

Summary

This reference manual describes the JScript scripting language used in Altium Designer.

The following topics are covered in this reference:

- [Exploring the JScript Language](#)
- [JScript Source Files](#)
- [About JScript Examples](#)
- [Writing JScript Scripts](#)
- [Using Altium Designer Run Time Library in JScript Scripts](#)
- [JScript Keywords](#)
- [JScript Statements](#)
- [JScript Functions](#)
- [Using Components in Script Forms](#)


Exploring the JScript Language

This Reference details each of the JScript Scripting statements, functions and extensions that are supported in the scripting system. The Javascript Scripting or JScript for short also can deal with DXP Object Models and Visual Components. It is assumed that you are familiar with basic programming concepts and as well as the basic operation of your Altium Designer software.

The scripting system supports the JScript language (along with other scripting languages) which is derived from Microsoft Active Scripting system. All scripting languages supported in Altium Designer are typeless or untyped, which means you cannot define records or classes and pass pointers as parameters to functions.


JScript Example

```
function DisplayDate(){
    var d, s = "Today's date is: "; //Declare variables.
    d = new Date();                //Create Date object.
    s += (d.getMonth() + 1) + "/"; //Get month
    s += d.getDate() + "/";       //Get day
    s += d.getFullYear();         //Get year.
    showmessage(s);               //Show date.
}
```

 For detailed information on JScript and its keywords, operators and statements, please refer to Microsoft Developers Network website, [http://msdn2.microsoft.com/en-us/library/hbxc2t98\(vs.71\).aspx](http://msdn2.microsoft.com/en-us/library/hbxc2t98(vs.71).aspx)

Altium Designer and Borland Delphi Run Time Libraries

The Scripting system also supports a subset of Borland Delphi Run Time Library (RTL) and a subset of Altium Designer RTL. There are several Object Models in Altium Designer; for example you can use the PCB Object Model in your VB Scripts to deal with PCB objects on a PCB document, Workspace Manager Object Model to work with Projects and their documents and extract netlist data.

 You can navigate to the Scripting resources via **Documentation » Configuring the System » Scripting in Altium Designer** from the *Knowledge Center* panel.

Server Processes

A script can execute server processes. Refer to the [Server Process Reference](#) for more information on server processes and parameters.

JScript Source Files

A script project is organized to store script documents (script units and script forms). You can execute the script from a menu item, toolbar button or from the *Run Script* dialog from the system menu.

PRJSCR, JS and DFM files

The scripts are organized into projects with a *.PRJSCR extension. Each project consists of files with a *.js extension. Files can be either script units or script forms (each form has a script file with *.js extension and a corresponding form with a *.dfm extension). A script form is a graphical window that hosts different controls that run on top of Altium Designer.

It is possible to attach scripts to different projects and it is highly recommended to organize scripts into different projects to manage the number of scripts and their procedures / functions.

Scripts (script units and script forms) consist of functions/procedures that you can call within Altium Designer.

About JScript Examples

The examples that follow illustrate the basic features of JScript programming in Altium Designer. The examples show simple scripts for the Altium Designer application.

The JScripts can use script forms, script units, functions and objects from the Altium Designer Run Time Library and a subset of functions and objects from the Borland Delphi that is exposed in the scripting system.

The example scripts are organized into \Examples\Scripts\JScript Scripts\ folder.

Writing JScript Scripts

In this section:

- JScript Naming Conventions
- Local and Global variables
- Functions
- Including Comments in Scripts
- Splitting a Line of script.

JScript Naming Conventions

JScript is a case sensitive language which means the keywords, variables, function names and other identifiers must be typed with consistent capitalization of letters.

Example

```
function Displaymessage //valid function.  
Function Displaymessage // invalid function statement  
a = 60 //  
A = 45 // a and A are two different variables with different memory locations!
```

Local and Global Variables

Since all scripts have local and global variables, it is very important to have unique variable names in your scripts within a script project. If the variables are defined outside any procedures and functions, they are global and can be accessed by any unit in the same project.

If variables are defined inside a procedure or function, then these local variables are not accessible outside these procedures/functions.

Example of local and global variables in a script

```
// Variables from UnitA script are available to this unit script,
// as long UnitA is in the same project as this Unit script.
var
    GlobalVariableFromThisUnit="Global Variable from this unit";

function TestLocal() {
var
    Local;
    // can we access a variable from UnitA without the Uses
    Local = "Local Variable";
    ShowMessage(Local);
}

function TestGlobal {
    //ShowMessage(Local); // produces an error.
    ShowMessage(GlobalVariableFromThisUnit);
    ShowMessage(GlobalVariableFromUnitA);
}
```

Unit A script

```
Var
    GlobalVariableFromUnitA = "Global Variable from Unit A";
```

Functions

The function statement defines a JScript function. The block of the function is defined by the curly brackets {}. The syntax for a function is:

```
function functionname ([arg1 [, arg2[... , argn]]) {
//statements
}
```

Example

```
function DisplayMessage()
{
    var
        Message = "Hello World";
    Showmessage(Message);
}
```

Returning results in a function

The return statement is used to specify the value returned by a function.

Example

```
function square (x){  
    return x * x;  
}
```

Parameters and Arguments

The function declaration normally has a list of parameters (in scripts, variables are considered typeless and the scripting system works out automatically what the variable types are). The value used in place of the parameter when you make a procedure call is called an argument.

It is important to remember that functions with parameters will not appear on the *Select Item To Run* dialog

Example of a function with a parameter

```
function DisplayName (sName)  
{  
    ShowMessage("My Name is " + sName);  
}
```

Including Comments in Scripts

JScript supports both C++ and C style comments. Any text between a `//` and the end of a line is a comment.

Any text between the characters `/*` and `*/` is a comment.

// Comment type example

```
//This whole line is a comment
```

/* */ Comment type example

```
/* This whole line is a comment */  
/*  
This whole line is a comment  
This whole line is a comment  
This whole line is a comment  
*/
```

Comments can also be included on the same line as executed code. For example, everything after the semi colon in the following code line is treated as a comment.

```
ShowMessage("Hello World"); //Display Message
```

Splitting a Line of Script

Each code statement is terminated with the semi-colon " ; " character to indicate the end of this statement. JScript allows you to write a statement on several lines of code, splitting a long instruction on two or more lines. The only restriction in splitting programming statements on different lines is that a string literal may not span several lines.

For example:

```
X.AddPoint( 25, 100);
X.AddPoint( 0, 75);
// is equivalent to:
X.AddPoint( 25, 100); X.AddPoint( 0, 75);
```

But

```
"Hello World!"
```

is not equivalent to

```
"Hello
World!"
```

JScript does not put any practical limit on the length of a single line of code in a script, however, for the sake of readability and ease of debugging it is good practice to limit the length of code lines so that they can easily be read on screen or in printed form.

If a line of code is very long, you can break this line into multiple lines and this code will be treated by the JScript interpreter as if it were written on a single line.

Unformatted code example

```
If Not (PcbApi_ChooseRectangleByCorners(BoardHandle,"Choose first corner","Choose final
corner",x1,y1,x2,y2)) Then Exit;
```

Formatted code example

```
If Not (PcbApi_ChooseRectangleByCorners(BoardHandle,
                                         "Choose first corner",
                                         "Choose final corner",
                                         x1,y1,x2,y2)) Then Exit;
```

Using Altium Designer Run Time Library and Object Models in JScript Scripts

The biggest feature of the scripting system is that the Interfaces of DXP objects are available to use in scripts. For example, you have the ability to massage design objects on Schematic and PCB documents through the use of Schematic Interfaces and PCB interfaces.

Normally in scripts, there is no need to instantiate an interface, you extract the interface representing an existing object in Altium Designer and from this interface you can extract embedded or aggregate interface objects and from them you can get or set property values. Interface names as a convention have an **I** added in front of the name for example `IPCB_Board` represents an interface for an existing PCB document in Altium Designer.

To access to a schematic document, you invoke the `SchServer` function first.

Example

```
// Checks if the current document is a Schematic document
if SchServer != Null {
    CurrentSheet = SchServer.GetCurrentSchDocument;
    if (CurrentSheet != Null {
        // statements
    }
}
```

To access to a PCB document, you invoke the `PCBServer` function first.

Creating a PCB object example

```
function ViaCreation() {
var Board; //IPCB_Board;
var Via;   //IPCB_Via;
    Board = PCBServer.GetCurrentPCBBoard;
    if (Board != Null)
    {
        /* Create a Via object */
        Via          = PCBServer.PCBObjectFactory(eViaObject, eNoDimension, eCreate_Default);
        Via.X         = MilsToCoord(7500);
        Via.Y         = MilsToCoord(7500);
        Via.Size      = MilsToCoord(50);
        Via.HoleSize  = MilsToCoord(20);
        Via.LowLayer  = eTopLayer;
        Via.HighLayer = eBottomLayer;
        /* Put this via in the Board object*/
        Board.AddPCBObject(Via);
    }
}
```

Objects, Interfaces, functions and types in your scripts can be used from the following:

- Client API
- PCB Server API
- Schematic Server API
- Work Space Manager Server API
- Nexus API
- DXP RTL functions
- Parametric processes.
-



Refer to [Getting Started With Scripting](#) and [Building Script Projects](#) tutorials.



Refer to the [Using the Altium Designer RTL](#) guide for details on how to use design objects and their interfaces in your scripts.



You can navigate to the Scripting resources via **Documentation » Configuring the System » Scripting in Altium Designer** from the *Knowledge Center* panel.

JScript Keywords

The scripting system supports the JScript language which is derived from the Microsoft Active Scripting language technology. This section covers the JScript Keywords.

Reserved Words in JScript

The following words are reserved in JScript and cannot be used for variable names.

B,C

`abstract, boolean, break, byte, case, catch, class, const, continue`

D,E

`debugger, default, delete, do, else, enum, export, extends`

F, G

`false, final, finally, for, function, goto`

I

`if, implements, import, in, instanceof, int, interface, long`

N, R, S

`native, new, null, return, short, static, super, switch, synchronized`

T, V

`this, throw, throws, transient, true, try, typeof, var, void, volatile`

W

`while, with`

JScript Statements

In this section of JScript Statements:

- [Conditional Statements](#)
- [Expressions and Operators](#)

Conditional Statements

The main conditional statements supported by JScript;

- if (expression) else
- else if
- switch
- while loop
- do while loop
- for loop
- for in

You have to be careful to code your scripts to avoid infinite loops, i.e. the conditions will eventually be met.

The if.. else statement

The syntax is

```
if Condition {  
}  
else if ANotherCondition {  
}  
else{  
}
```

The switch statement

The switch statement is like a multi-way branch. The basic syntax is:

```
switch (n) {  
case 1: //n == 1  
//execute code.  
break  
case 2: //n==2  
//execute code.  
break;  
default: // if all else fails...  
//execute code.  
break;  
}
```

The while statement

The while statement is a basic statement that allows repetitive actions until a condition is met. It is possible that the statements inside the while body never get executed if the condition is not met once.

```
while (expression) {  
    //statement...
```



```
}
```

The do/while statement

The do / while statement is a variation on the while statement which is that the loop expression is tested at the bottom of the loop rather at the top. This means the body of the loop is always executed at least once. The general syntax is:

```
do
    // statements
while (expression);
```

The for statement

The for statement provides a common loop statement with a counter variable of some kind.

```
for (initialize ; test ; increment)
    statement
```

Example

```
for (count = 0; count < 10; count ++ )
    showmessage(inttostr(count));
```

The for/in Statement

The for/in statement provides a way to loop through the properties of an object or all the elements of an array. The for/in loop does not specify the order in which the properties of an object are assigned to the variable.

```
for (variable in object)
    //statement.
```

Expressions and Operators

An expression is a valid combination of constants, variables, literal values, operators and function results. Expressions are used to determine the value to assign to a variable, to compute the parameter of a function or to test for a condition. Expressions can include function calls.

JScript has a number of logical, arithmetic, Boolean and relational operators. These operators are grouped by the order of precedence which is different to the precedence orders used by Basic, C etc. For example, the AND and OR operators have precedence compared to the relational one.

Arithmetic Operators

+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulo
--	Decrement
++	Increment
-	Unary negation

Logical Operators

!	Logical Not
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
==	equality
!=	inequality
&&	Logical and
	Logical or
?:	conditional ternary
,	comma
===	strict equality
!==	strict inequality

Bitwise Operators

~	Bitwise Not
<<	Bitwise Left Shift
>>	Bitwise Right Shift
>>>	Bitwise Unsigned right shift
&	Bitwise And
^	Bitwise Bitwise XOR
	Bitwise OR

Operator Precedence

Operator	Description
. [] ()	Field access, array indexing, function calls, and expression grouping
++ -- ~ ! delete new typeof void	Unary operators, return data type, object creation, undefined values
* / %	Multiplication, division, modulo division
+ - +	Addition, subtraction, string concatenation
<< >> >>>	Bit shifting
< <= > >= instanceof	Less than, less than or equal, greater than, greater than or equal, instanceof
== != === !==	Equality, inequality, strict equality, and strict inequality
&	Bitwise AND
^	Bitwise XOR
	Bitwise OR

Operator	Description
&&	Logical AND
	Logical OR
?:	Conditional
= OP=	Assignment, assignment with operation
,	Multiple evaluation

JScript Functions

JScript functions are based on built in objects such as Math object and Data object etc in which you can invoke the methods to acquire the required data.

Built-in Functions

Available objects that are built-in JScript language in which you can use for your scripts. These objects have methods and properties that you can invoke.

Consult the Microsoft Developers Network website, [http://msdn2.microsoft.com/en-us/library/hbxc2t98\(vs.71\).aspx](http://msdn2.microsoft.com/en-us/library/hbxc2t98(vs.71).aspx) for further details.

Example of a built in Date object

```
function DateDemo() {
    var d , s = "Today's date is: ";           //Declare variables
    d = new Date();                           //Create Date object
    s += (d.getMonth() + 1) + "/";           //Get month
    s += d.getDate() + "/";                  //Get day
    s += d.getFullYear();                     //Get year
    showmessage(s);                           //Display the date.
}
```

Built in Objects Table

Language Element	Description
ActiveXObject Object	Enables and returns a reference to an Automation object
Array Object	Provides support for creation of arrays of any data type
arguments Object	An object representing the arguments to the currently executing function, and the functions that called it
Boolean Object	Creates a new Boolean value.
Date Object	Enables basic storage and retrieval of dates and times.
Debug Object	An intrinsic object that can send output to a script debugger.
Enumerator Object	Enables enumeration of items in a collection.
Error Object	An object that contains information about errors that occur while JScript code is running.
Function Object	Creates a new function.
Global Object	An intrinsic object whose purpose is to collect global methods into one object.
Math Object	An intrinsic object that provides basic mathematics functionality and constants.
Number Object	An object representation of the number data type and placeholder for numeric constants.
Object Object	Provides functionality common to all JScript objects.
RegExp Object	Stores information on regular expression pattern searches.
Regular Expression	Contains a regular expression pattern.

Language Element	Description
Object	
String Object	Allows manipulation and formatting of text strings and determination and location of substrings within strings
VBAArray Object	Provides access to Visual Basic safe arrays.

Using Components in Script Forms

Although Forms and Components are based on Borland Delphi's Visual Component Library, you still use the *Tool Palette* to drop controls on a form, generate JScript based event handlers and write code in JScript language.

In this section of Forms and Components:

- [Introduction to Components](#)
- [Designing Script Forms](#)
- [Writing Event Handlers.](#)

Introduction to Components

The scripting system handles two types of components: Visual and Non-visual components. The visual components are the ones you use to build the user interface and the non-visual components are used for different tasks such as these Timer, OpenFileDialog and MainMenu components. You use the non-visual Timer component to activate specific code at scheduled intervals and it is never seen by the user. The Button, Edit and Memo components are visual components and are seen by the user.

Both types of components appear at design time, but non visual components are not visible at runtime. Components from the *Tool Palette* panel are object oriented and have the three following items:

- Properties
- Events
- Methods

A property is a characteristic of an object that influence either the visible behavior or the operations of this object. For example, the `Visible` property determines whether this object can be seen or not on a script form.

An event is an action or occurrence detected by the script. In a script, the programmer writes code for each event handler which is designed to capture a specific event such as a mouse click.

A method is a procedure that is always associated with an object and defines the behavior of an object.

All script forms have one or more components. Components usually display information or allow the user to perform an action. For example a Label is used to display static text, an Edit box is used to allow user to input some data, a Button can be used to initiate actions.

Any combination of components can be placed on a form and while your script is running, a user can interact with any component on a form. It is your task as a programmer to decide what happens when a user clicks a button or changes a text in an Edit box.

The Scripting system supplies a number of components for you to create complex user interfaces for your scripts. You can find all the components you can place on a form from the *Tool Palette*.

To place a component on a form, locate its icon on the *Tool Palette* panel and double-click it. This action places a component on the active form. Visual representation of most components is set with their set of properties. When you first place a component on a form, it is placed in a default position, with default width and height, however you can resize or re-position this component. You can also change the size and position later using the *Object Inspector*.

When you drop a component onto a form, the Scripting system automatically generates code necessary to use the component and updates the script form. You only need to set properties, put code in event handlers and use methods as necessary to get the component on the form working.

Designing Script Forms

A script form is designed to interact with the user within the Altium Designer environment. Designing script forms is the core of visual development in the Altium Designer. Every component you place on a script form and every property you set is stored in a file describing the form (*.DFM file) and has a relationship with the associated script code (the *.VBS file). For every script form, there is the *.VBS file and the corresponding *.DFM file.

When you are working with a script form and its components, you can operate on its properties using the **Object Inspector** panel. You can select more than one component by shift clicking on the components or by dragging a selection rectangle around the components on this script form. A script form has a title mapped to the **Caption** property on the *Object Inspector* panel.

Creating a New Script Form

With a script project open, right click on a project in the *Projects* panel, and a pop up menu appears, click on the **Add New to Project** item, and choose **Java Script Form** item. A new script form appears with the `EditScript1.js` name as the default name. Alternatively, in a *.PrjPCB project, select **File » New » Script Files » Java Script Form** command.

Displaying a Script Form

In a script, you will need to have a routine that displays the form when the script form is executed in Altium Designer. Within this routine, you invoke the `ShowModal` method for the form. The `Visible` property of the form needs to be false if the `ShowModal` method of the script form is to work properly.

ShowModal example

```
function RunDialog(){
    DialogForm.ShowModal;
}
```

The `ShowModal` example is a simple example of displaying the script form when the `RunDialog` dialog from the script is invoked. Note, you can assign values to the components of the `DialogForm` object before the `DialogForm.ShowModal` is invoked.

ModalResult example

```
function bOKButtonClick(Sender){
    ModalResult = mrOK
}

function bCancelButtonClick(Sender){
    ModalResult = mrCancel
}

function RunShowModalExample(){
    //Form's Visible property must be false for ShowModal to work properly.
    if (Form.ShowModal == mrOk)      ShowMessage("mrOk");
    if (Form.ShowModal == mrCancel)  ShowMessage("mrCancel");
}
```

The `ModalResult` property example here is a bit more complex. The following methods are used for buttons in a script form. The methods cause the dialog to terminate when the user clicks either the **OK** or **Cancel** button, returning `mrOk` or `mrCancel` from the `ShowModal` method respectively.

You could also set the `ModalResult` value to `mrOk` for the **OK** button and `mrCancel` for the **Cancel** button in their event handlers to accomplish the same thing. When the user clicks either button, the dialog box closes. There is no need to call the `Close` method, because when you set the `ModalResult` method, the script engine closes the script form for you automatically.

Note, if you wish to set the form's `ModalResult` to cancel, when user presses the **Escape** key, enable the `Cancel` property to `True` for the **Cancel** button in the *Object Inspector* panel or insert `Sender.Cancel := True` in the form's button cancel click event handler.

Accepting input from the user

One of the common components that can accept input from the user is the `EditBox` component. This `EditBox` component has a field where the user can type in a string of characters. There are other components such as masked edit component which is an edit component with an input mask stored in a string. This controls or filters the input.

The example below illustrates what is happening, when user clicks on the button after typing something in the edit box. That is, if the user did not type anything in the edit component, the event handler responds with a warning message.

```
function TScriptForm.ButtonClick(Sender){
    if (Edit1.Text == "") {
        ShowMessage('Warning - empty input!')
        return;
    }
    ' do something else for the input
}
```

Note, A user can move the input focus by using the Tab key or by clicking with the mouse on another control on the form.

Responding to Events

When you press the mouse button on a form or a component, Altium Designer sends a message and the Scripting System responds by receiving an event notification and calling the appropriate event handler method.

Writing Event Handlers

Your script may need to respond to events that might occur to a component at run time. An event is a link between an occurrence in Altium Designer such as clicking a button and a piece of code that responds to that occurrence. The responding code is an event handler. This code modifies property values and calls methods.

Each component, beside its properties, has a set of event names. You as the programmer decide how a script will react to a user's actions in Altium Designer. For instance, when a user clicks a button on a form, Altium Designer sends a message to the script and the script reacts to this new event. If the `OnClick` event for a button is specified, it gets executed.

All such components have an event for getting and losing focus too. However, if you do not specify the code for `OnEnter` and `OnExit` (`OnEnter` - the control has focus; `OnExit` - the control loses focus) the event will be ignored by your script.

List of Properties for a Component

To see a list of properties for a component, select a component and in the *Object Inspector*, activate the **Properties** tab.

List of Events for a Component

To see a list of events a component can react on, select a component, and in the *Object Inspector* activate the **Events** tab. To create an event handling procedure, decide on what event you want your component to react to and double click the event name.

For example, select the `Button1` component from the *Tool Palette*, drop it on the script form and double click next to the **OnClick** event name. The scripting system will bring the Code Editor to the top of the Altium Designer and the skeleton code for the `OnClick` event will be created.

For example, a button has a `Close` method in the `CloseClick` event handler. When the button is clicked, the button event handler captures the on click event, and the code inside the event handler gets executed. That is, the `Close` method closes the script form.

Event Handler Example

```
function bCloseClick(Sender)
{
    Close();
}
```

Standalone function example

```
function DrawSine()
{
```

```
ShowModal ( ) ;  
}
```

In a nutshell, you select a component either on the form or by using the *Object Inspector* panel, select the **Events** page, and double click on the right side of the `OnClick` event, a new event handler will appear on the script. Alternatively, double click on the button and the scripting system will add a handler for this `OnClick` event. Other types of components will have completely different default actions.

List of Methods for a Component

To see a list of methods for a component, see the [Component Reference](#) and check out the Borland Delphi documentation.

Creating Components from a Script during run time

You can directly create and destroy components in a script – normally you don't need to pass in the handle of the form because the script form takes care of it automatically for you, instead pass a `Nil` parameter to the Constructor of a component.

For example, you can create and destroy Open and Save Dialogs (`TOpenDialog` and `TSaveDialog` classes as part of Borland Delphi Run Time Library).

Revision History

Date	Version No.	Revision
01-Dec-2004	1.0	New product release
26-Apr-2005	1.1	Updated for Altium Designer
15-Dec-2005	1.2	Updated for Altium Designer 6
13-Jan-2006	1.3	Minor text updates.
11-Dec-2007	1.4	Updated for Altium Designer 6.9
27-Feb-2008	1.5	Updated for A4 page size.
31-Aug-2011	-	Updated template.

Software, hardware, documentation and related materials:

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