# XC2287M HOT

## PEC Solution

## Usage of PEC

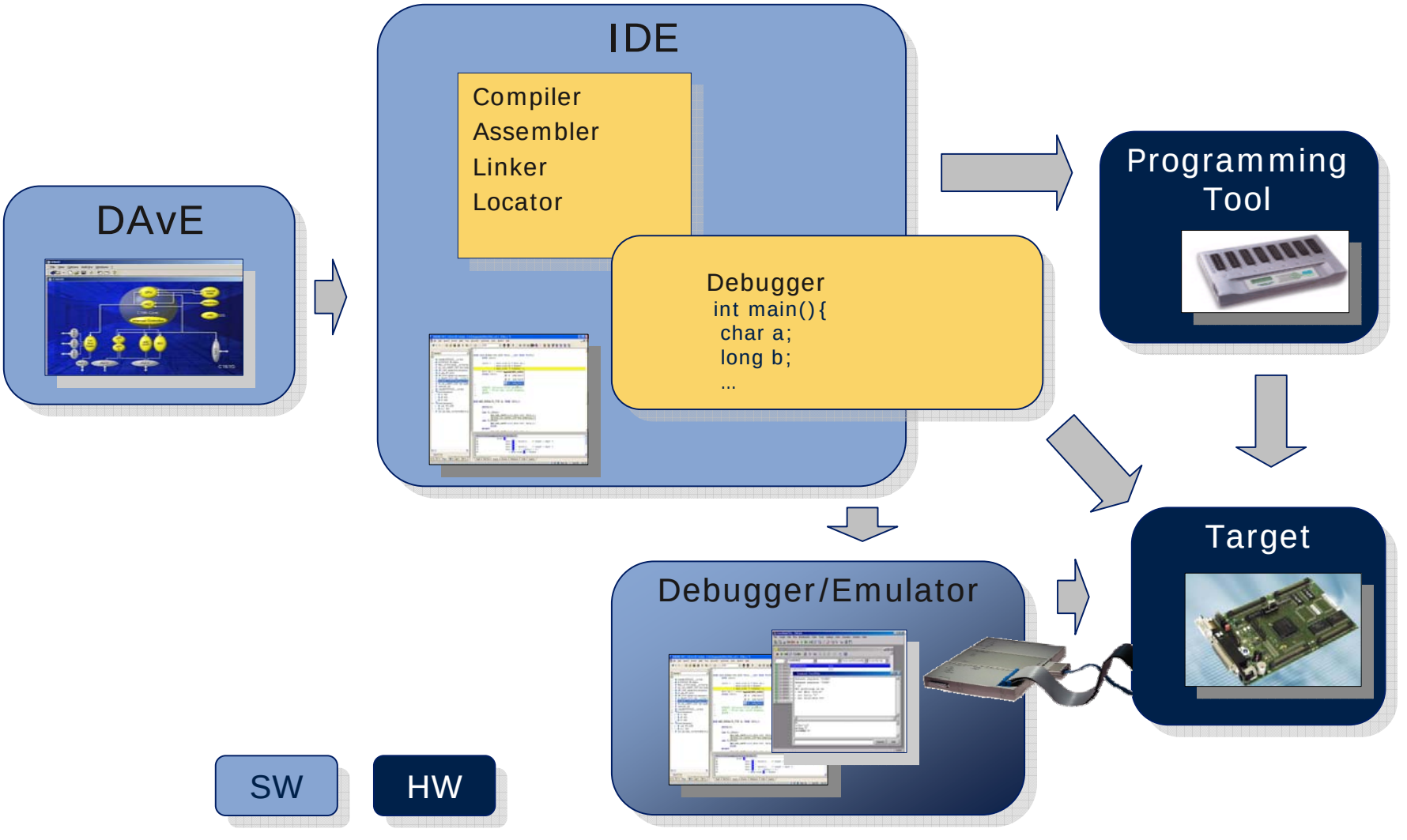
Device: XC2287-104F
Compiler: Tasking Viper 2.2r1
Code Generator: DAvE 2.1

Never stop thinking

# Usage of PEC


Let’s get started now!
OSC
Internal ROM Area
PWM
PEC
OSC
Internal ROM Area

# XC2287M HOT Exercise PEC
# Interaction of Development Tools



# HOT Exercise PEC
# Triggering of ADC + PEC

## In this exercise you will:

- Configure the XC2287M with DAvE
- Assign a potentiometer to an ADC cannel
- Define ADC parameters
- Develop a program that will do ADC conversion continuously
- Configure PEC
- Do performance tests

# HOT Exercise PEC
# Triggering of ADC + PEC

## Exercise goal:

Trigger ADC conversion by software

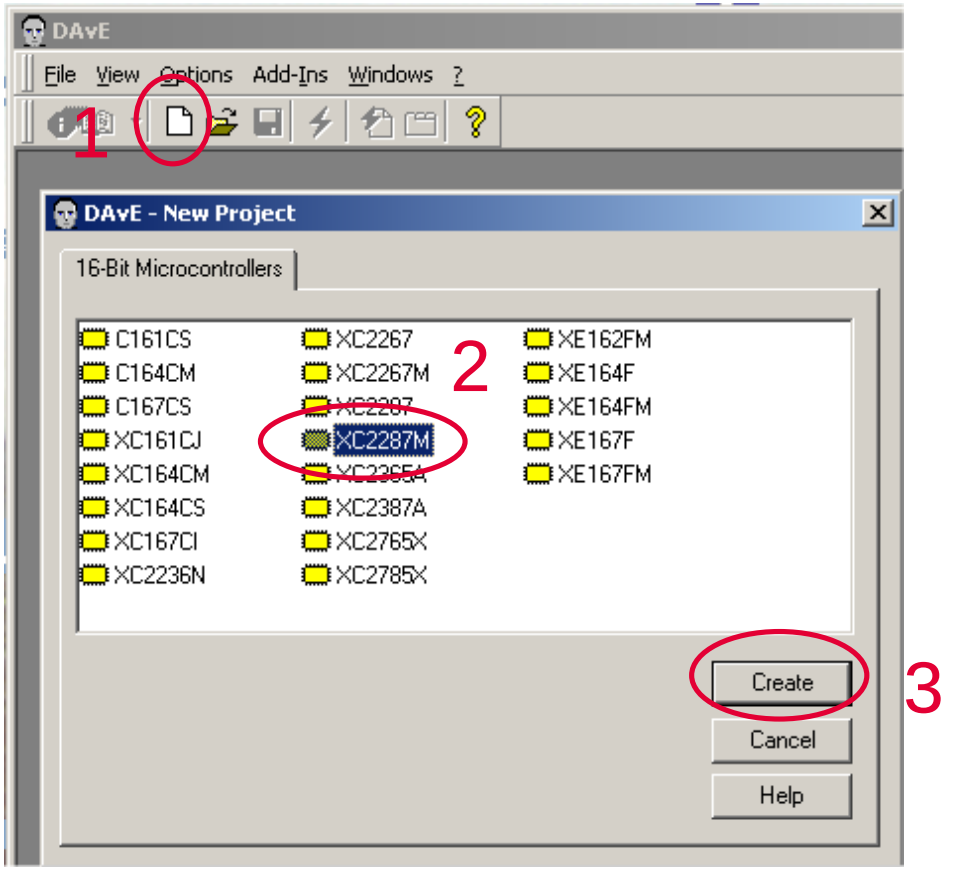
- The onboard potentiometer is connected to channel 0 (P5.0)
- A/D converter will run in software triggered autoscan mode
- Use wait for read mode
- Configure time base for performance measurements
- Configure PEC

# HOT Exercise PEC - DAvE Configurations
# Start DAvE

- **Start DAvE**
  - Click on the 

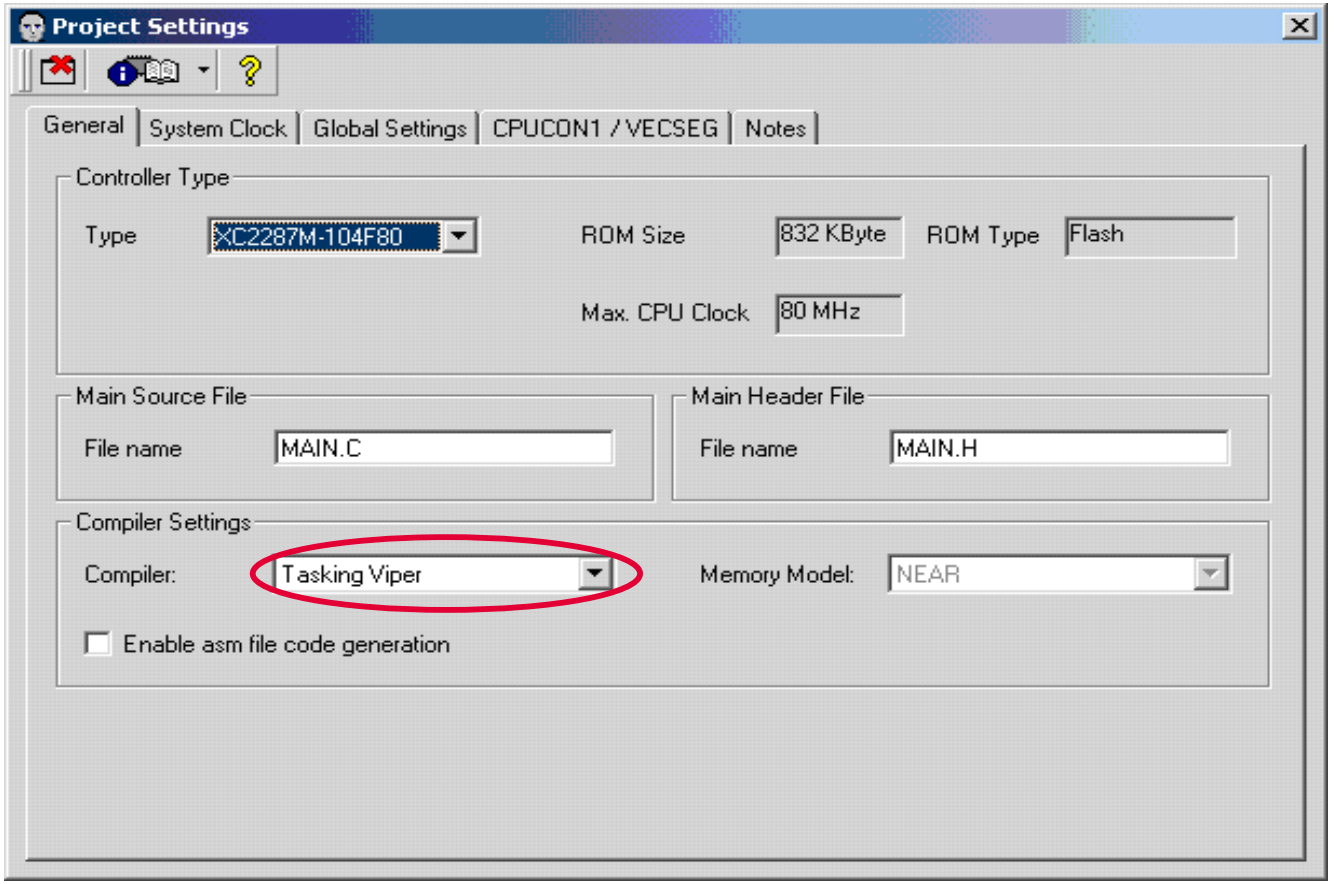
- **Create a new project** (Startup Dialog pop up automatically)
  - Click on ‘Create a new project’ or select File -> New
  - Select microcontroller: ‘XC2287M’

# HOT Exercise PEC - DAvE Configurations
# Start DAvE (cont.)



# HOT Exercise PEC - DAvE Configurations
# Project Settings

- Project Settings
- Close the window 

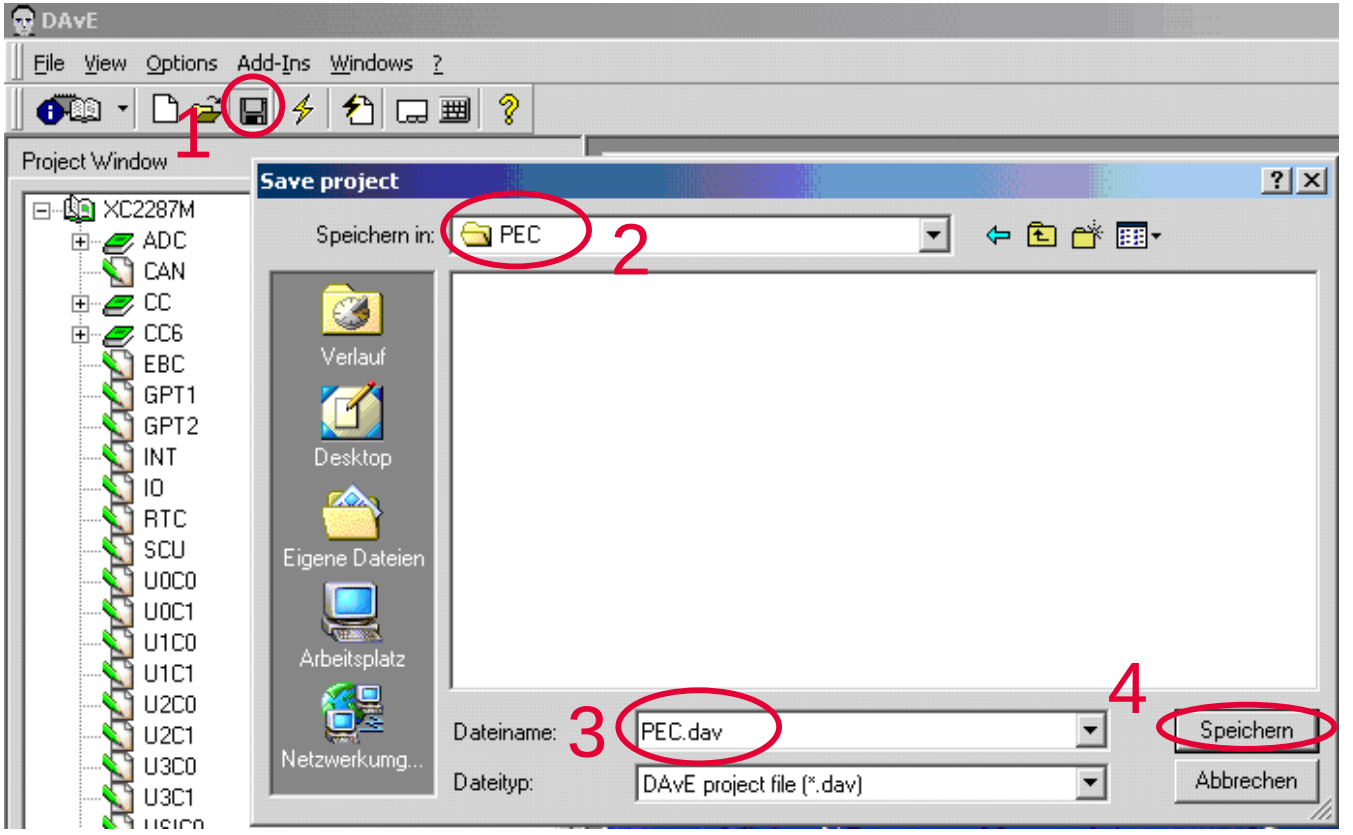


# HOT Exercise PEC - DAvE Configurations
# Save DAvE Project

- Save your DAvE project 
  - Path:
    C:\IFX_HOT\XC2287M\Examples\PEC
  - Project name:
    PEC\PEC.dav

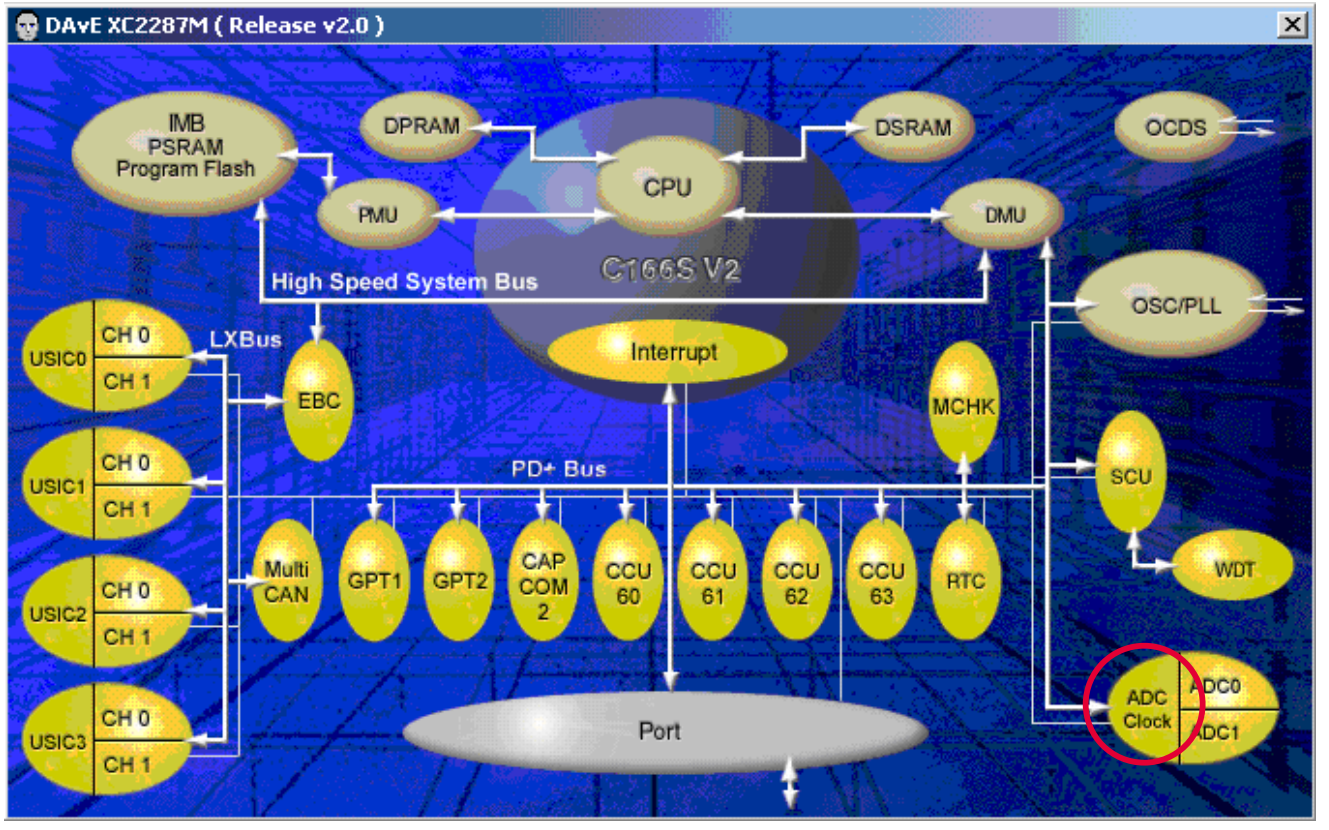
# HOT Exercise PEC - DAvE Configurations Project Settings (cont.)

- Save your DAvE Project File

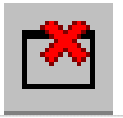


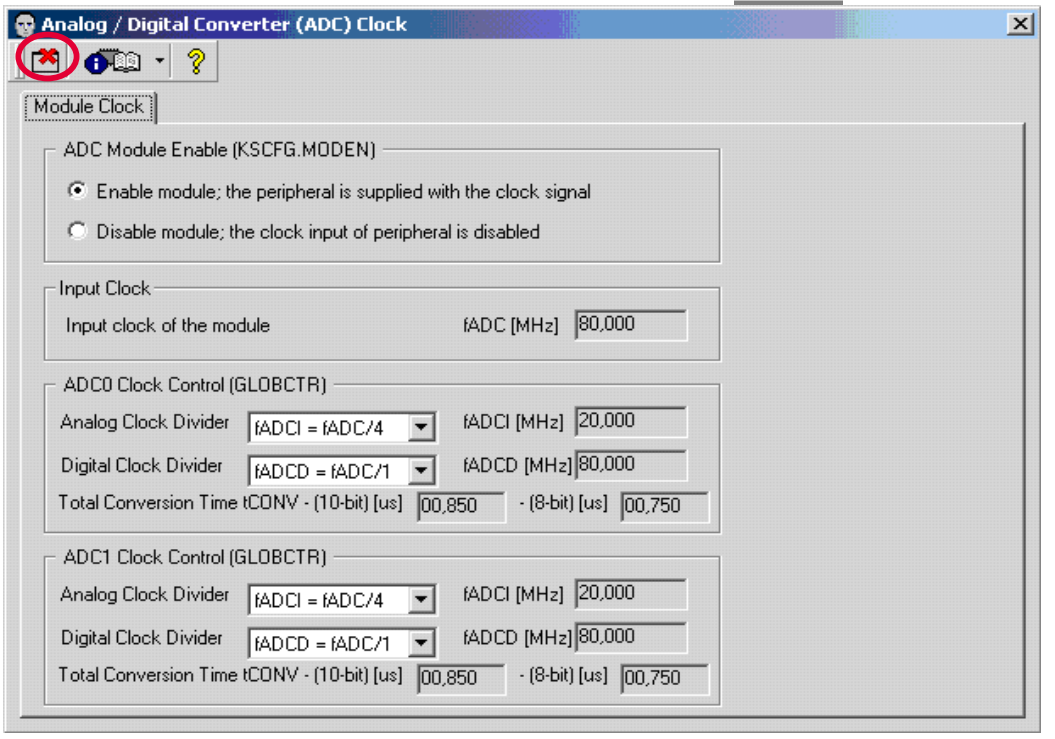
# HOT Exercise PEC - DAvE Configurations ADC Settings

- Click on ‘ADC Clock’ 

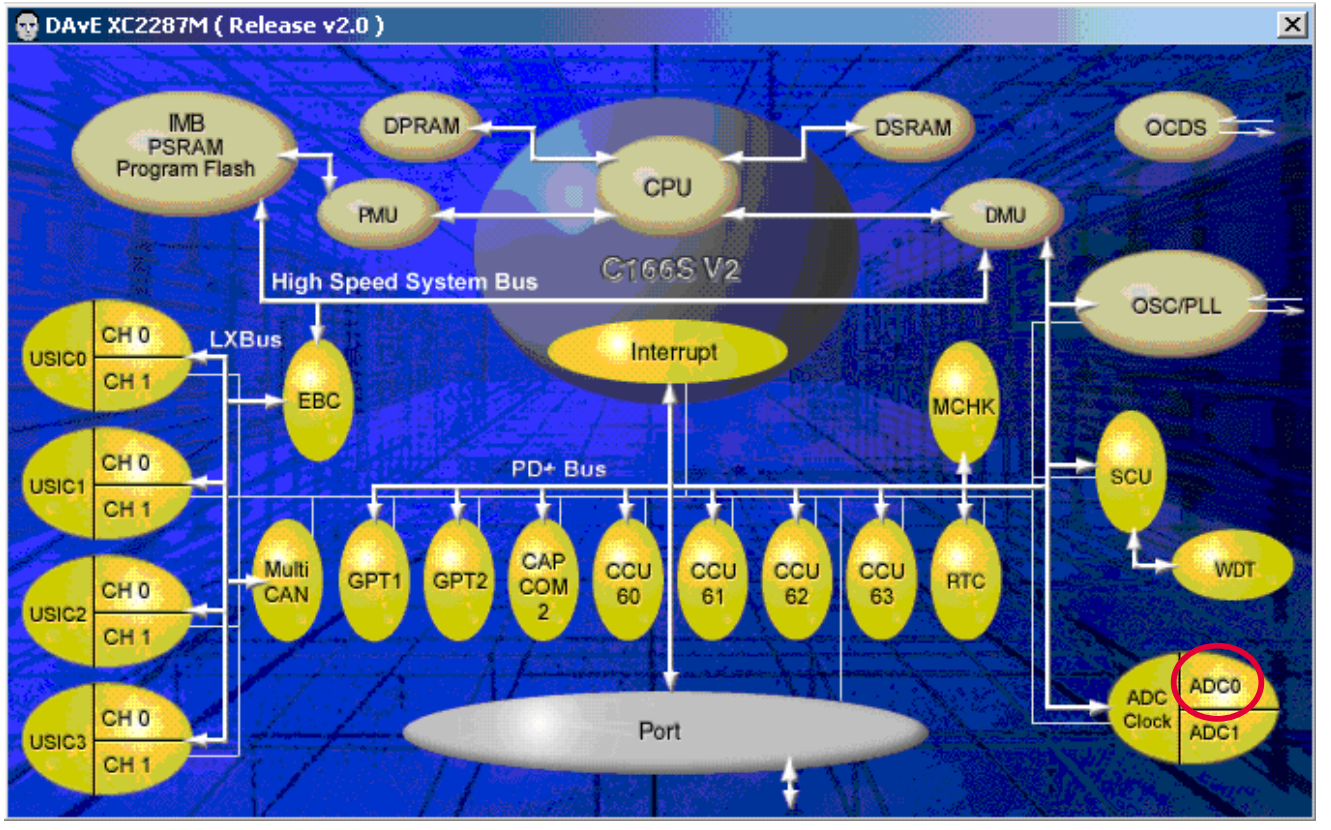
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Configure ‘ADC Clock’
  - Enable module
  - default settings for others
  - Close the windows by pressing 



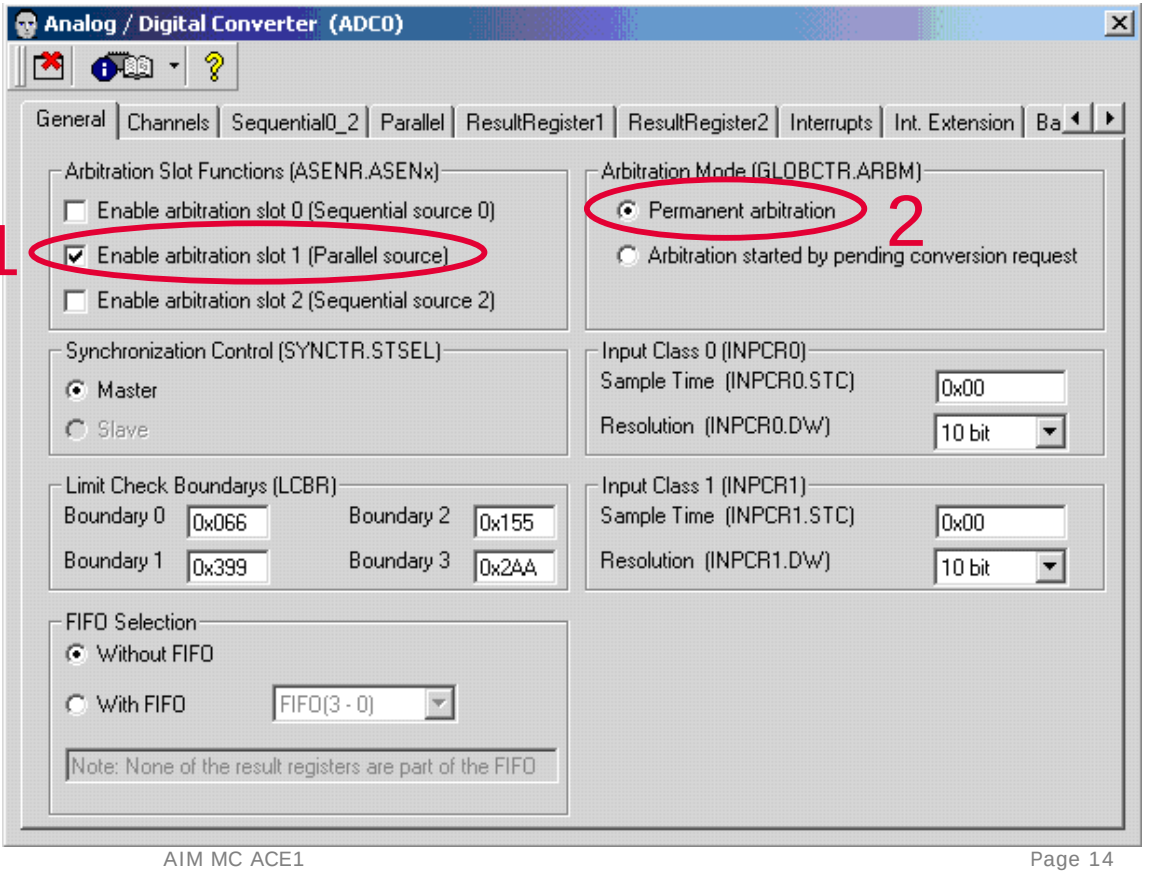
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Click on ADC0 

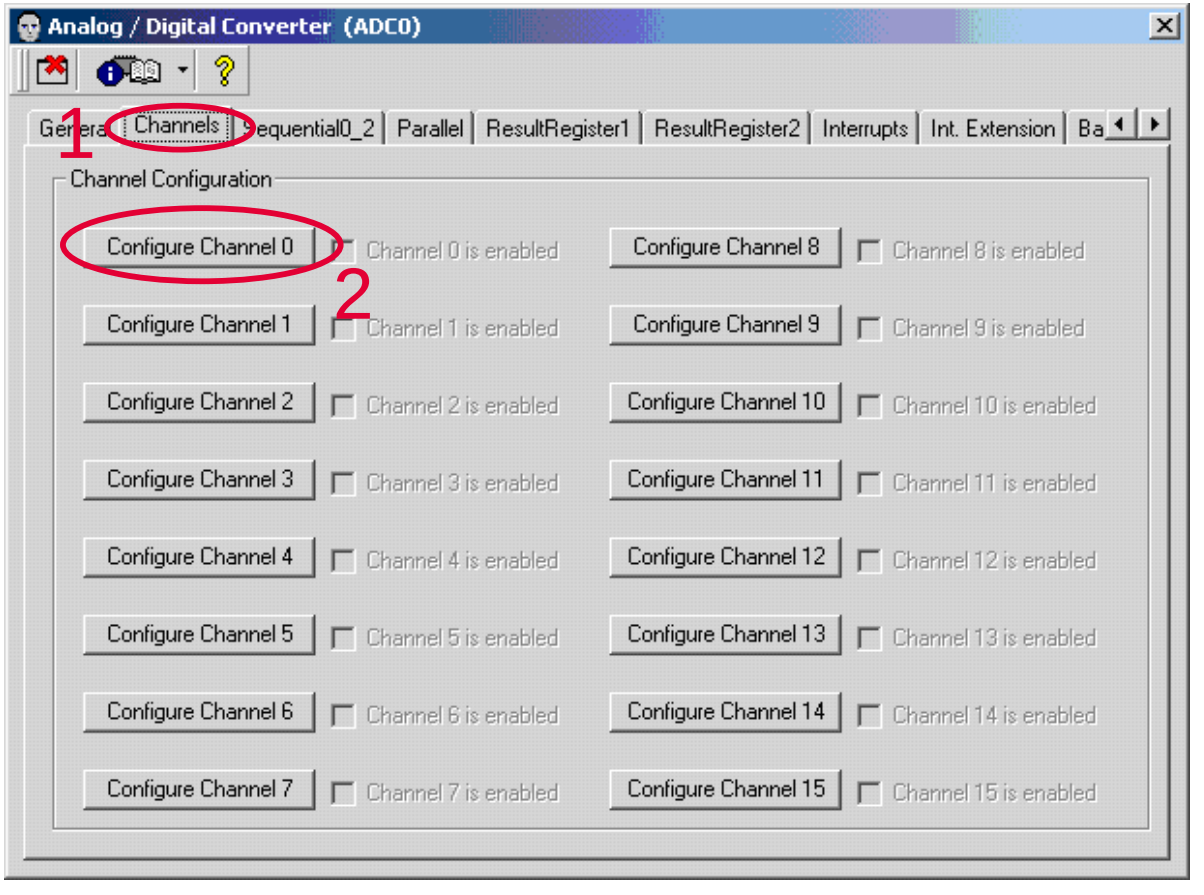
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Configure ADC0 – General
  - Arbitration Slot Functions – enable ‘arbitration slot 1’ only
  - Arbitration Mode – enable ‘Arbitration started by pending conversion request’
  - Others- default



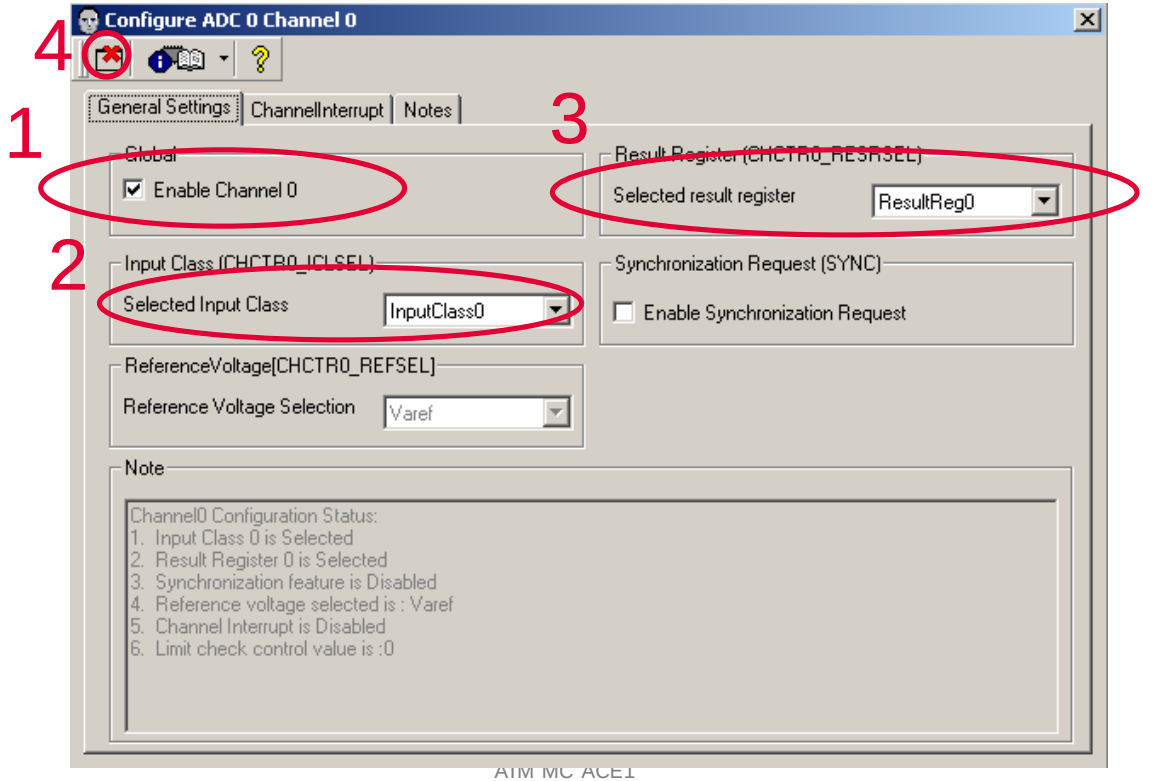
# HOT Exercise PEC - DAvE Configurations ADC Settings (cont.)

- Configure ADC0 – Channels
  - Click on ‘Configure Channel 0’



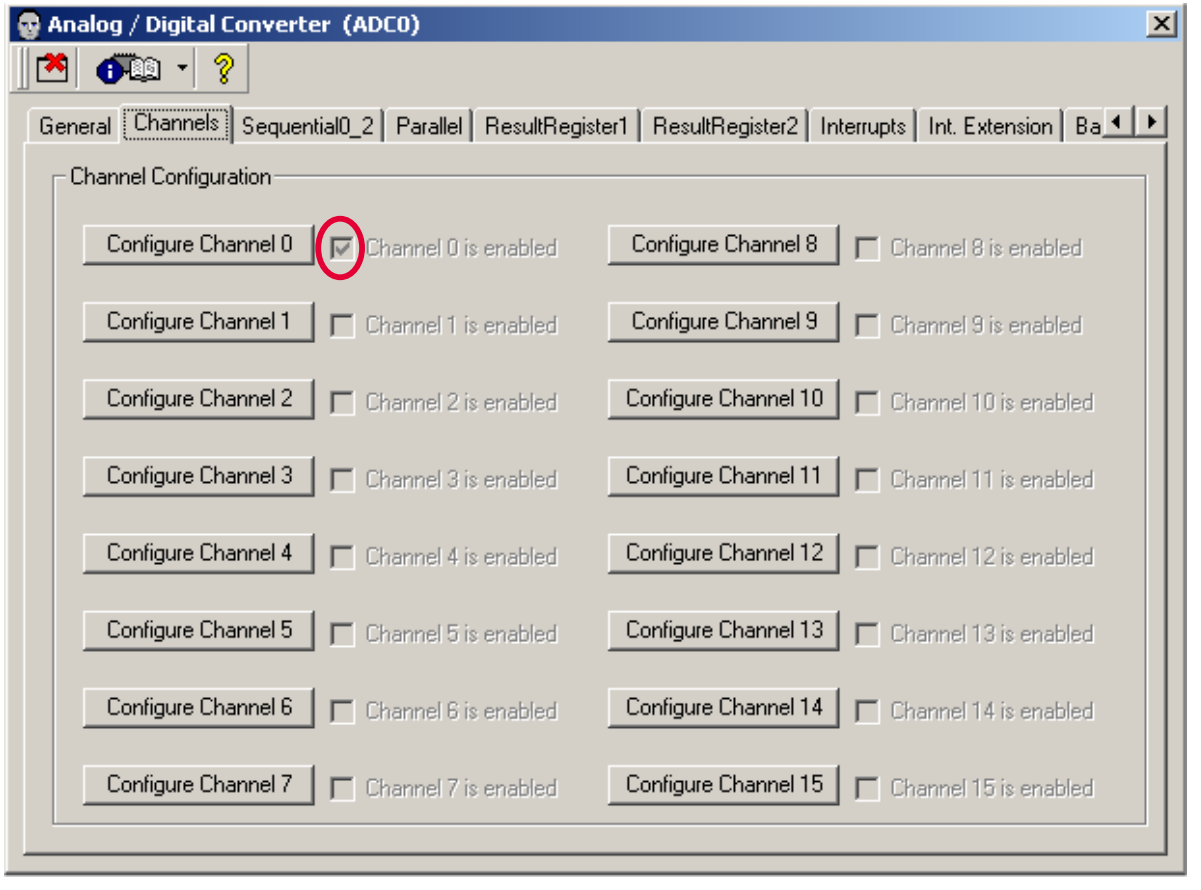
# HOT Exercise PEC - DAvE Configurations ADC Settings (cont.)

- Configure ADC0 – Channels
  - Enable Channel 0
  - Input Class – select ‘InputClass0’
  - Result Register - select ‘ResultReg0’



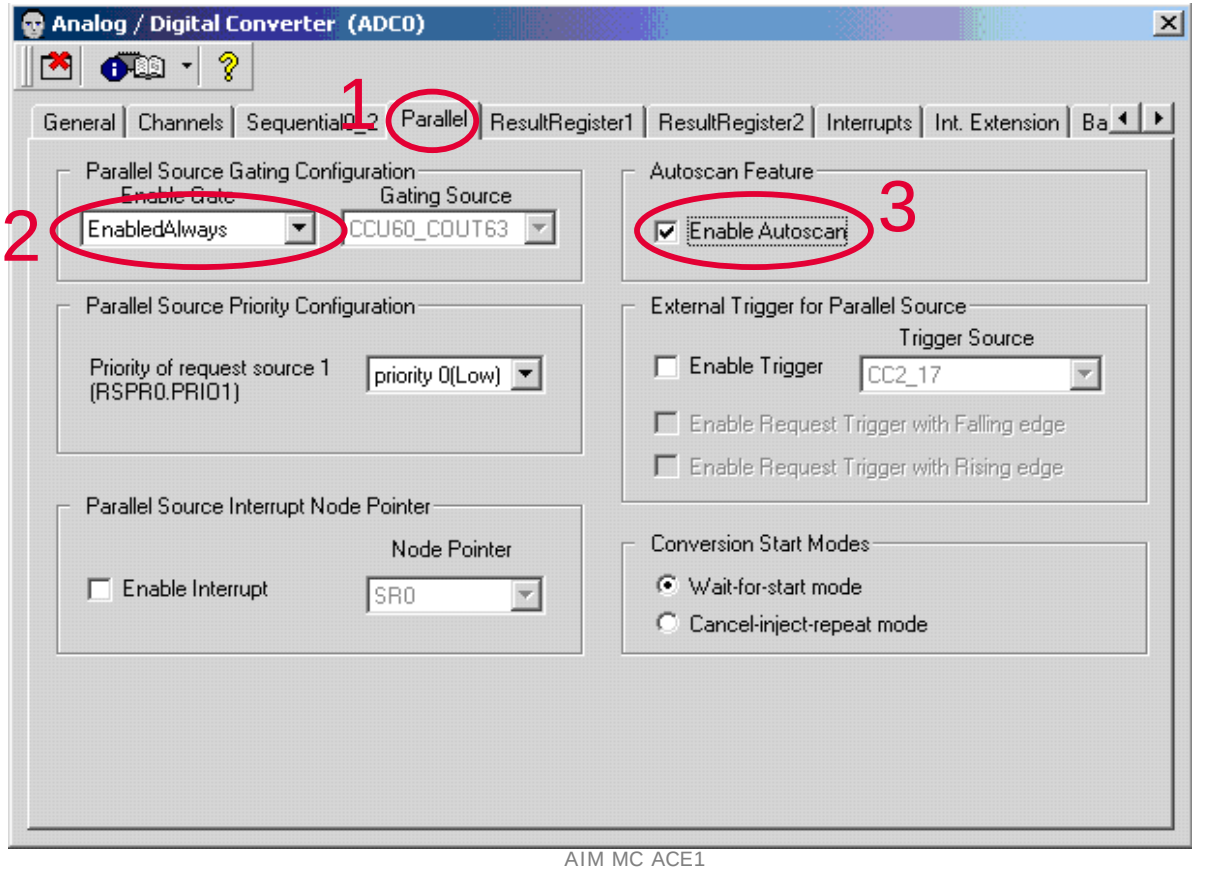
# HOT Exercise PEC - DAvE Configurations ADC Settings (cont.)

- Configure ADC0 – Channels
  - Channel 0 is now selected



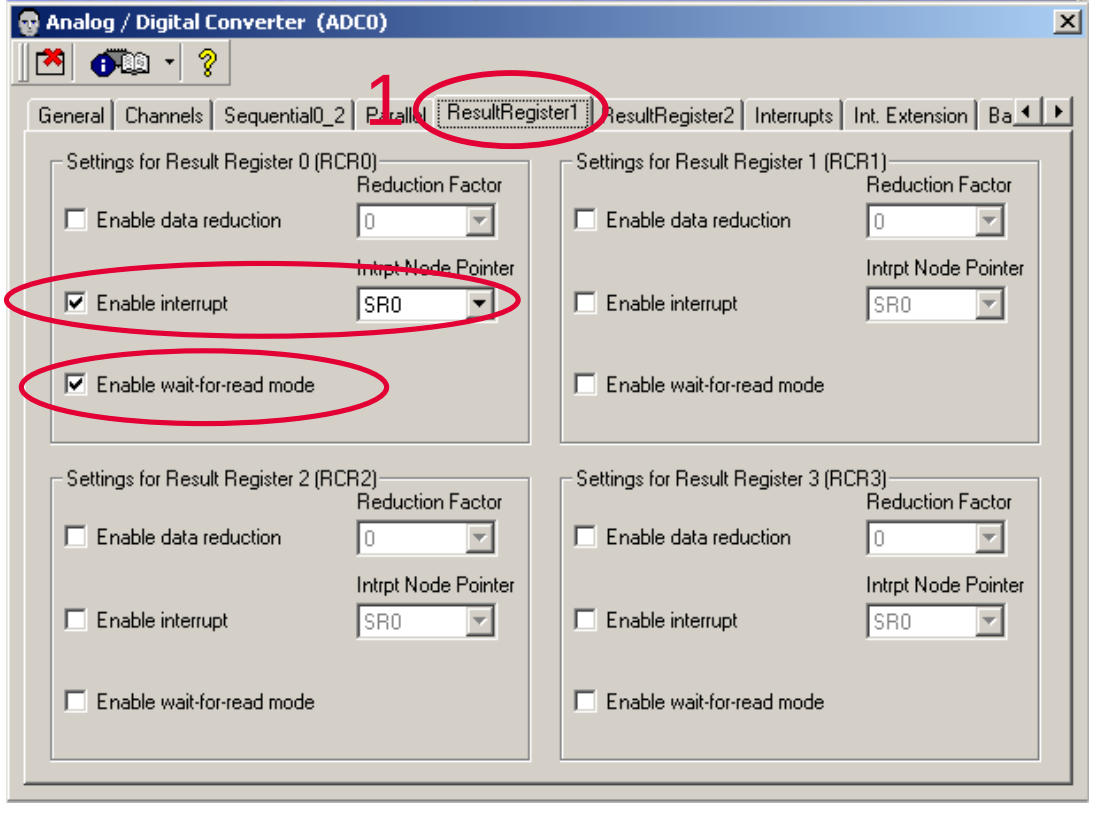
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Configure ADC0 – Parallel
  - Parallel Source Gating Configuration – select ‘EnabledAlways’
  - Autoscan Feature – enable ‘Autoscan’



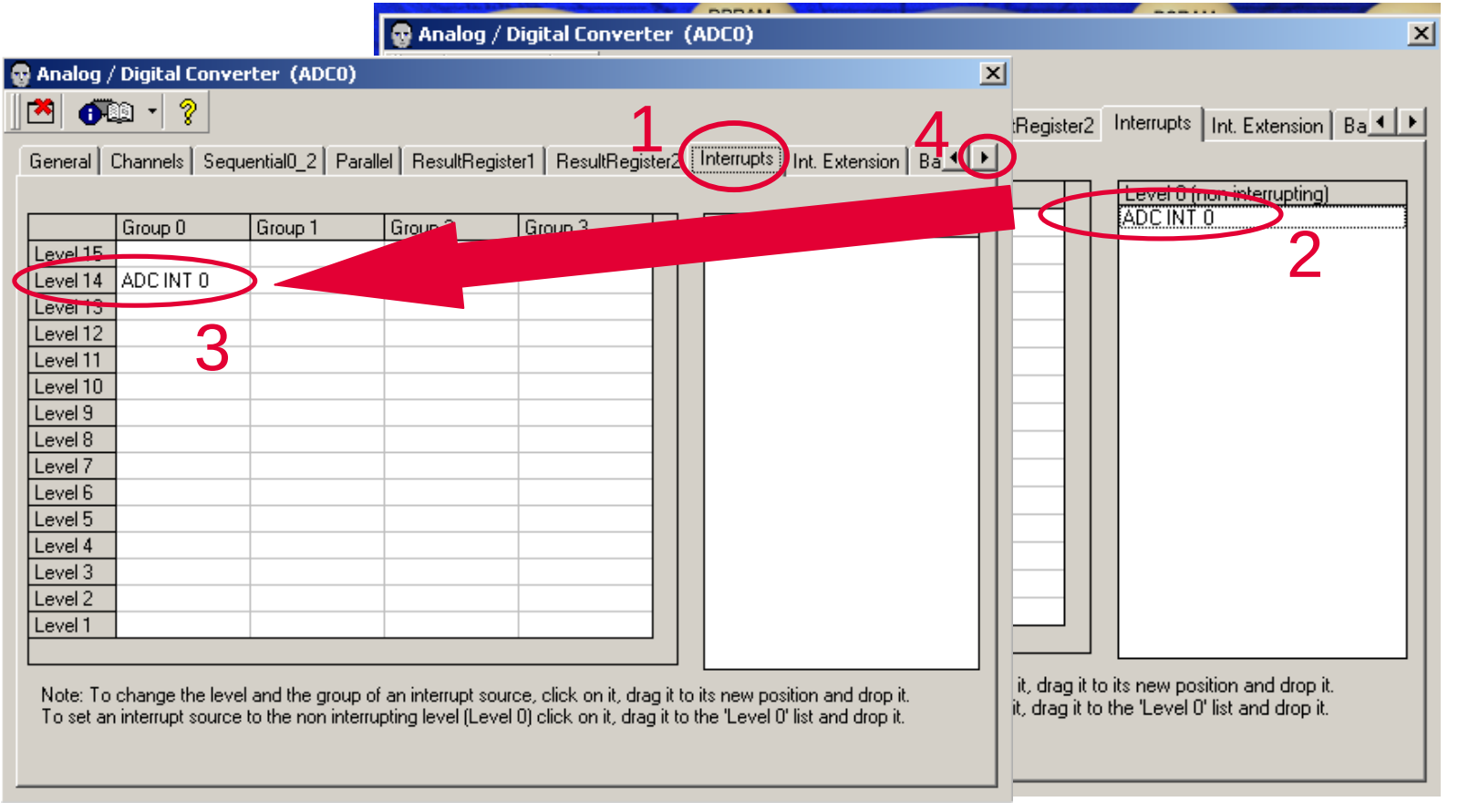
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Configure ADC0 – Result Register1
  - Settings for Register 0 – enable interrupt SR0
  - Settings for Register 0 – enable wait for read mode



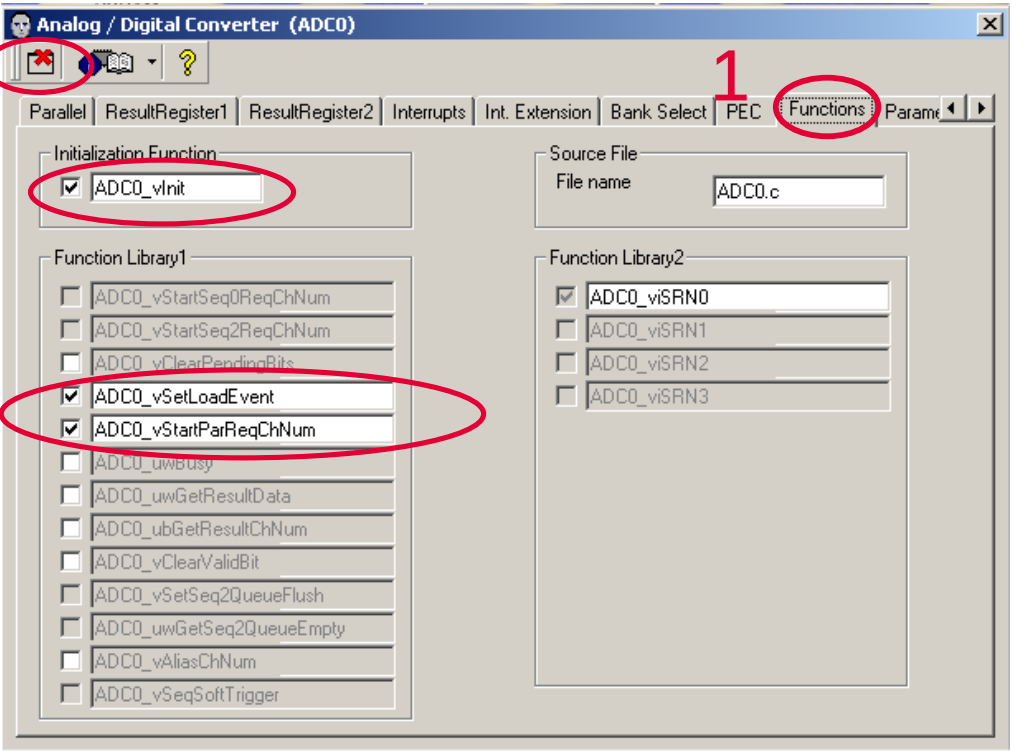
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Configure ADC0 – Interrupts
  - Drag ‘ADC INT 0’ from Level 0 to Level 14, Group 0



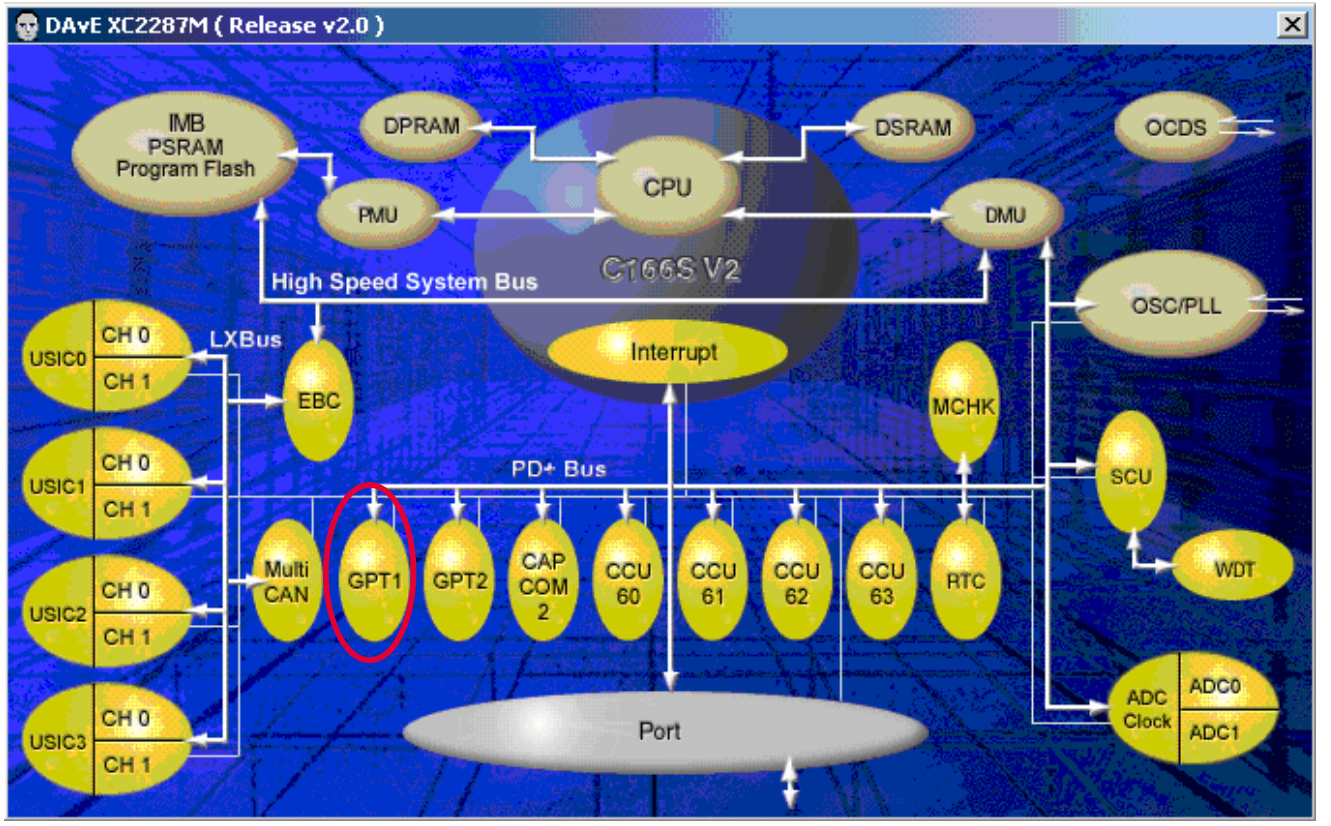
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (cont.)

- Configure ADC0 – Functions
  - Click on ‘ADC_vInit’
  - Click on ‘ADC0_vSetloadEvent’
  - Click on ‘ADC0_vStartParReqChNum’
  - Click on 



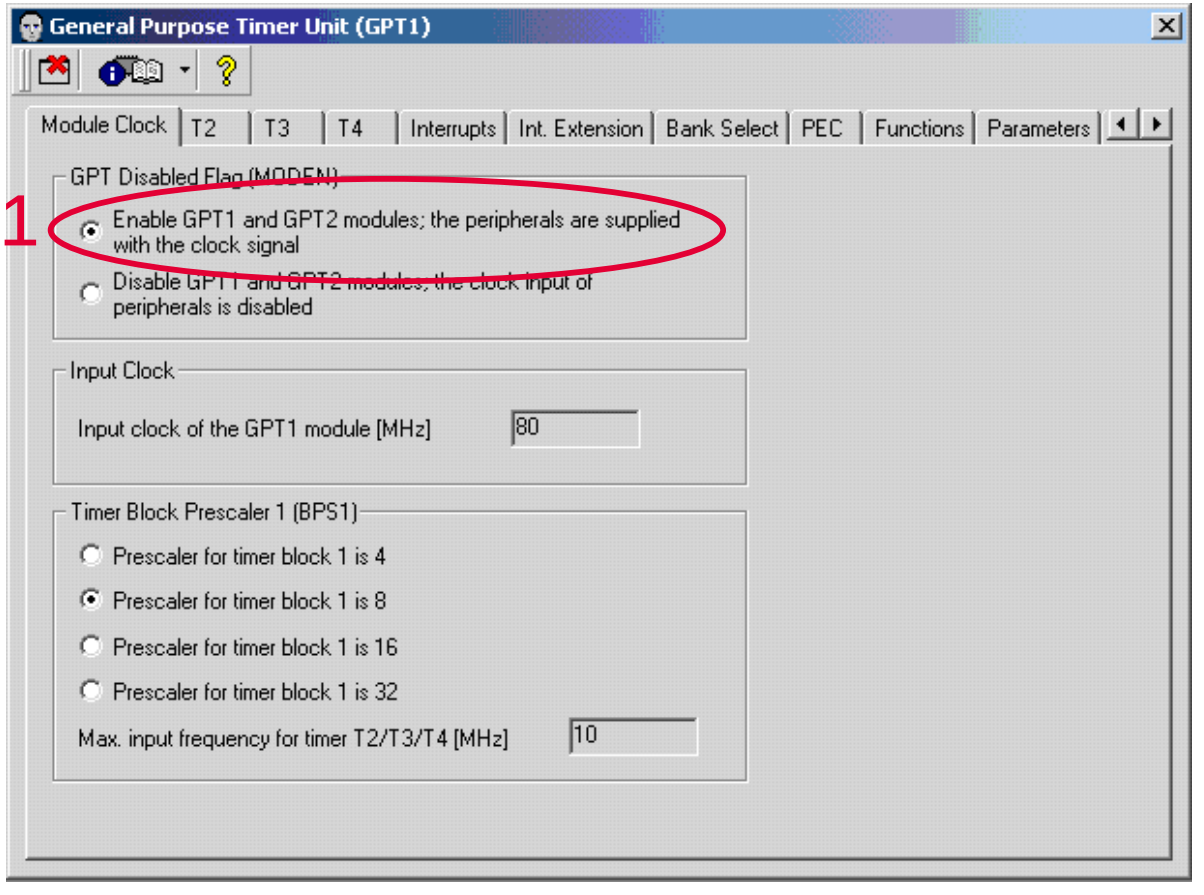
# HOT Exercise PEC - DAvE Configurations
# GPT1 Settings

- Click on ‘GPT1’

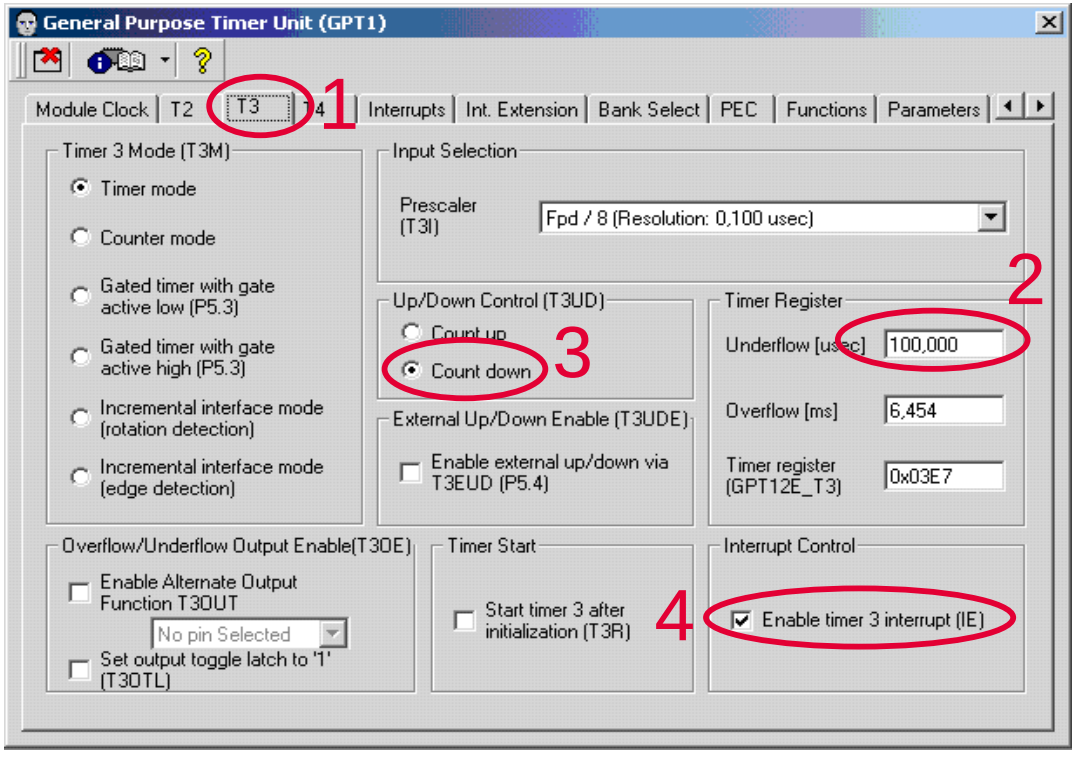
# HOT Exercise PEC - DAvE Configurations
# GPT1 Settings (cont.)

- Configure GPT1 – Module Clock
  - Enable module



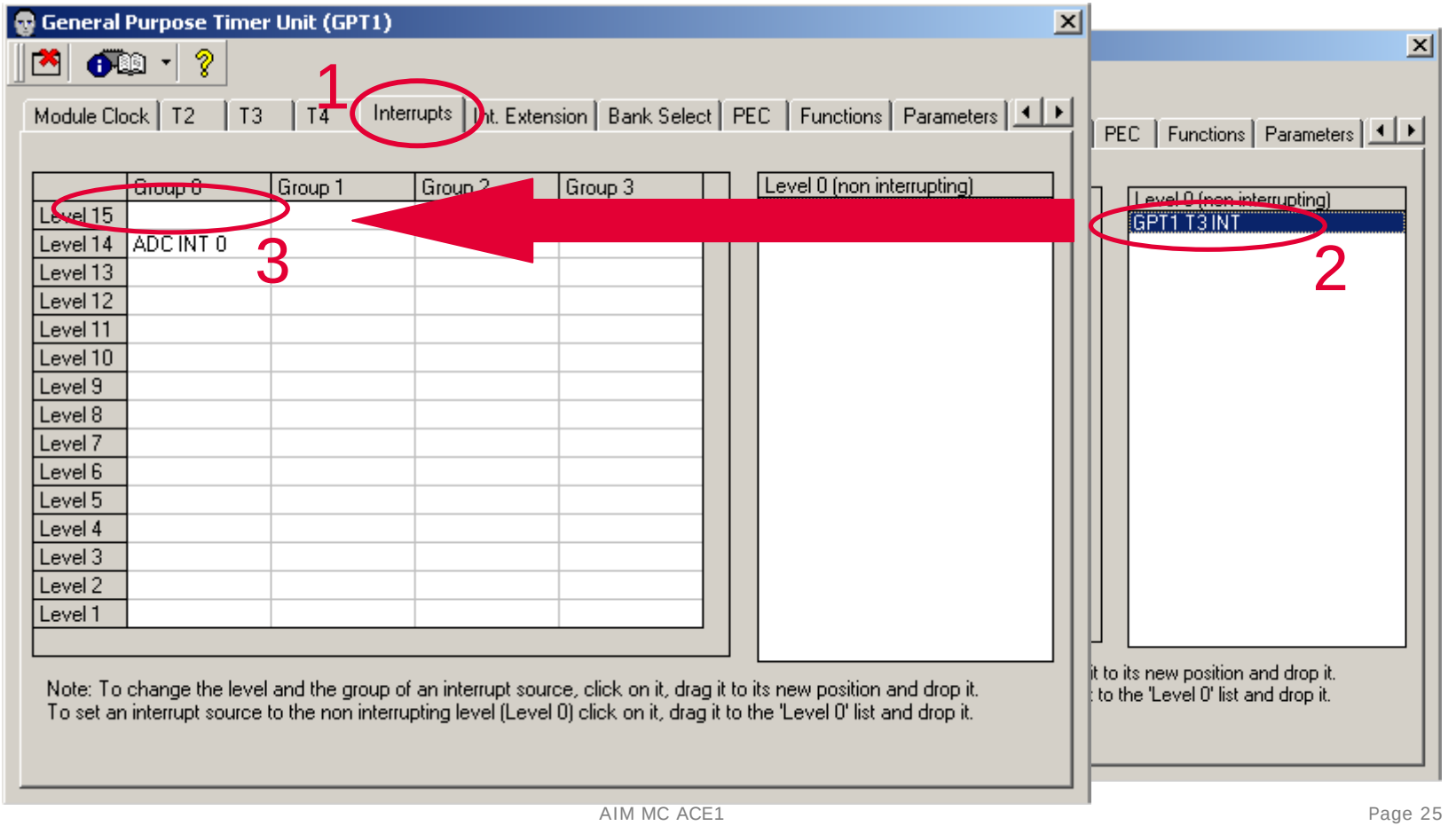
# HOT Exercise PEC - DAvE Configurations
# GPT1 Settings (cont.)

- Configure GPT1 – Timer 3
  - Up/Down Control – select ‘Counter down’
  - Timer Register (Underflow) – set as ‘100 µs’
  - Interrupt Control – click on ‘Enable timer 3 interrupt’



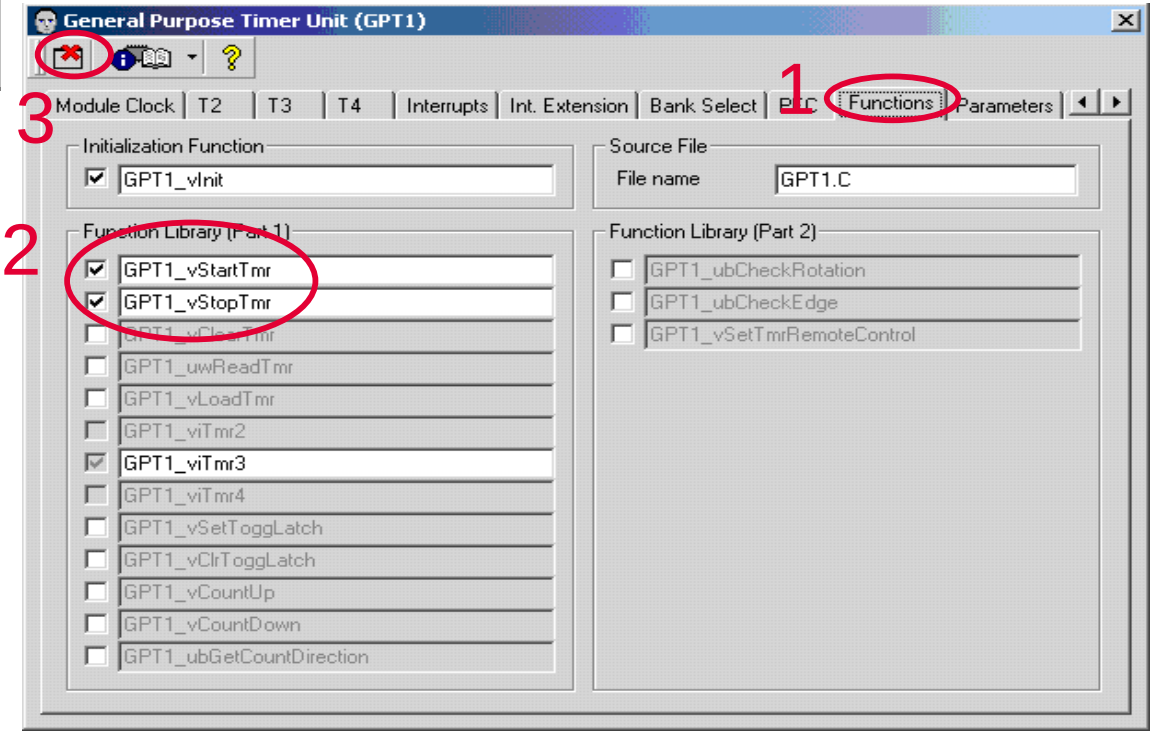
# HOT Exercise PEC - DAvE Configurations
# GPT1 Settings (cont.)

- Configure GPT1 – Interrupts
  - Drag ‘GPT1 T3 INT’ from Level 0 to Level 15, Group 0



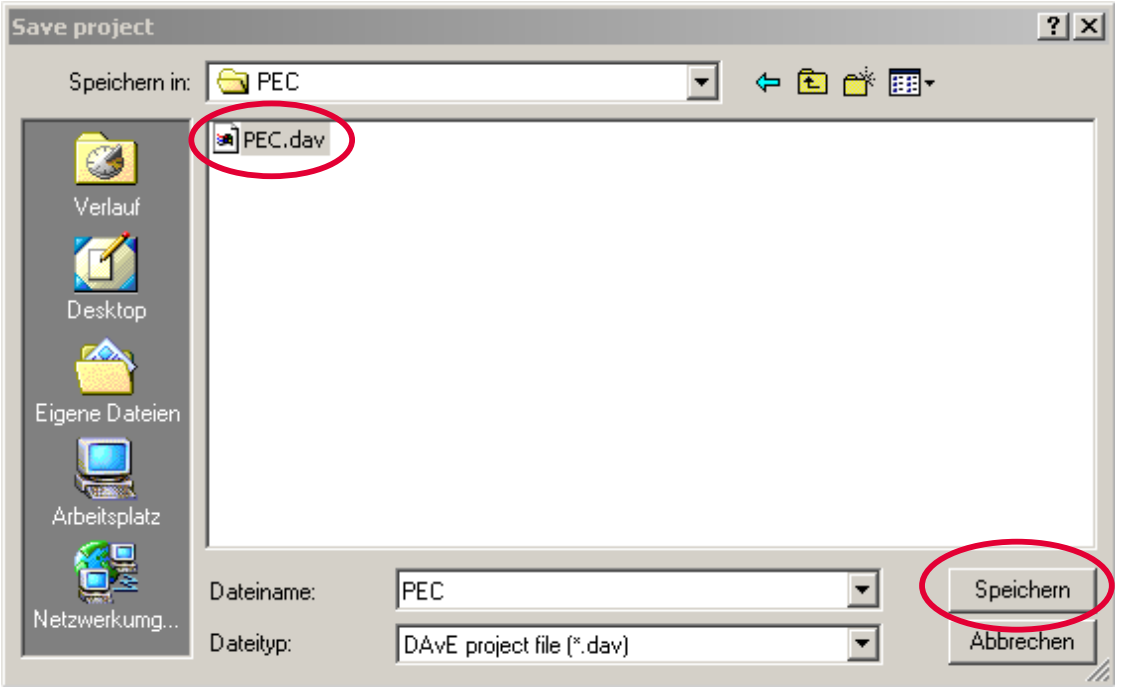
# HOT Exercise PEC - DAvE Configurations
# GPT1 Settings (cont.)

- Configure GPT1 – Functions
  - Initialization Function – click on ‘GPT1_cInit’
  - Function Library (part 1) – click on ‘GPT1_vStartTmr’
  - Function Library (part 1) – click on ‘GPT1_vStopTmr
  - Click on 



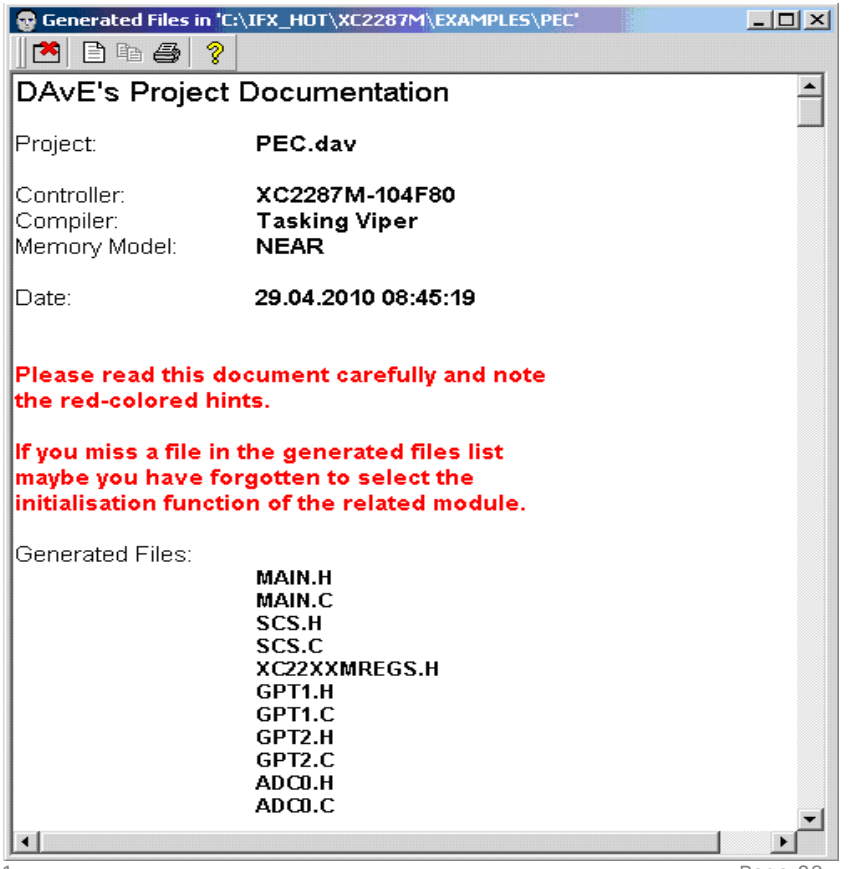
# HOT Exercise PEC - DAvE Configurations
# Save DAvE Project

- Save your DAvE Project File
  - Go to **File → Save (or Save As)** or click on 
  - Filename: **"c:\IFX_HOT\XC2287M\Examples\PEC\PEC.dav"**

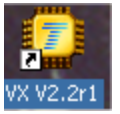


# HOT Exercise PEC - DAvE Configurations Code Generation

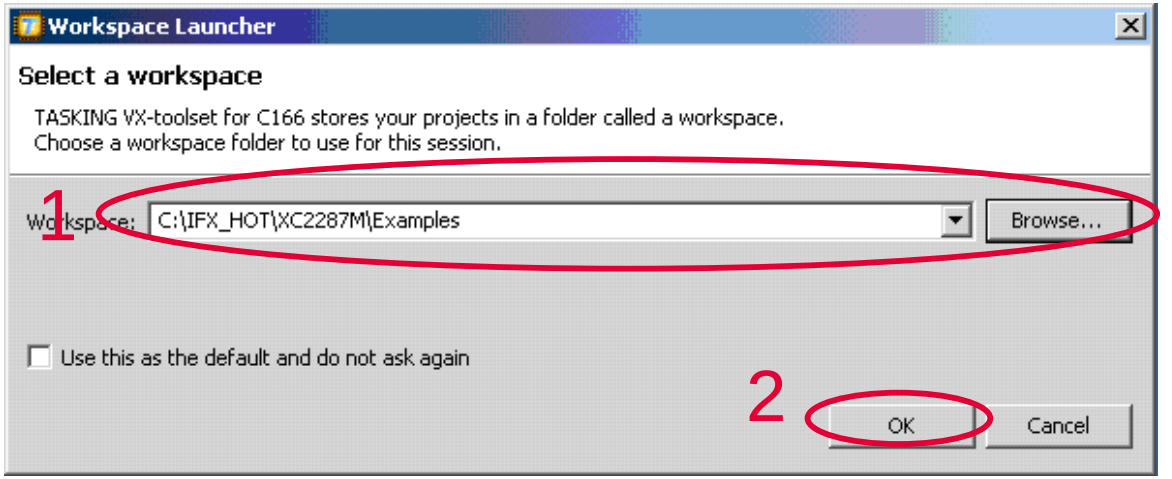
- Let DAvE Generate Code for You
  - Go to **File → generate Code** or click on 
  - DAvE generated code files are
    - MAIN.C, MAIN.H
    - GPT1.C, GPT1.H
    - GPT2.C, GPT2.H
    - ADC0.C ADC0.H
    - SCS.C, SCS.H
    - XC22XXREGS.H



# HOT Exercise PEC – Tasking VX Toolset

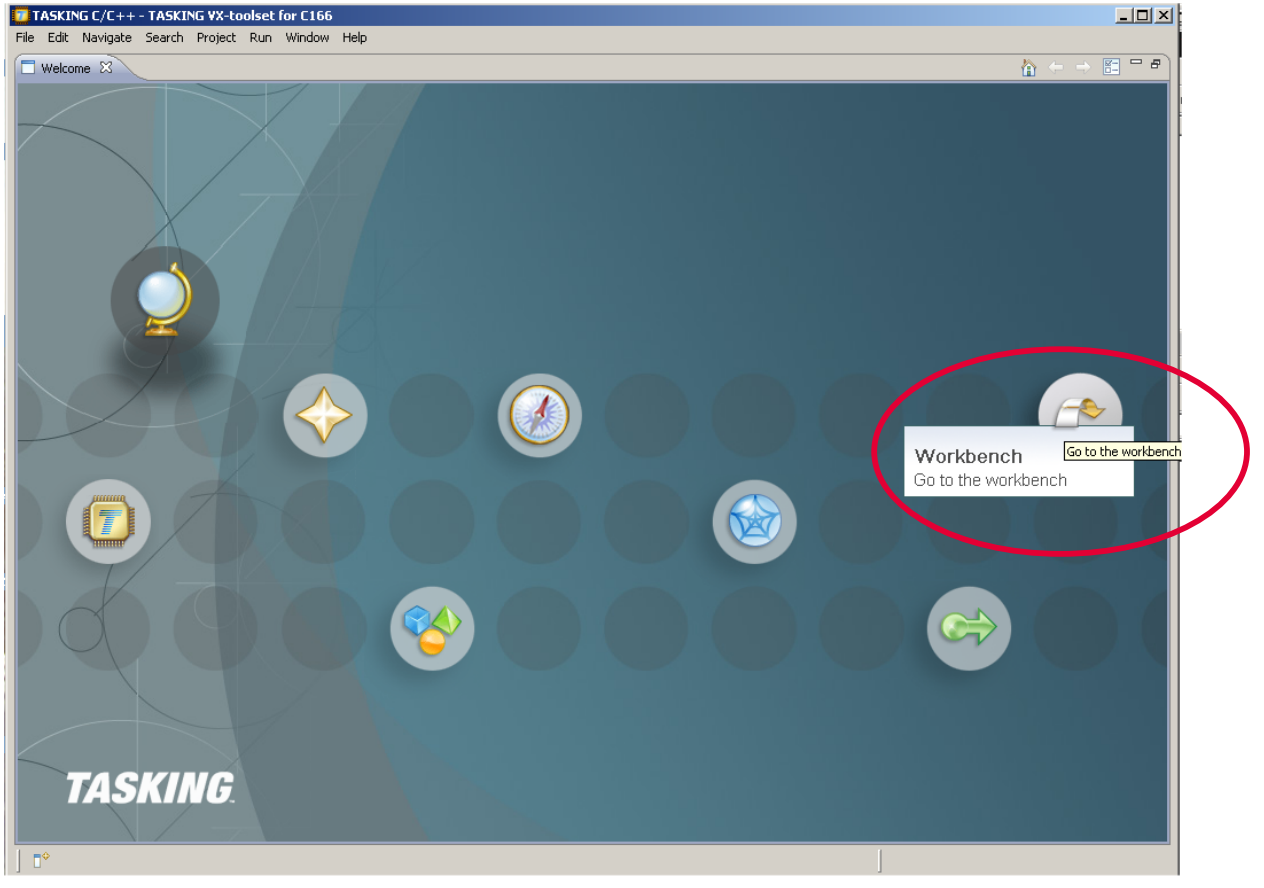
- Create New Work Space
  - Click on 

  - Filename: **“c:\IFX_HOT\XC2287M\Examples”**
  - Click ‘OK’



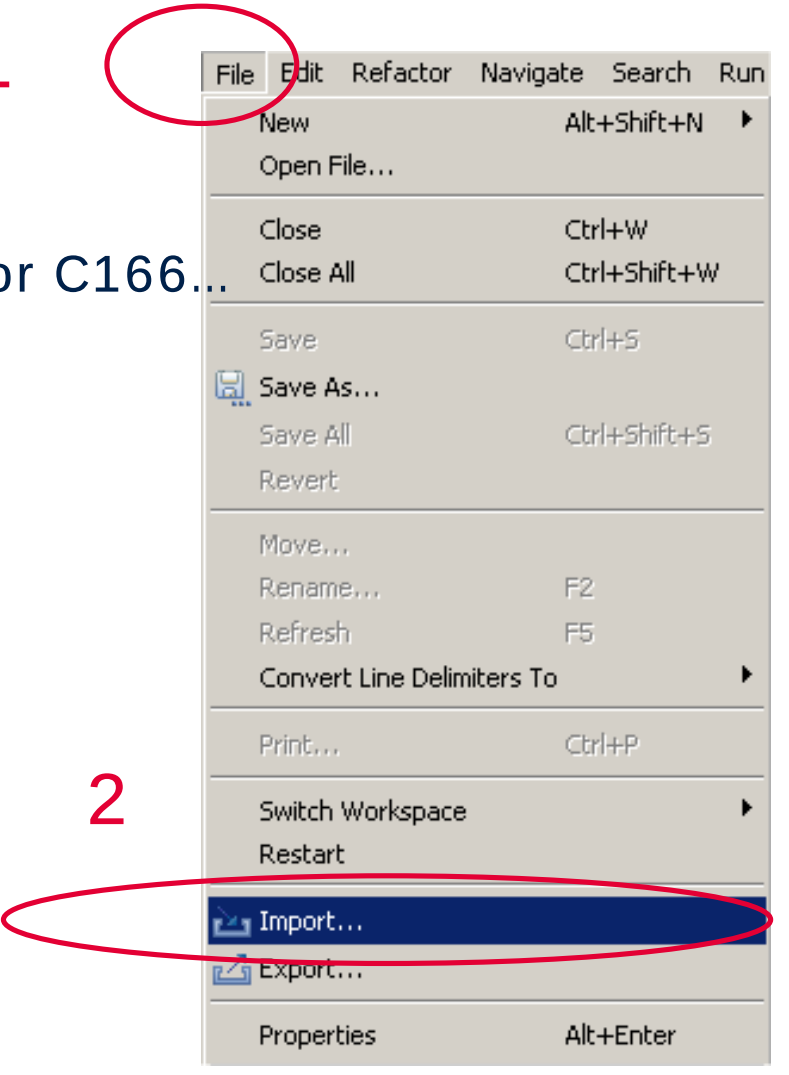
# HOT Exercise PEC – Tasking VX Toolset

- Create New Project
  - Click on Workbench



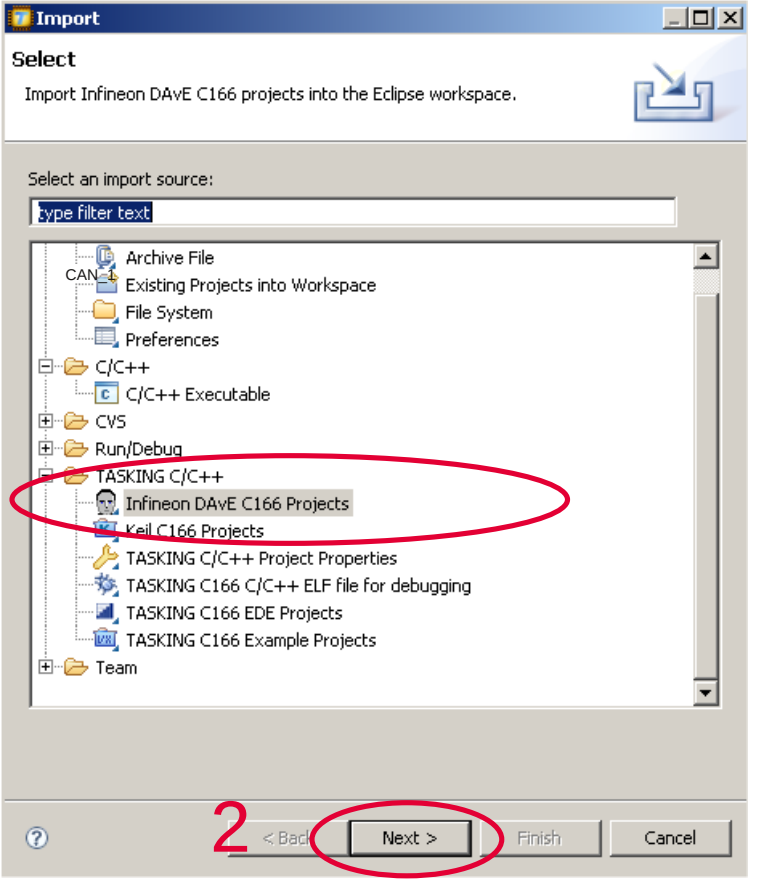
# HOT Exercise PEC – Tasking VX Toolset

- Import DAVE Project
  - Click on File -> Import
  - Select Tasking VX-toolset for C166...
  - Click ‘OK’



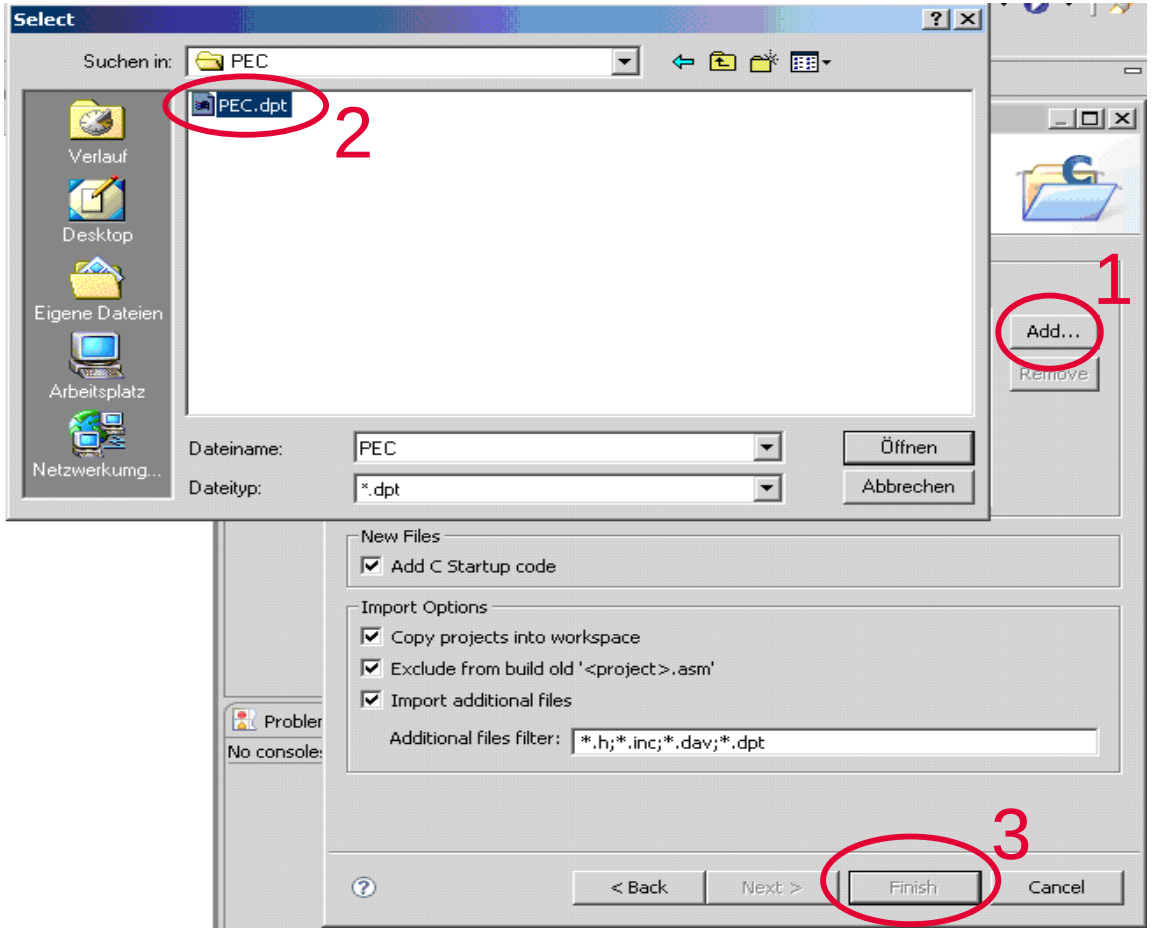
# HOT Exercise PEC – Tasking VX Toolset

- Import DAVE Project
  - Click `Infineon DAvE C166 Project´
  - Click ‘Next’



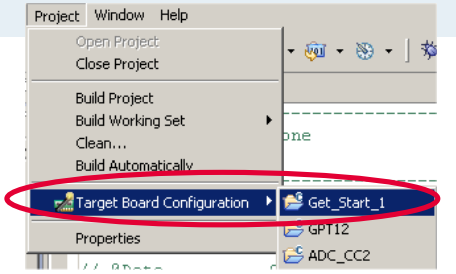
# HOT Exercise PEC – Tasking VX Toolset

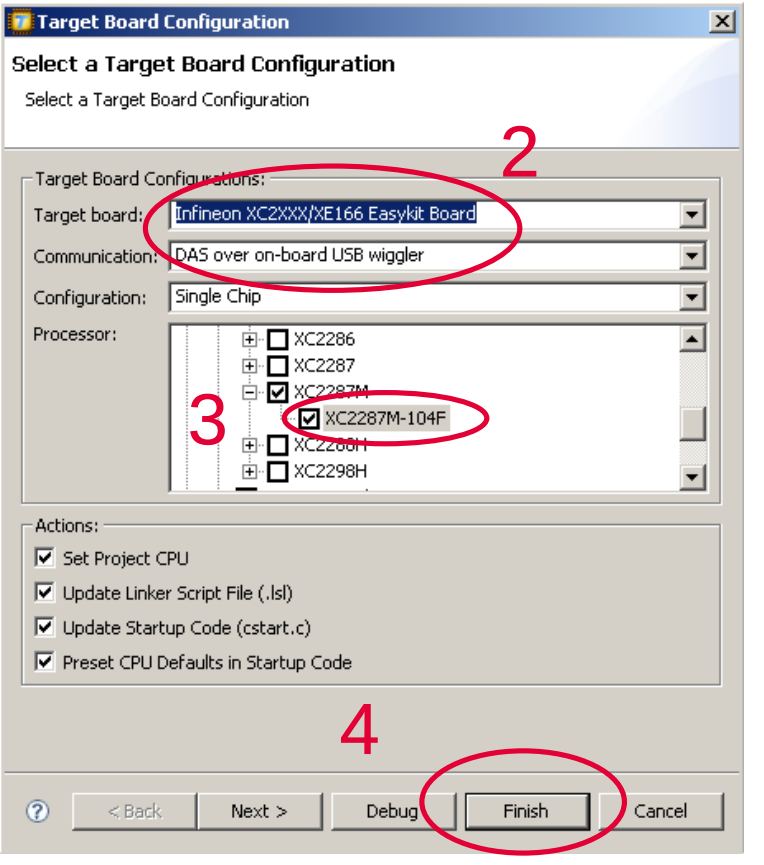
- Import DAvE Project
  - Add Dave Project ‘PEC´
  - Click `Finish´



# HOT Exercise PEC – Tasking VX Toolset

- Configure Target Board 
  - Select the project in the navigator
  - Select ‘Project/Target Board Configuration’
  - Select ‘Infineon XC2000/XE166 Easykit Board’
  - Choose `XC2287M-104F´
  - Click `Finish´



# HOT Exercise PEC – Tasking VX Toolset

- Software Hint
  - DAvE doesn't change code that is inserted in the 'USER CODE' sections if you let DAvE regenerate the code.

    Therefore, whenever adding code to the generated code, write it into a 'USER CODE' section.

    The code you really have to add looks like this:

```
while(1)
{
// USER CODE BEGIN (Main,4)

BlinkLED();

// USER CODE END
}
```

# HOT Exercise PEC – Tasking VX Toolset
# Add User Code – MAIN.C

```
void main(void)
{
  // USER CODE BEGIN (Main,2)
  // USER CODE END

  MAIN_vInit();

  // USER CODE BEGIN (Main,3)
  ADC0_vStartParReqChNum(0x0001);//Start conversion channel 1 to channel 0 / P5.0
  ADC0_vSetLoadEvent();       //Set software trigger
  GPT1_vStartTmr_GPT1_TIMER_3();
  // USER CODE END

  while(1)
  {

   // USER CODE BEGIN (Main,4)

   // USER CODE END

  }

} //  End of function main
```

# HOT Exercise PEC – Tasking VX Toolset
# Add User Code – ADC0.C

```
// @Global Variables
//*****************************************************************

// USER CODE BEGIN (ADC0_General,7)
unsigned int size = 0;
unsigned int buffer[100]__at(0xA000);
// USER CODE END

_interrupt(ADC0_SRN0INT)  void ADC0_viSRN0(void)
{

   if((ADC0_EVINFR & 0x0100) == 0x0100)    //Result0 event interrupt
   {
      ADC0_EVINCR = 0x0100;     // Clear Result0 event interrupt


     // USER CODE BEGIN (ADC0_viSRN0,20)
      buffer[size++] = (ADC0_RESRA0 << 4); // put ADC value in array
     // USER CODE END

   }

   if((ADC0_EVINFR & 0x0200) == 0x0200)    //Result1 event interrupt
   {
      ADC0_EVINCR = 0x0200;     // Clear Result1 event interrupt
     // USER CODE BEGIN (ADC0_viSRN0,21)

     // USER CODE END

   }
```

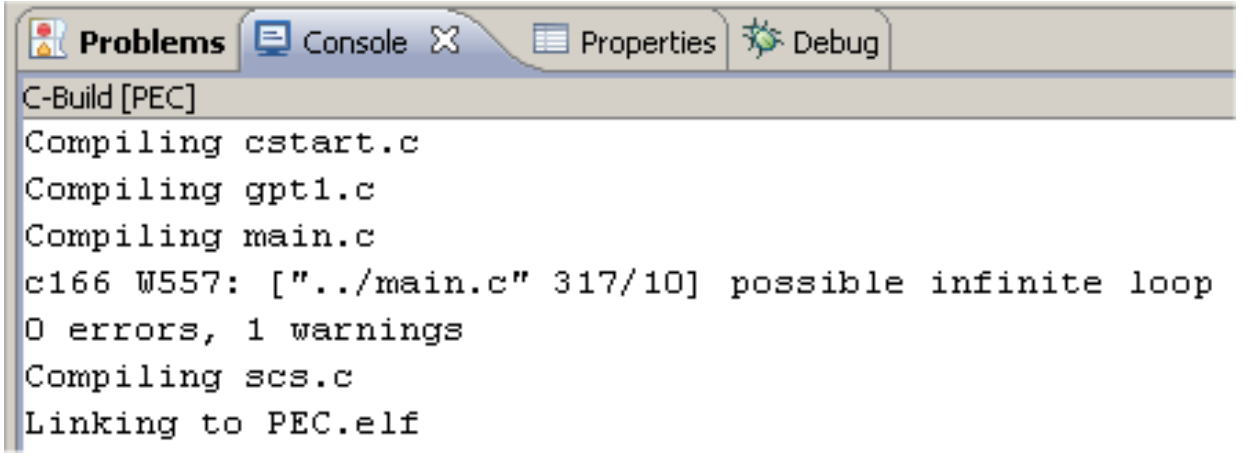
# HOT Exercise PEC – Tasking VX Toolset
# Add User Code – GPT1.C

```
// @Imported Global Variables
//*****************************************************************************

// USER CODE BEGIN (GPT1_General,6)
extern int size;
extern int buffer[];
// USER CODE END


_interrupt(T3INT)  void GPT1_viTmr3(void)
{
  // USER CODE BEGIN (Tmr3,2)
            ADC0_CRMR1 = ADC0_CRMR1 && 0xFFEF;          //Disable autoscan
            GPT1_vStopTmr_GPT1_TIMER_3();
  // USER CODE END


  // USER CODE BEGIN (Tmr3,5)

  // USER CODE END

} //  End of function GPT1_viTmr3
```

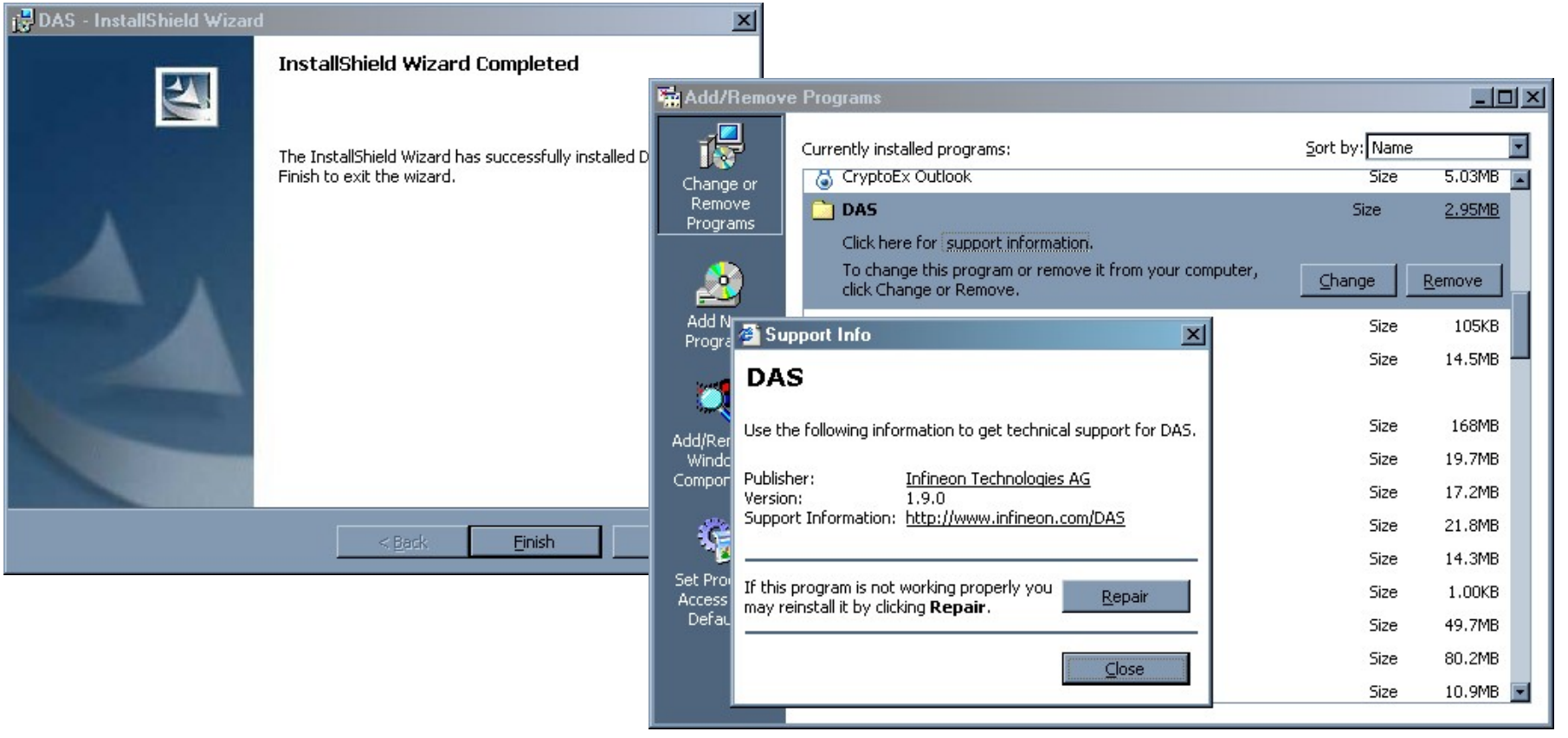
# HOT Exercise PEC – Tasking VX Toolset
# Build Project

1


- Click on ‘Build Project PEC’

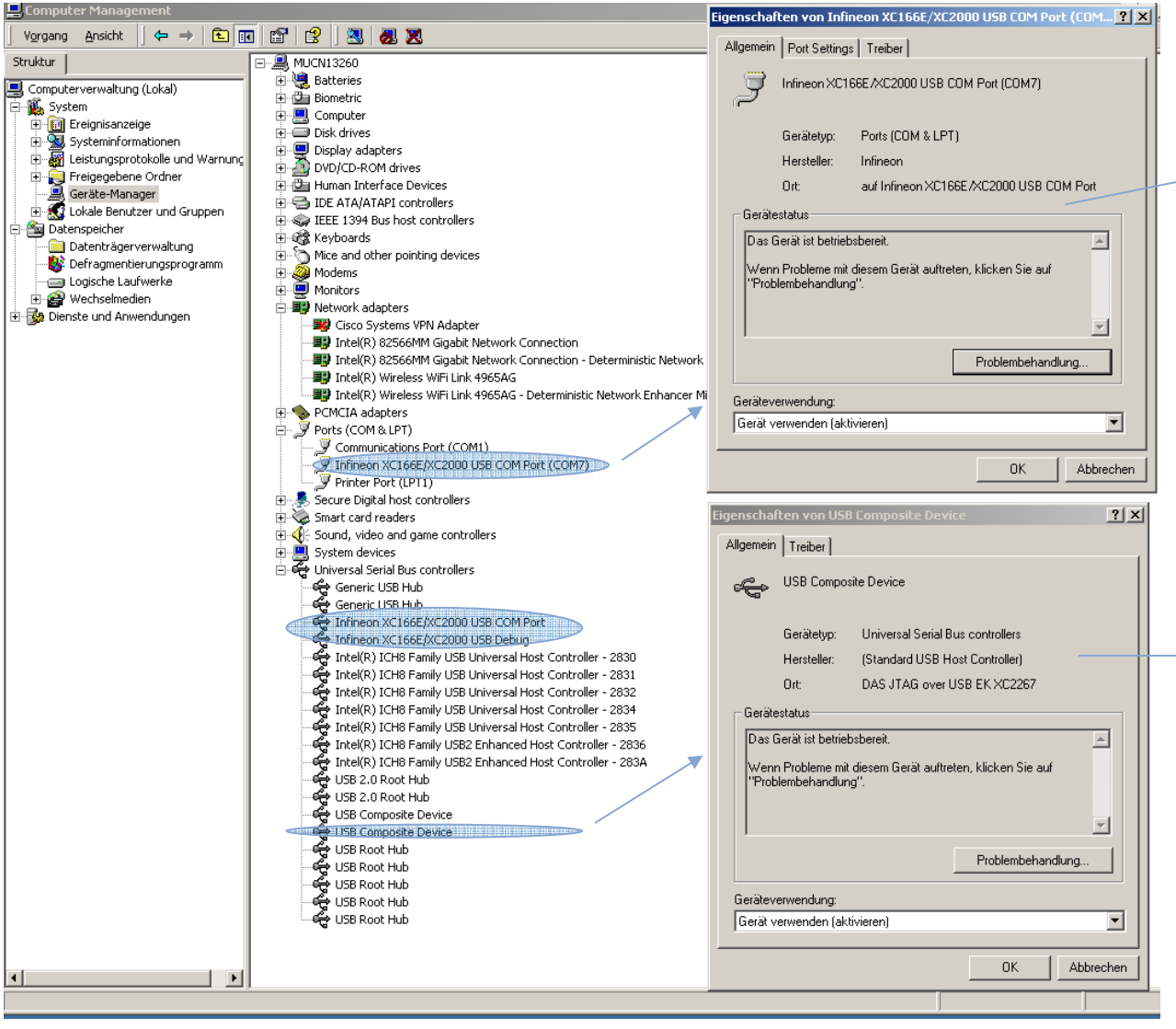


# HOT Exercise PEC - Device Access Server
# Check for the latest DAS version




Note: It is recommended to use the latest DAS version.
Download the latest version at www.infineon.com\DAS

# HOT Exercise PEC - Device Access Server
# 1.) Checking USB connections

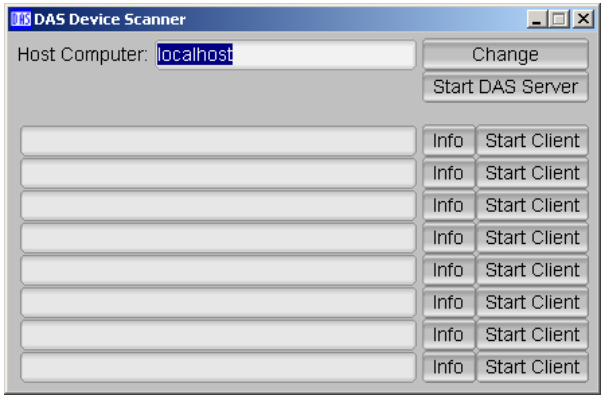


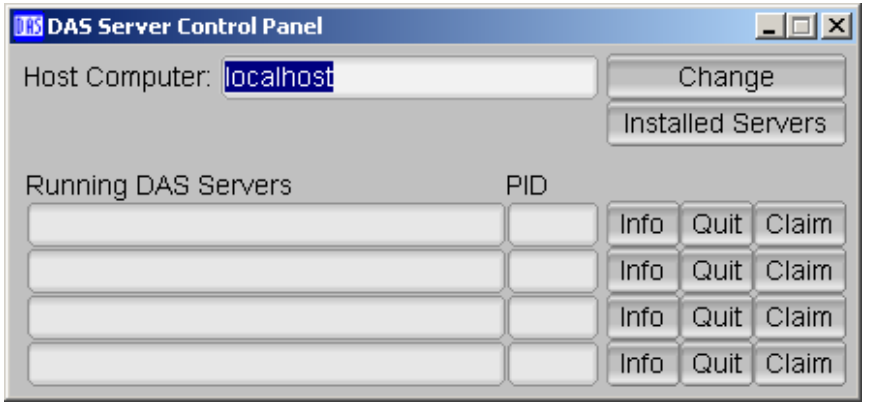

This gets identified only when COM port is used
- Via the USB interface on the Easykit with FTDI chip

The DAS JTAG composite device gets identified
- When miniWiggler is connected
- When USB Wiggler Box is connected
- Via the USB interface on the Easykits with FTDI chip

# HOT Exercise PEC - Device Access Server
# 2.) Check DAS status

1. Start DAS device scanner
2. Start DAS Server Control panel

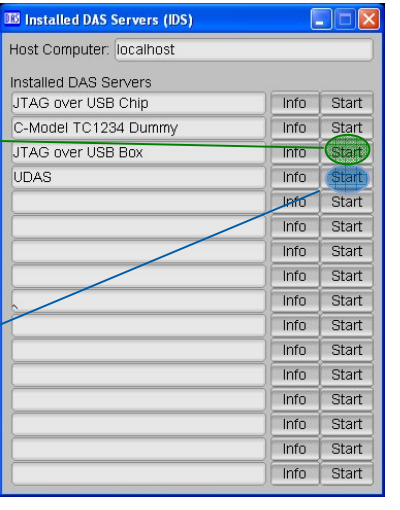



3. If DAS device scanner does not show any device, start the appropriate DAS server

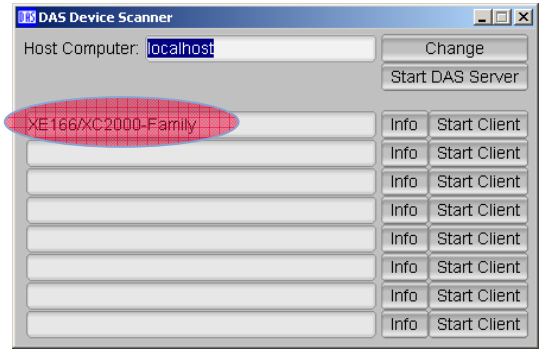
Incase you are connected via the USB Wiggler box, then start „JTAG over USB Box“

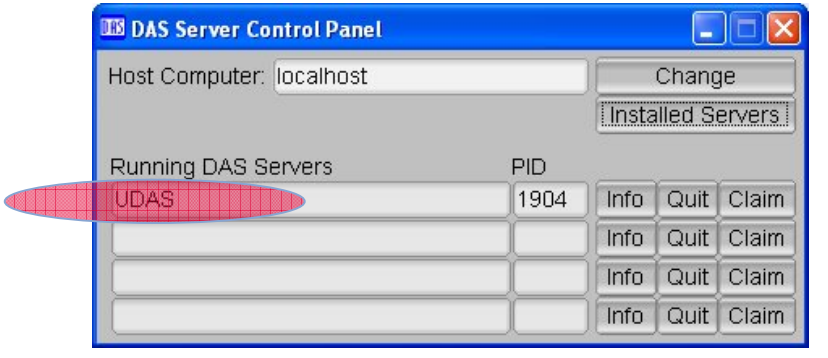
Incase you are connected via the FTDI chip or mini wiggler, then start „UDAS“



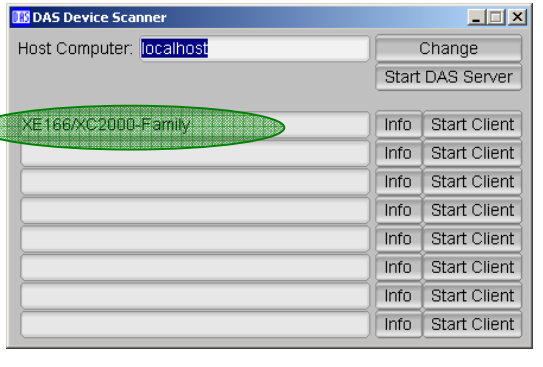
# HOT Exercise PEC - Device Access Server
# 3.) Starting the servers manually

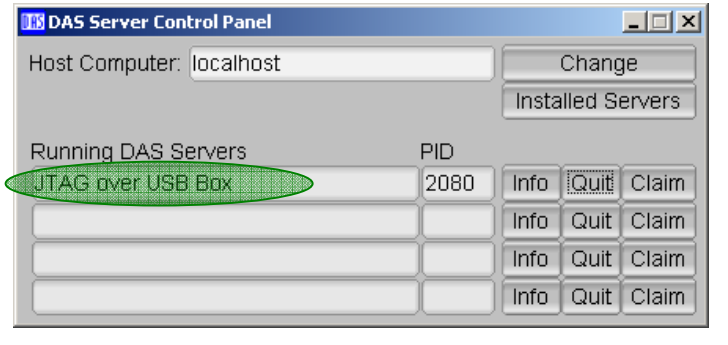
4. Incase „UDAS“ server is started and XC2000 easykit is connected via on-chip FTDI or via separate miniWiggler, following status changes could be noted




5. Incase „JTAG over USB Box“ server is started and XC2000 starter kit is connected via Wiggler box, following status changes could be noted

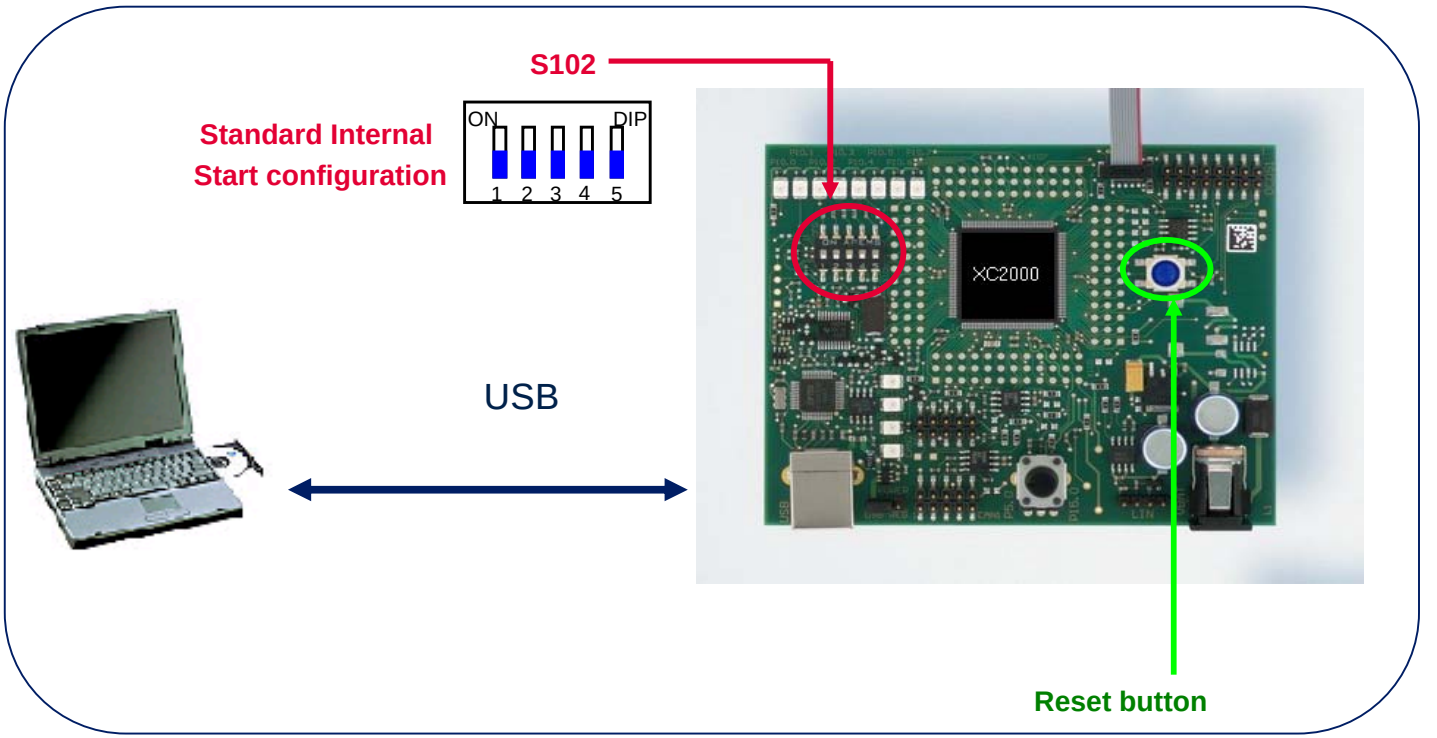


# HOT Exercise PEC – Tasking VX Toolset
# Connect XC2287M Easy Kit

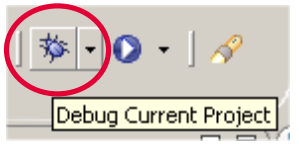
- Connect XC2287M Board to PC
- Modify The DIP Switch Settings, S102: **OFF-OFF-OFF-OFF-OFF**

  (Start from Internal Flash)
- Reset The Board (Press The Reset Button)

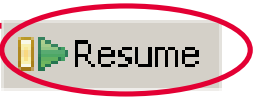


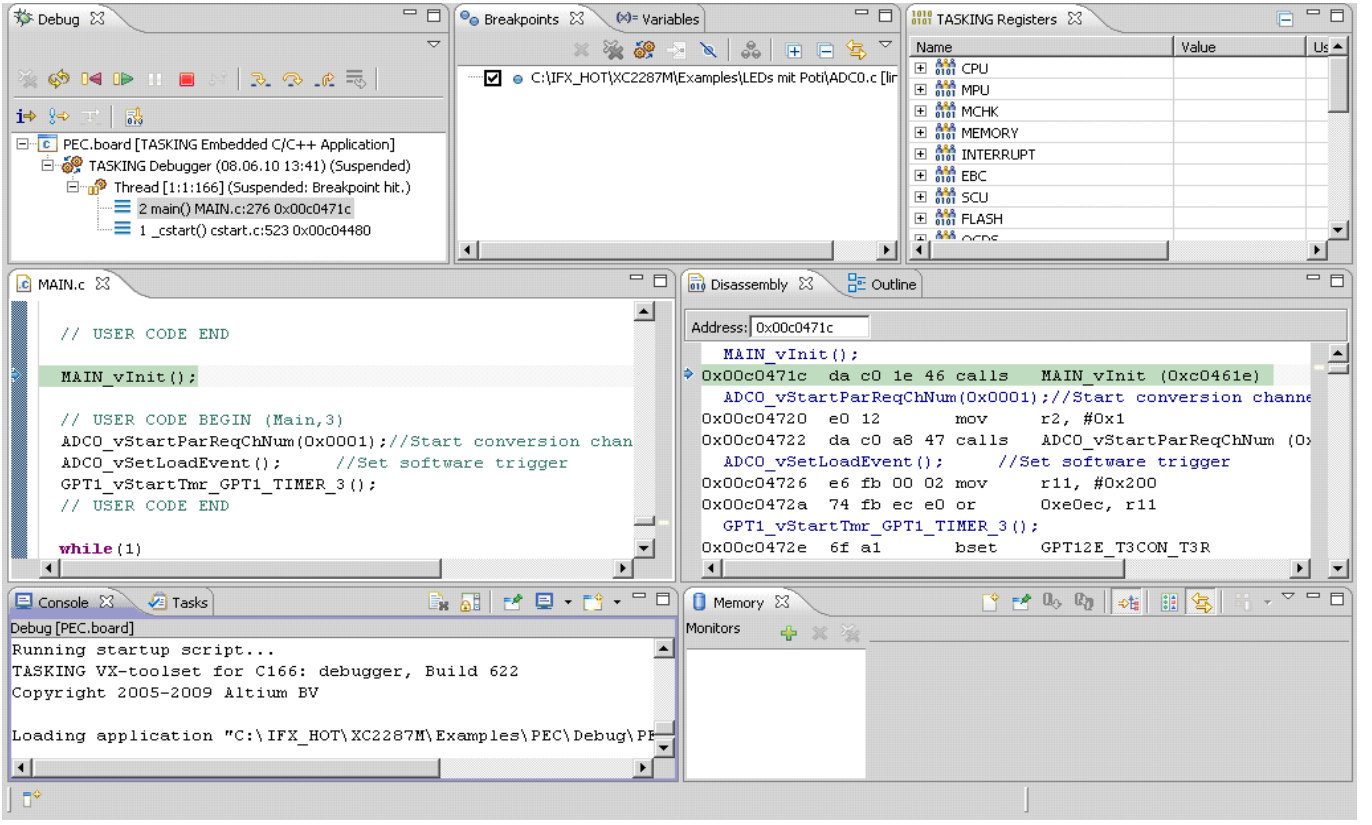
# HOT Exercise PEC – Tasking VX Toolset
# Run Debugger

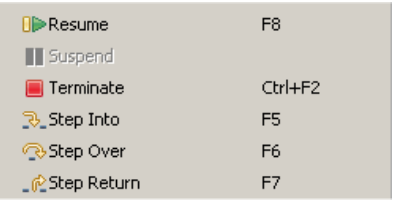
- Click on 1




- Click on ‘Resume’ and start program 2

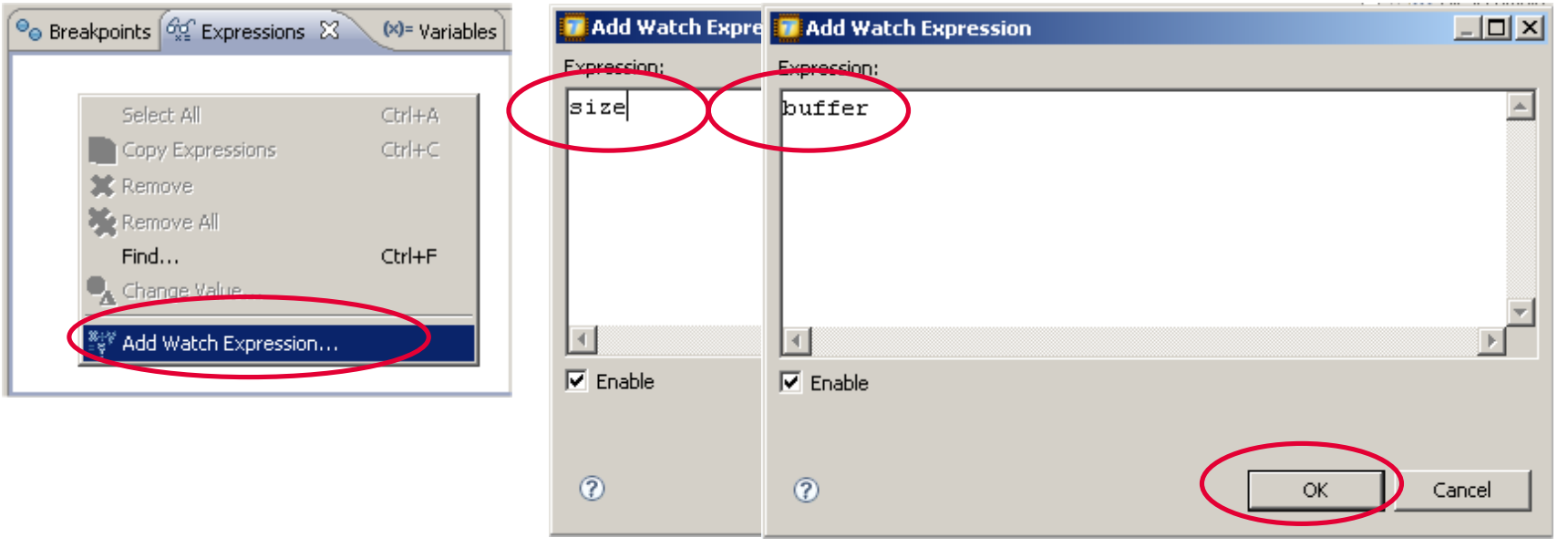


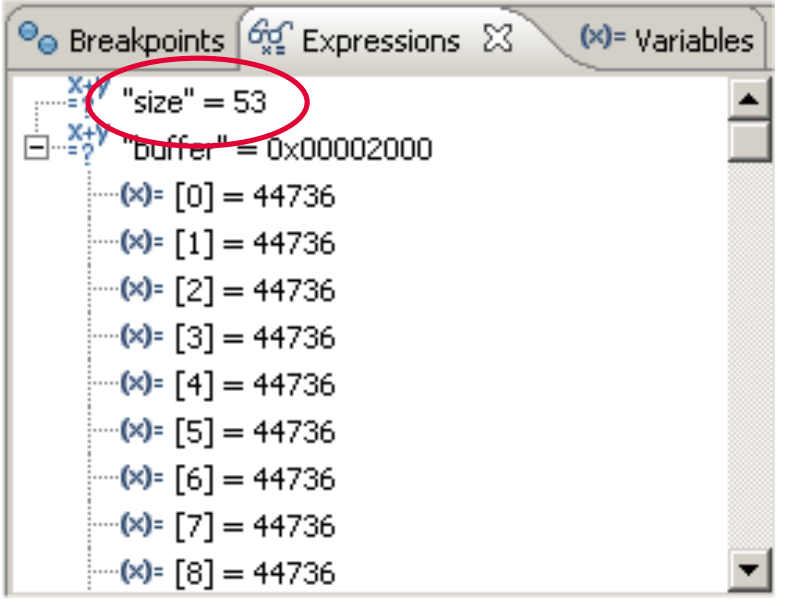
# HOT Exercise PEC – Tasking VX Toolset
# Run Debugger

- See Results
  - Add Watch Expression
  - Add ´size` and ´buffer`
  - Click on ‘Resume’ and start program 

# HOT Exercise PEC – Tasking VX Toolset Run Debugger

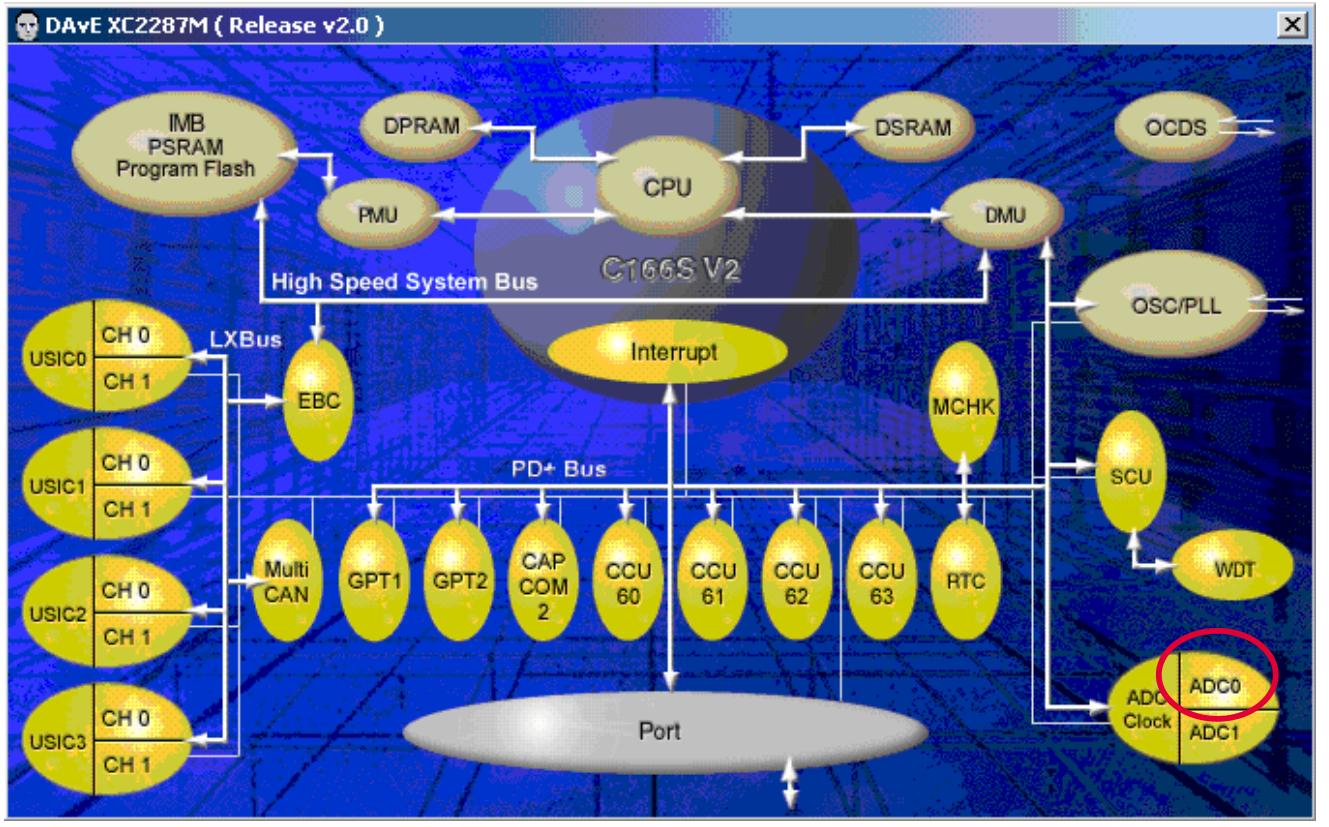
- See Results
  - Click on ‘Suspend’ 




Result: 53 AD conversions in 100µs

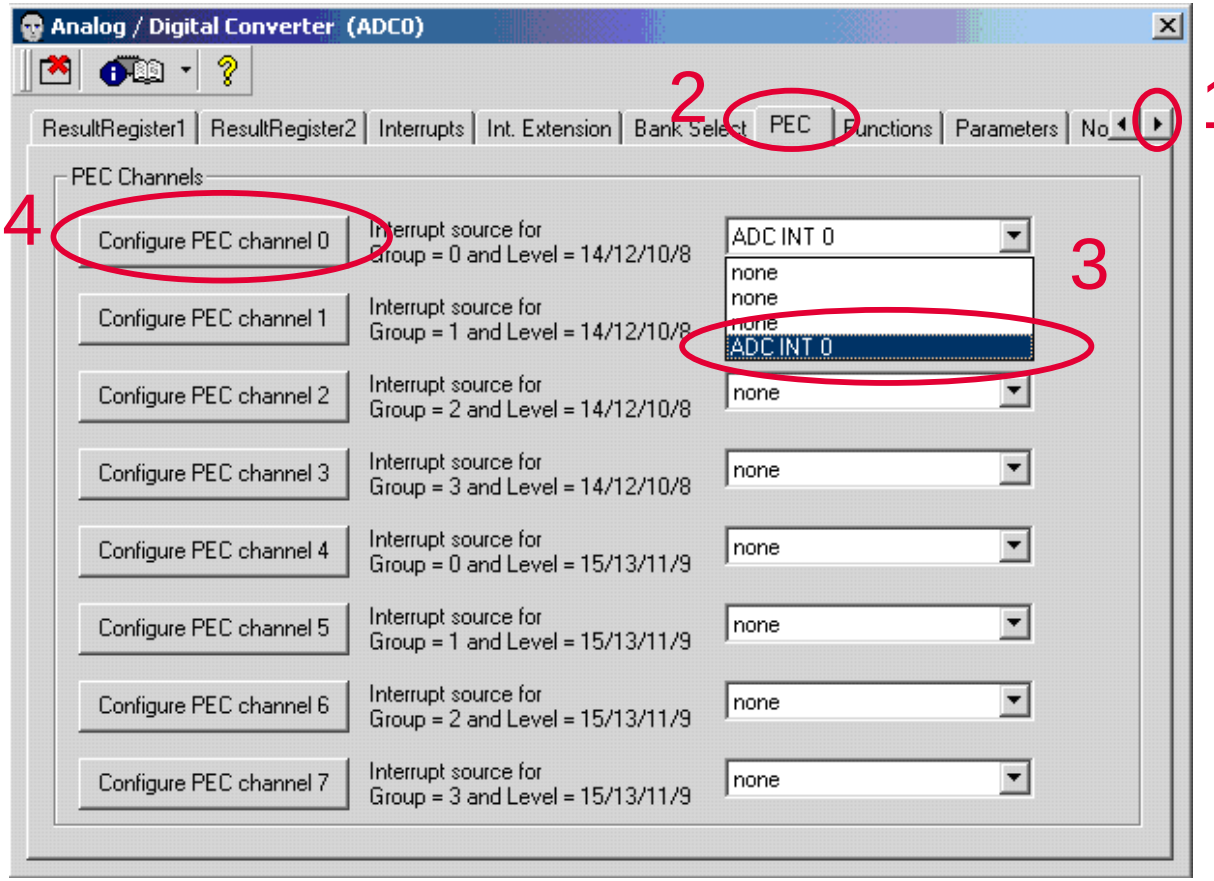
# HOT Exercise PEC - DAvE Configurations ADC Settings (PEC)

- Click on ADC0 

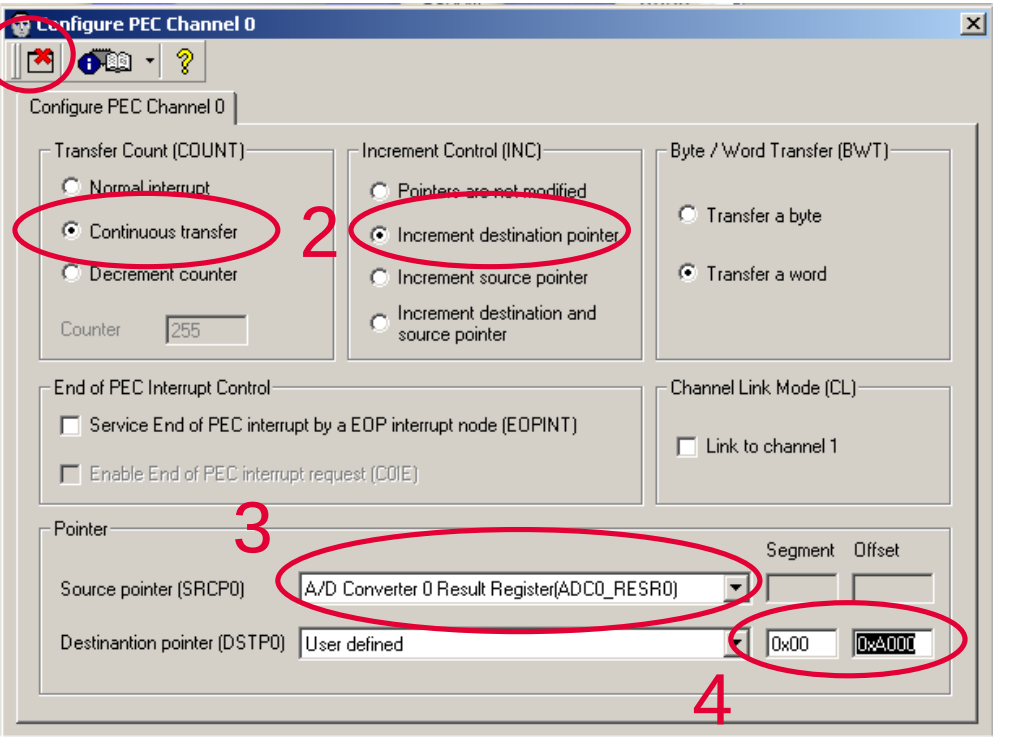
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (PEC)

- Configure PEC – Functions
  - Click on ‘ADC INT 0’, then on ‘Configure PEC Channel 0’



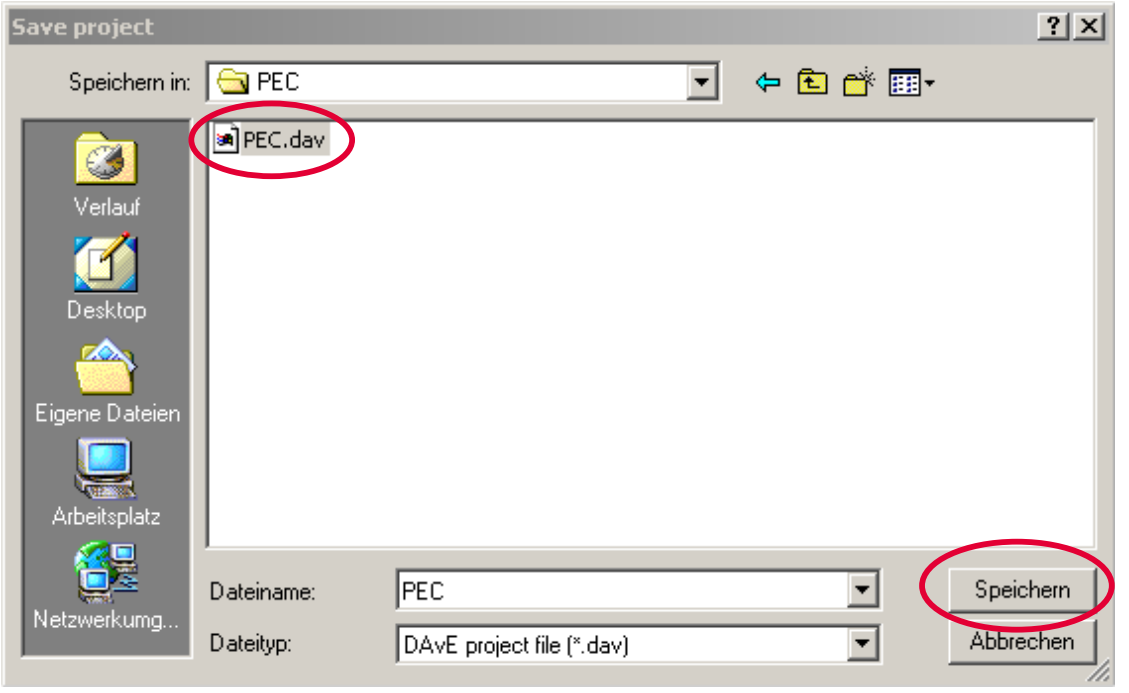
# HOT Exercise PEC - DAvE Configurations
# ADC Settings (PEC)

- Configure PEC channel 0
  - Click on ‘Continuous transfer’
  - Click on ‘Increment destination pointer’
  - Search for Source pointer / Destination pointer
  - Click on 



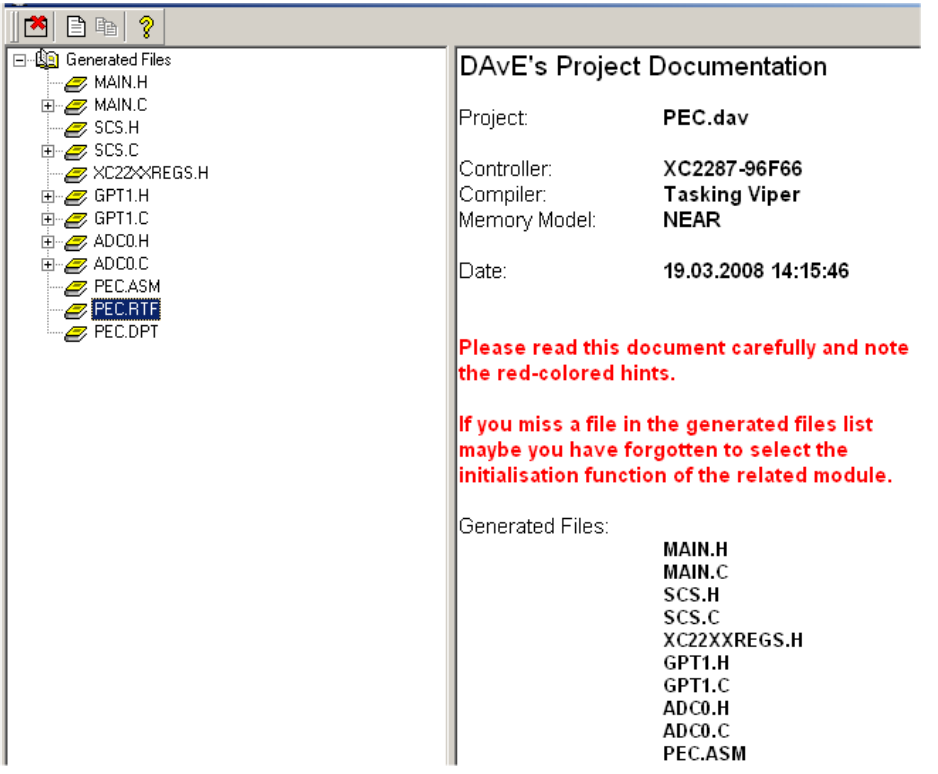
# HOT Exercise PEC - DAvE Configurations
# Save DAvE Project

- Save your DAvE Project File
  - Go to **File → Save (or Save As)** or click on 
  - Filename: **"c:\IFX_HOT\XC2287\Example\PEC\PEC.dav"**



# HOT Exercise PEC - DAvE Configurations Code Generation

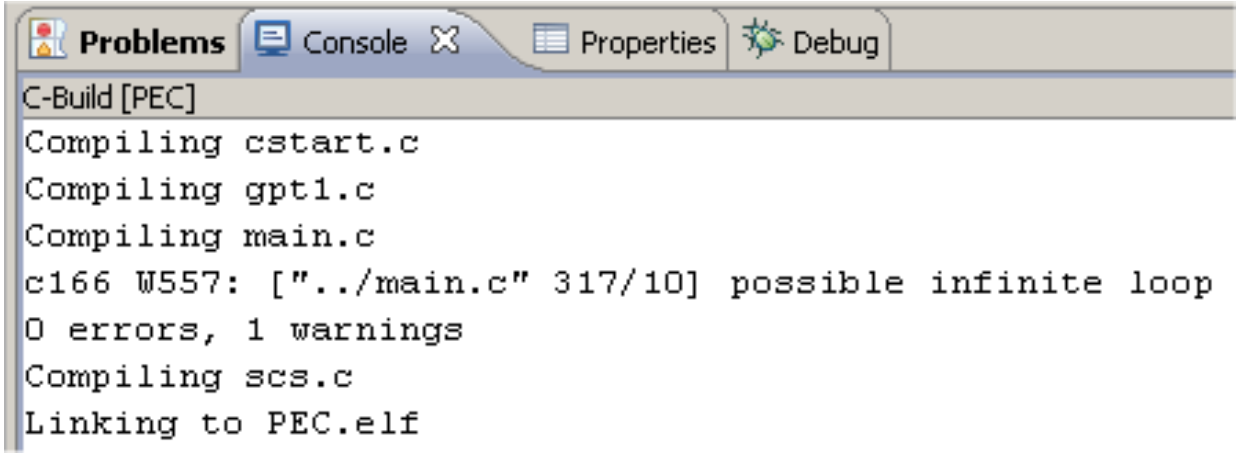
- Let DAvE Generate Code for You
  - Go to **File → generate Code** or click on 
  - DAvE generated code files are
    - MAIN.C, MAIN.H
    - GPT1.C, GPT1.H
    - ADC0.C ADC0.H
    - SCS.C, SCS.H
    - XC22XXREGS.H



# HOT Exercise PEC – Tasking VX Toolset
# Build Project

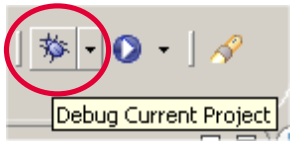
1


- Click on ‘Build Project PEC’

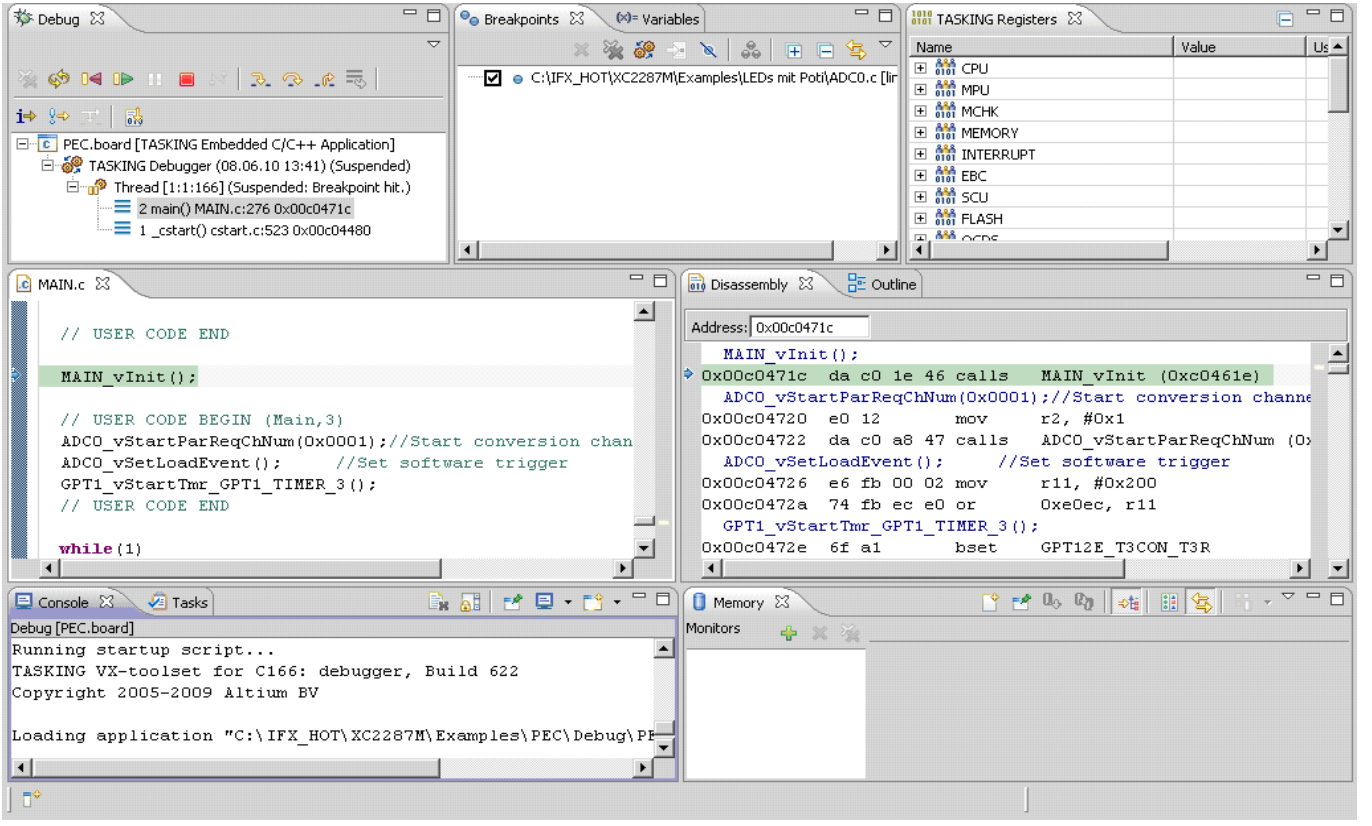


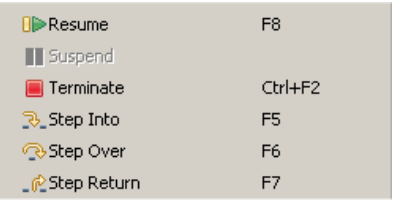
# HOT Exercise PEC – Tasking VX Toolset
# Run Debugger

- Click on 1



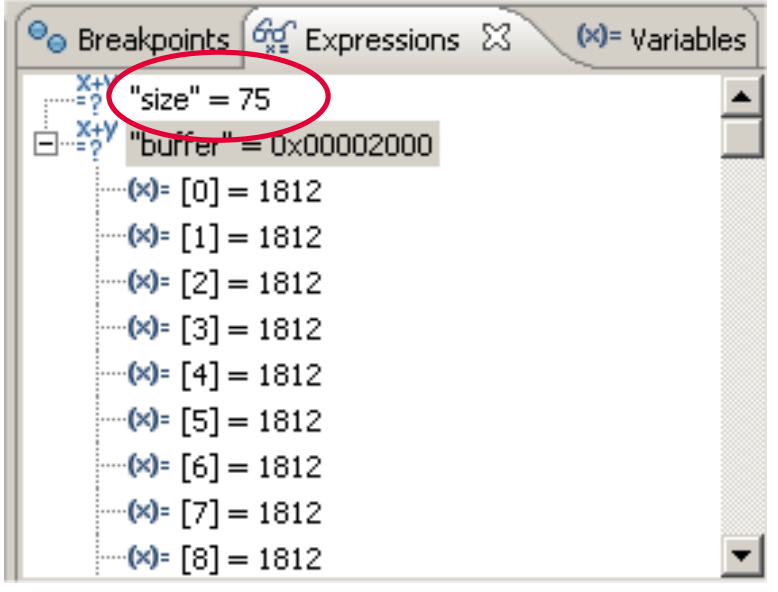

- Click on ‘Resume’ and start program 2

# HOT Exercise PEC – Tasking VX Toolset
# Run Debugger

- See Results
  - Click on ‘Suspend’ 




Result: 75 AD conversions in 100µs
Improvement: ~ 41 %


Never stop thinking