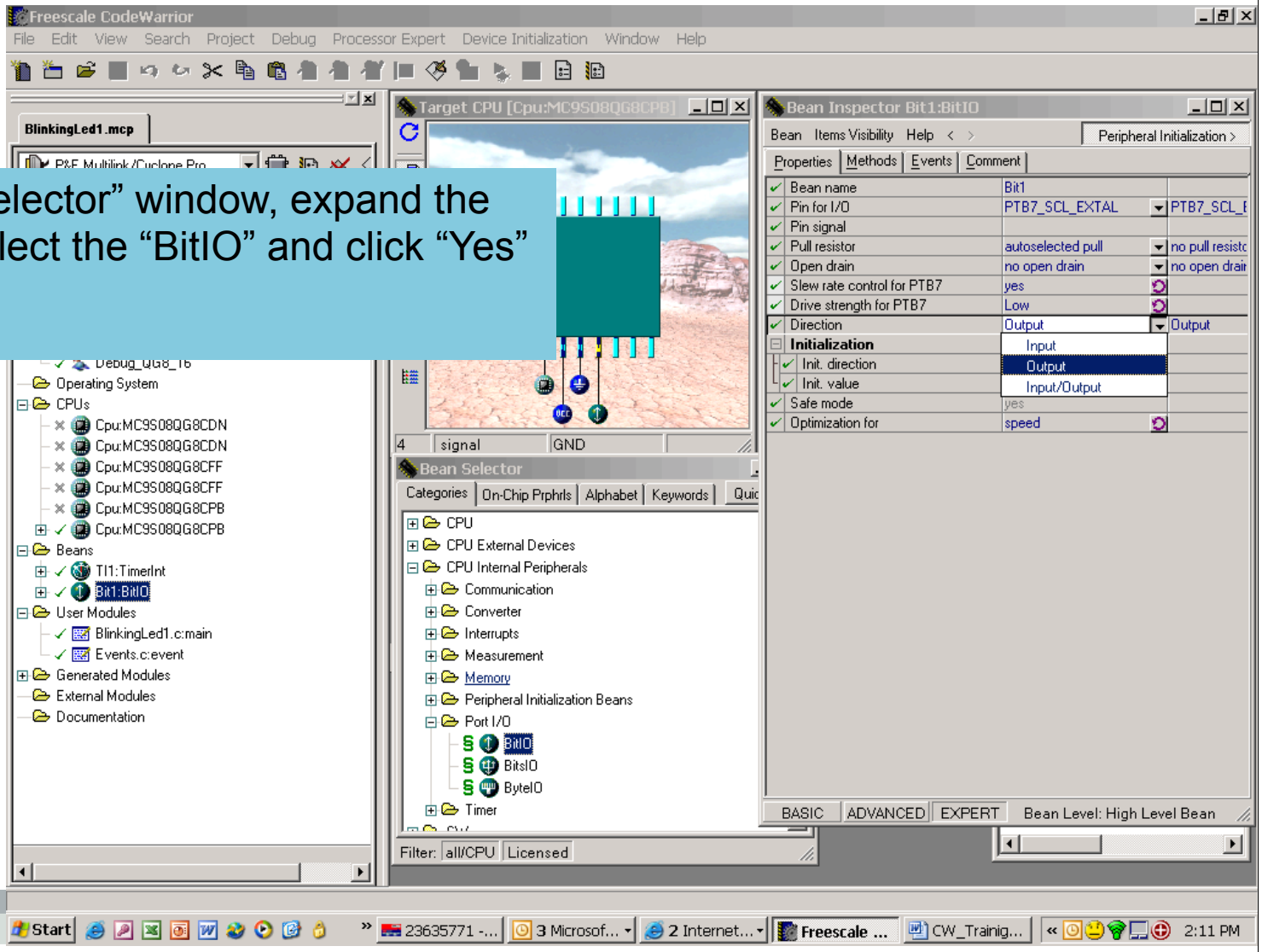
LAB1 -- Blinking LED

►In the “Bean Selector” window, expand the “Port I/O” and select the “BitIO” and click “Yes” to confirm.



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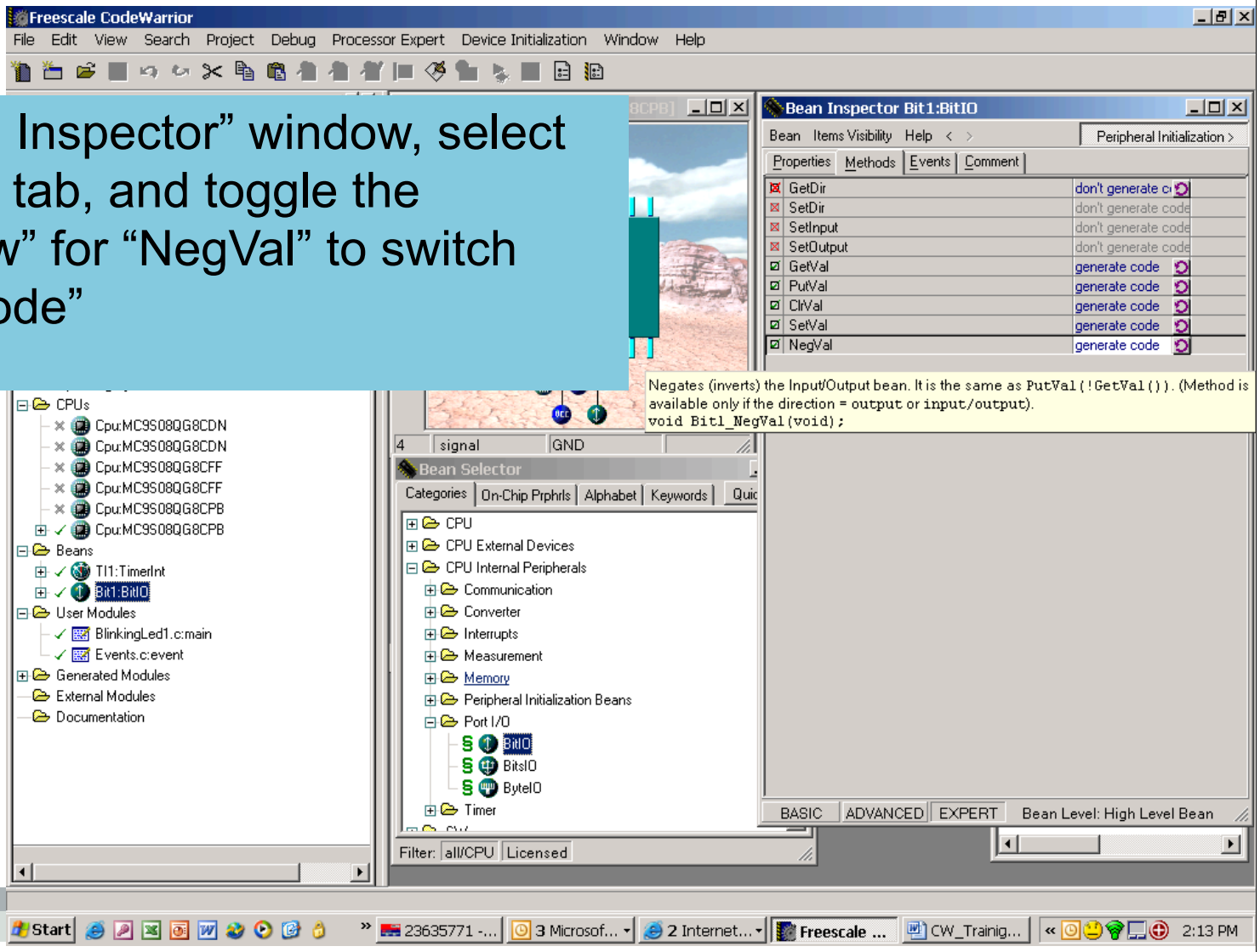
LAB1 -- Blinking LED

►In the “Bean Inspector” window, select the “Methods” tab, and toggle the “Circular Arrow” for “NegVal” to switch to“generate code”



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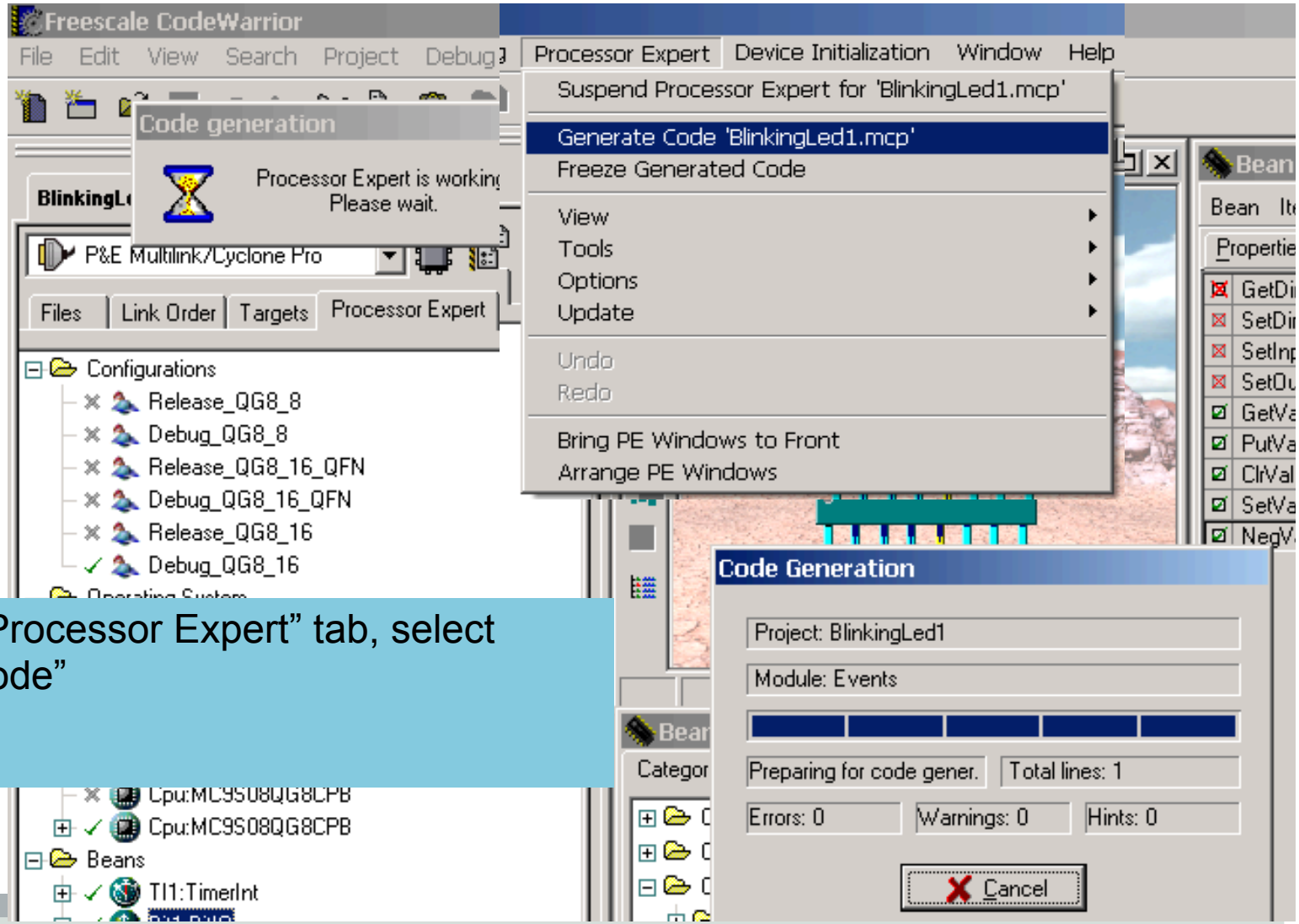
LAB1 -- Blinking LED



►From the “Processor Expert” tab, select “Generate Code”

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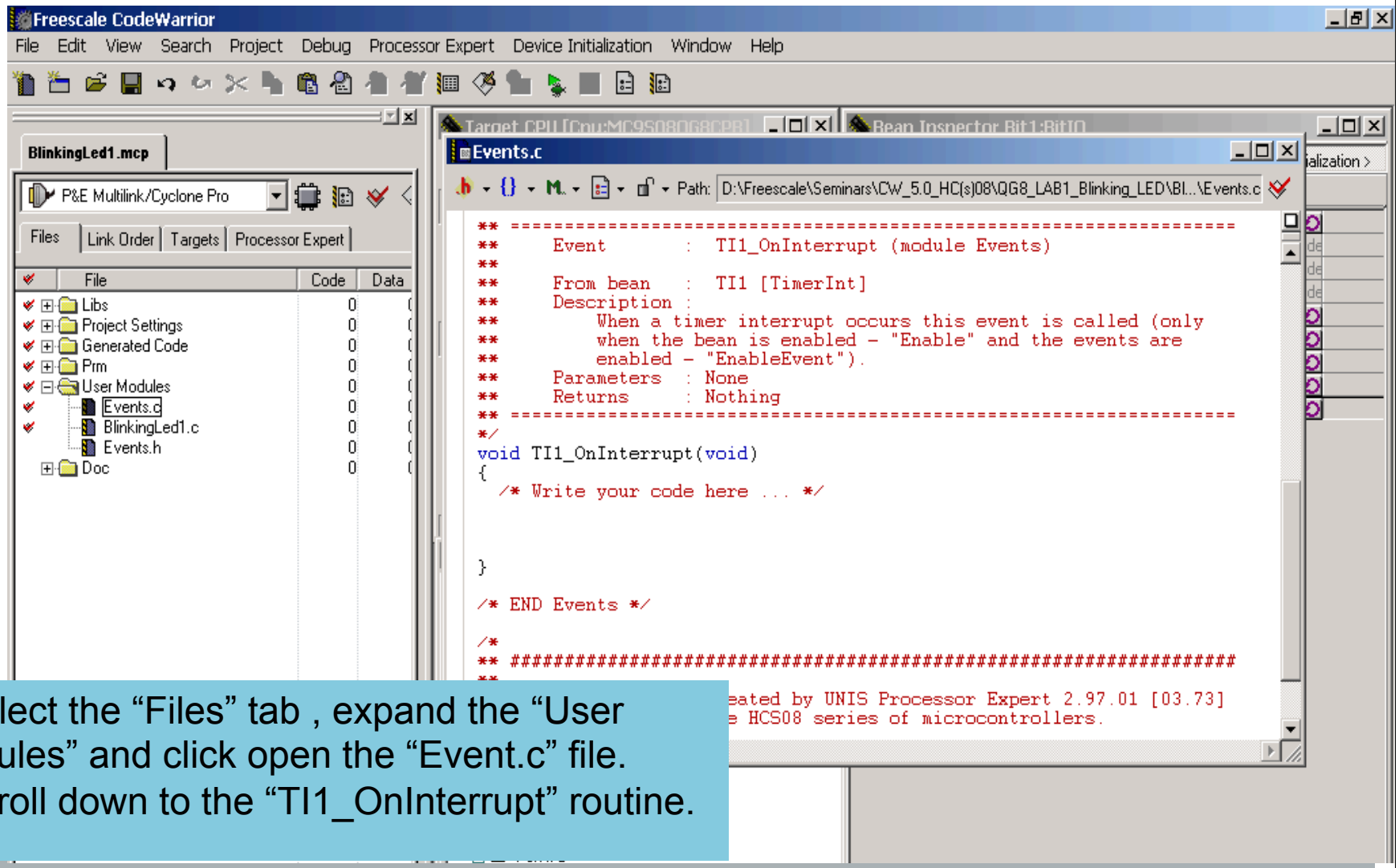
LAB1 -- Blinking LED



►Select the “Files” tab , expand the “User Modules” and click open the “Event.c” file.
►Scroll down to the “TI1_OnInterrupt” routine.

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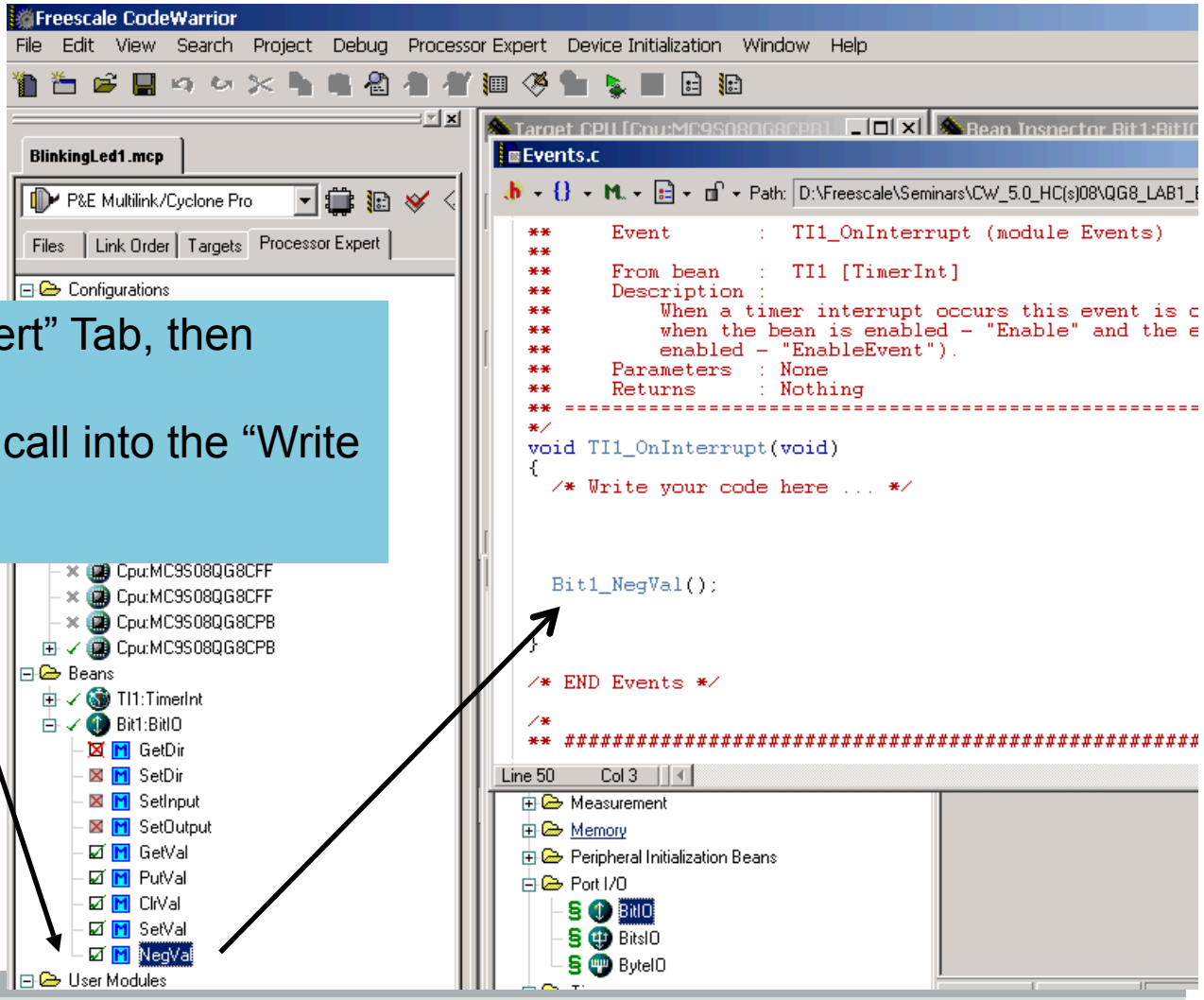
LAB1 -- Blinking LED

►Select the “Processor Expert” Tab, then expand the “BitIO” bean.

►Drop n Drag the “NegVal” call into the “Write your code here” section.



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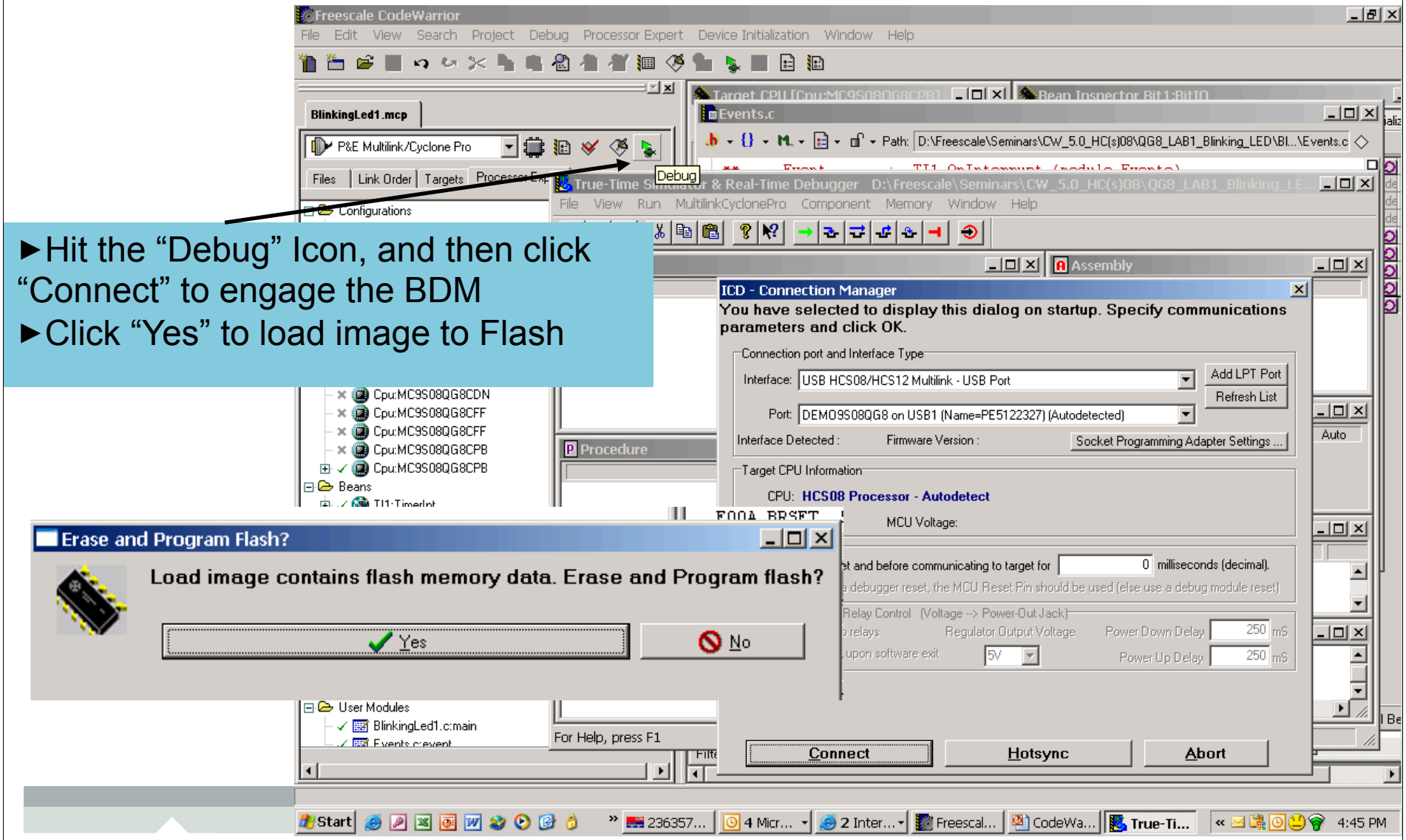
LAB1 -- Blinking LED



►Hit the “Debug” Icon, and then click “Connect” to engage the BDM

►Click “Yes” to load image to Flash

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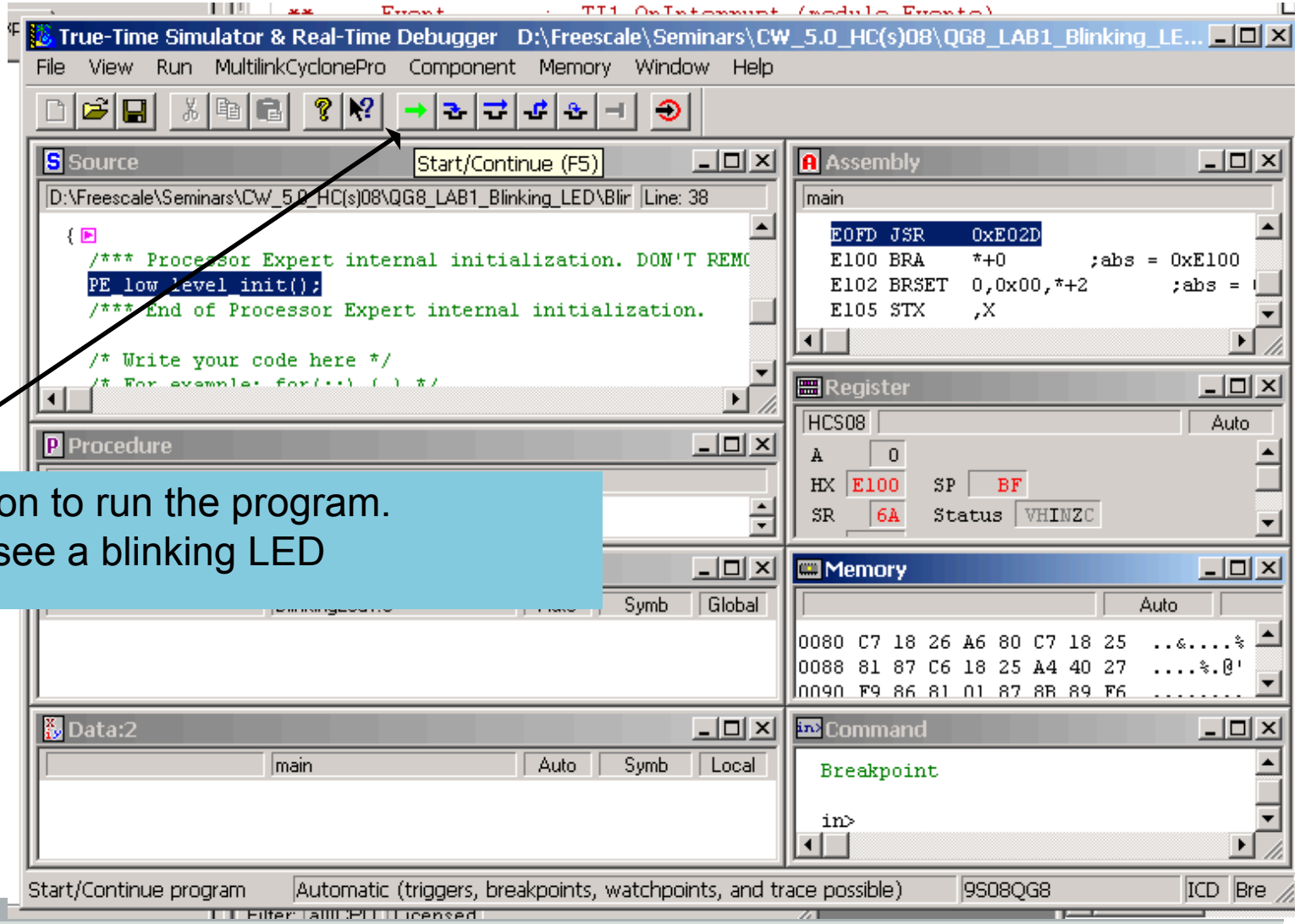
LAB1 -- Blinking LED



- ►Hit “Start” icon to run the program.
- ►You should see a blinking LED

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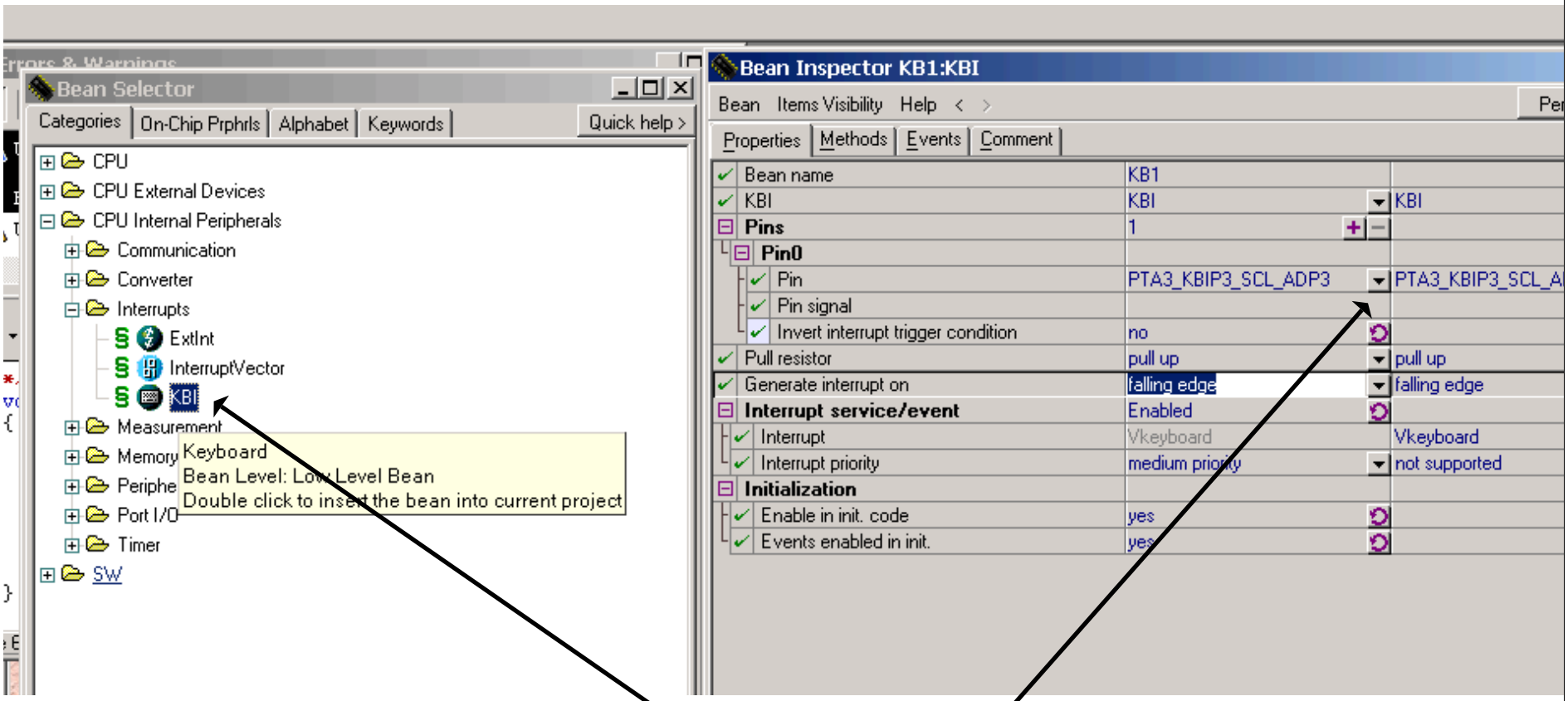
LAB 2 – KBI & ACMP

- Initialized KBI on SW2(PORTA3)
- Use SW2 to toggle LED1(PORTB6).
- Initialized Analog Comparator
- To use Photolight sensor to toggle LED2(PORTB6)

LAB2 – KBI & ACMP



- ►From the “Bean Selector” click on “KBI” bean
- ►Configure the Pin 0 for the KBI to be “PTA3_KBIP3_SCL_ADP3”
- ►Select “Pull Up” and “fallling edge” options .
- ►Make sure that Interrupts service is “Enabled”

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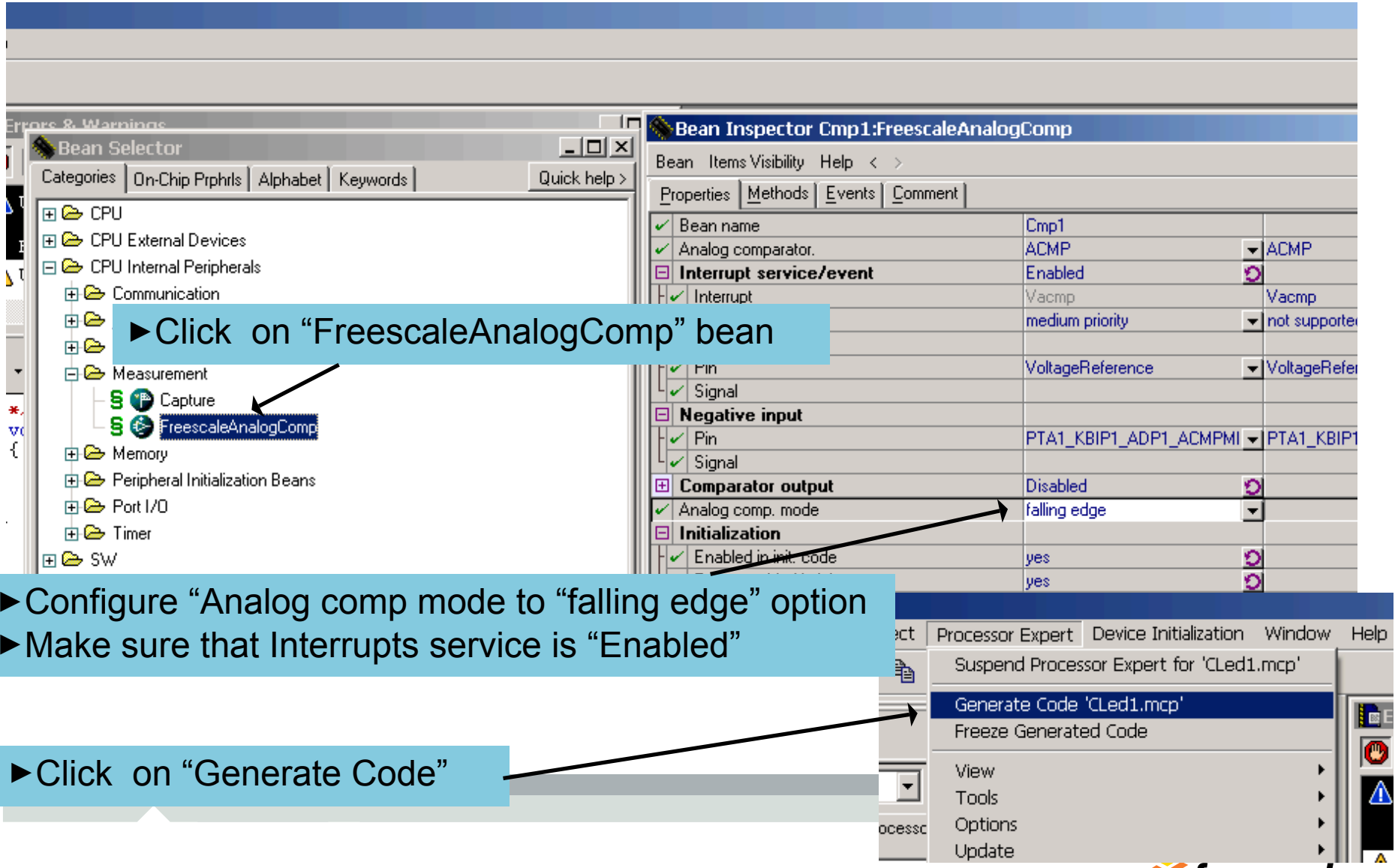
LAB2 – KBI & ACMP



►Click on “FreescaleAnalogComp” bean

►Configure “Analog comp mode to “falling edge” option

►Make sure that Interrupts service is “Enabled”

►Click on “Generate Code”

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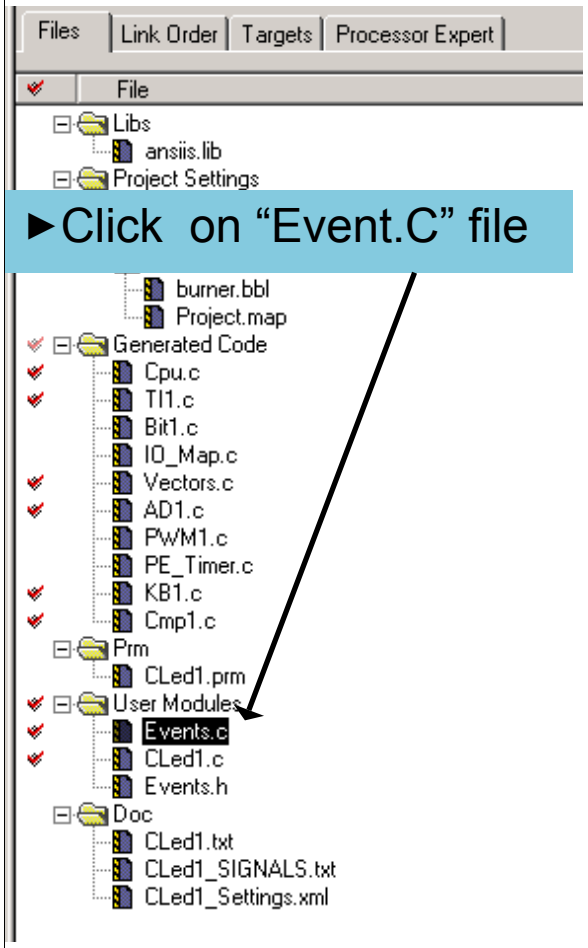
LAB2 – KBI & ACMP



►Click on “Event.C” file

```
**         comparator output. Interr
**         enabled for this event to
**     Parameters  : None
**     Returns     : Nothing
** ===================================
*/
void Cmp1_OnCompare(void)
{
  /* Write your code here ... */
}

/*
** ===================================
**     Event       :  KB1_OnInterrup
**
**     From bean   :  KB1 [KBI]
**     Description :
**         This event is called when
**         occurs.
**     Parameters  : None
**     Returns     : Nothing
** ===================================
*/
void KB1_OnInterrupt(void)
{
  /* Write your code here ... */
}

/* END Events */
```

►Scroll down to these two Events

►This is where you would add the code to toggle LED1

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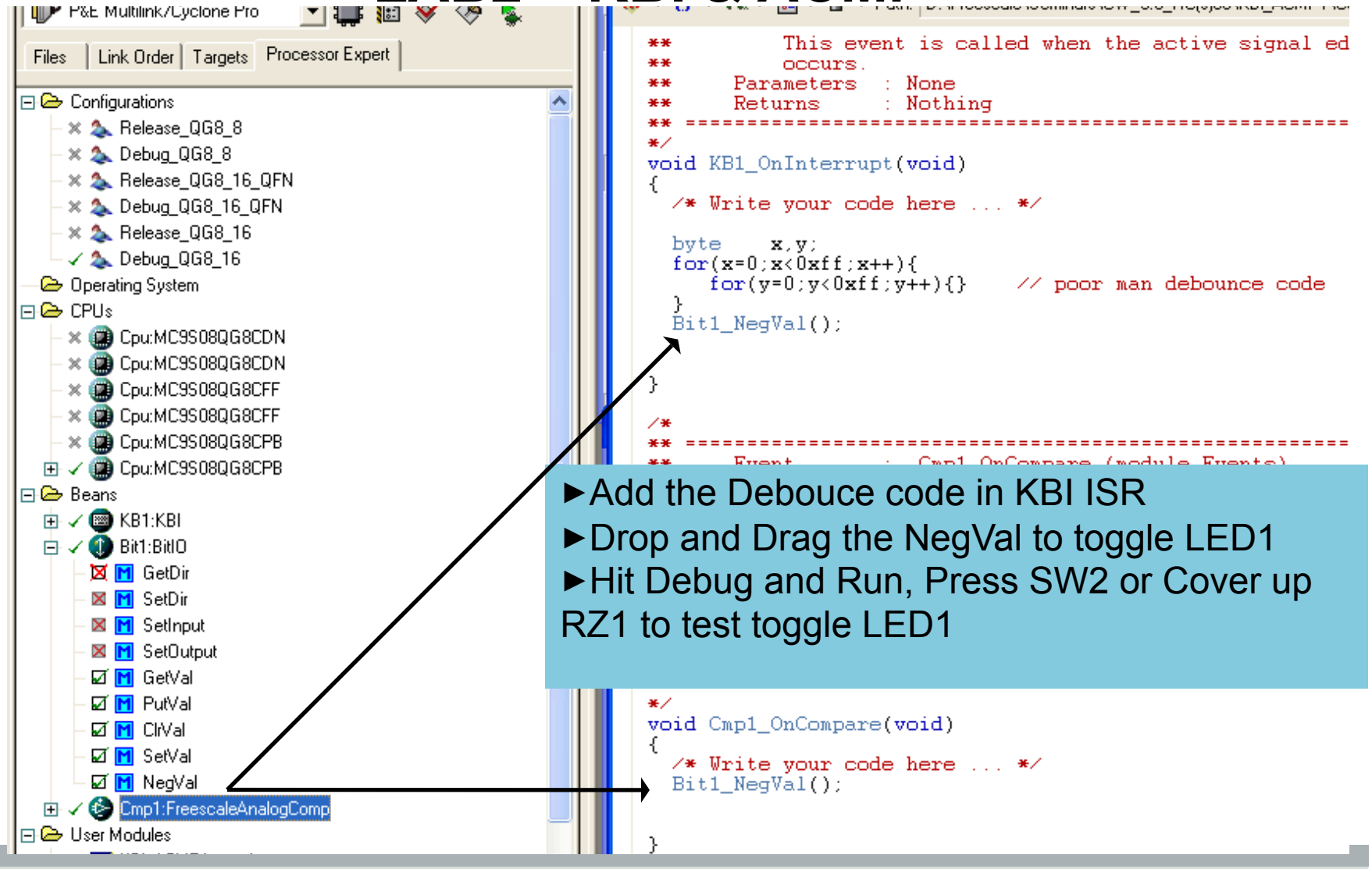
LAB2 – KBI & ACMP



- ►Add the Debouce code in KBI ISR
- ►Drop and Drag the NegVal to toggle LED1
- ►Hit Debug and Run, Press SW2 or Cover up RZ1 to test toggle LED1

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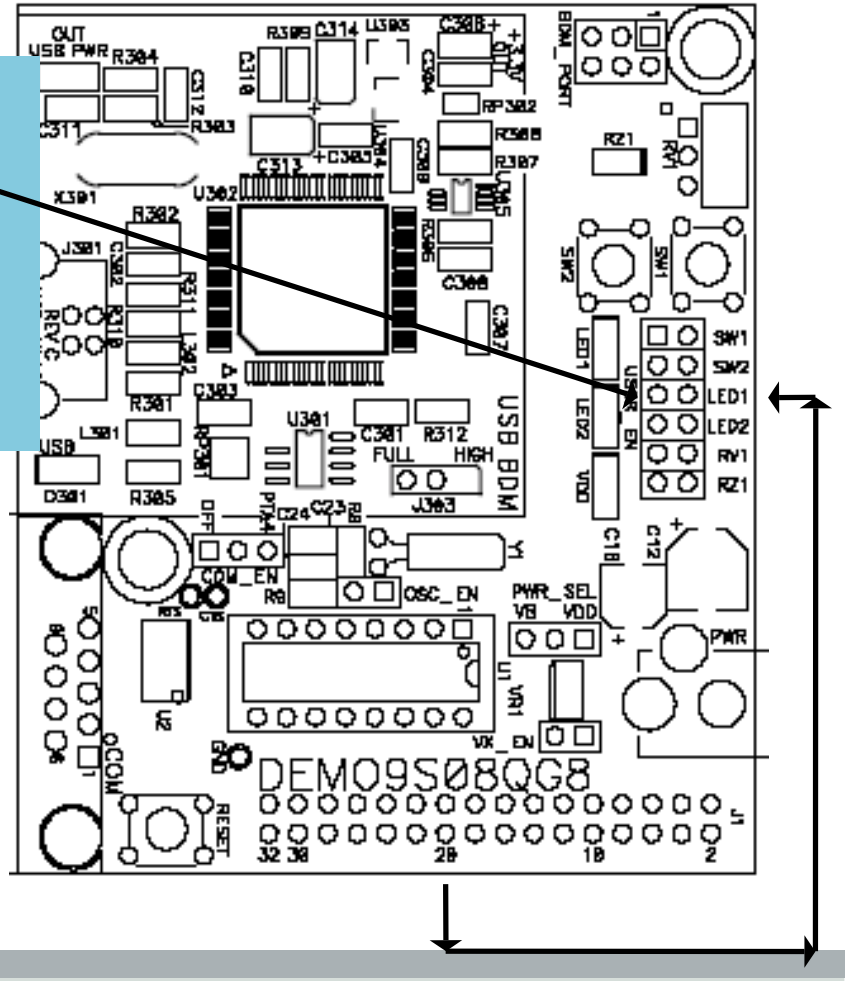
LAB3 – ADC & PWM

- Initialize ADC Channel 0 (PORTA0 –Potentiometer)
- Initialize PWM for 1mSec period with 64uSec initial on Pulse.
- Use ADC reading to reconfigure PWM ratio (duty cycle).
- Re-route PWM output to an LED1 to show dimming effect.

LAB3 – ADC & PWM

►Remove Jumper on LED1

►Jumper a wire between
J1(23) and LED1(2)
LED1(2) is the pin closer to the edge of the board



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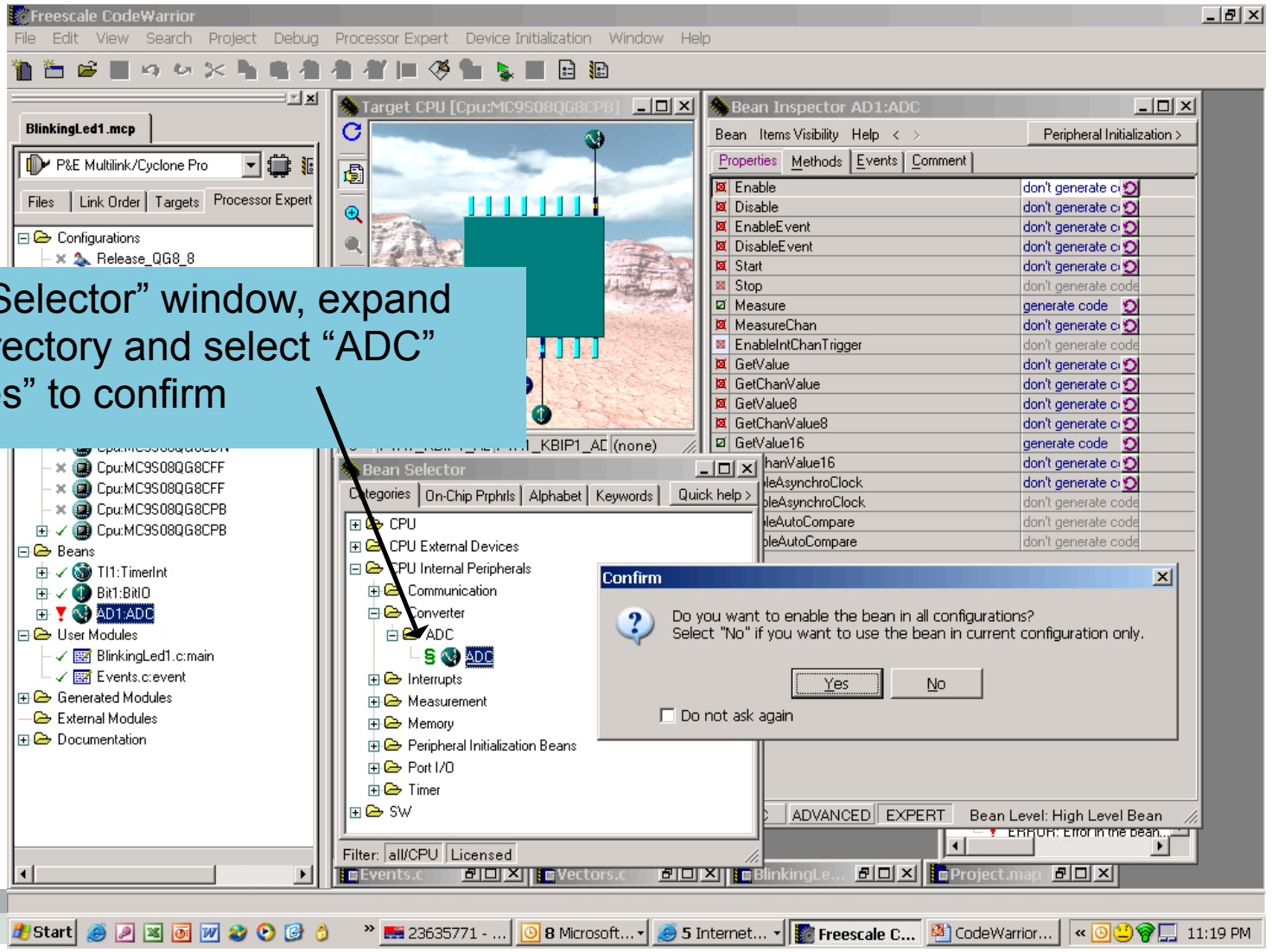
LAB3 – ADC & PWM

►From the “Bean Selector” window, expand the “Converter” directory and select “ADC” bean, and click “Yes” to confirm



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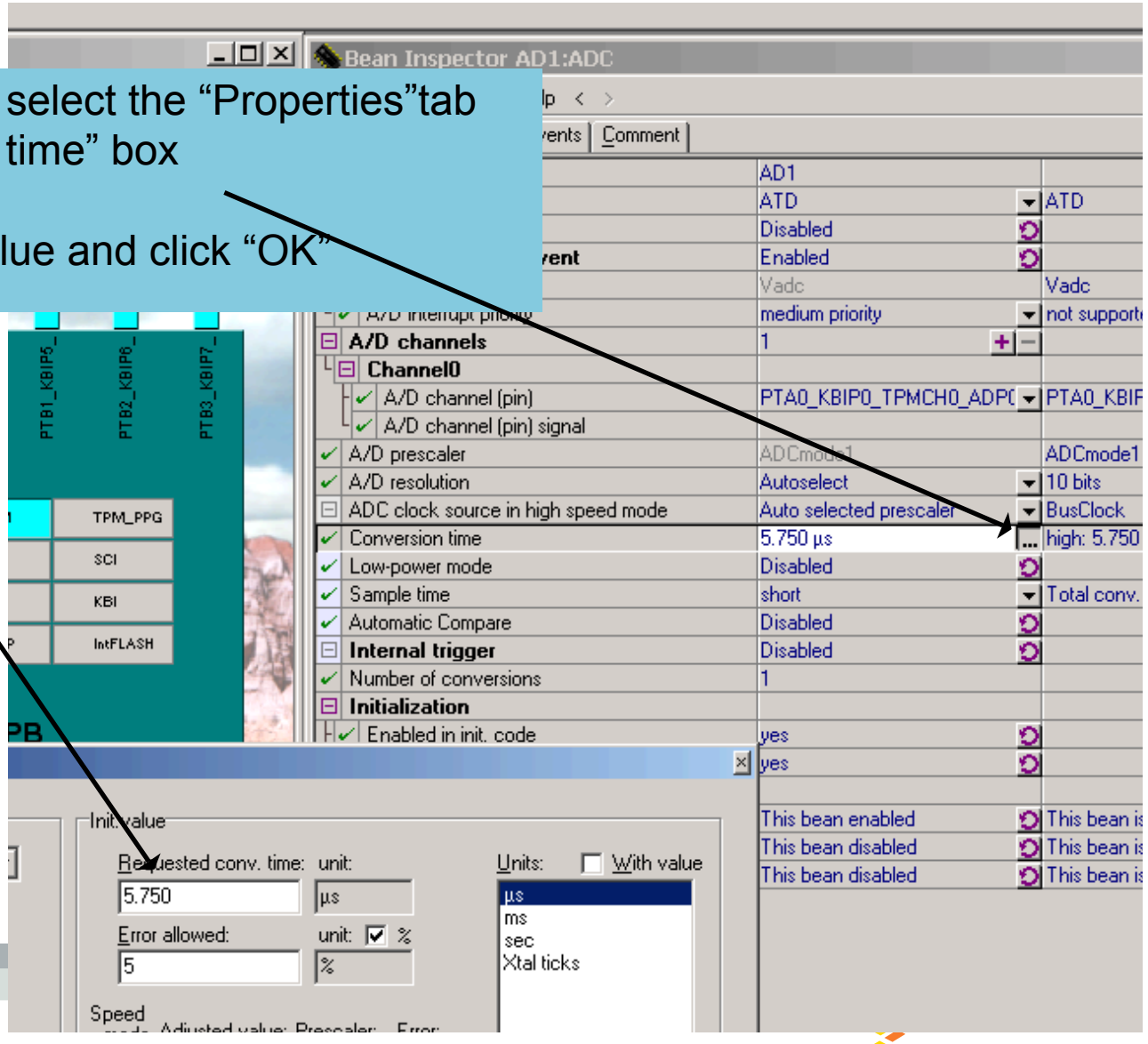
LAB3 – ADC & PWM

►In the “Bean Inspector”, select the “Properties”tab and click the “Conversion time” box

►Enter a “5.750” uSec value and click “OK”



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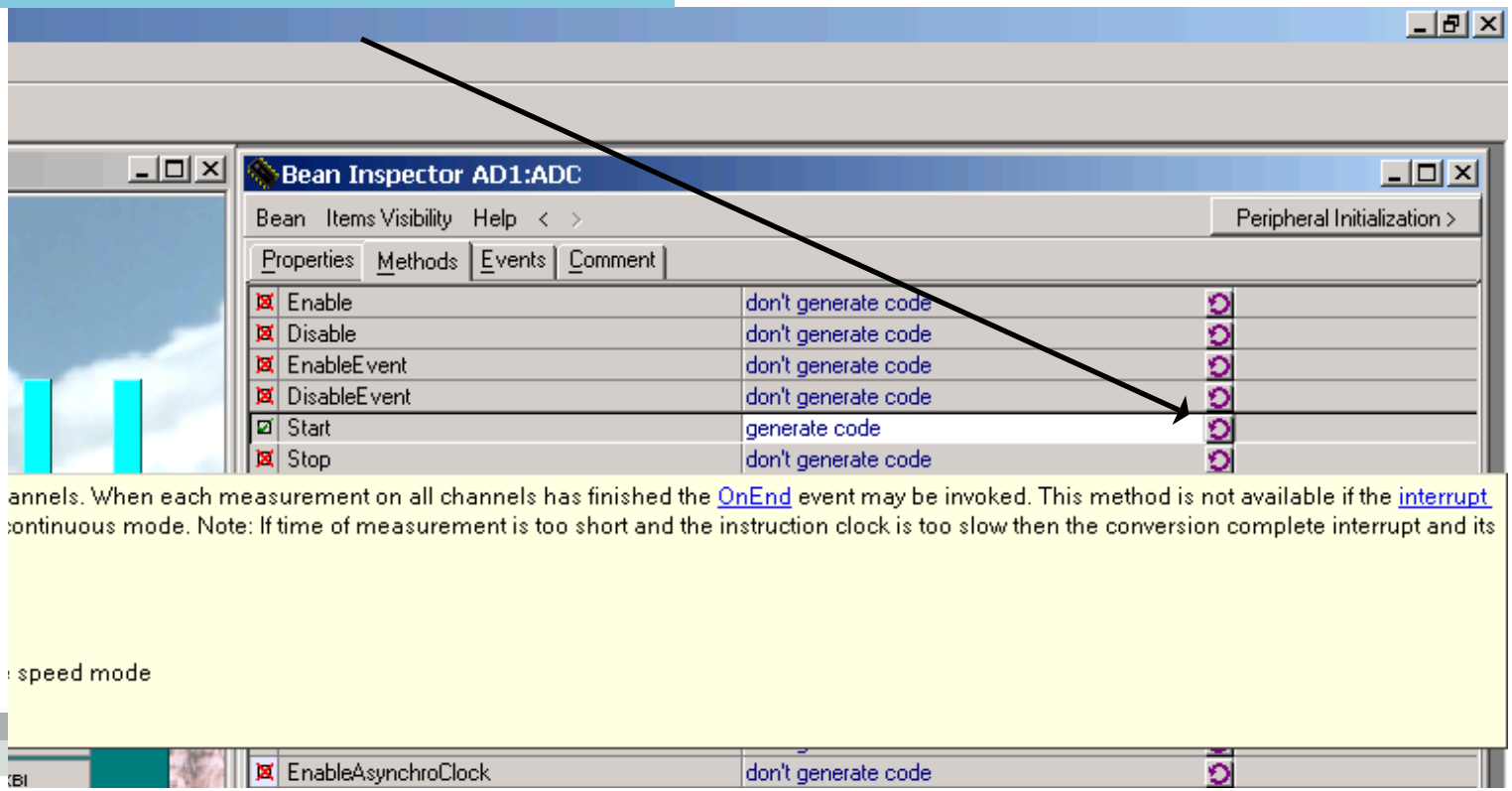
LAB3 – ADC & PWM

►In the “Bean Inspector”, select the “Properties”tab and toggle the “Start” method to indicate “generate code”



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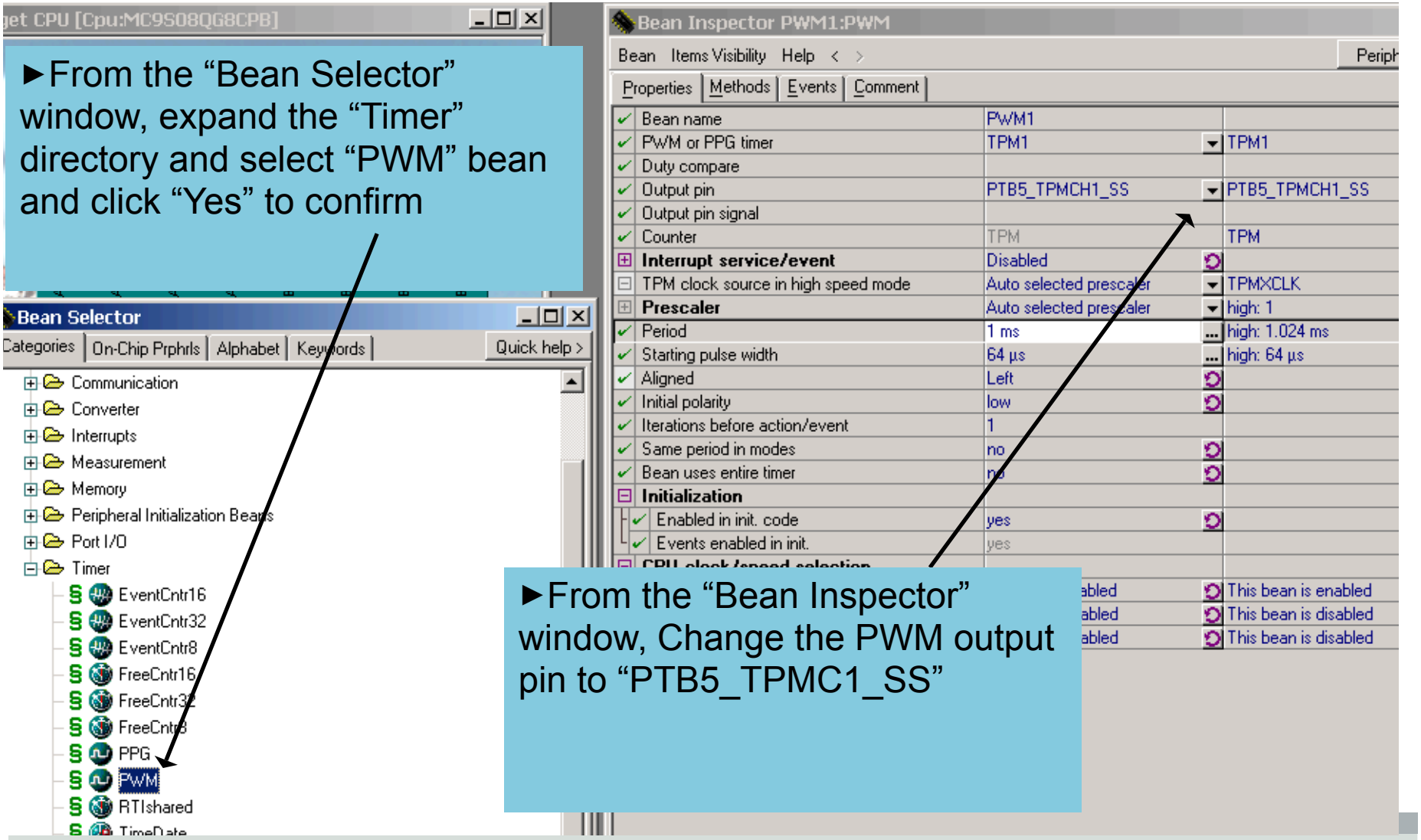
LAB3 – ADC & PWM



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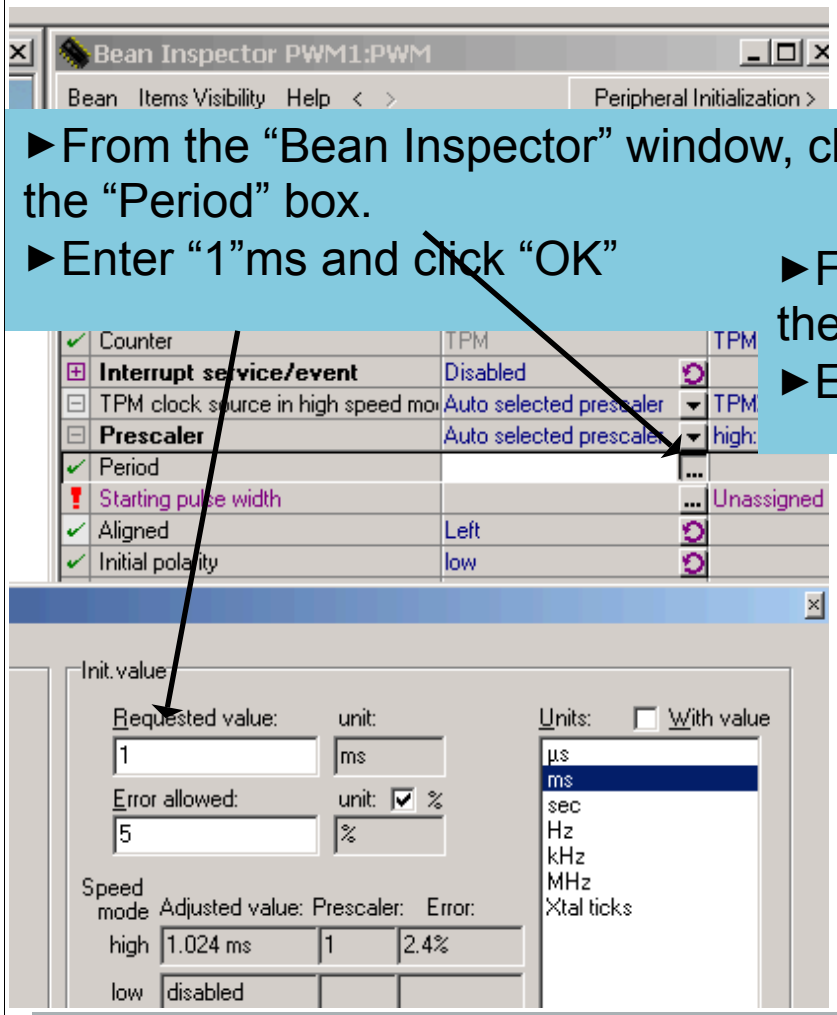
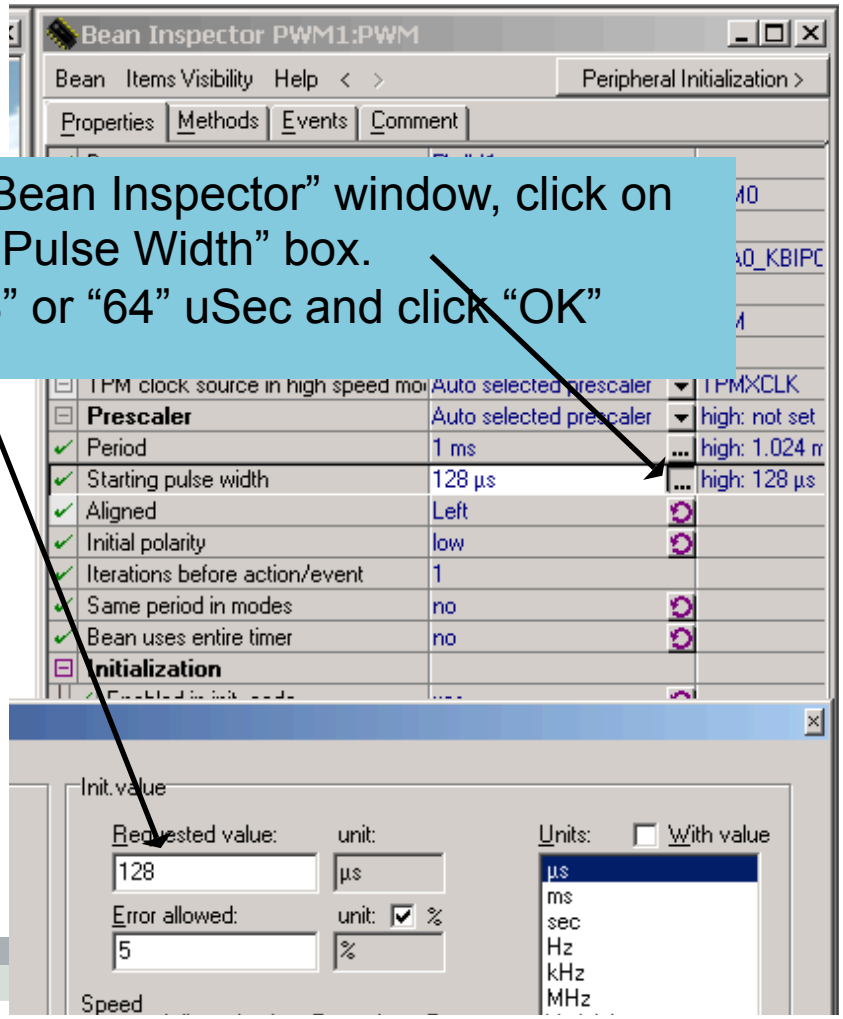
LAB3 – ADC & PWM

►From the “Bean Inspector” window, click on the “Period” box.
►Enter “1”ms and click “OK”



►From the “Bean Inspector” window, click on the “Starting Pulse Width” box.
►Enter “128” or “64” uSec and click “OK”



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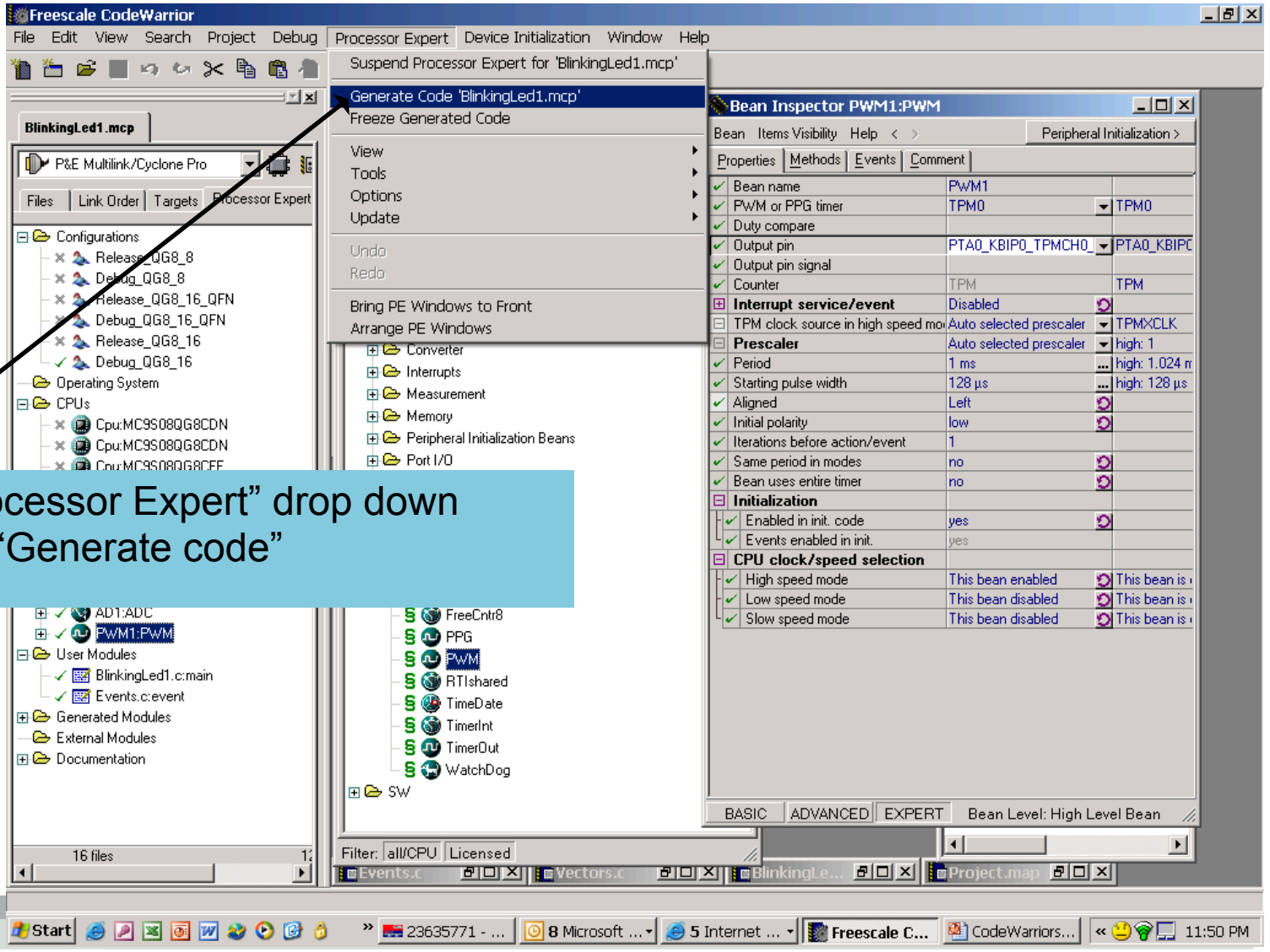
LAB3 – ADC & PWM



►From the “Processor Expert” drop down menu, click on “Generate code”

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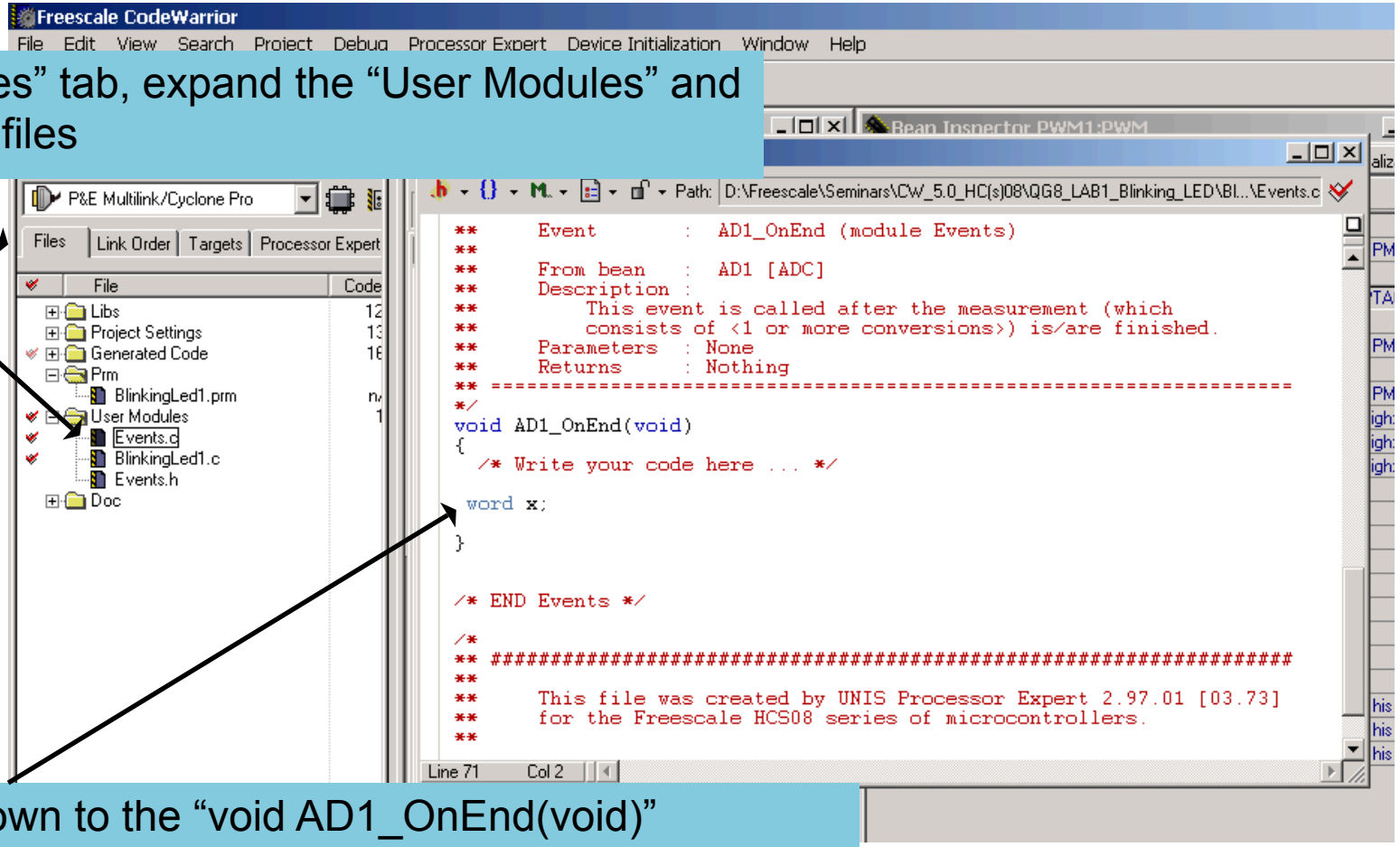
LAB3 – ADC & PWM



►From the “Files” tab, expand the “User Modules” and open “Event.c” files

►Scroll down to the “void AD1_OnEnd(void)”

►Type “word x;” in the /*Write your code here*/

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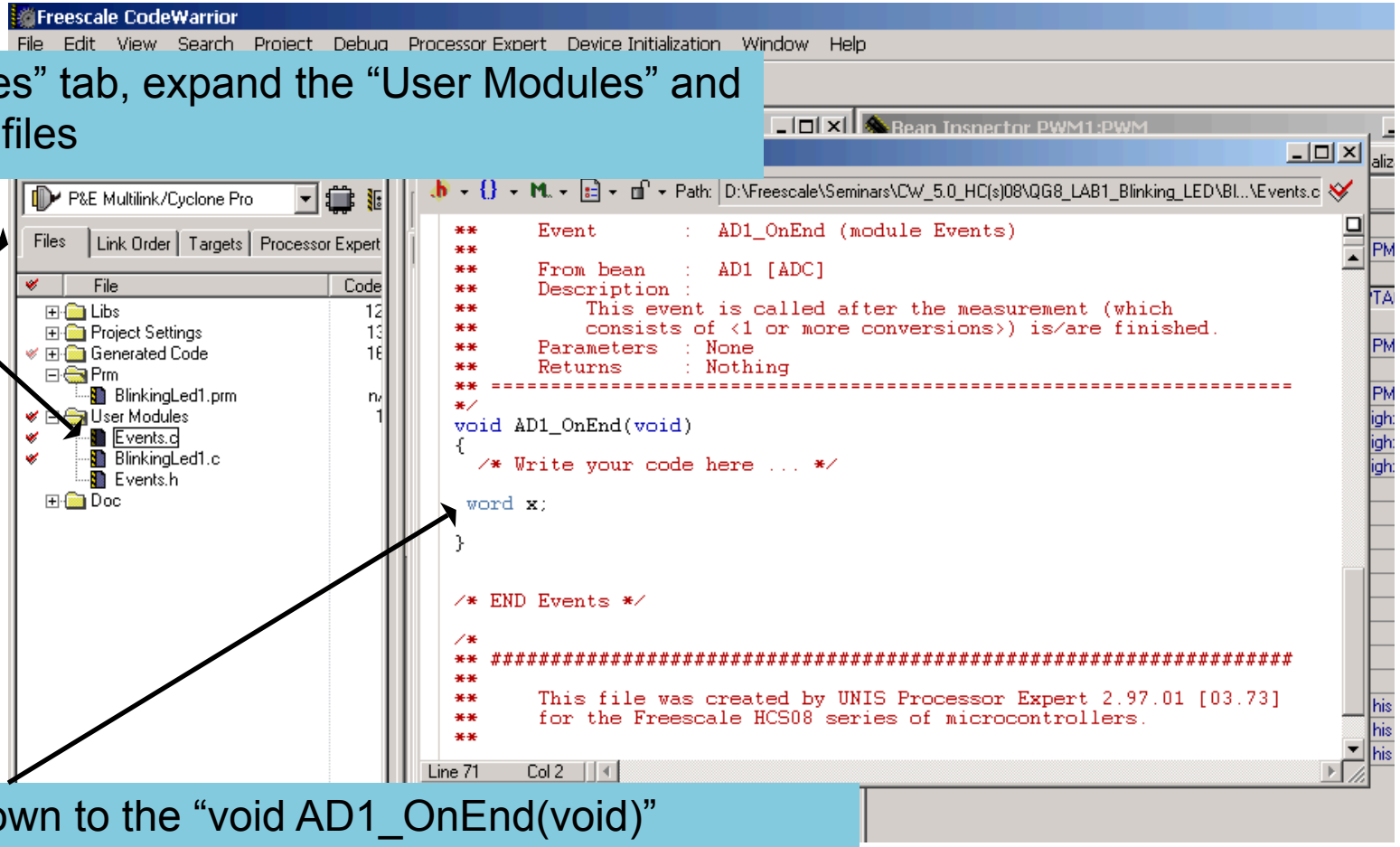
LAB3 – ADC & PWM

►From the “Files” tab, expand the “User Modules” and open “Event.c” files



►Scroll down to the “void AD1_OnEnd(void)”
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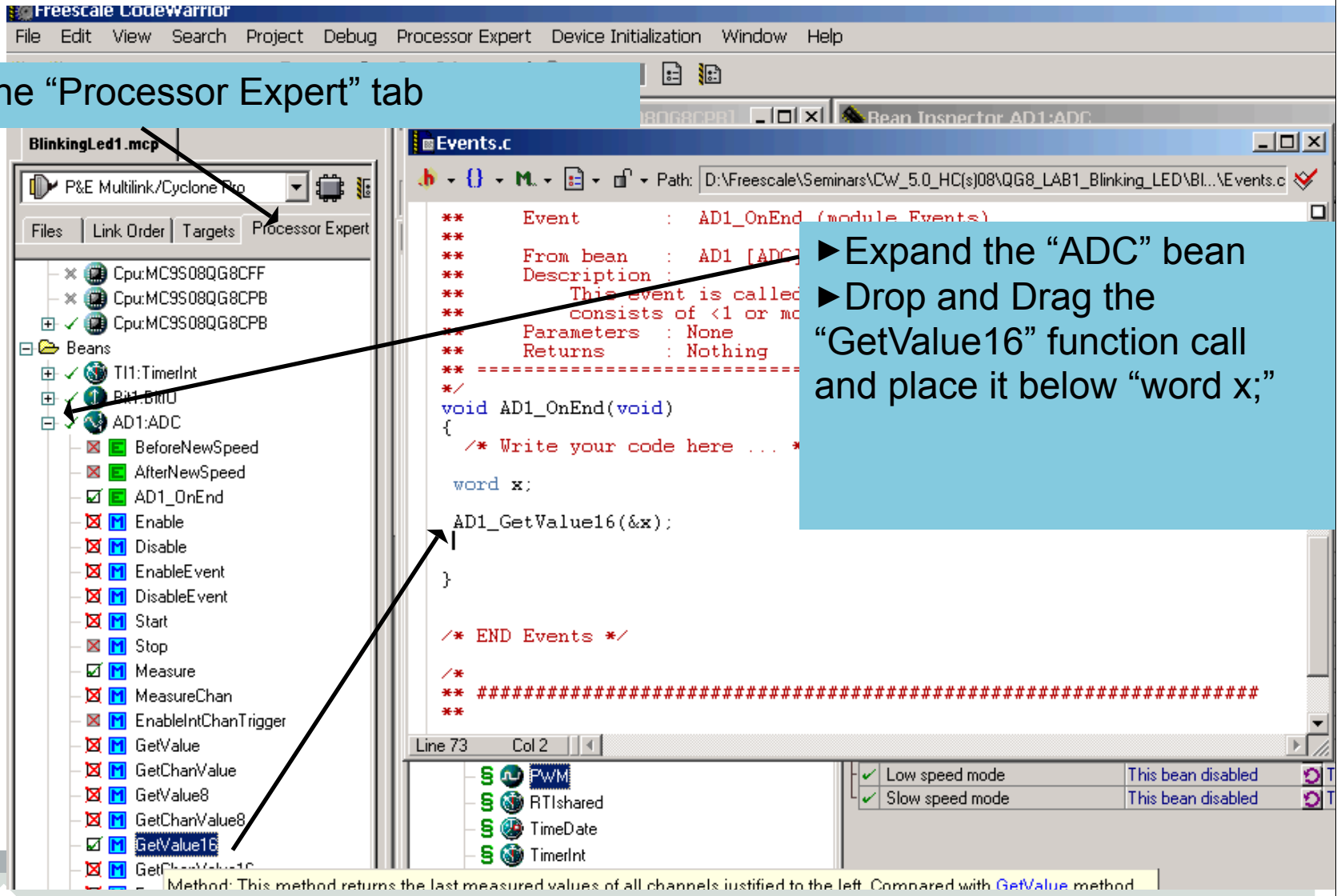
LAB3 – ADC & PWM



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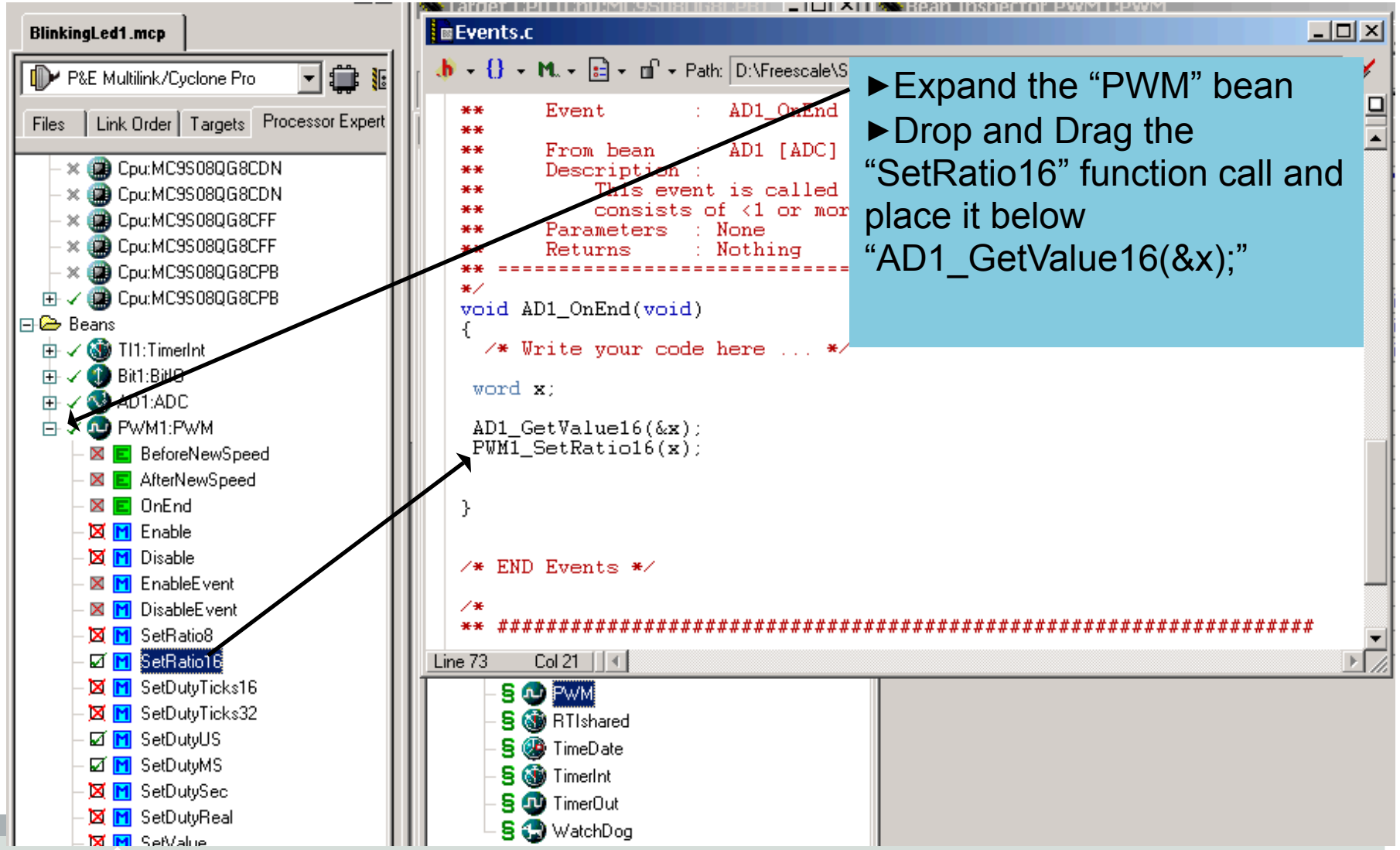
LAB3 – ADC & PWM



►Expand the “PWM” bean

►Drop and Drag the “SetRatio16” function call and place it below “AD1_GetValue16(&x);”

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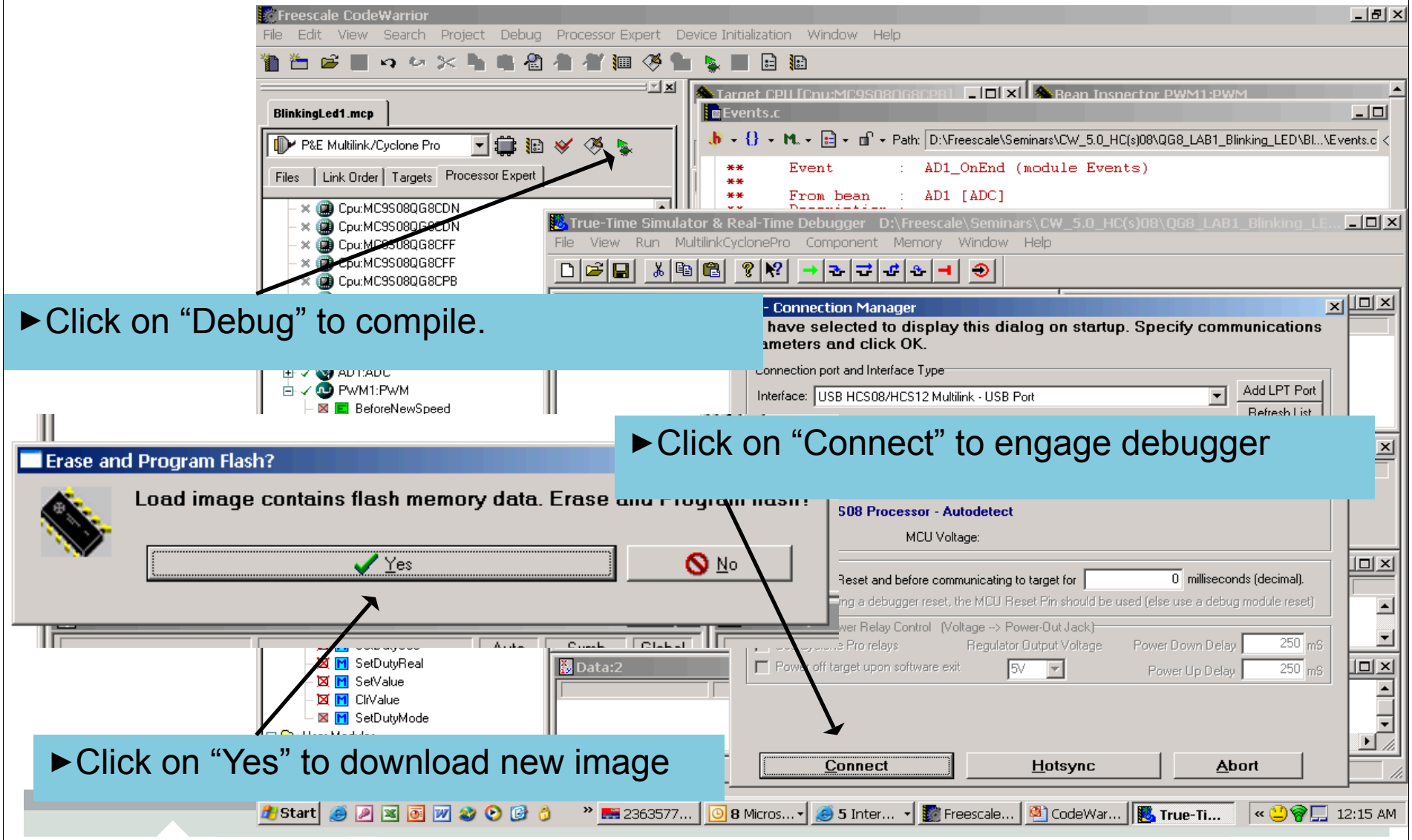
LAB3 – ADC & PWM



►Click on “Debug” to compile.

►Click on “Connect” to engage debugger

►Click on “Yes” to download new image

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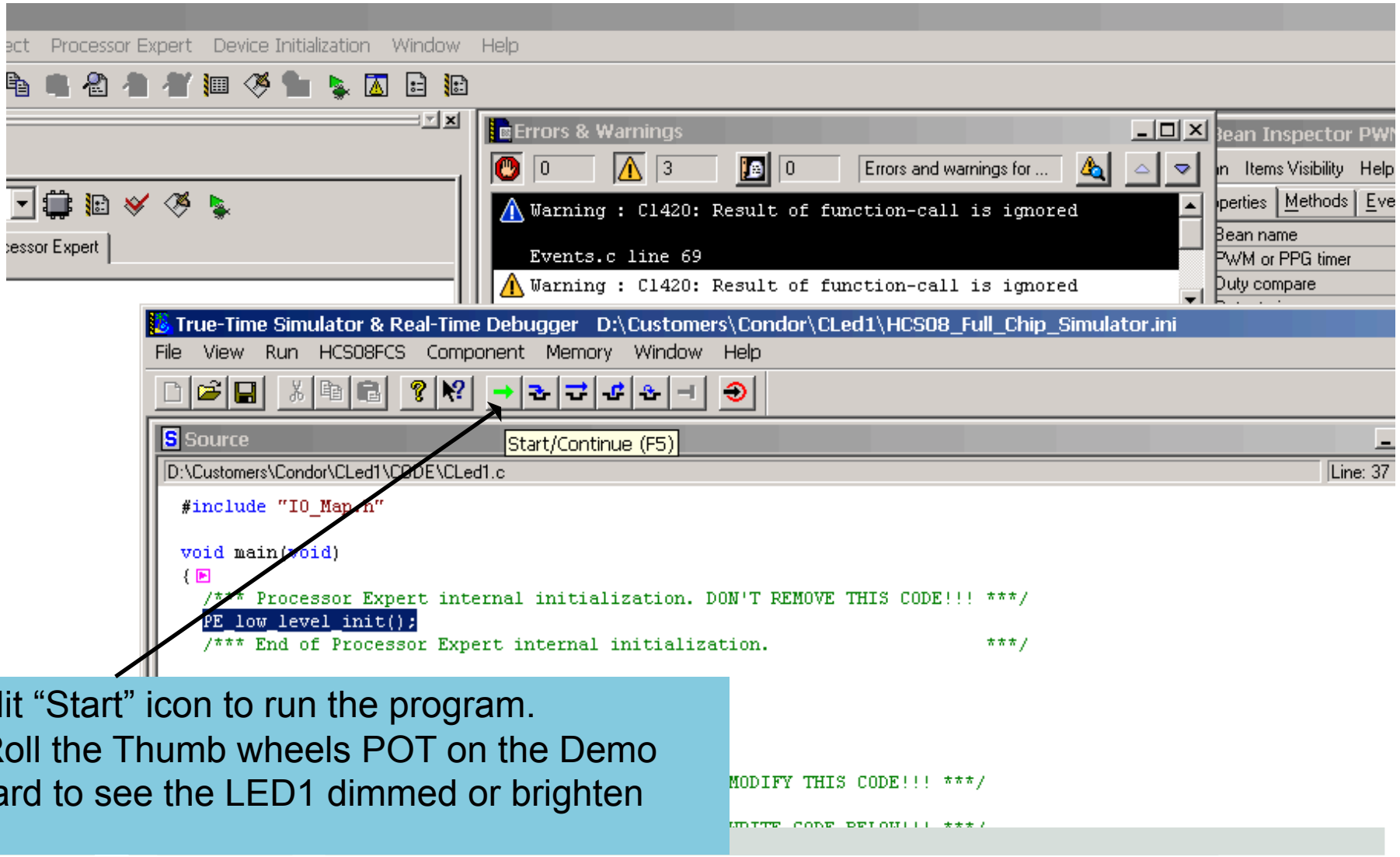
LAB3 – ADC & PWM



►Hit “Start” icon to run the program.
►Roll the Thumb wheels POT on the Demo board to see the LED1 dimmed or brighten

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LAB4 – SCI Communication

Create a brand new project and set bus clk to 8Mhz.

Initialize SCI(Serial) Comm to 9600 Baud rate

Set Interrupt upon received of Character.

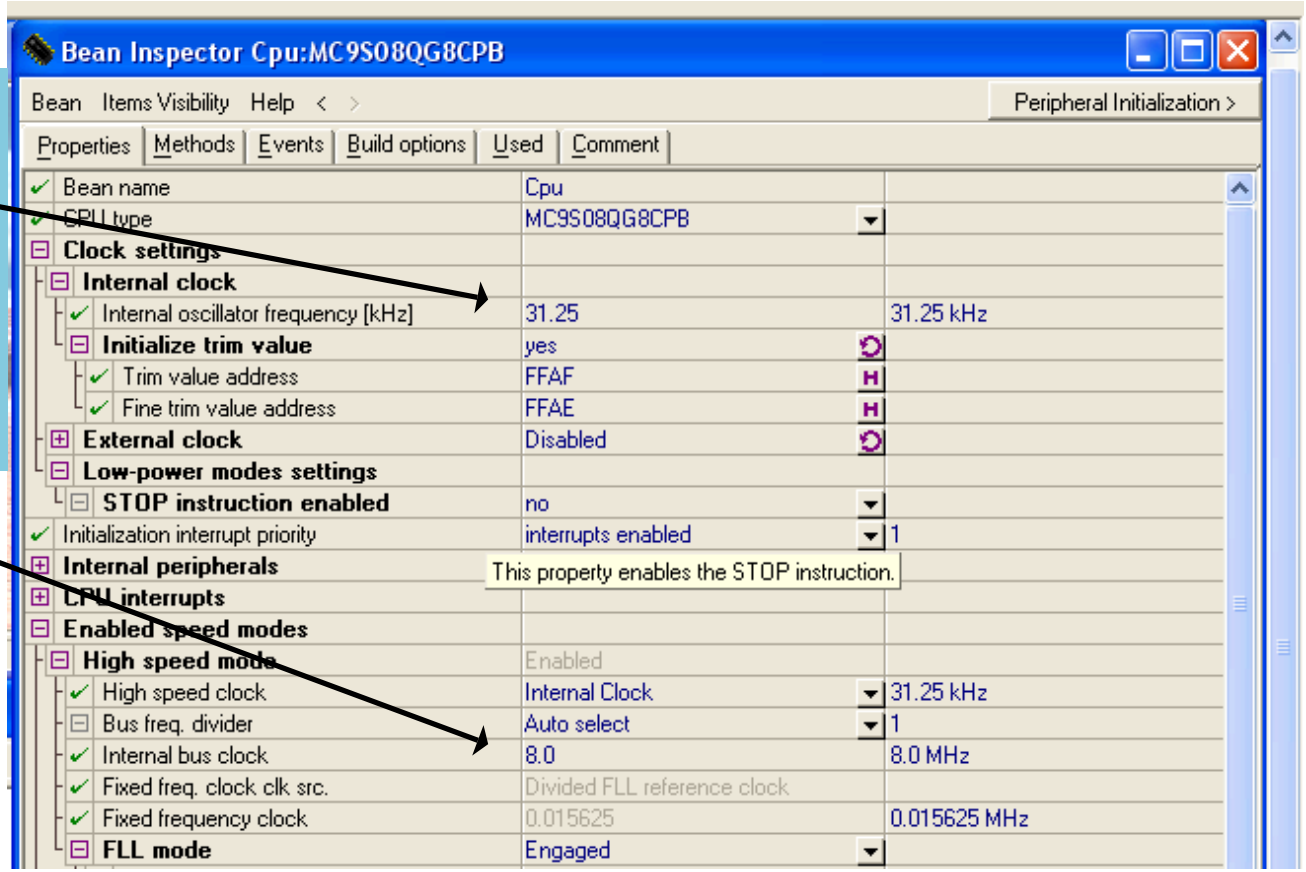
Set Hyperterminal on PC to 9600 baud.

Write application to echo received character back to PC

LAB4 – SCI Communication

►Change the Internal Osc Frequency to 31.25Khz.

►Change the Internal BusClock to 8.0 Mhz



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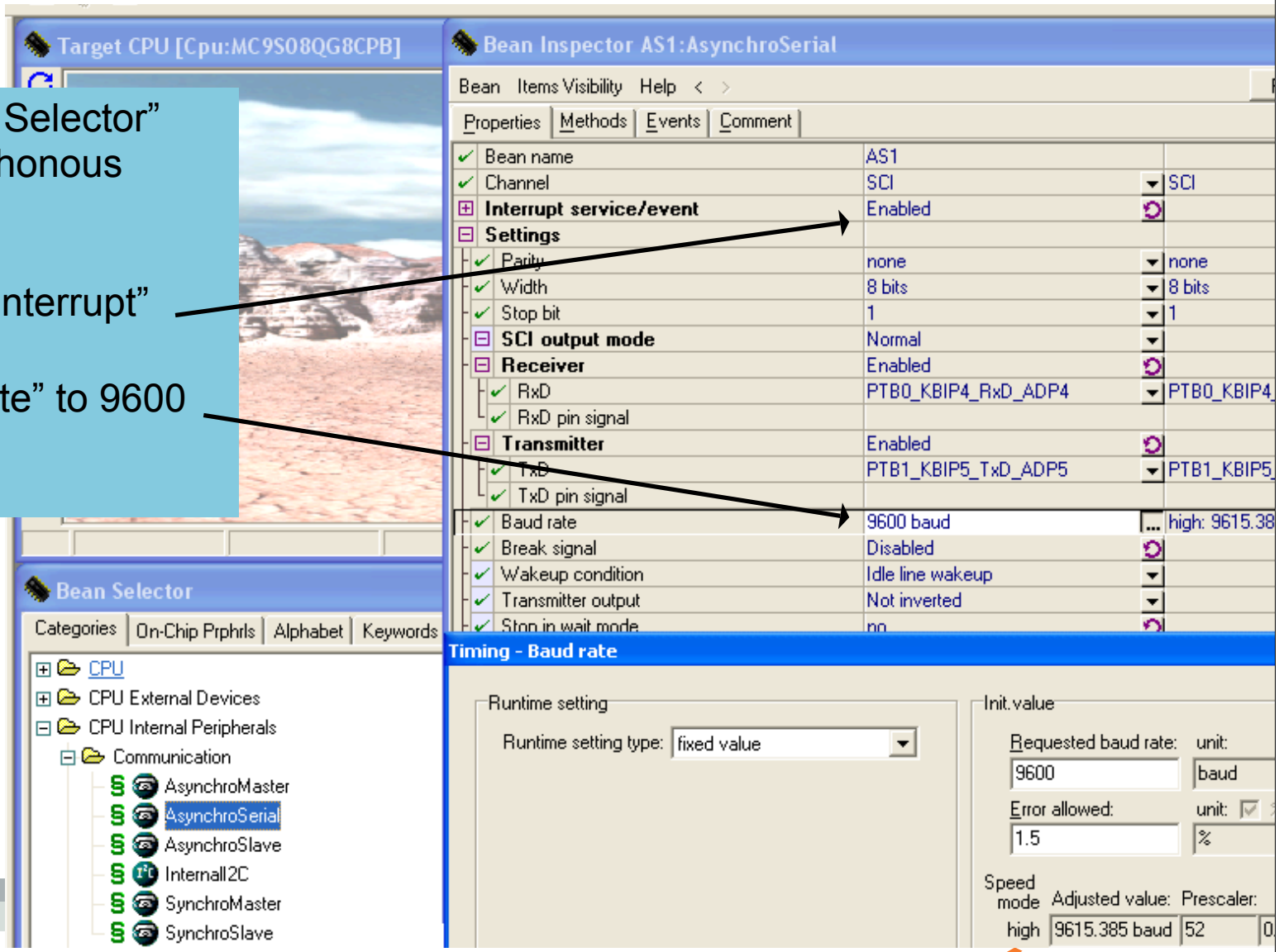
LAB4 – SCI Communication

►In the “Bean Selector” select “Asyncrhonous Serial” bean.

►Enable the “Interrupt”

►Set “Baud rate” to 9600



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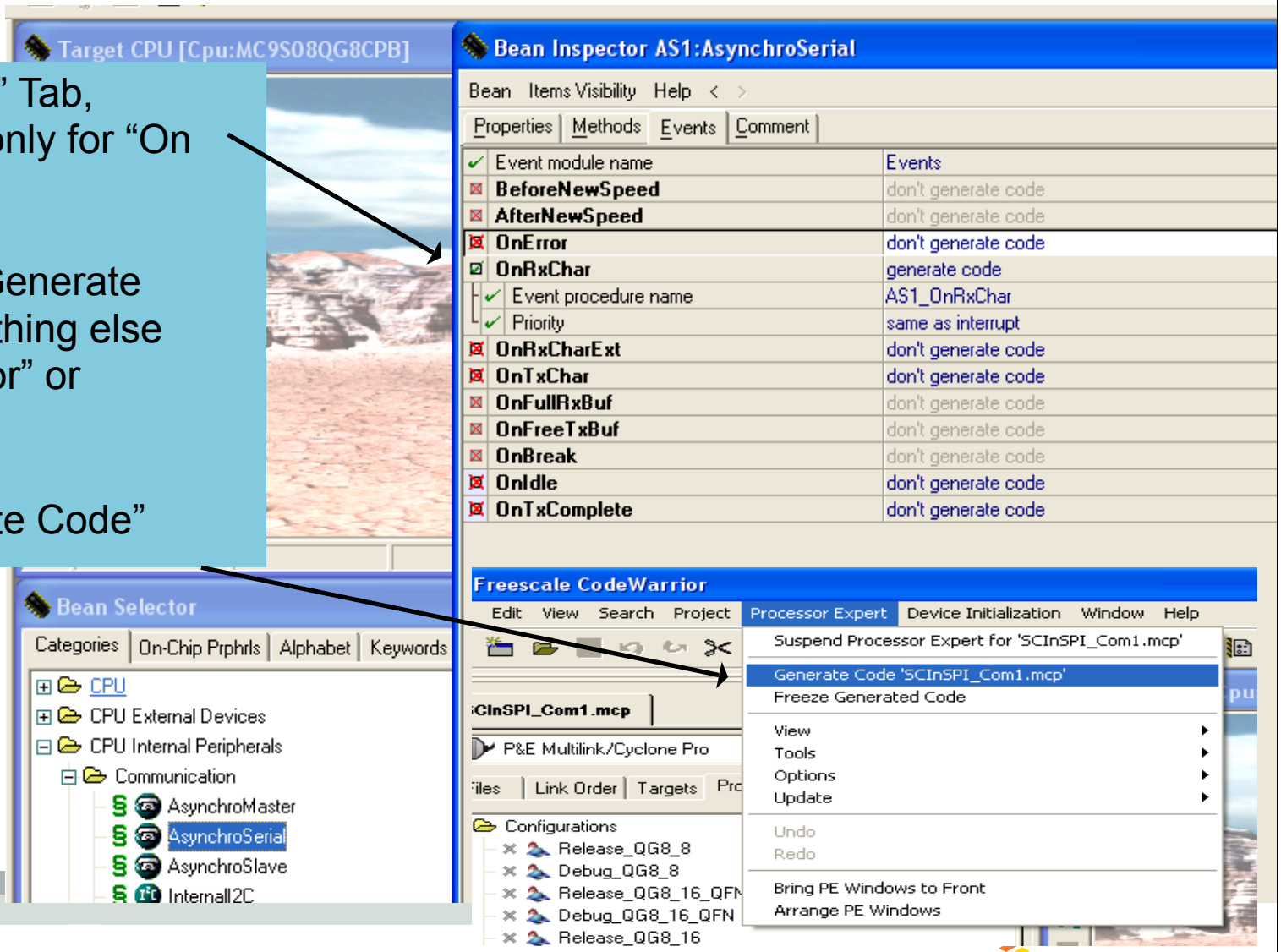
LAB4 – SCI Communication

- In the “Events” Tab, generate code only for “On RXChar”
- Select Don’t Generate Code” for everything else such as “OnError” or “OnTxChar”
- Click “Generate Code”



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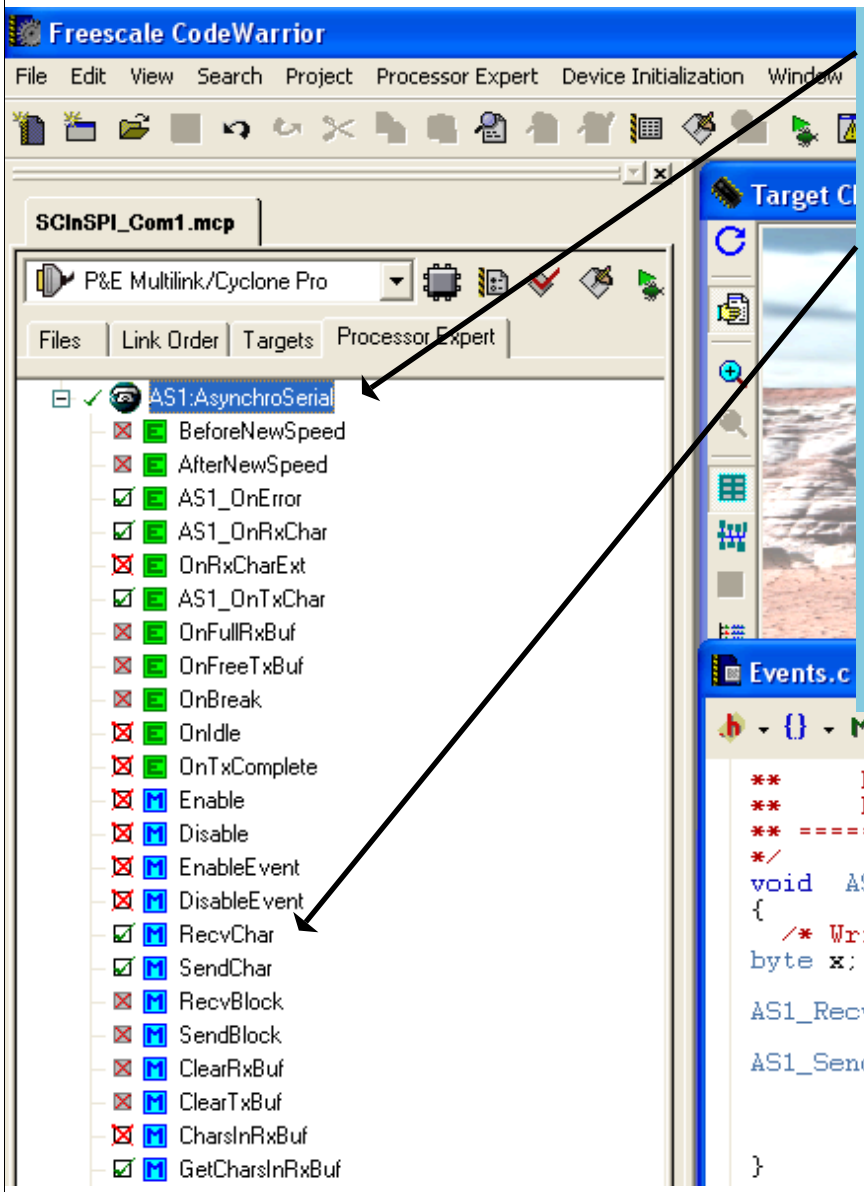
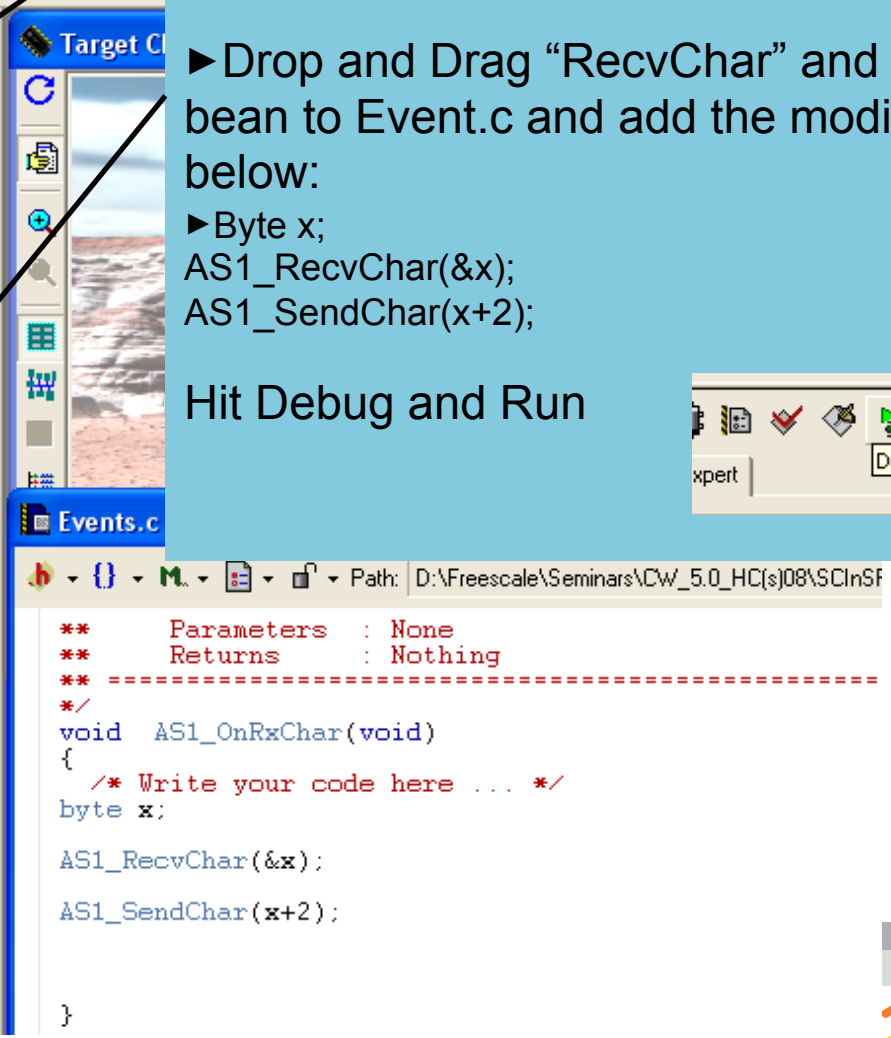
LAB4 – SCI Communication





►Under “Processor Expert” Tab, expand the “ AS1 AsynchronousSerial” bean

►Drop and Drag “RecvChar” and “SendChar” bean to Event.c and add the modification below:

►Byte x;
AS1_RecvChar(&x);
AS1_SendChar(x+2);

Hit Debug and Run

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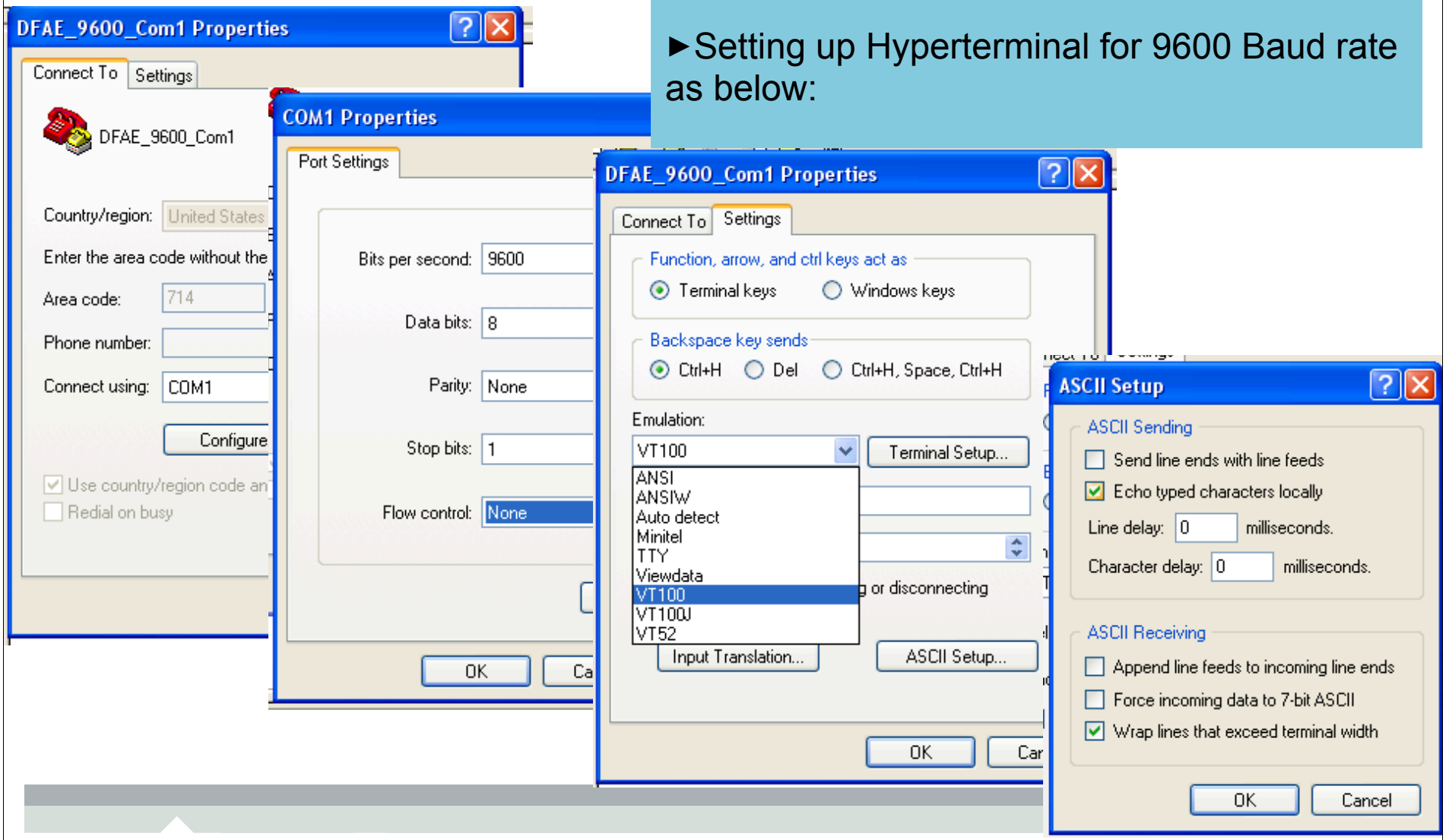
LAB4 – SCI Communication

►Setting up Hyperterminal for 9600 Baud rate as below:



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LAB5 – SPI Communication

- To send communication from PC to PC via an QG8 SCI/SPI converter
- Continuation with LAB4 (SCI Comm).
- Initialize SPI for MasterMode
- Initialize SPI for Slave Mode
- Write SCI/SPI Converter code
- Use Hyperterminal to test and application.

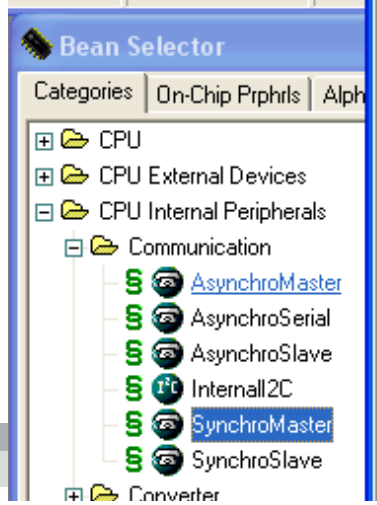
LAB5 – SPI Communication(Master)

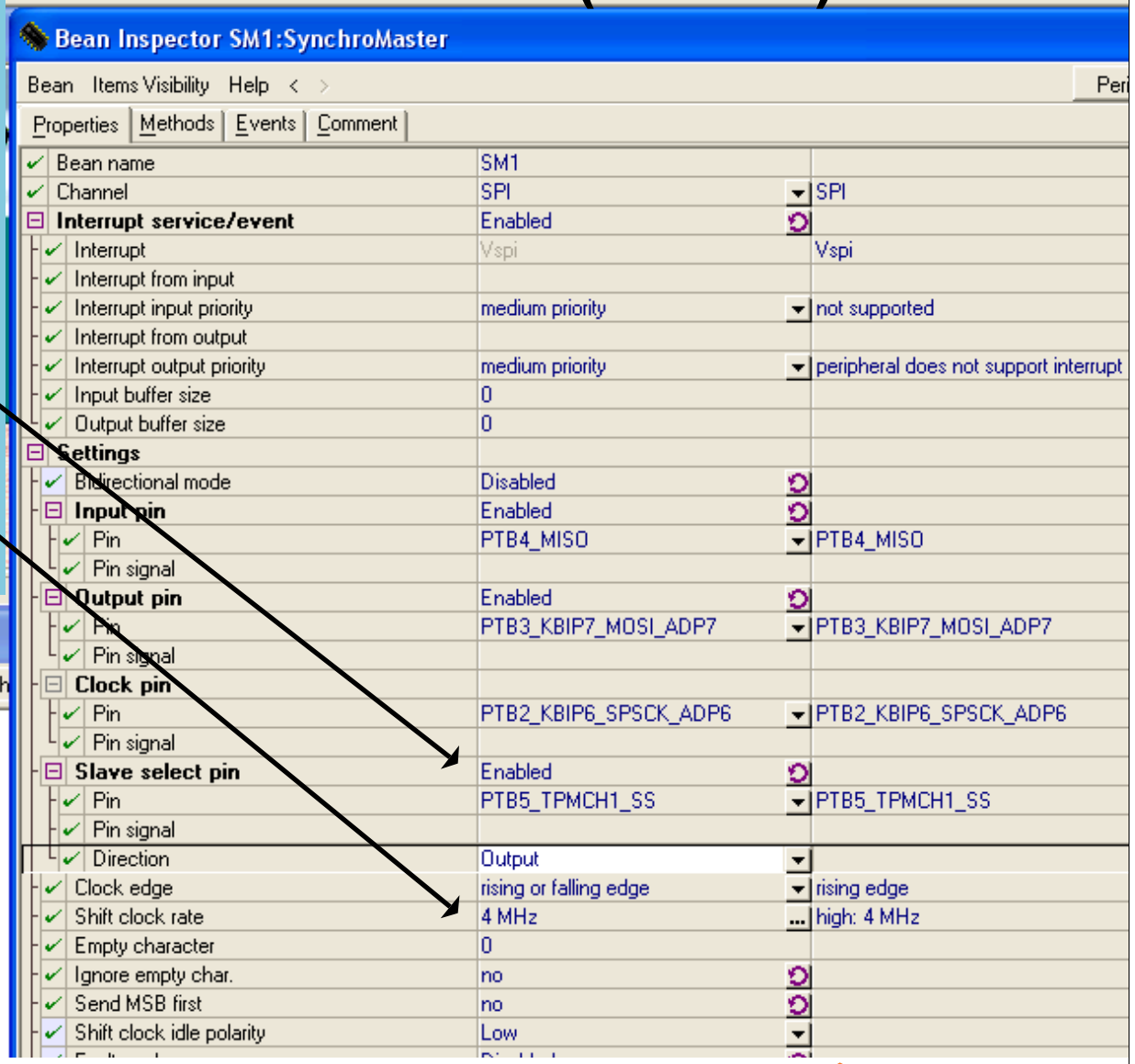
SPI Master Configuration

►In the “Bean Selector” window, select Synchronous Master.

►Enable “Slave Select pin” and set Direction to Output

►Set “Clock rate” to 4Mhz





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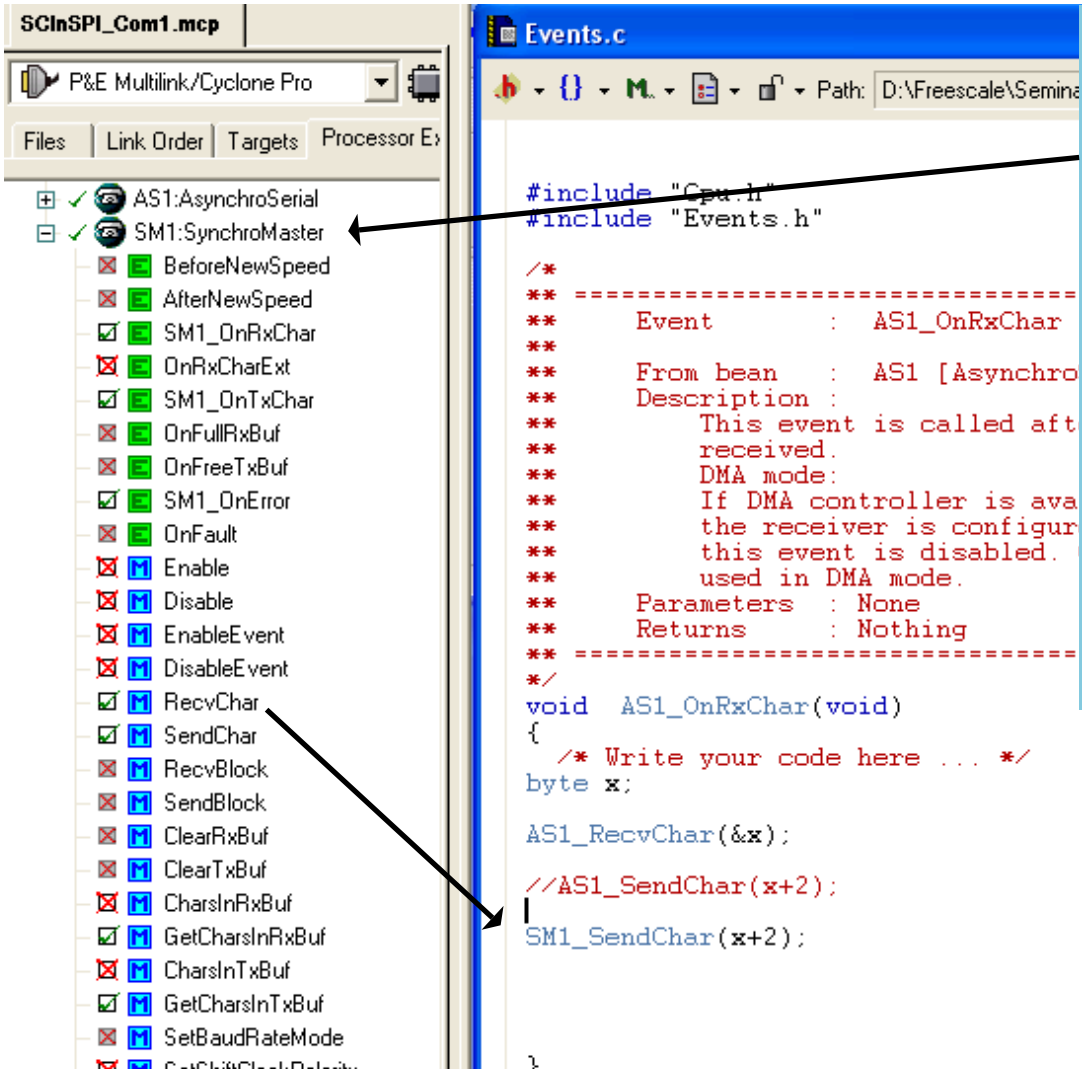
LAB5 – SPI Communication(Master)



►Under “Processor Expert” Tab, expand the “SM1:SyncrhronousMaster” bean

►Drop and Drag “SendChar” and modifiy as below:

SM1_SendChar(x+2);

►Hit Debug and Run

►Use Hyper-terminal to test Communication

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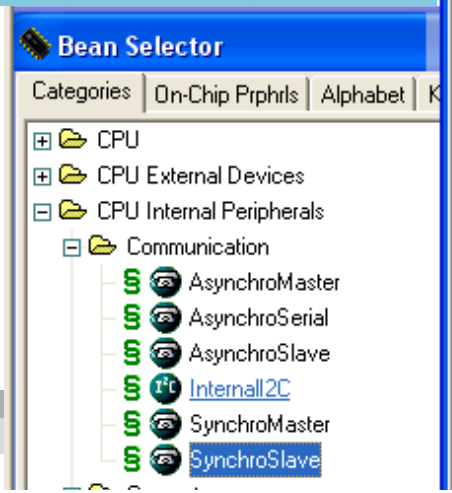
LAB5 – SPI Communication(Slave)

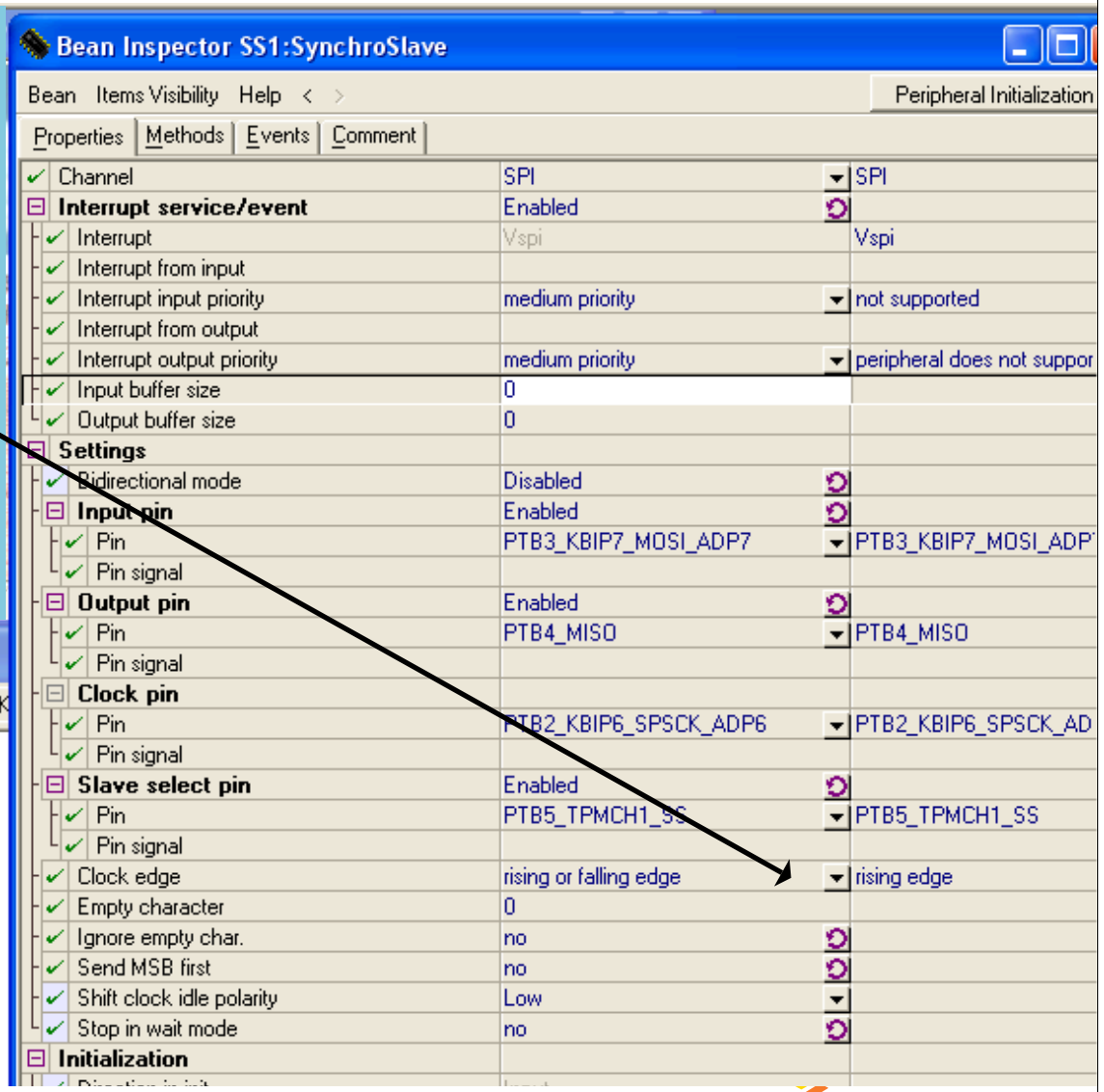
SPI Slave Configuration

►In the “Bean Selector” window, select SynchronousSlave.

►Set “Clock Edge” to rising edge to match up with the Master mode.

►Generate Code





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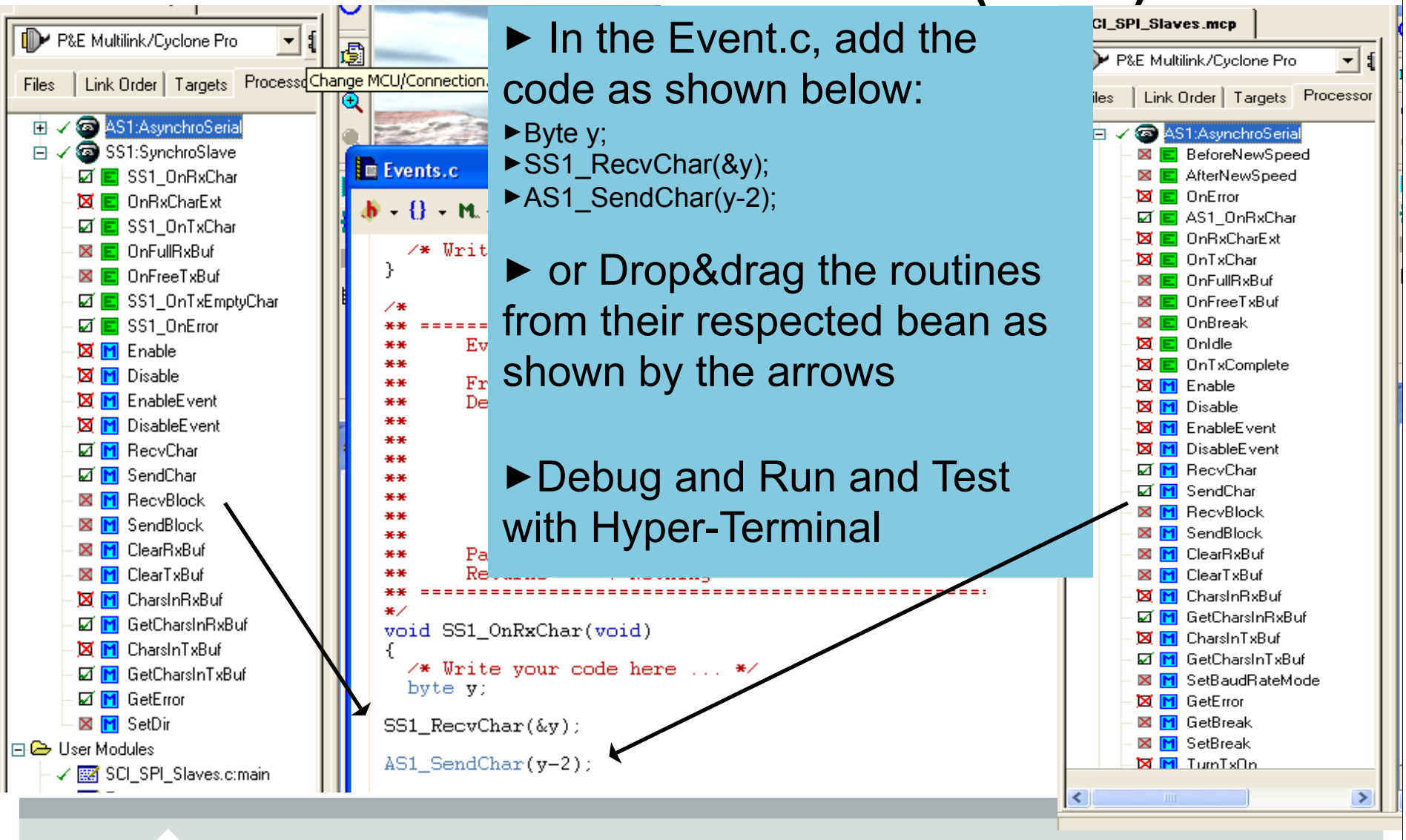
LAB5 – SPI Communication(Slave)



► In the Event.c, add the code as shown below:

►Byte y;

►SS1_RecvChar(&y);

►AS1_SendChar(y-2);

► or Drop&drag the routines from their respected bean as shown by the arrows

►Debug and Run and Test with Hyper-Terminal

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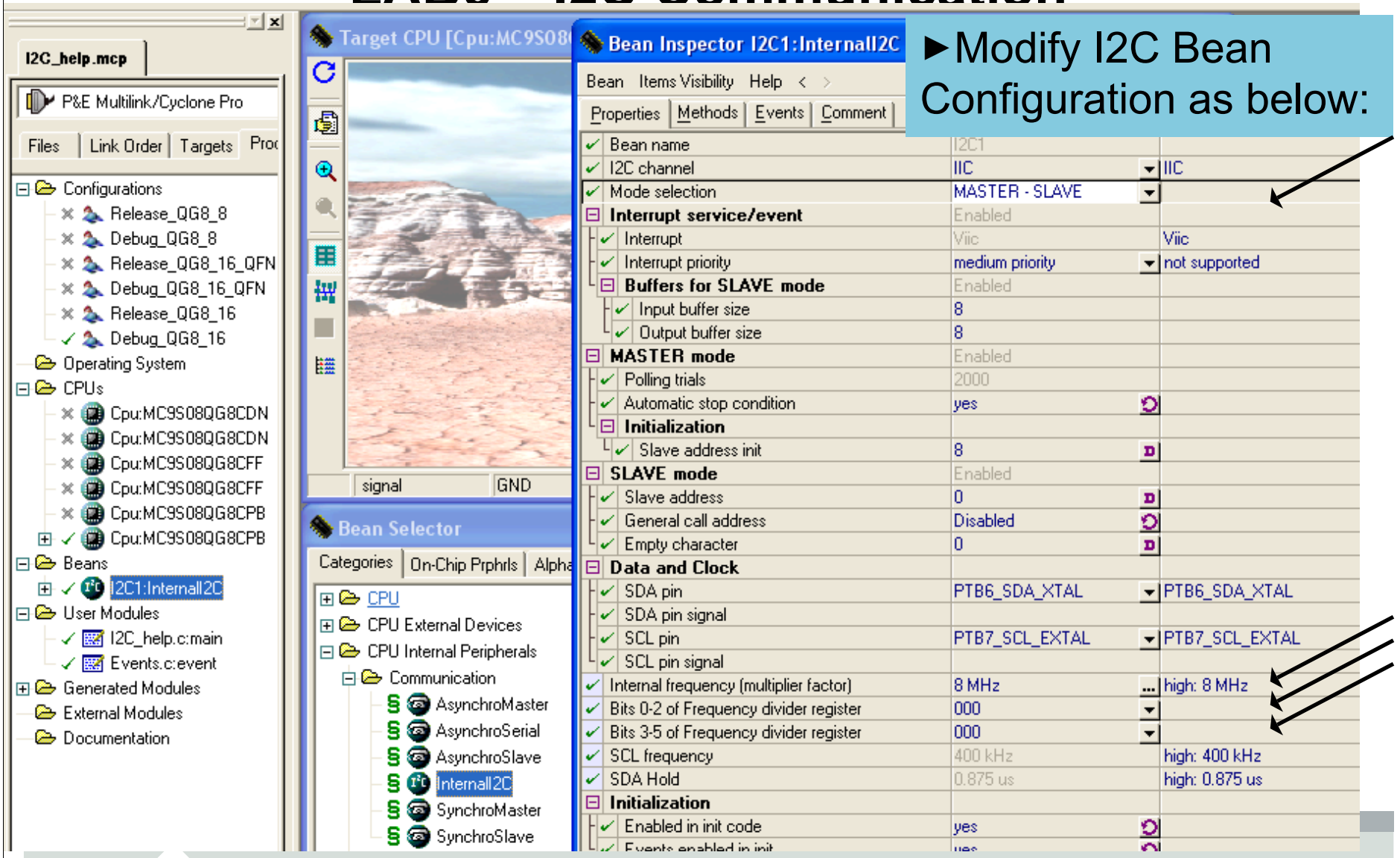
LAB6 – I2C Communication

- Modify HW to add 4.7K resistors to SCL and SDA signals
- Initialize I2C HW
- Write I2C application

LAB6 – I2C Communication



►Modify I2C Bean Configuration as below:

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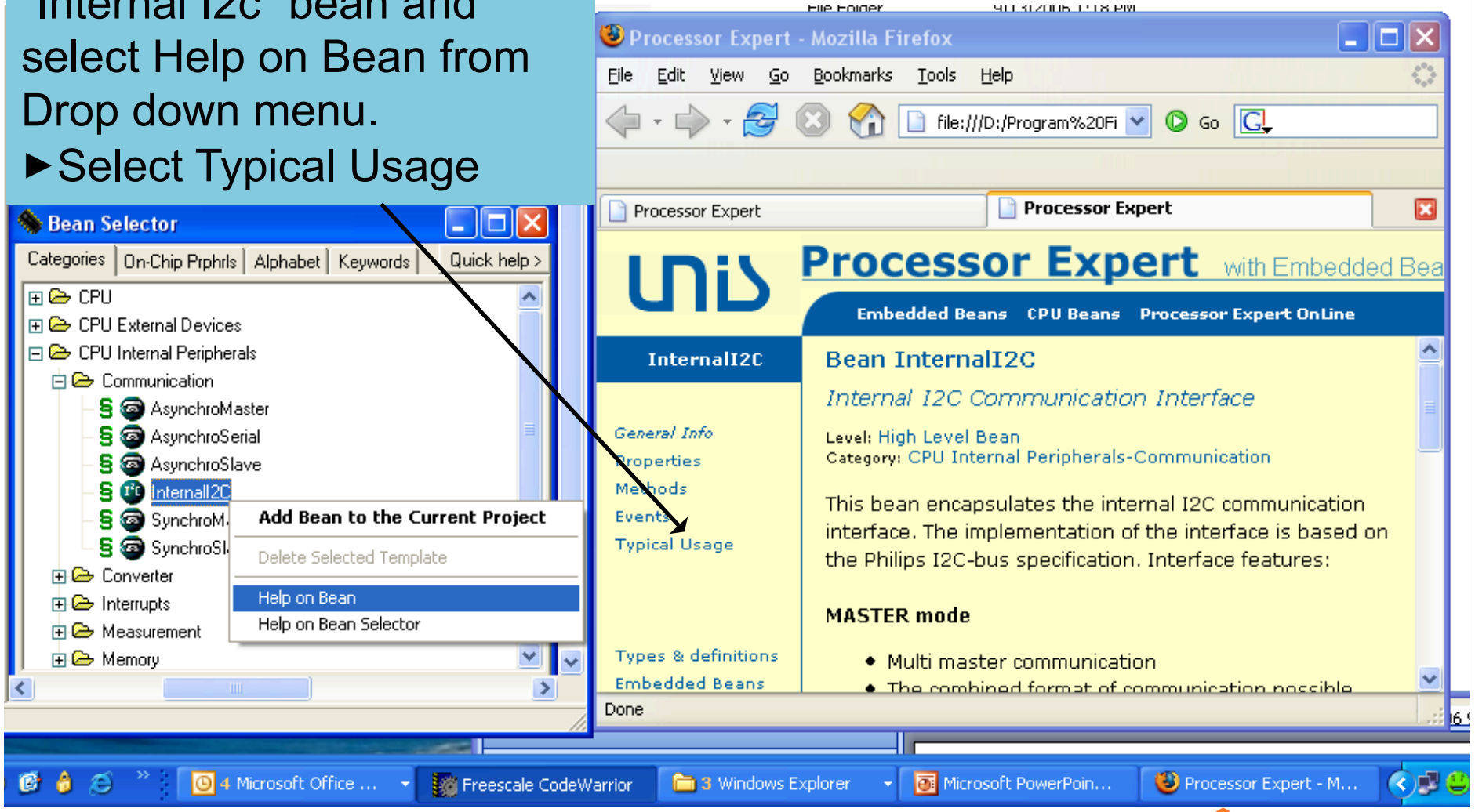
LAB6 – I2C Communication

►Right hand click on "Internal I2c" bean and select Help on Bean from Drop down menu.

►Select Typical Usage



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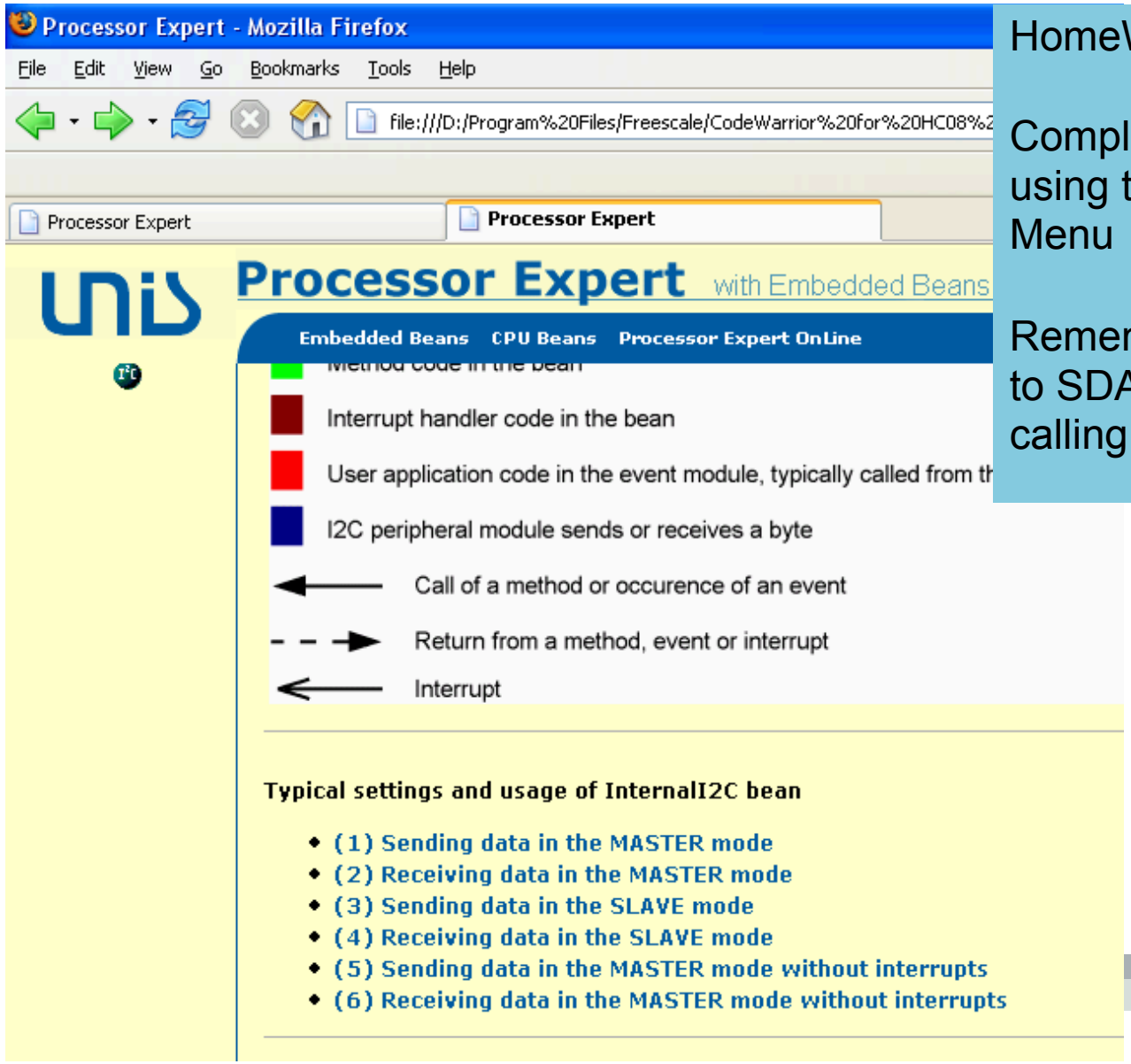
LAB6 – I2C Communication



HomeWork:

Complete an I2C application using the Typical Usage Help Menu

Remember to add 4.7k resistors to SDA and SCL line before calling He My FAE.

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Thank You