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An Introduction to Scripting in VisualDSP++®

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Introduction

VisualDSP++® 3.5 introduces a language-independent scripting host that utilizes the Microsoft® ActiveX® script host framework. The scripting host permits the use of multiple scripting engines (languages) that conform to the Microsoft ActiveX script engine framework. Scripting is a powerful and flexible tool that you can use to extend and customize the built-in capabilities of the IDDE or to automate repetitive tasks. It is ideal for non-interactive scripting needs such as accessing DSP resources (reading/writing memory or reading/writing registers), performing repetitive tasks (executing external tools prior to or after a build completes, or setting registers and memory prior to loading a program), or running full-blown regression tests. These are only a few examples of what can be done with scripting; the possibilities are endless. This EE-Note outlines the components involved in scripting and explains how to use the new scripting capabilities in the IDDE.

A Note About Tcl

Prior to the release of VisualDSP++ 3.5, Tcl (http://www.tcl.tk) was the default scripting language in the IDDE. Since Tcl is not a true ActiveX script engine, Tcl has been deprecated with release 3.5 and will not be covered in this EE-Note. Although most Tcl functionality has been maintained for backward compatibility, no new functionality will be added to the Tcl library going forward.

Supported Languages

The following script languages are officially supported by Analog Devices:

VBScript

A scripting language developed by Microsoft, with syntax based on Visual Basic®. If you already know Visual Basic or Visual Basic for Applications (VBA), VBScript will be very familiar.

JScript

A scripting language developed by Microsoft that implements the ECMAScript standard. It is a very powerful interpreted scripting language that is object-based and loosely typed. This will be the most familiar language to users that are comfortable with C/C++.

Although each scripting language has its own syntax, all the scripting languages access the same features in VisualDSP++. For example, calls to subroutines (methods with no return types) using VBScript do not use parentheses, even though JScript does.

Although the IDDE permits the use of other scripting languages, Analog Devices Technical Support does not support them at this time.

The benefits of using the new ActiveX script engines include:

- More language choices
- Better language support and documentation
- Shorter learning curve for users who are already familiar with a language
- Much more powerful API (Automation)
- Better performance and flexibility

VisualDSP++ Automation API

VisualDSP++ includes a unified programming interface, called the VisualDSP++ Automation API, which provides all script languages with broad access to all of the capabilities of the IDDE in a language-independent manner. Automation, formerly called OLE Automation, is a Microsoft COM-based technology that allows an application to use the services provided by another application (VisualDSP++). It makes the VisualDSP++ environment programmable by any application that understands Automation. Since script languages (VBScript or JScript) support the COM interface, they may be used to access to the Automation API.

When a language is selected as the current language in the Console tab of the IDDE's Output window, an instance of the VisualDSP++ application object is created. This object, called Idde, is used to easily access the VisualDSP++ Automation's methods and properties. The use of this object is shown later in this document. For detailed information about the Automation API, refer to the online Help, which can be found at <VisualDSP install>\help\VisualDSPAutomation.chm.

Detecting Installed Languages

By default, under Windows 2000 or later, everything you need for scripting is already installed on the operating system. However, under Windows 98 and Windows NT, if VisualDSP++ does not automatically detect any languages, you may have to download Microsoft Windows Script 5.6 or upgrade to the latest version of Internet Explorer, which installs the VBScript and JScript libraries necessary to use the scripting capabilities. For further information, visit the following Microsoft site:

http://www.microsoft.com/scripting

Getting Familiar with Scripting

Open VisualDSP++ and click the Console tab of the Output window. To see the list of available languages, right-click in the Output window and choose Languages. Choose VBScript to select it as the current scripting language.

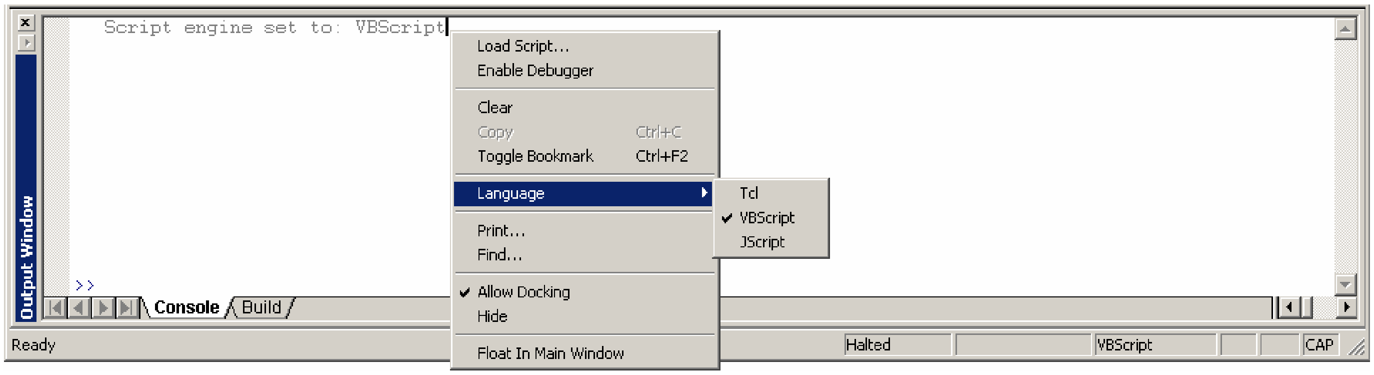


Figure 1. Language selection menu

The best way to become familiar with the scripting capabilities is to enter a few commands in the Output window. Type the following lines:

```
a = 5
b = 2
c = a + b
? c
```

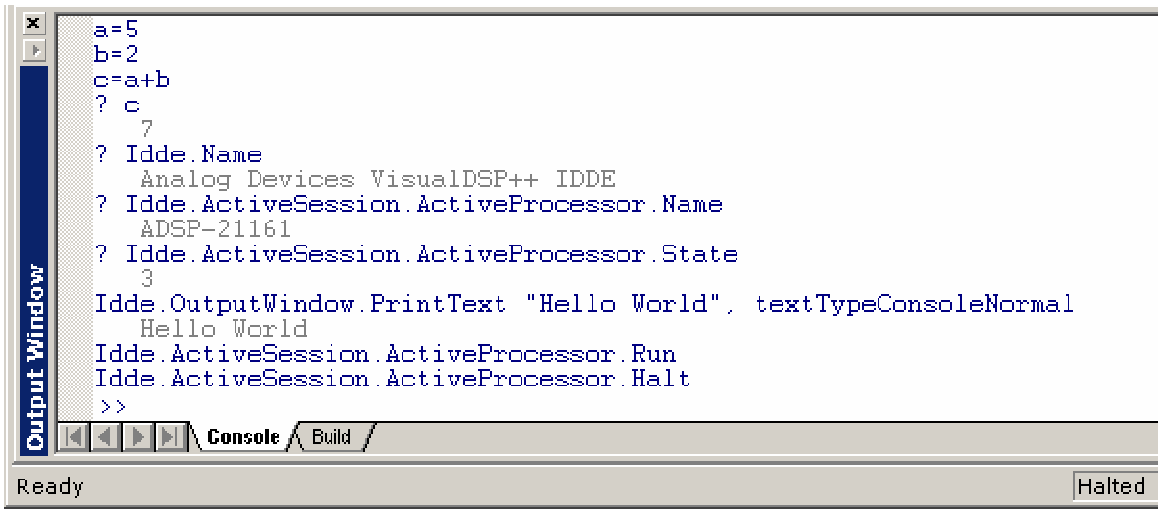
Listing 1. Simple commands

Evaluate expressions by preceding the text with a question mark (**?**) when a Microsoft activeX script engine is selected.

Now, let’s use the **Idde** object mentioned earlier to access some automation methods and properties. Type the following commands in the Output window and observe the output for each command:

```
? Idde.Name

? Idde.ActiveSession.ActiveProcessor.Name

? Idde.ActiveSession.ActiveProcessor.State

Idde.OutputWindow.PrintText “Hello World”, textTypeConsoleNormal

Idde.ActiveSession.ActiveProcessor.Run

Idde.ActiveSession.ActiveProcessor.Halt
```

Listing 2. Idde object commands



```
a=5
b=2
c=a+b
? c
    7
? Idde.Name
    Analog Devices VisualDSP++ IDDE
? Idde.ActiveSession.ActiveProcessor.Name
    ADSP-21161
? Idde.ActiveSession.ActiveProcessor.State
    3
Idde.OutputWindow.PrintText "Hello World", textTypeConsoleNormal
    Hello World
Idde.ActiveSession.ActiveProcessor.Run
Idde.ActiveSession.ActiveProcessor.Halt
>>
```

Figure 2. Output window with Idde object commands

Loading a Script

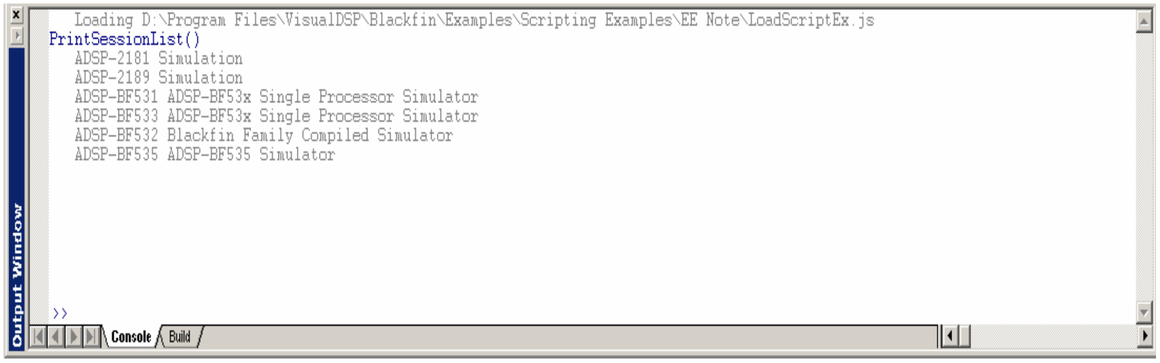
VisualDSP++ provides multiple ways to load a script:

- Choose File->Load Script from the IDDE's main menu
- Choose File->Recent Scripts from the IDDE's main menu
- Choose Load Script from the Output window's right-click menu
- Choose Load Script via the right-click menu in an editor window

Following is an example. First, right-click in the Output window, and change the script language to JScript. Open a new document in VisualDSP++ by clicking File->New on the main menu. Copy the following script into the blank document. Save the file as LoadScriptEx.js to a directory of your choice. Once the file has been saved, right-click on the LoadScriptEx.js file in the editor window and choose LoadScript. In the Output window, type PrintSessionList() and press Enter. The list of sessions previously created in VisualDSP++ should print to the Output window (Figure 3).

```
function PrintSessionList()
{
    SessionList = Idde.SessionList;

    for( var i=0; i< SessionList.Count; i++ )
    {
        Session = SessionList.Item(i);
        Idde.OutputWindow.PrintText(Session.Name, 0);
    }
}
```

Listing 3. PrintSessionList code



```
   Loading D:\Program Files\VisualDSP\Blackfin\Examples\Scripting Examples\EE Note\LoadScriptEx.js
PrintSessionList()
   ADSP-2181 Simulation
   ADSP-2189 Simulation
   ADSP-BF531 ADSP-BF53x Single Processor Simulator
   ADSP-BF533 ADSP-BF53x Single Processor Simulator
   ADSP-BF532 Blackfin Family Compiled Simulator
   ADSP-BF535 ADSP-BF535 Simulator

>>
```

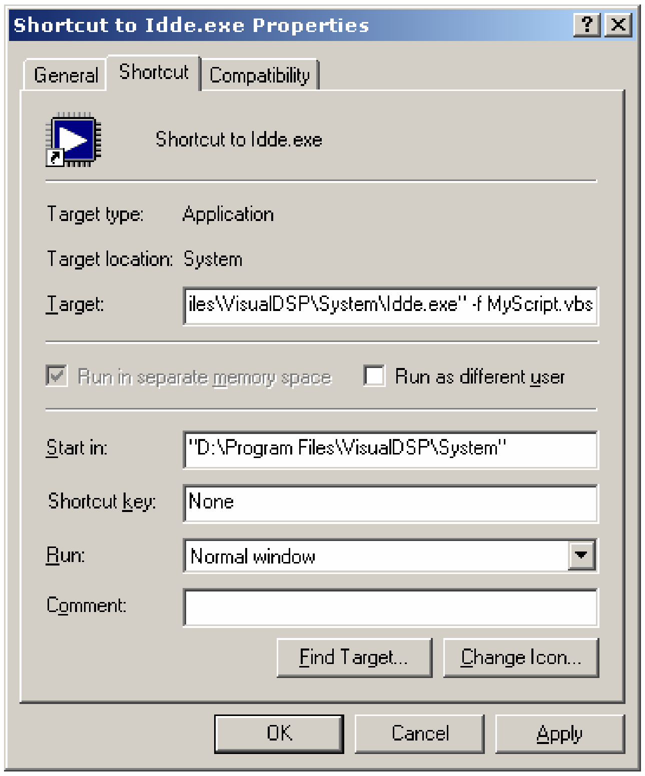
Figure 3. Output window with PrintSessionList output

Code not contained within a function is considered global code and executes immediately after the script is loaded. Code contained within a function is executed only when called within the global code or when you type the function name into the Output window of the IDDE.

Automatically Invoking a Script

A script can automatically be loaded on startup of the IDDE by using the –f parameter and a shortcut to the Idde.exe. This is ideal for recurring tasks.

To use this feature, create a shortcut to the Idde.exe. Right-click on the shortcut and choose Properties. Place "–f" and file name at the end of the Target field located on the Shortcut tab (Figure 4). Click OK. The next time the IDDE is started, the script will load automatically.



Target type:	Application
Target location:	System
Target:	iles\VisualDSP\System\Idde.exe" -f MyScript.vbs
[✓] Run in separate memory space	[ ] Run as different user
Start in:	"D:\Program Files\VisualDSP\System"
Shortcut key:	None
Run:	Normal window
Comment:	

Figure 4. Specifying a script from the Shortcut tab

Creating a Toolbar Button

You can map a script to a toolbar button in the IDDE. For example, let's use the PrintSessionList code from Listing 3 to create a toolbar button. First, create a tool by choosing Settings->Preferences and clicking the Tools tab. Then click New to define the tool.

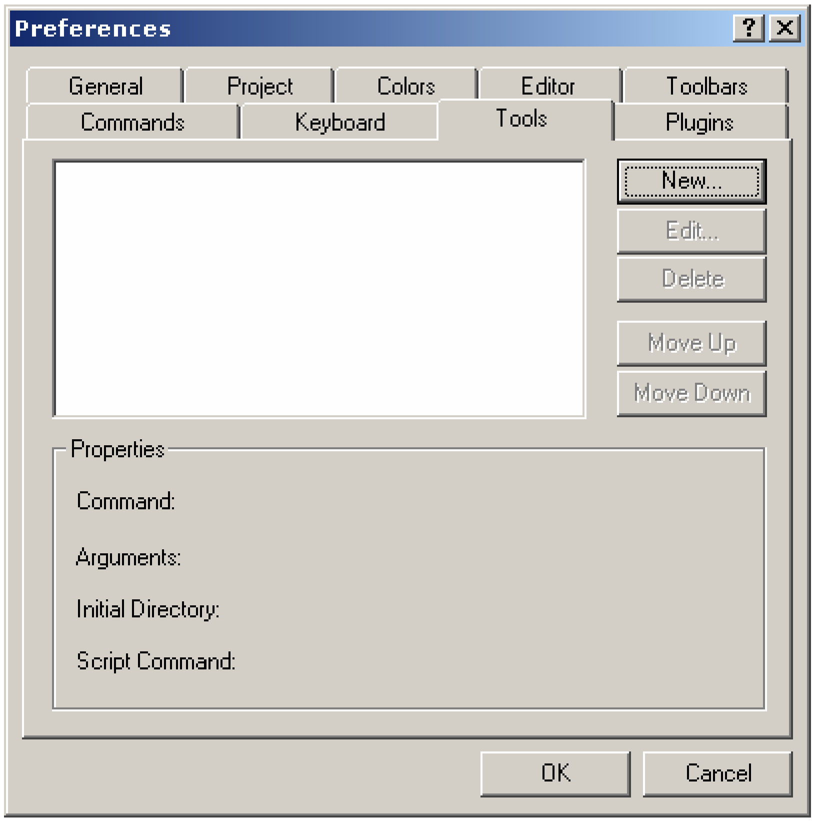
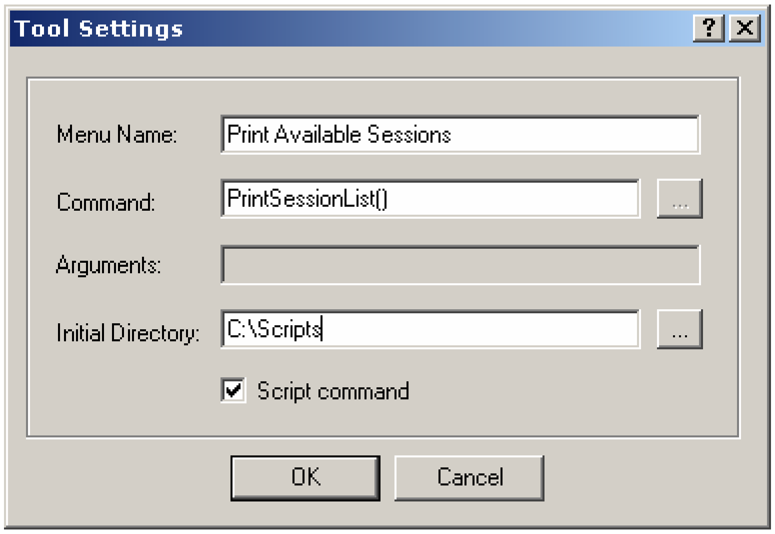


Figure 5. Tools tab of the Preferences dialog box

As shown in Figure 6, assign the new tool with the name Print Available Sessions and specify the function to be executed, PrintSessionList(). Enter the directory where the script is located and select the Script command option. Click OK to save the tool's settings.


Tool Settings

Menu Name: Print Available Sessions

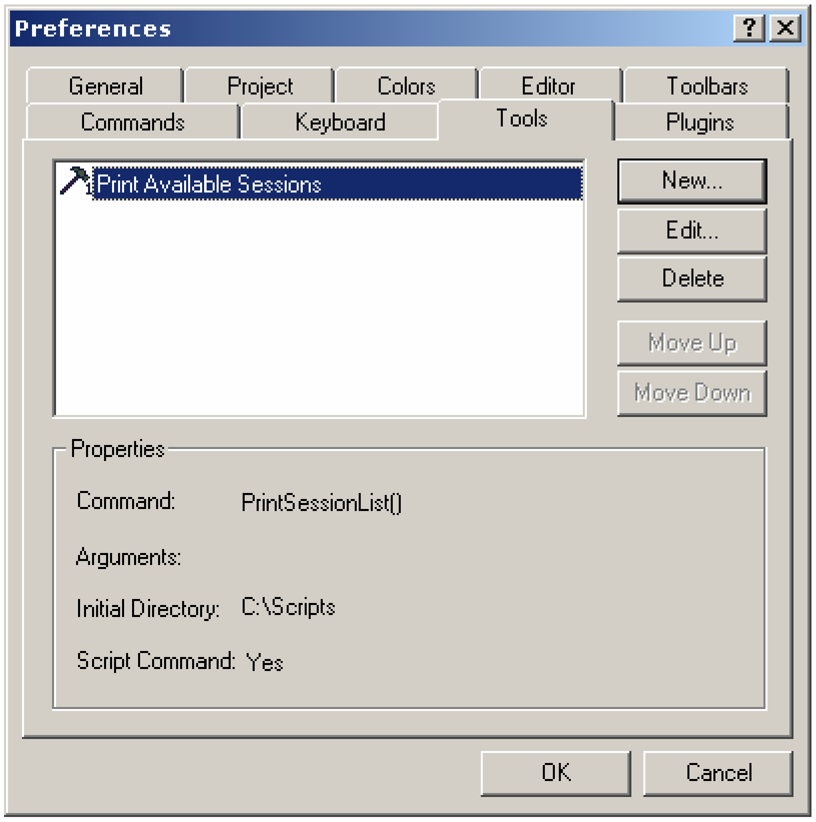
Command: PrintSessionList()

Arguments:

Initial Directory: C:\Scripts

☑ Script command

Figure 6. Specifying settings for the tool


Preferences

Print Available Sessions

Properties

Command: PrintSessionList()

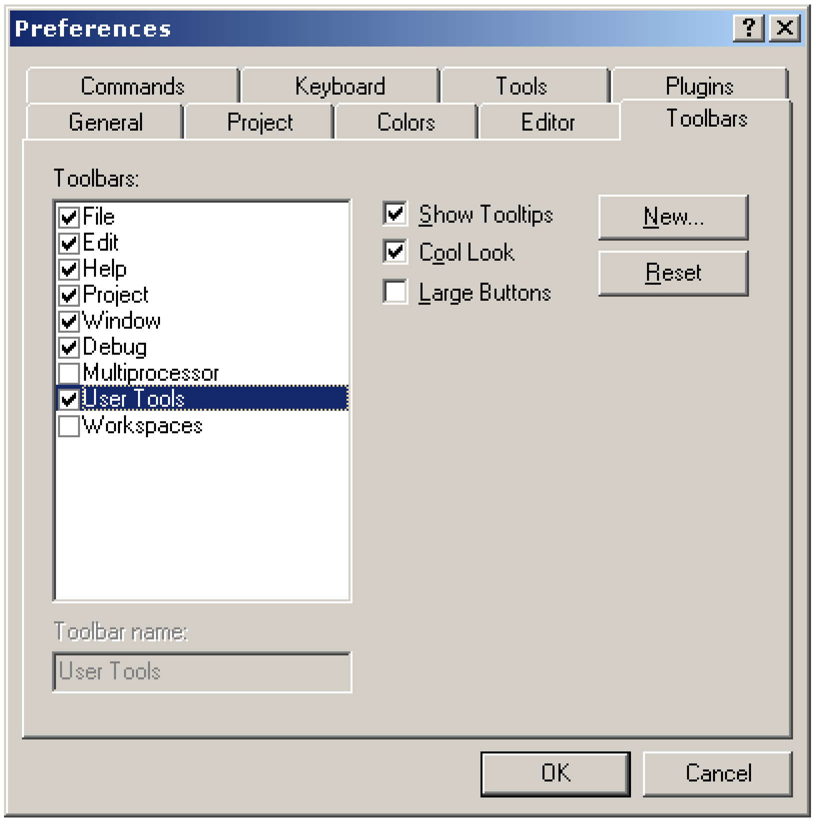
Arguments:

Initial Directory: C:\Scripts

Script Command: Yes

Figure 7. PrintSessionList() tool

The final step is to enable the display of the User Tools toolbar. You do this via the Toolbars tab of the Preferences dialog box (Settings->Preferences). Select User Tools in the Toolbars list and then click OK to display the toolbar in the IDDE. The User Tools toolbar is now available (Figure 9) and the Print Available Settings command may be run by clicking the first tool.



Preferences

Commands | Keyboard | Tools | Plugins | General | Project | Colors | Editor | Toolbars

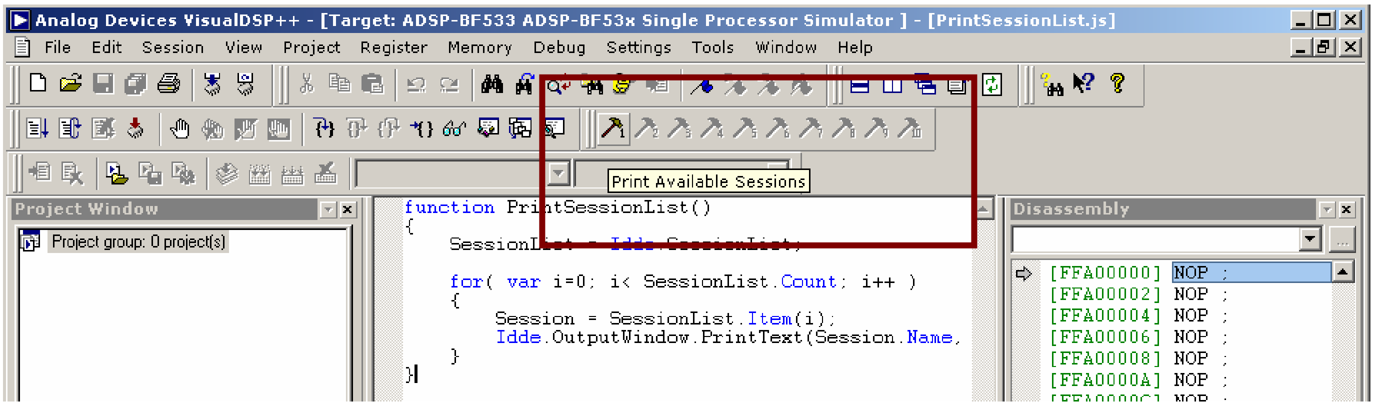
Toolbars:

- [✓] File
- [✓] Edit
- [✓] Help
- [✓] Project
- [✓] Window
- [✓] Debug
- [ ] Multiprocessor
- [✓] User Tools
- [ ] Workspaces

[✓] Show Tooltips
[✓] Cool Look
[ ] Large Buttons

Toolbar name: User Tools

Figure 8. Toolbars dialog



Analog Devices VisualDSP++ - [Target: ADSP-BF533 ADSP-BF53x Single Processor Simulator] - [PrintSessionList.js]

```
function PrintSessionList()
{
    SessionList = Idde.SessionList;

    for( var i=0; i< SessionList.Count; i++ )
    {
        Session = SessionList.Item(i);
        Idde.OutputWindow.PrintText(Session.Name,
    }
}
```

```
[FFA00000] NOP ;
[FFA00002] NOP ;
[FFA00004] NOP ;
[FFA00006] NOP ;
[FFA00008] NOP ;
[FFA0000A] NOP ;
```

Figure 9. User Tools toolbar in the IDDE

MenuManger Object

Similar to the built-in Idde object, there is also a built-in MenuManager object. This object allows you to add menu items to the IDDE's menu and also allows you to modify the state of the menu items. The following is a simple example (in VBScript) that creates a menu (Figure 10) and declares an event to handle the menu click.

```
menuid = MenuManager.AddMenuTail( "&Tools:&My Menu Item", "This is a custom menu item." )
Sub menumanager_OnMenuItemClicked(ByVal MenuID)
If (MenuID = menuid) Then
    Idde.OutputWindow.PrintText "My Menu Item was clicked", tabConsole
End If
End Sub
```

Listing 4. Adding a menu item with the MenuManager object

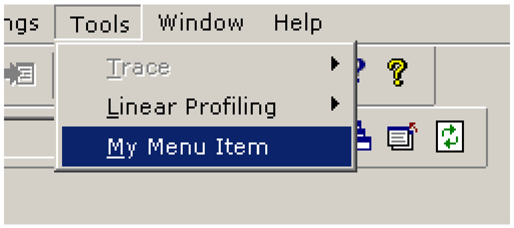


Figure 10. Custom menu item

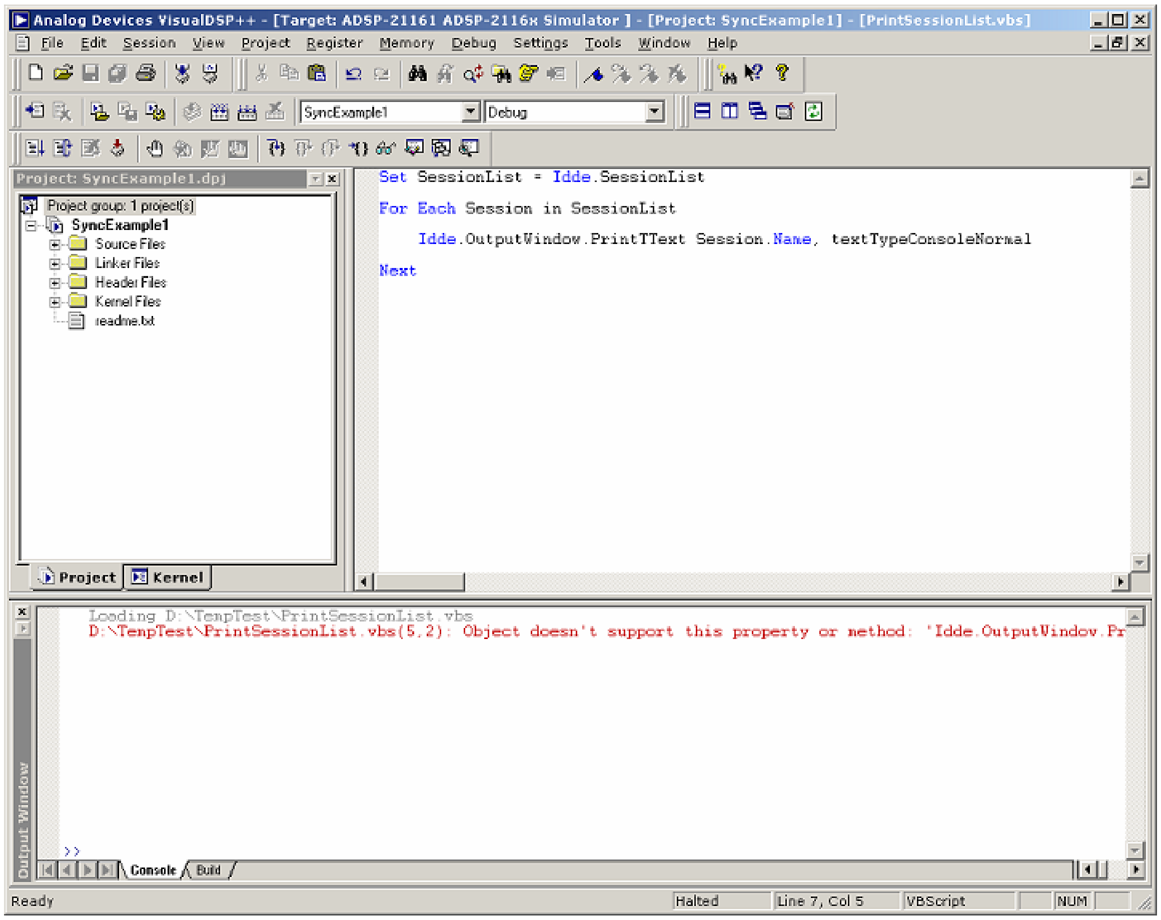
Debugging Scripts

The IDDE reports script errors to the Output window. The format of an error message is: File name, Line number, Column number, Error reason, Error type. Double-clicking on an error line in the Output window opens the script file and positions the cursor on the line where the error occurred. For example, let's look at the following script, which is located in a file named PrintSessionList.vbs:

```
Set SessionList = Idde.SessionList
For Each Session in SessionList
    Idde.OutputWindow.PrintTText Session.Name, textTypeConsoleNormal
Next
```

Listing 5. Example script file containing an error

Since the line "`Idde.OutputWindow.PrintTText Session.Name, textTypeConsoleNormal`" contains a syntax error, an error message would display in the Output window when the file is loaded. Once the extra "T" is removed, the script will proceed normally.


Analog Devices VisualDSP++ - [Target: ADSP-21161 ADSP-2116x Simulator] - [Project: SyncExample1] - [PrintSessionList.vbs]
File Edit Session View Project Register Memory Debug Settings Tools Window Help
SyncExample1
Debug
Project: SyncExample1.dpj
Project group: 1 project(s)
SyncExample1
Source Files
Linker Files
Header Files
Kernel Files
readme.txt
Project
Kernel
Output Window
Console
Build
Ready
Halted
Line 7, Col 5
VBScript
NUM

```
Set SessionList = Idde.SessionList

For Each Session in SessionList

    Idde.OutputWindow.PrintTText Session.Name, textTypeConsoleNormal

Next
```

```
Loading D:\TempTest\PrintSessionList.vbs
D:\TempTest\PrintSessionList.vbs(5,2): Object doesn't support this property or method: 'Idde.OutputWindow.Pr
>>
```

Figure 11. Error message output in the Output window

Enabling the Microsoft Script Debugger

If the Microsoft Script Debugger is already installed on the machine, the Enable Debugger command should be available from the Output window's right-click menu. If the debugger is not installed, the command will be grayed out. To get a copy of the Microsoft Script Debugger, refer to the following Microsoft site: http://www.microsoft.com/downloads and search for "Script Debugger".

To enable the script debugger, right-click on the Output window and choose Enable Debugger. This will activate the script debugger to launch when should a script error be encountered or when a command is typed in the Output window.

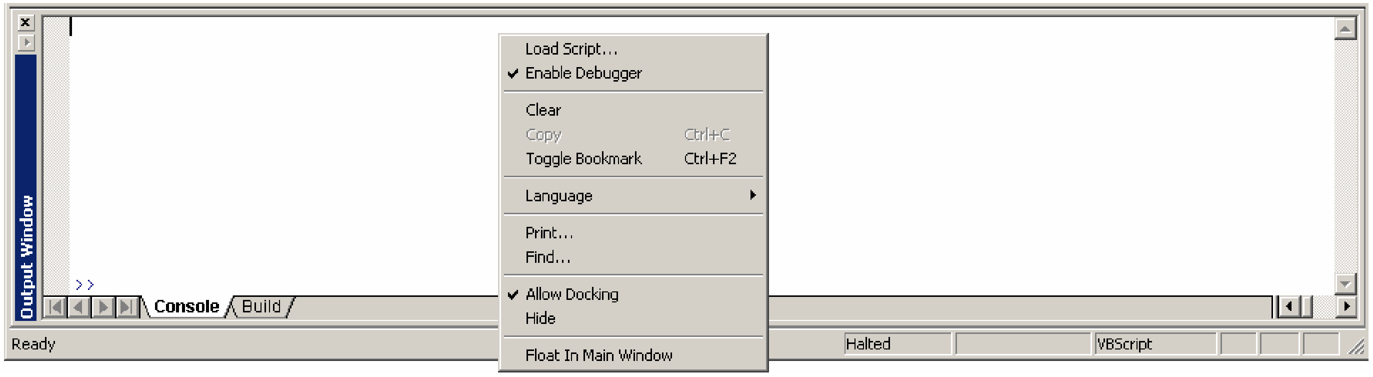
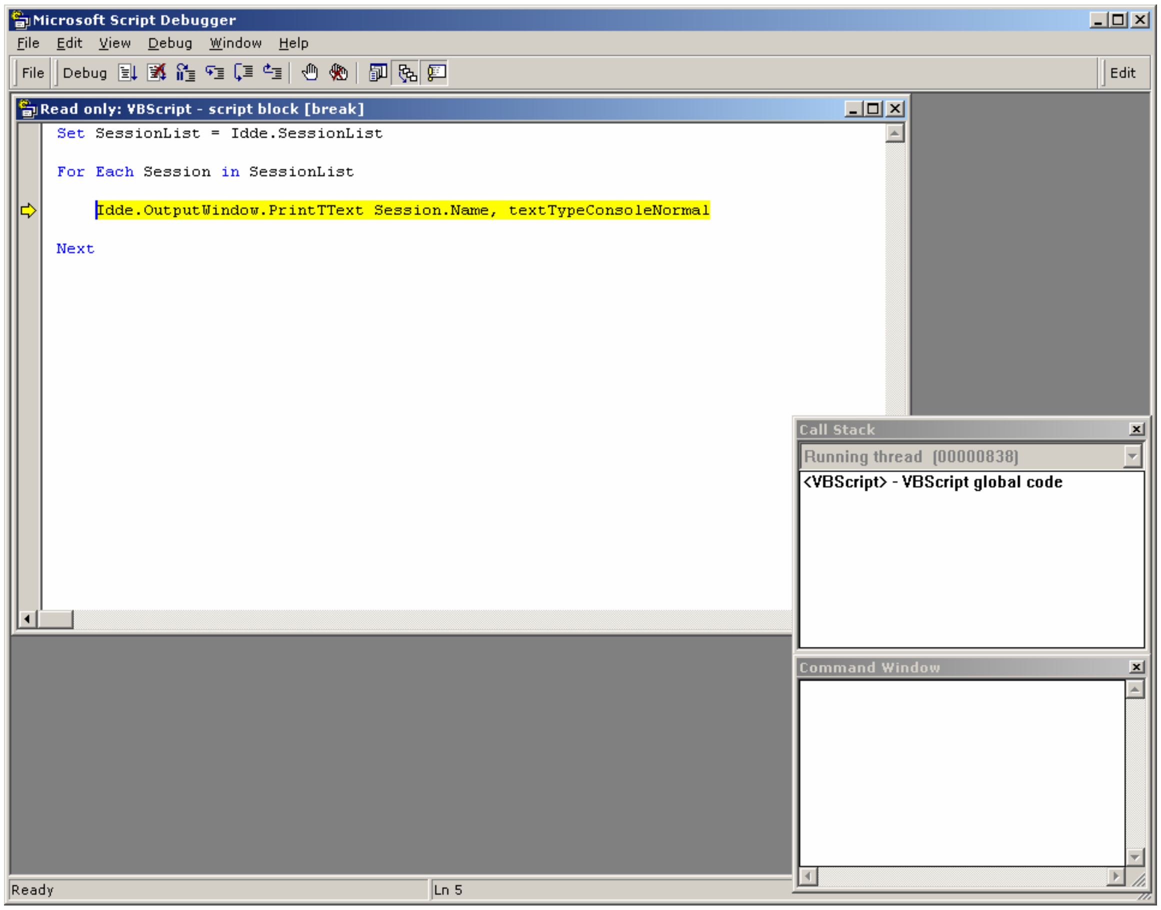


Figure 12. Enable Debugger menu item

If the PrintSessionList.vbs script above is loaded while the script debugger is enabled, the debugger will launch and stop on the line containing the error. With the Microsoft script debugger, you can step, run, halt, set breakpoints, etc. Once you have finished debugging, the focus should return to the IDDE and show the error message in the Output window.


Microsoft Script Debugger
File Edit View Debug Window Help
File
Debug
Edit
Read only: VBScript - script block [break]
Call Stack
Running thread (00000838)
<VBScript> - VBScript global code
Command Window
Ready
Ln 5

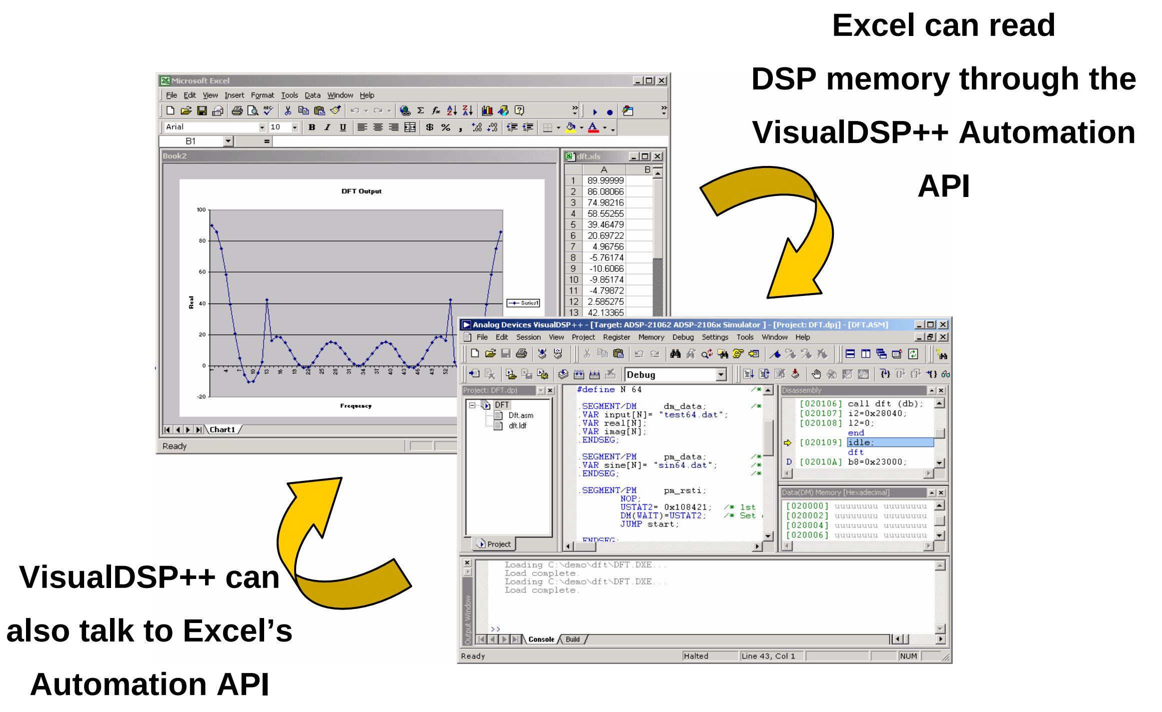
```
Set SessionList = Idde.SessionList

For Each Session in SessionList

    Idde.OutputWindow.PrintTText Session.Name, textTypeConsoleNormal

Next
```

Figure 13. Microsoft Script Debugger

To disable the script debugger, choose Enable Debugger from the Output window's right-click menu again and close the debugger.

Accessing VisualDSP++ from Another Application

VisualDSP++ can be controlled by another application such as a Visual Basic or C++ program. This allows Automation aware applications to communicate and control VisualDSP++ and vice versa. As an example application, a simple script could be written in Microsoft Excel that would connect to a target board, load a program, set and run to a breakpoint, and then read a block of memory into Excel for data analysis.


Excel can read DSP memory through the VisualDSP++ Automation API
VisualDSP++ can also talk to Excel's Automation API
Microsoft Excel
Book2
DFT Output
Real
Frequency
Series1
Chart1
dft.xls
Analog Devices VisualDSP++ - [Target: ADSP-21062 ADSP-2106x Simulator] - [Project: DFT.dpj] - [DFT.ASM]
Project: DFT.dpj
Disassembly
Data(DM) Memory [Hexadecimal]
Console
Build
Ready
Halted
Line 43, Col 1

	A
1	89.99999
2	86.08066
3	74.98216
4	58.55255
5	39.46479
6	20.69722
7	4.96756
8	-5.76174
9	-10.6066
10	-9.85174
11	-4.79872
12	2.585275
13	42.13365

```
#define N 64

.SEGMENT/DM     dm_data;
.VAR input[N]= "test64.dat";
.VAR real[N];
.VAR imag[N];
.ENDSEG;

.SEGMENT/PM     pm_data;
.VAR sine[N]= "sin64.dat";
.ENDSEG;

.SEGMENT/PM     pm_rsti;
        NOP;
        USTAT2= 0x108421;  /* 1st
        DM(WAIT)=USTAT2;   /* Set
        JUMP start;
```

```
[020106] call dft (db);
[020107] i2=0x28040;
[020108] l2=0;
         end
[020109] idle;
         dft
[02010A] b8=0x23000;
```

```
[020000] uuuuuuuu uuuuuuuu
[020002] uuuuuuuu uuuuuuuu
[020004] uuuuuuuu uuuuuuuu
[020006] uuuuuuuu uuuuuuuu
```

```
Loading C:\demo\dft\DFT.DXE...
Load complete.
Loading C:\demo\dft\DFT.DXE...
Load complete.
>>
```

Figure 14. Automation aware applications

The syntax of languages varies when creating an instance of VisualDSP++. The following is a sample of some of the languages and their methods used to create an instance of an object.

Language	**Syntax**
VBScript	`Set app = CreateObject("VisualDSP.ADspApplication")`
JScript	`app = new ActiveXObject("VisualDSP.ADspApplication")`
C++	`IADspApplicationPtr pApp( "VisualDSP.ADspApplication" );`

Scripting Examples

The VisualDSP++ installation directory includes example scripts in the "Scripting Examples" folder located under the DSP family name (e.g., Blackfin\Examples\Scripting Examples).

Scripting References

VisualDSP++ Automation API

For detailed information about the Automation API, refer to the online Help, which can be found at <VisualDSP install>\help\VisualDSPAutomation.chm.

http://msdn.microsoft.com/scripting

This is a good starting point for learning more about ActiveX scripting. The site includes in-depth documents that describe the ActiveX technology and languages.

http://msdn.microsoft.com

This is a good starting point for in-depth knowledge on any Microsoft technology including ActiveX scripting.

http://www.activestate.com

This site offers free, quality-assured language distributions such as perl and python.

news://msnews.microsoft.com/microsoft.public.inetsdk.programming.active_scrptng

This site covers general ActiveX scripting issues.

news://msnews.microsoft.com/microsoft.public.inetsdk.programming.scripting.vbscript

This site covers VBScript related issues.

news://msnews.microsoft.com/microsoft.public.inetsdk.programming.scripting.jscript

This site covers JScript related issues.

Conclusion

This EE-Note shows a fraction of what can be done with scripting. Scripting in VisualDSP++ is a powerful tool that makes VisualDSP++ a more versatile application and provides users with infinite possibilities.

Appendix A. Example: Project and IDDE Operations in VBScript

The following script example is simple but powerful. It creates a project, creates a file, adds the file to the project, builds the project, loads the program, runs the program, retrieves the value of a variable within the program, and then prints the value to the Output widow.

Change the script language to VBScript in the Output window. Open a new document in VisualDSP++ by choosing File->New on the main menu. Copy the following script into the blank document and save it to a directory of your choice as EE235ExA.vbs. Right-click on the file in the editor and choose Load Script. This will start the script.

Exercise caution when using the `Idde.Interactive` property of the Automation API, as it will suppress all dialog boxes including error messages, making script debugging potentially difficult. If you use this property in a script, catch errors within the script and set this property back to True.

EE235ExA.vbs

```
' Don't show any dialog boxes
Idde.Interactive = False

' Create the project
Set Project = Idde.ProjectList.CreateProject( "EE235Ex", "EE235Ex.dpj" )

' Set the project options
Project.Processor = Idde.ActiveSession.ActiveProcessor.Type
Project.TargetType = "DSP executable file"
Project.ActiveConfiguration = "Debug"

' Create a new file system object.
Set FSO = CreateObject( "Scripting.FileSystemObject" )

' Create the source file.
Set F = FSO.OpenTextFile( "EE235Ex.c", 2, True ) '2 = Writing

' Write the data to the file.
F.Write( "int a, b, nValue;" & vbCrlf & "void main( void )" & vbCrlf & "{"
  & vbCrlf & vbTab & "a = 5;" & vbCrlf & vbTab & "b = 3;" & vbCrlf & vbTab & "
  nValue = a + b;" & vbCrlf & "}" & vbCrlf )

' Close the file.
F.Close

' Add the file to the project.
Project.AddFile "EE235Ex.c", "Source Files"

' Build the project
Project.Build True

' Get the active processor
Set Processor = Idde.ActiveSession.ActiveProcessor

' Load the program
Processor.LoadProgram Project.TargetFileNameList(0)
```

```
' Run the program to the end of main
Processor.Run True

' Get the address of the variable
Address = Processor.MemoryTypeList.FindSymbol("nValue")(0).Address

' Get the memory type
Set MemoryType = Processor.MemoryTypeList.Item(0)

' Read the value of the variable
Set ValueList = MemoryType.GetMemory( Address, 1, 1 )

' Print the value
Idde.OutputWindow.PrintText “The value = “ & ValueList(0).Value, 0

' Show dialog boxes again
Idde.Interactive = True

If Err.Number <> 0 Then

    ' Show dialog boxes again
    Idde.Interactive = True
    Idde.OutputWindow.PrintText "An Error occurred.", 3
    Err.Clear

End If
```

Listing 1. EE235ExA.vbs

Appendix B. Example: Project and IDDE Operations in JScript

The following script example is simple but powerful. It creates a project, creates a file, adds the file to the project, builds the project, loads the program, runs the program, retrieves the value of a variable within the program, and then prints the value to the Output widow.

Change the script language to JScript in the Output window. Open a new document in VisualDSP++ by choosing File->New on the main menu. Copy the following script into the blank document and save it to a directory of your choice as EE235ExB.js. Right-click on the file in the editor and select Load Script. This will start the script.

EE235ExB.js

```
try
{
    // Don't show any dialog boxes
    Idde.Interactive = false;

    // Create the project
    Project = Idde.ProjectList.CreateProject( "EE235Ex", "EE235Ex.dpj" )

    // Set the project options
    Project.Processor = Idde.ActiveSession.ActiveProcessor.Type;
    Project.TargetType = "DSP executable file";
    Project.ActiveConfiguration = "Debug";

    // Create a new file system object.
    FSO = new ActiveXObject( "Scripting.FileSystemObject" );

    // Create the source file.
    F = FSO.CreateTextFile( "EE235Ex.c", true ); //2 = Writing

    // Write the data to the file.
    F.Write( "int a, b, nValue;" + "\n" + "void main( void )" + "\n" + "{" + "\n" +
      "\t" + "a = 5;" + "\n" + "\t" + "b = 3;" + "\n" + "\t" + " nValue = a + b;" +
      "\n" + "}" + "\n" );

    // Close the file.
    F.Close();

    // Add the file to the project.
    Project.AddFile( "EE235Ex.c", "Source Files" );

    // Build the project and wait
    Project.Build( true );

    // Get the active processor
    Processor = Idde.ActiveSession.ActiveProcessor;

    // Reset the processor and wait
    Processor.Reset( true );

    // Load the program
    Processor.LoadProgram( Project.TargetFileNameList(0) );
    // Run the program to the end of main
    Processor.Run( true );

    // Get the address of the variable
    Address = Processor.MemoryTypeList.FindSymbol("nValue")(0).Address;

    // Get the memory type
    MemoryType = Processor.MemoryTypeList.Item(0);

    // Read the value of the variable
    ValueList = MemoryType.GetMemory( Address, 1, 1 );

    // Print the value
    Idde.OutputWindow.PrintText( "The value = " + ValueList(0).Value, 0 );

    // Close the project
    Idde.ProjectList.RemoveProject( 0 );

    // Show dialog boxes again
    Idde.Interactive = true;
}
catch(e)
{
    // Show dialog boxes again
    Idde.Interactive = true;
    Idde.OutputWindow.PrintText( "An Error occurred: " + e.description, 3 );
}
```

Listing 2. EE235ExB.js

Appendix C. Example: Saving Projects and Dependencies in VBScript

The following script example illustrates how to load multiple projects and set dependencies on those projects.

EE235ExC.vbs

```
‘ get the project list
Set project_list = Idde.ProjectList

‘ empty the project list first
While (project_list.Count > 0)
    project_list.RemoveProject 0
WEnd

‘ add the projects
Set project1 = project_list.AddProject("sdram.dpj")
Set project2 = project_list.AddProject(".\CoreA\CoreA.dpj")
Set project3 = project_list.AddProject("..\CoreB\CoreB.dpj")
Set project4 = project_list.AddProject("..\L2\L2.dpj")
Set project5 = project_list.AddProject("..\L3\L3.dpj")

‘ set the dependencies on the projects
Set dependencies = CreateObject( "VisualDSP.ADspStringList" )
dependencies.Add project2.Name
dependencies.Add project3.Name
dependencies.Add project4.Name
dependencies.Add project5.Name
project1.DependentProjectList = dependencies
```

Listing 3. EE235ExC.vbs

Document History

Revision	**Description**
Rev 1 – May 11, 2004 by J. Pound	Initial Release