# Athena Knowledge Base

The Athena Visual Studio **Knowledge Base** contains a number of tips, suggestions and how to's that have been recommended by the users of the software. We will continue to enhance this knowledge base in order to serve the needs of the engineering and scientific community.

How to Select the Fortran Compiler

To select one of the Fortran Compilers used by Athena Visual Studio do the following:

►Open **Athena Visual Studio**

►From the **Tools** menu choose **Options**
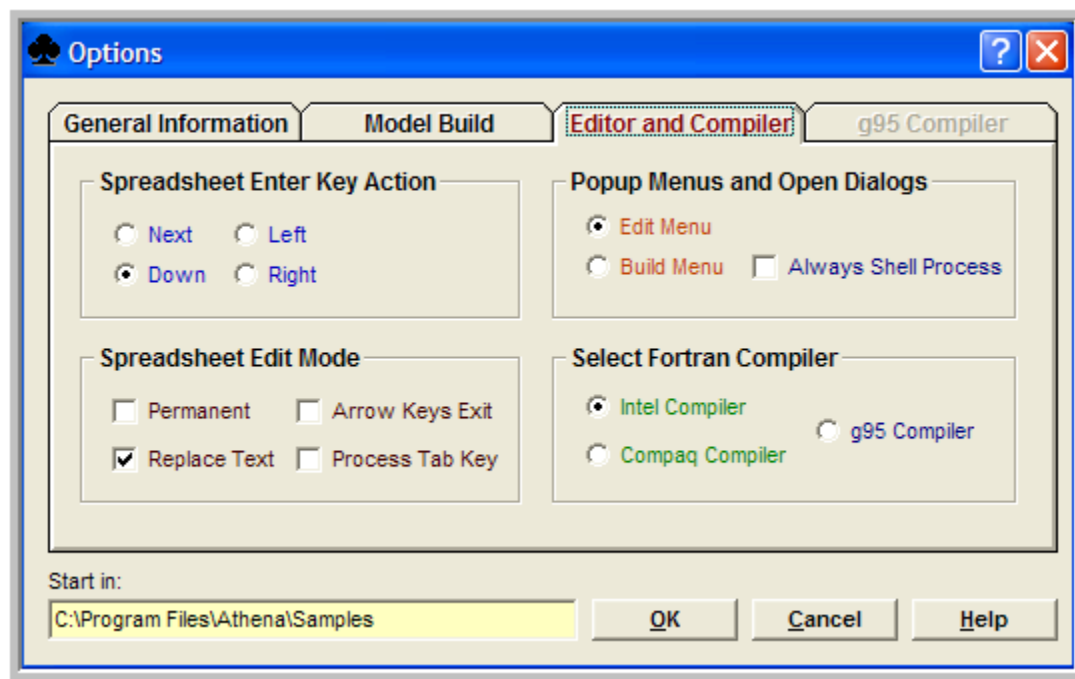
►Click the **Editor and Compiler** tab

►Select the compiler you wish to use and click **OK**

Athena Visual Studio has been designed to work with three Fortran 95 compilers. The **g95 Fortran** compiler which is free and comes with the Athena installation package, the **Compaq Visual Fortran** compiler and the **Intel Visual Fortran 95** compiler which must be purchased separately by the user. The **Compaq Visual Fortran** compiler is no longer available for purchase but is widely used by the engineering and scientific community. Detailed information about the current development activities for the **g95 Fortran** compiler can be found at www.g95.org

How to Declare Variables and Constants in Athena

Global Variables: To declare global variables in the Athena Visual Studio environment you must use the **Global** keyword as the examples below illustrate:

> **Global**   *x, y, z, krate*   **As Real**
>
> **Global**   *Skount*   **As Integer**
>
> **Global**   *myName* **As Character**
>
> **Global**   *myDecision* **As Logical**

In the above statements the variables *x,y,z,krate* will be treated as double precision and will be accessible by all parts of the modeling code. Similarly the variable *Skount* will be treated as integer and be accessible through out all the modeling sections. Character variables are assigned as Character*132 from the Athena Visual Studio parser. Vectors and matrices can be declared in a similar manner. The array size, type and number of dimensions are declared with the **Global** statement. The elements of the array can be referenced by an integer index number, which runs from one to the maximum number declared in the **Global** statement:

> **Global**   *y(10), a(4,50), b(2,4,6)*   **As Real**
>
> **Global**   *istate(5)*   **As Integer**

Local Variables: To declare local variables in the Athena Visual Studio environment you must use the **Dim** keyword as the examples below illustrate:

> **Dim**   *z, krate*   **As Real**
>
> **Dim**   *x, y*   **As Single**
>
> **Dim**   *Skount*   **As Integer**

In the above statements the variables *z,krate* will be treated as double precision, while the variables *x,y* will be treated as single precision and will be accessible only at the section where they have been declared. Similarly the variable *Skount* will be treated as integer and will be accessible only by the corresponding modeling section where it has been declared. Vectors and matrices can be declared in a similar manner. The array size, type and number of dimensions are declared with the **Dim** statement. The elements of the array can be referenced by an integer index number, which runs from one to the maximum number declared in the **Dim** statement:

> **Dim**   *x(10), b(4,50)*   **As Real**
>
> **Dim**   *istate(5)*   **As Integer**

Parameter Statement: Use the Parameter keyword to define named constants as the examples below illustrate:

> **Parameter**   *y=2.0, z=4.0* **As Real**
>
> **Parameter**   *Skount=1*   **As Integer**

In the above statements the variables *y,z* will be treated as double precision and will be accessible by all parts of the modeling code. Similarly the variable *Skount* will be treated as integer and will be accessible through out all the modeling sections. The Parameter keyword is only allowed in the Data section of the Athena Visual Studio modeling code. If it is used in the other modeling sections it will be ignored. You may view the generated Fortran code to see how the parser interprets the Parameter keyword.

Important Note: Always remember to declare all of your variables. Athena treats **Real** variables as double precision, **Integer** variables as 4-byte integers, **Character** variables as Character*132 and **Logical** variables as **.True.** or **.False.** Single precision variables are only allowed if are declared as local with the **Dim** keyword.

Fortran 95 Declaration Statements: You can insert Fortran 95 declaration statements by prefixing them with the double dollar sign. Below please see a list of Fortran 95 declaration statements that you can insert in your Athena code. Consult your Fortran 95 manual for the syntax rules of variable and constant declarations:

      $$Integer, Parameter:: dp=Kind(1.0D0)

      $$Integer, Parameter:: sp=Kind(1.0)

      $$Real(Kind=dp):: v1,v2

      $$Real(Kind=sp), Dimension(3):: a1,a2

      $$Integer:: I1, I2

      $$Character(Len=3):: s2,s3

      $$Character(Len=10), Dimension(2):: s1

      $$Logical:: Done

      $$Real(Kind=dp), Dimension(:), Allocatable:: w

Fortran 95 Type Declaration Statements: You can insert Fortran 95 declaration **Type** statements by prefixing them with the double dollar sign. If there is a large number of **Type** variables it is recommended that be inserted in a Module. Below please see an example of a **Type** variable:

      $$Type Employee

      $$ Character(Len=20):: LastName

      $$ Integer:: Age

      $$End Type Employee

Use the following statement to declare a variable as **Type** Employee:

      Dim Michael As Type(**Employee**)   or

      $$Type(**Employee**) **Michael**

and then you may enter data as follows:

      Michael%LastName="Caracotsios"

      Michael%Age**=**35

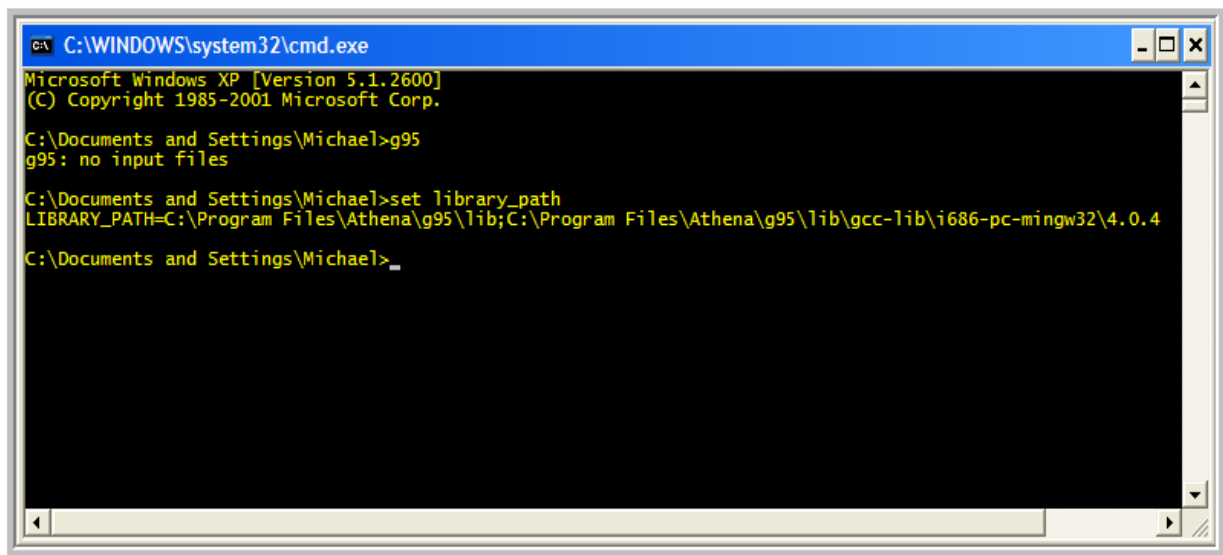# How to Compile and Link with the g95 Fortran Compiler

First you must select the g95 Fortran Compiler; then follow the instructions outline below:

►Open an **MS-DOS** Window.

Windows XP	Windows 7 or Vista
Click **Start**	Click **Start**
Click **Run**	Type **cmd** and press enter
Type **cmd** and press enter	

►At the **MS-DOS** command prompt type **g95** and press enter.

►Next at the **MS-DOS** command prompt type **Set Library_Path** and press enter

You should see the logo for the g95 Fortran Compiler as indicated below. (Note that the actual message might be different depending on the operating system, the version of the compiler that you are using and the default folder of the **cmd** Windows command).

If you do not see the above message, Athena will be unable to compile and link your project. This may happen if you do not have the proper administrative rights on your computer. In this case, you may request an IT person with proper administrative rights to reinstall Athena Visual Studio, or alternatively, you may configure the g95 Fortran compiler by following the steps outlined below:

►Open **Athena Visual Studio**
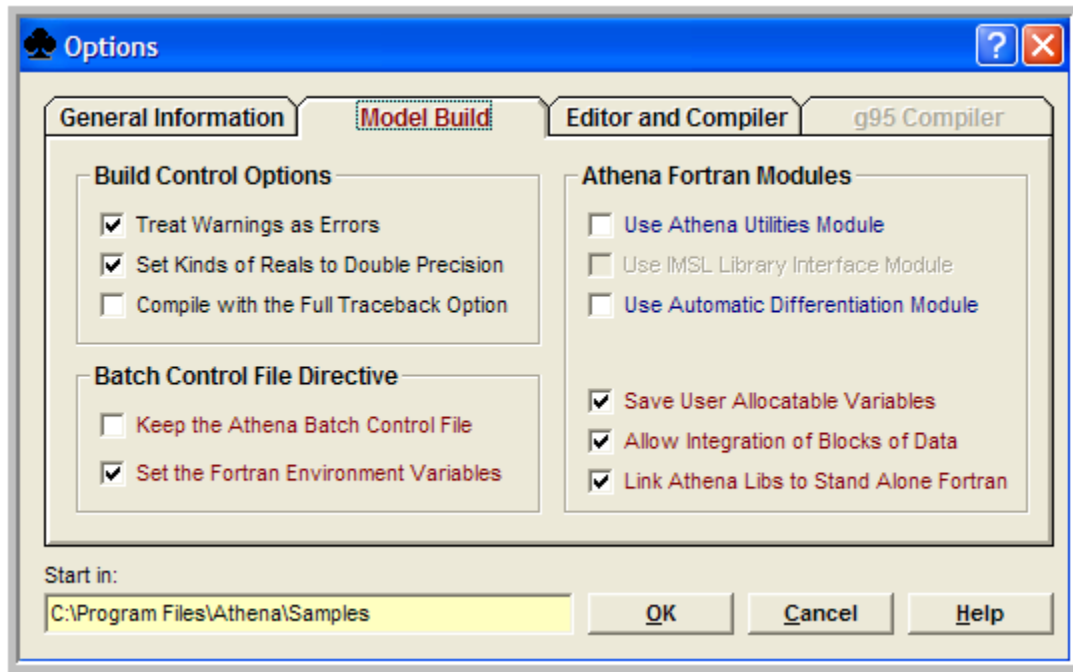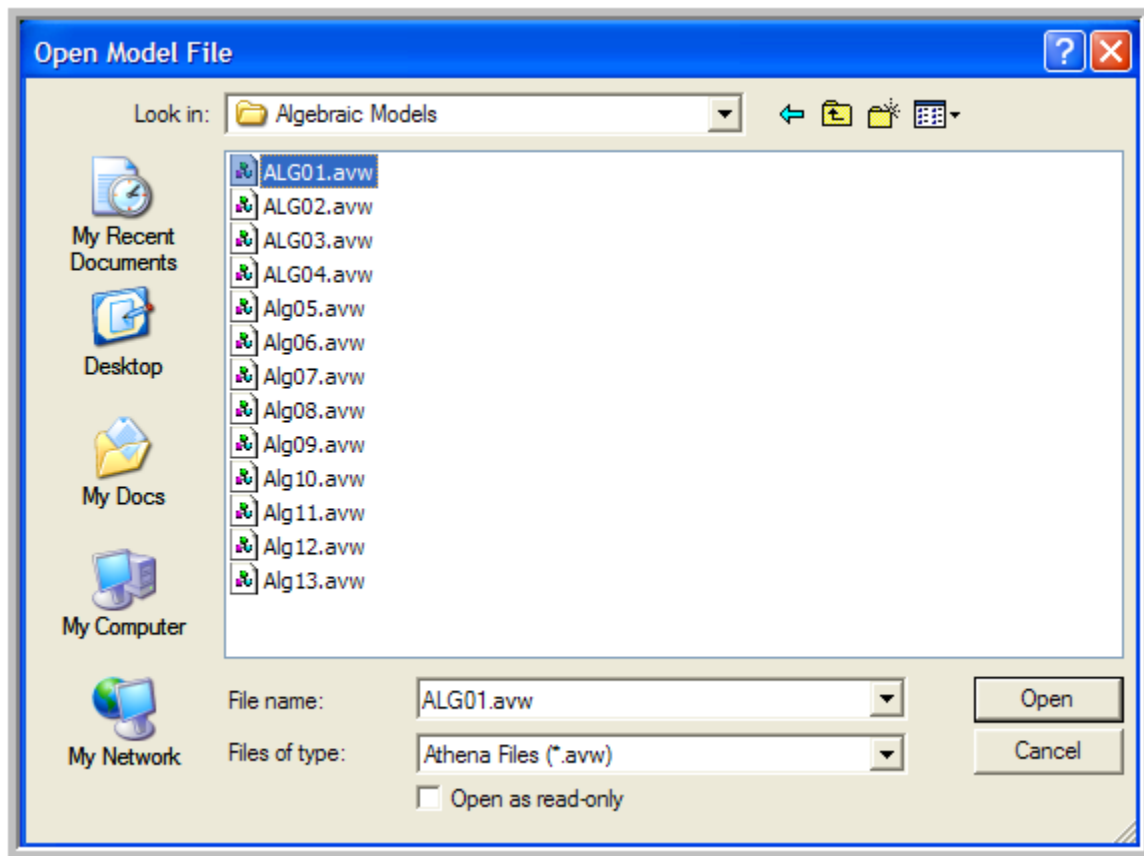
►Form the **Tools** menu select **Options**

►Select the **Model Build** tab

►Click the **Set the Fortran Environment Variables** check box.

►Click **OK** to close this dialog window.

If you have installed Athena Visual Studio in a folder other than the default one that was indicated in the installation program, you must make changes to the pertinent environment variables that are related to the **g95 Fortran** compiler. To do that, open the Windows Explorer and navigate to the:

[<Your Installation Folder>]\Athena\Bin folder.

Select the file **G95Vars.bat**, do a right mouse click and select **Edit**; change the **G95_COMPILER** environment variable to reflect your installation folder and then save your changes. You are now ready to compile, build and execute your models. Follow the steps outlined below to test the compiler, with one of the sample problems that comes with the Athena Visual Studio installation.

►Open **Athena Visual Studio**

►Form the **File** menu choose **Open**

►Select the **\Program Files\Athena\Samples\Algebraic Equations** folder

►Select **Alg01.avw** and click **Open**

►From the **File** menu, click **Save**

►From the **Build** menu, click **Compile** then **Build EXE** then **Execute**

You should see the following window:

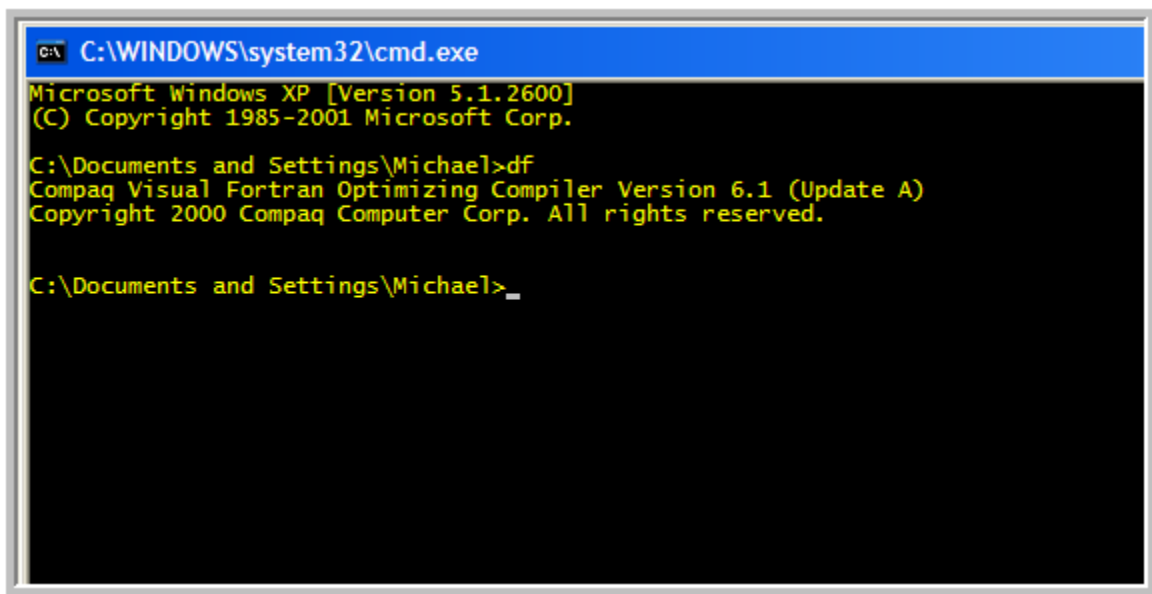# How to Compile and Link with the Compaq Visual Fortran Compiler

First you must select the Compaq Fortran Compiler; then follow the instructions outline below:

►Open an **MS-DOS** Window.

Windows XP	Windows 7 or Vista
Click **Start**	Click **Start**
Click **Run**	Type **cmd** and press enter
Type **cmd** and press enter	

►At the **MS-DOS** command prompt type **df** and press enter.

You should see the logo for the Compaq Visual Fortran Compiler as indicated below. (Note that the actual message might be different depending on the operating system, the version of the compiler that you are using and the default folder of the **cmd** Windows command)


If you do not see the above message, Athena will be unable to compile and link your project. You have therefore to set the environment variables, **Path** and **Lib** so that Athena knows where the location of the compiler. To do that, reinstall the compiler and answer **YES** to the question at the end of the installation about setting the environment variables. Alternatively, you may configure the Compaq Visual Fortran compiler by following the steps outlined below:

►Perform a Search to find the file **DFVARS.BAT**

►Copy this file and paste it in the **\Program Files\Athena\Bin** or **[<InstallDir>]\Athena\Bin** folder.
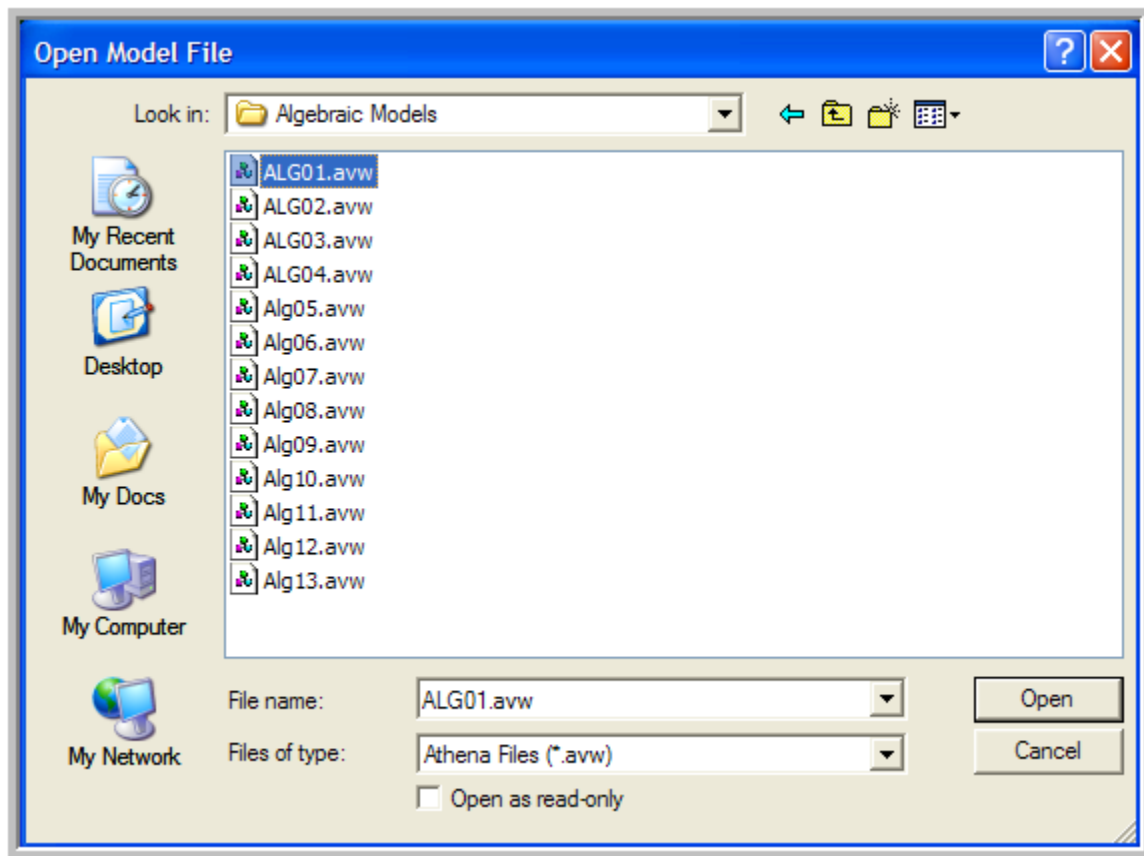
After you have completed these steps do the following:

►Open **Athena Visual Studio**

►Form the **Tools** menu select **Options**
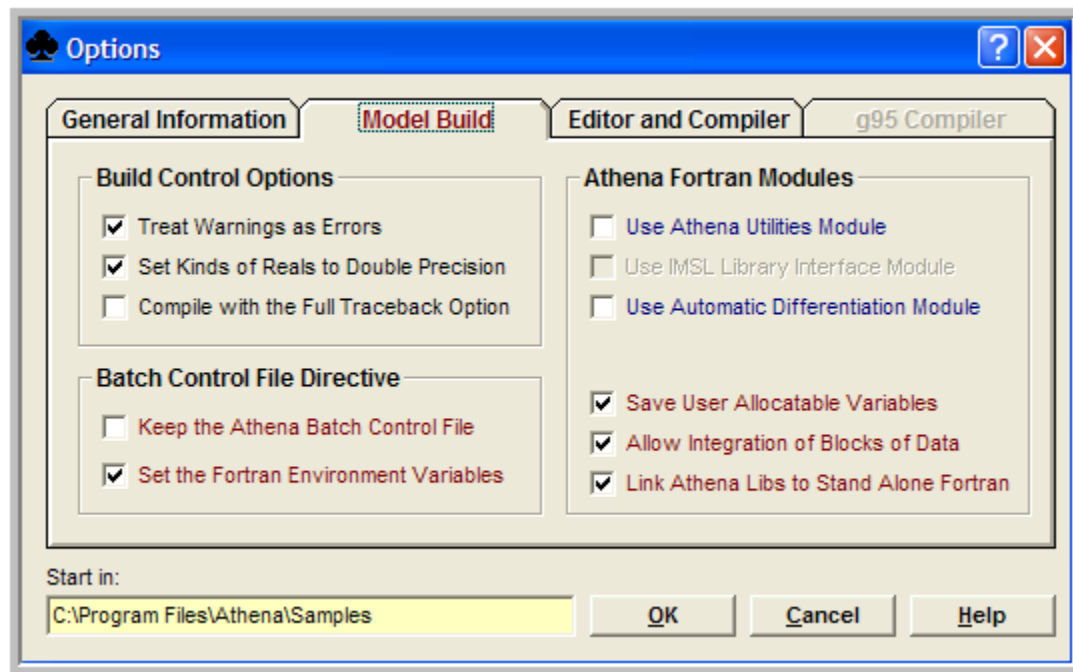
►Select the **Model Build** tab

►Click the **Set the Fortran Environment Variables** check box

►Click **OK** to close the dialog window

You are now ready to compile, build and execute your models. Follow the steps outlined below to test the compiler, with one of the sample problems that comes with the Athena Visual Studio installation.

►Open **Athena Visual Studio**

►Form the **File** menu choose **Open**

►Select the **\Program Files\Athena\Samples\Algebraic Equations** folder

►Select **Alg01.avw** and click **Open**

►From the **File** menu, click **Save**

►From the **Build** menu, click **Compile** then **Build EXE** then **Execute**

You should see the following window:

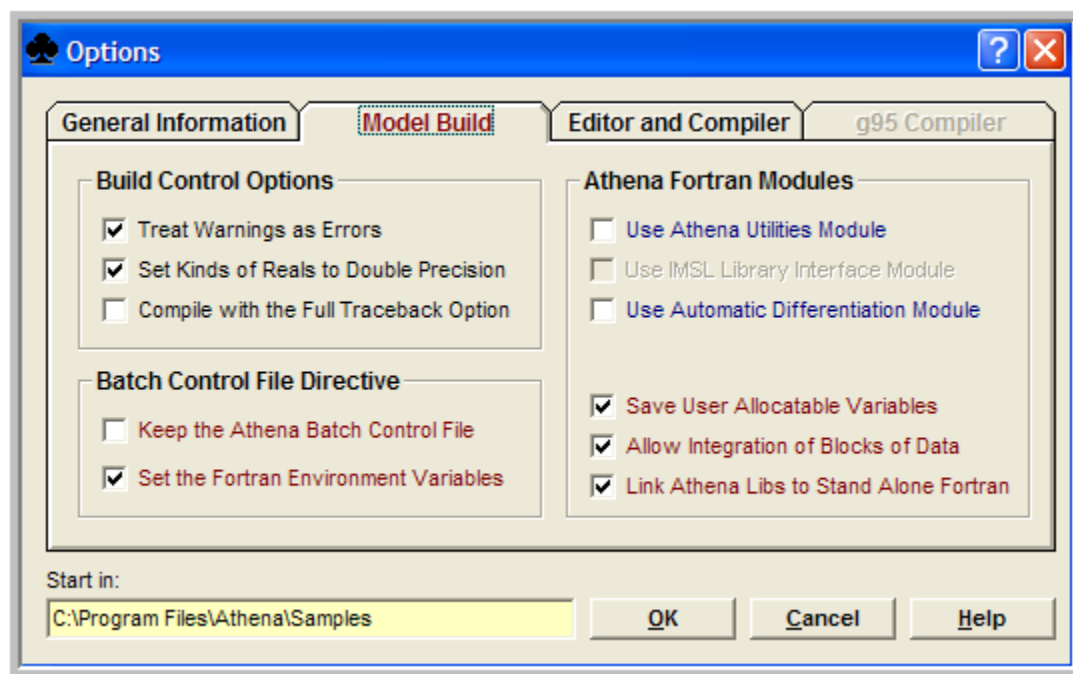# How to Compile and Link with the Intel Visual Fortran Compiler version 10

First you must select the Intel Fortran Compiler; then follow the instructions outline below:

►Perform a Search to find the file **IFORTVARS.BAT**

►Copy this file and paste it in the **\Program Files\Athena\Bin** folder.

If you have installed Athena in a different folder simply copy the **IFORTVARS.BAT** file into the **[<InstallDir>]\Athena\Bin** folder. Please note that there may be more than one **IFORTVARS.BAT**; make sure you select the right one for your Intel Fortran installation.

After you have completed these steps do the following:

►Open **Athena Visual Studio**

►Form the **Tools** menu select **Options**

►Select the **Model Build** tab

►Click the **Set the Fortran Environment Variables** check box.

►Click **OK** to close this dialog window.

You are now ready to compile, build and execute your models. Follow the steps outlined below to test the compiler, with one of the sample problems that comes with the Athena Visual Studio installation.

►Open **Athena Visual Studio**

►Form the **File** menu choose **Open**

►Select the **\Program Files\Athena\Samples\Algebraic Equations** folder

►Select **Alg01.avw** and click **Open**

►From the **File** menu, click **Save**

►From the **Build** menu, click **Compile** then **Build EXE** then **Execute**

You should see the following window:

How to Compile and Link with the Intel Visual Fortran Compiler version 11

First you must select the Intel Fortran Compiler; then follow the instructions outlined below:

►Perform a Search to find the file **IFORTVARS_IA32.BAT**

►Copy this file, paste it in the **C:\Program Files\Athena\Bin** folder and rename it to **IFORTVARS.BAT**.

If you have installed Athena Visual Studio in a different folder simply copy, paste and rename the **IFORTVARS_IA32.BAT** file into the **[<InstallDir>]\Athena\Bin** folder. Please note that there may be more than one **IFORTVARS_IA32.BAT**; make sure you select the right one for your Intel Fortran installation.
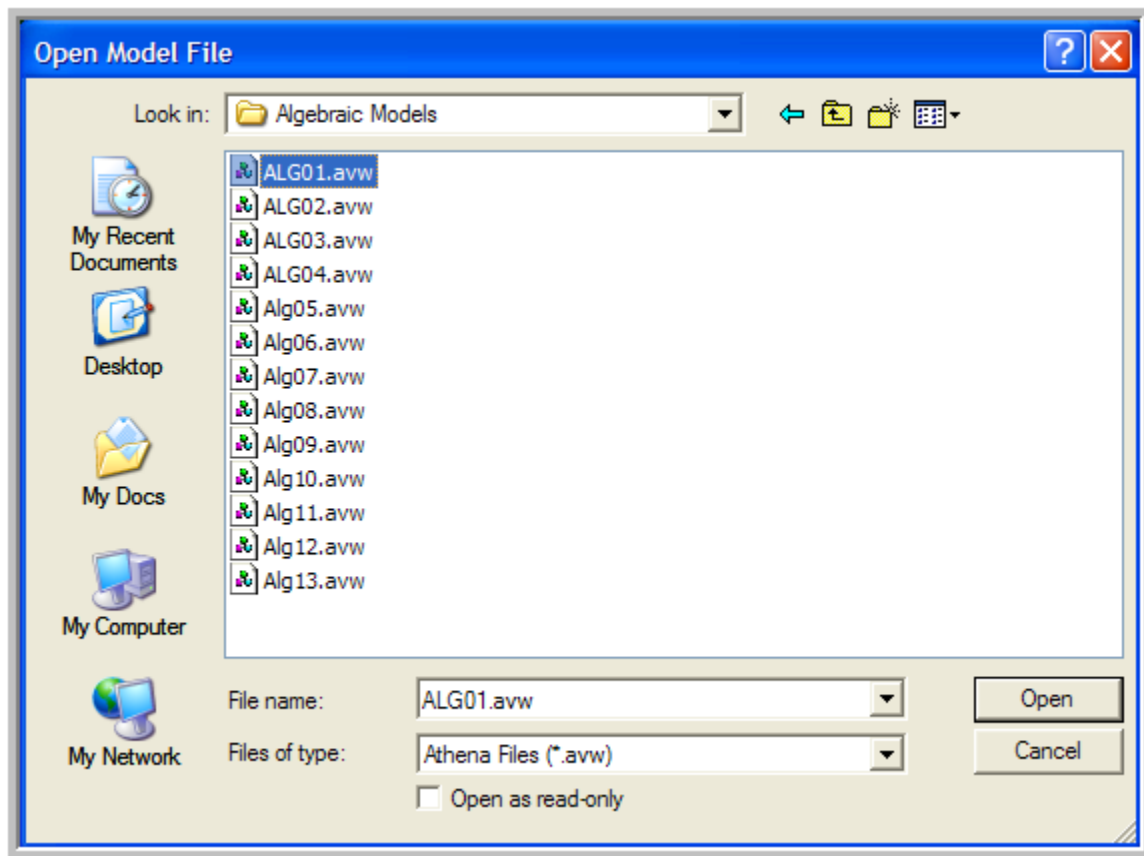
After you have completed these steps do the following:

►Open **Athena Visual Studio**

►Form the **Tools** menu select **Options**

►Select the **Model Build** tab

►Click the **Set the Fortran Environment Variables** check box.

►Click **OK** to close this dialog window.

You are now ready to compile, build and execute your models. Follow the steps outlined below to test the compiler, with one of the sample problems that comes with the Athena Visual Studio installation.

►Open **Athena Visual Studio**

►Form the **File** menu, choose **Open**

►Select the **\Program Files\Athena\Samples\Algebraic Equations** folder

►Select **Alg01.avw** and click **Open**

►From the **File** menu, click **Save**

►From the **Build** menu, select **Fortran and Code Generation Options**

►Insert the **Additional Options** indicated in the image below *[-Qvc7.1 –threads]*

►From the **Build** menu click **Compile** then **Build EXE** then **Execute**

You should see the following window:

```
Number of Algebraic Equations.................    3
Number of Sensitivity Parameters..............    3
Number of User Specified Iterations...........   30

EXIT DDAPLUS: SOLUTION FOUND

VARIABLE   INITIAL GUESS      RESIDUALS     FINAL VALUE         SENSITIVITY MATRIX
 U(1)        2.00000E+00     1.57860E-16    1.20337E+00  ||  -1.63213E-02    3.09127E-01   -1.47851E-01
 U(2)        2.00000E+00    -4.77916E-16    1.72619E+00  ||  -9.06358E-03   -3.39866E-01    3.52386E-01
 U(3)        2.00000E+00    -1.78677E-16    2.71318E+00  ||   1.34708E-01   -4.29585E-01    3.46344E-01

Number of Newton Iterations...................    8
Number of Function Evaluations................   36
Number of Jacobian Evaluations................    8
Number of Jacobian Factorizations.............    8
```

Note: If the **Additional Options** inserted above generate compilation or linking errors and warnings, remove them and try again. If you are still having problems contact tech.support@athenavisual.com.

How to Obtain Information about the Fortran Compilers

You may obtain more information about the Fortran Compilers in Athena Visual Studio as follows:

►Open **Athena Visual Studio**

►From the **Help** menu select **Fortran Compilers**.
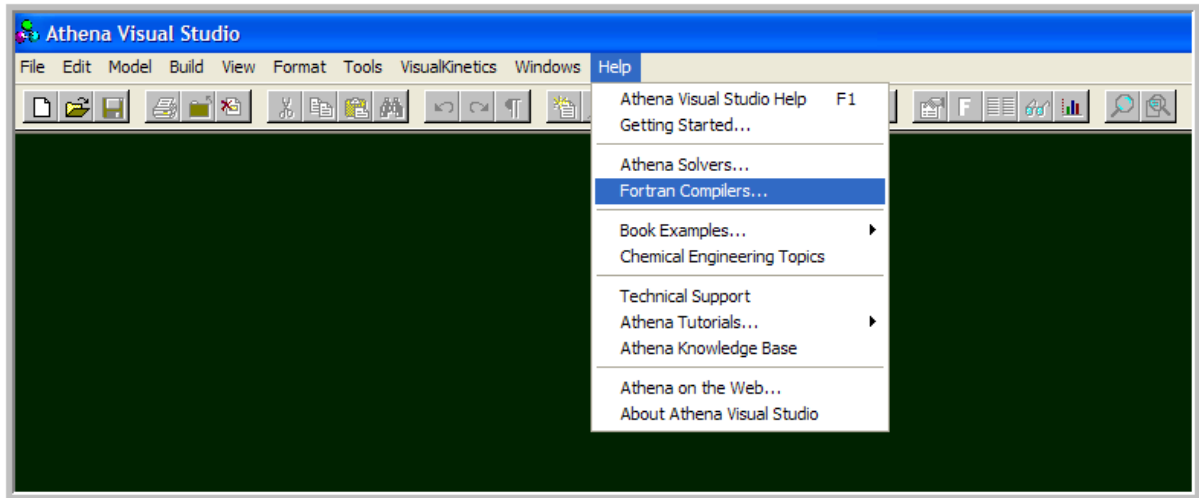
How to Obtain Information about the Athena Solvers

You may obtain more information about the Solvers in Athena Visual Studio as follows:

►Open **Athena Visual Studio**

►From the **Help** menu select **Athena Solvers**.
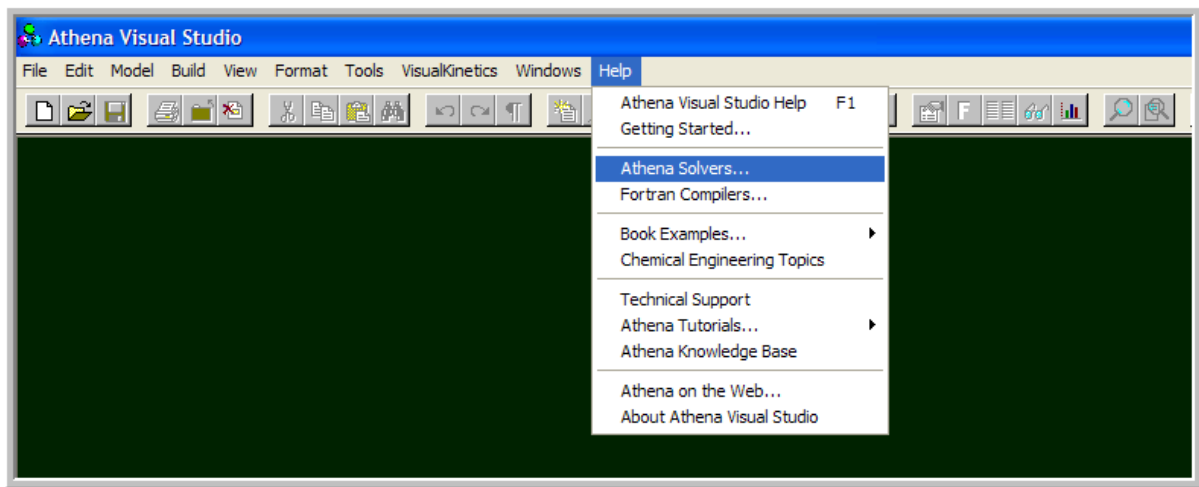
How does Athena store the Sensitivity Functions

Consider the following system of Differential/Algebraic Equations

State Equations

$$\mathbf{E}(t,\mathbf{u};\boldsymbol{\theta})\frac{d\mathbf{u}}{dt} = \mathbf{F}(t,\mathbf{u};\boldsymbol{\theta})$$

$$t = t_0 \quad \mathbf{u} = \mathbf{u}_0(\boldsymbol{\theta})$$

Sensitivity Functions

$$\mathbf{W} = \frac{\partial \mathbf{u}}{\partial \boldsymbol{\theta}}$$

The following nomenclature applies in Athena Visual Studio for a differential system with 3 state equations and 2 parameters.

$$\begin{bmatrix} U(1,1) & U(1,2) & U(1,3) \\ U(2,1) & U(2,2) & U(2,3) \\ U(3,1) & U(3,2) & U(3,3) \end{bmatrix} = \begin{bmatrix} u_1 & \dfrac{\partial u_1}{\partial \boldsymbol{\theta}_1} & \dfrac{\partial u_1}{\partial \boldsymbol{\theta}_2} \\ u_2 & \dfrac{\partial u_2}{\partial \boldsymbol{\theta}_1} & \dfrac{\partial u_2}{\partial \boldsymbol{\theta}_2} \\ u_3 & \dfrac{\partial u_3}{\partial \boldsymbol{\theta}_1} & \dfrac{\partial u_3}{\partial \boldsymbol{\theta}_2} \end{bmatrix}$$

Fatal Error: While reading module '***' found module version 8, expected 6.

This error results when the **g95 Fortran Compiler** version installed on your computer is older than the one used by the current version of Athena Visual Studio. To resolve this error follow the steps that are outlined below:

►Go to **\Program Files\Athena** [or the folder you installed Athena if different]

►Delete the folder **g95**

►Uninstall and Reinstall **Athena Visual Studio**

►Start **Athena Visual Studio**

►From the **File** menu click **Open**

►Go to **\Program Files\Athena\Samples\Algebraic Equations**

►Pick up the first example **Alg01.avw**

►Save, **Compile**, **Build EXE** and **Execute** to make sure the compiler works

►Now you are ready to run your models

EXE Building Messages: ld: crt2.o: No such file: No such file or directory

This **EXE Building** error occurs when the environment variable **LIBRARY_PATH** has not been set correctly. To resolve this error follow the steps that are outlined below:

►Open **Athena Visual Studio**

►From the **Tools** menu select **Options**

►Go to **Model Build** tab

►Click the **Set the Fortran Environment Variables** check box and then press **OK**

►Open your application and try again

If these steps do not alleviate the problem, then you most likely installed Athena and the compiler in a directory other than the installation default [**\Program Files**]. In this case, in addition to the steps above you must do the following:
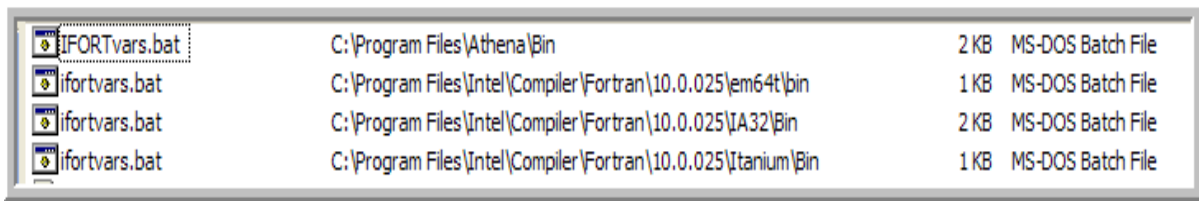
►Navigate with the Windows Explorer to the folder **[<INSTALLDIR>]\Athena\Bin**

►Select the **G95vars.bat** file and then, do a right mouse click and select **Edit** from the menu.

►Modify the **G95_COMPILER** environment variable to reflect your installation directory.

►Save the **G95vars.bat** file, then open your Application and try again.

Error: This module file was generated for a different platform or by an incompatible compiler or compiler release.

This error occurs when the user copies the wrong **IFORTvars.bat** file in the *\Athena\Bin* folder. To resolve this error follow the steps that are outline below:

►Perform a **Search** for **ifortvars.bat**

►When the search is completed the *Search Results* window may look like the image below:

IFORTvars.bat	C:\Program Files\Athena\Bin	2 KB	MS-DOS Batch File
ifortvars.bat	C:\Program Files\Intel\Compiler\Fortran\10.0.025\em64t\bin	1 KB	MS-DOS Batch File
ifortvars.bat	C:\Program Files\Intel\Compiler\Fortran\10.0.025\IA32\Bin	2 KB	MS-DOS Batch File
ifortvars.bat	C:\Program Files\Intel\Compiler\Fortran\10.0.025\Itanium\Bin	1 KB	MS-DOS Batch File

►You may see more than one batch files especially if you have upgraded the Intel Visual Fortran Compiler from an earlier version

►Select the batch file that corresponds to the correct Intel Visual Fortran version that is installed in your computer

►Select the batch file that is located in the *IA32\Bin* folder

►Copy this file into the *\Athena\Bin* folder

►Reopen your Athena project, *Save* it and proceed to *Compile*, *Build* the *EXE* and *Execute* it.

IFORT: error #10037: could not find 'link'

This error occurs when the user copies the wrong **IFORTvars.bat** file in the *\Athena\Bin* folder. To resolve this error follow the steps that are outline below:

►Perform a **Search** for **ifortvars.bat**

►When the search is completed the *Search Results* window may look like the image below:

IFORTvars.bat	C:\Program Files\Athena\Bin	2 KB	MS-DOS Batch File
ifortvars.bat	C:\Program Files\Intel\Compiler\Fortran\10.0.025\em64t\bin	1 KB	MS-DOS Batch File
ifortvars.bat	C:\Program Files\Intel\Compiler\Fortran\10.0.025\IA32\Bin	2 KB	MS-DOS Batch File
ifortvars.bat	C:\Program Files\Intel\Compiler\Fortran\10.0.025\Itanium\Bin	1 KB	MS-DOS Batch File

►You may see more than one batch files especially if you have upgraded the Intel Visual Fortran Compiler from an earlier version

►Select the batch file that corresponds to the correct Intel Visual Fortran version that is installed in your computer

►Select the batch file that is located in the *IA32\Bin* folder
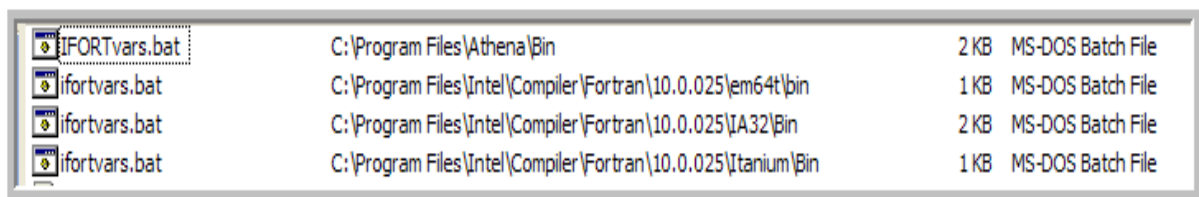
►Copy this file into the *\Athena\Bin* folder

►Reopen your Athena project, *Save* it and proceed to *Compile*, *Build* the *EXE* and *Execute* it.

How to View and Edit Athena Options in Windows Registry.

Click on **Start** and **Run** and then type in **regedit** and press the Enter key. First save a copy of the complicated system registry file so that you can restore it if you mess up while making the change(s) needed. To do that, select **File** and **Export** to create a copy of the registry on your desktop. If you double-click the icon this creates, your registry will return to the current settings.

To change the registry settings for Athena Visual Studio expand the folders as follows:

HKEY_CURRENT_USER

►Software

►VB and VBA Program Settings

►Athena

►Options

Scroll down to the desired item and click on it. In the box that appears, type the new settings that you wish.

Fortran runtime error: Bad value during floating point read

This error occurs during Parameter Estimation when the **Regional Options** in the user's computer have been set to a value other that **English(United States)**. The Regional Options can be changed from the Windows Control Panel or from Athena Visual Studio as follows:

►Open **Athena Visual Studio**

►From the **Tools** menu select **Change Regional Options**
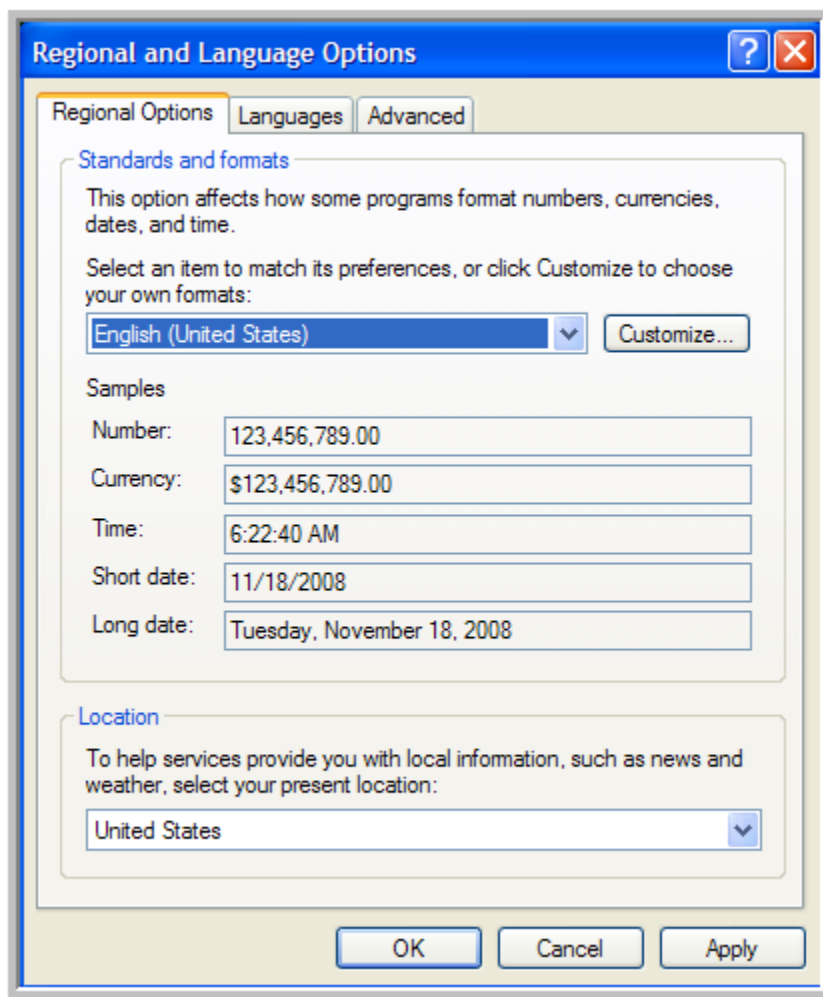
►From the drop down menu select **English(United States)**

►Click **OK**

►Close **Athena Visual Studio**

In order to run your parameter estimation project you need to recreate the data file required by the Athena solvers. To do that:

►Open **Athena Visual Studio**

►From the **File** menu click **Open** and select your project

►Hit **F12** to load the Parameter Estimation Solver

►Click **OK** to recreate the parameter estimation data file

►You may now **Compile**, **Build EXE** and **Execute** your model.

If you want to see the parameter estimation data file that Athena generates:

►From the **View** menu, select **Parameter Estimation Data File**

FATAL ERROR. Unauthorized License Has Been Detected

This error usually occurs if you try to run a model that was created on a different computer (for instance if a coworker has sent you his or her Athena model). If you are an authorized user of Athena Visual Studio and receive this error follow the steps below:

►Open **Athena Visual Studio**

►From the **File** menu click **Open** and select your project

►From the **Edit** menu click **Clean Up** to delete all intermediate files of your current project

►From the **File** menu click **Save** to recreate the Fortran code of your current model

►You may now **Compile**, **Build EXE** and **Execute** your model.

Fortran Compilation and Linking Errors

The following is a list of commonly encountered warnings and errors and some helpful hints in troubleshooting them.
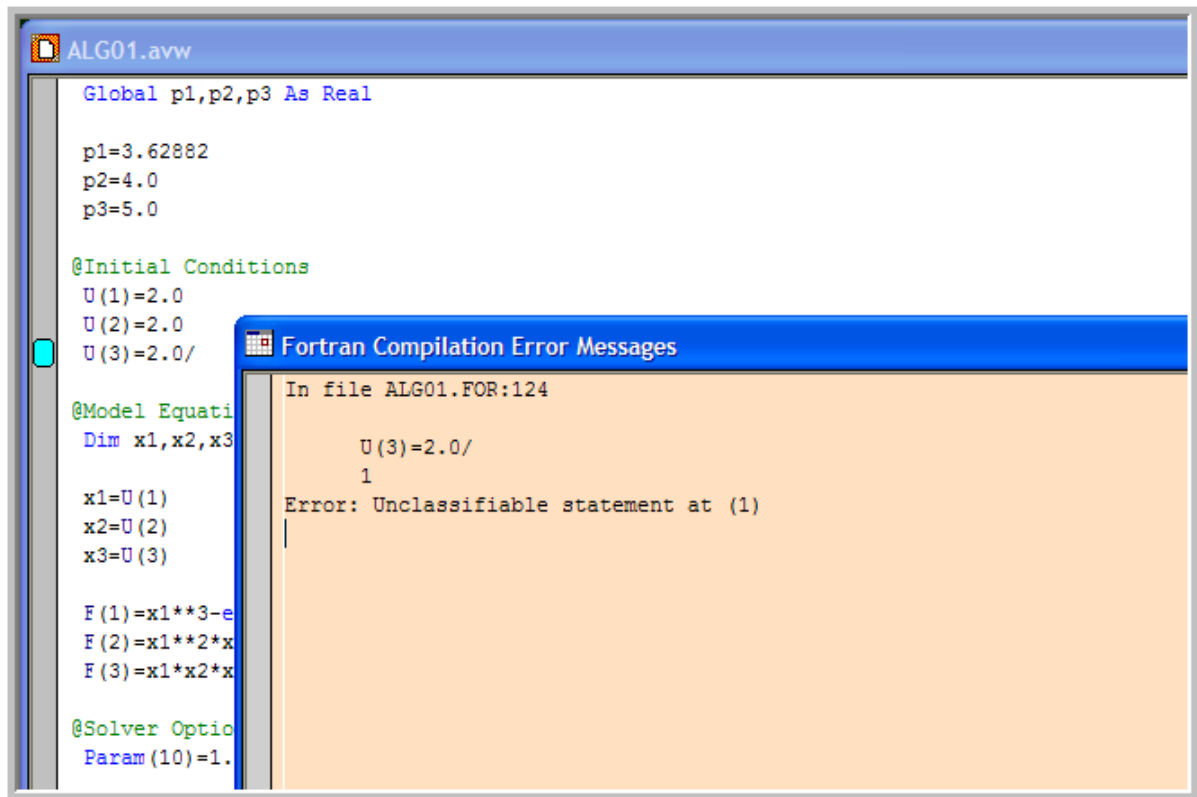
Warnings: The presence of warnings in your Fortran Compilation and/or Linking output indicates that you are using parameters or variables that you have not declared. These variables will be assigned zero or unpredicted values by the compiler and this action may have detrimental effects on your simulation. Make sure you remove all critical warnings before you proceed with the execution of your program. This is ordinarily done by declaring all your model variables and constants with the Global or Dim keywords

Syntax Errors: Syntax errors arise form statements in your model code that do not comply with standard Fortran 77 or Fortran 90/95 rules. In most cases syntax errors are easy to correct. To do that place your cursor on the statement that describes the syntax error and double-click. This will take you back to your model code and highlight in the offending statement. You may then correct the statement and recompile your model. If this does not happen, you will have to find the offending statement manually. This is ordinarily very easy since there is often a clear description of the error.

Unresolved Externals Errors: This message arises when you try to access a subroutine or function that you have not included in your project. The name of this subroutine or function should be given in the following format: **_Rates@0**. This message means that you are trying to access the subroutine or function **Rates** and the linker cannot find it anywhere. To correct this problem make sure you include the missing subroutine or function in your project. Sometimes your subroutine is already included in your project and you still see this message. This is an indication that you are calling the subroutine with the wrong set of arguments. Frequently you misspell a variable and get the same message. For example suppose that you want to type k1=3 and instead you typed k(1)=3. Then you will get an unresolved external because the linker things you are trying to access the function k(x).

Viewing Fortran Compilation and Linking Errors

To view the compilation and/or linking errors click **Yes** in the Message Box at the end of the compilation or linking process. Place your cursor on the first statement that contains the error or the critical warning and double-click. (This will be the line *In file ALG01.FOR:124* for the example below)

If Athena locates the error it will display your model code with a blue bookmark next to the offending statement. Correct the statement and recompile your project. Repeat this procedure, troubleshooting one error or critical warning at a time.

If Athena is unable to locate the error then do the following. First click here to read some information about the most commonly encountered errors. Then, read the Fortran line number that has the error or warning. This number is 124 for our example above or it may be enclosed in parentheses (depending on the compiler that you are using). From the **View** menu choose **Fortran Code** to see your Fortran code. Go to the offending statement and check for errors. To go to the offending line quickly: Make sure that your Fortran Code window is active. From the Edit Menu choose **Go To**. Enter the line number (124 in our example) that contains the compilation error. Then choose **OK**.

Athena Visual Studio Error Messages

The following is a list of miscellaneous errors that occur during the model building process

Illegal Declaration Statement: Make sure you declare your model variables and constants correctly using the Global and Dim keywords.

Unable to Locate Source [Object] [Library] File: You have attempted to include in your active project a Fortran Source or Object or Library file that does not exist. Please check the name and path of the file and try again.

Fatal Error During Installation with Windows Vista

When running the installation under Windows Vista, you may receive one of the following errors when clicking the **Next** button on the Welcome Dialog:

Title: Fatal Error

Text: Installation ended prematurely because of an error

Example #1

Action ended 11:44:17: WiseNextDlg. Return value 3.

DEBUG: Error 2896: Executing action WiseNextDlg failed.

Internal Error 2896. WiseNextDlg

Action ended 11:44:17: Welcome_Dialog. Return value 3.

Example#2

Action start 11:39:42: RebuildListbox.

Action ended 11:39:42: RebuildListbox. Return value 3.

DEBUG: Error 2896: Executing action RebuildListbox failed.

Internal Error 2896. RebuildListbox

Action ended 11:39:42: Welcome_Dialog. Return value 3.

MSI (c) (A0:50) [11:39:42:282]: Doing action: Fatal_Error

This occurs when you are unable to run VBScripts on your computer. This can be due to either VBScript being disabled or unregistered. To resolve this issue follow the steps below to register VBscript your computer:

►Ensure the VBscript is installed.

►Turn off script blocking antivirus and personal firewall software.

►Locate the **vbscript.dll** on your system. On 32-bit systems, this file should be located at C:\Windows\System32. On 64-bit systems, the file should be located at C:\Windows\SysWOW64.

►Go to **Start** > **Run** and at the prompt enter: **regsvr32.exe** *<path to vbscript.dll>.*

Windows Vista should then confirm that the vbscript has been registered.