



# **Using Intel® Visual Fortran to Create and Build Windows\*-Based Applications**

Document Number: 324197-001US

[www.intel.com](http://www.intel.com)

[Legal Information](#)

# Contents

<b>Legal Information.....</b>	<b>5</b>
<b>Chapter 1: Introduction</b>	
Overview.....	6
Notational Conventions.....	6
Related Information.....	7
<b>Chapter 2: Creating Windowing Applications</b>	
Creating Windowing Applications Overview.....	8
Understanding Coding Requirements for Fortran Windowing Applications.....	8
Using Menus and Dialogs in SDI and MDI Fortran Windowing Applications.....	11
Sample Fortran Windows Applications.....	13
Advanced Graphics Using OpenGL.....	13
<b>Chapter 3: Creating and Using DLLs</b>	
Creating and Using Fortran DLLs Overview.....	15
Coding Requirements for Sharing Procedures in DLLs.....	15
Coding Requirements for Sharing Data in DLLs.....	16
Building Dynamic-Link Libraries.....	18
Building Executables that Use DLLs.....	20
<b>Chapter 4: Using QuickWin</b>	
Using QuickWin Overview.....	21
Special Naming Convention for Certain QuickWin and Windows* Graphics Routines.....	22
Comparing QuickWin with Windows*-Based Applications.....	22
Using Windows API Routines with QuickWin.....	23
Types of QuickWin Programs.....	23
QuickWin Programs Overview.....	23
Fortran Standard Graphics Applications.....	24
Fortran QuickWin Graphics Applications.....	24
The QuickWin User Interface.....	25
QuickWin User Interface Overview.....	25
Default QuickWin Menus.....	25
USE Statement Needed for Fortran QuickWin Applications.....	26
Creating QuickWin Windows.....	27
Creating QuickWin Windows Overview.....	27
Accessing Window Properties.....	27
Creating Child Windows.....	29
Giving a Window Focus and Setting the Active Window.....	31
Keeping Child Windows Open.....	32
Controlling Size and Position of Windows.....	32
Using QuickWin Graphics Library Routines.....	33
Using Graphics Library Routines.....	33
Selecting Display Options.....	33
Checking the Current Graphics Mode.....	34

Setting the Graphics Mode.....	34
Setting Figure Properties.....	35
Understanding Coordinate Systems.....	35
Understanding Coordinate Systems Overview.....	35
Text Coordinates.....	36
Graphics Coordinates.....	36
Setting Graphics Coordinates.....	39
Real Coordinates Sample Program.....	39
Adding Color.....	43
Adding Color Overview.....	43
Color Mixing.....	44
VGA Color Palette.....	45
Using Text Colors.....	46
Writing a Graphics Program.....	46
Writing a Graphics Program Overview.....	46
Activating a Graphics Mode.....	47
Drawing Lines on the Screen.....	48
Drawing a Sine Curve.....	49
Adding Shapes.....	50
Displaying Graphics Output.....	51
Displaying Graphics Output Overview.....	51
Drawing Graphics.....	51
Displaying Character-Based Text.....	53
Displaying Font-Based Characters.....	54
Using Fonts from the Graphics Library.....	54
Storing and Retrieving Images.....	57
Working With Screen Images.....	57
Transferring Images in Memory.....	58
Loading and Saving Images to Files.....	58
Editing Text and Graphics from the QuickWin Edit Menu.....	58
Customizing QuickWin Applications.....	59
Customizing QuickWin Applications Overview.....	59
Enhancing QuickWin Applications.....	59
Controlling Menus.....	60
Changing Status Bar and State Messages.....	63
Displaying Message Boxes.....	63
Defining an About Box.....	64
Using Custom Icons.....	64
Using a Mouse.....	64
QuickWin Programming Precautions.....	67
QuickWin Programming Precautions Overview.....	67
Using Blocking Procedures.....	67
Using Callback Routines.....	68
Simulating Nonblocking I/O.....	68

## Chapter 5: Using Dialog Boxes for Application Controls

Using Dialog Boxes for Application Controls Overview.....	69
Using the Resource Editor to Design a Dialog Box.....	69
Designing a Dialog Box Overview.....	69
Setting Control Properties.....	73

Including Resources Using Multiple Resource Files.....	74
The Include (.FD and .H) Files.....	74
Writing a Dialog Application.....	74
Writing a Dialog Application Overview.....	75
Initializing and Activating the Dialog Box.....	75
Using Dialog Callback Routines.....	77
Using a Modeless Dialog Box.....	78
Using Fortran AppWizards to Help Add Modal Dialog Box Coding.....	79
Using Fortran AppWizards to Help Add Modeless Dialog Box Coding.....	81
Using Dialog Controls in a DLL.....	83
Summary of Dialog Routines.....	84
Understanding Dialog Controls.....	85
Understanding Dialog Controls Overview.....	85
Using Control Indexes.....	86
Available Indexes for Each Dialog Control.....	87
Specifying Control Indexes.....	90
Using Dialog Controls.....	91
Using Dialog Controls Overview.....	91
Using Static Text.....	92
Using Edit Boxes.....	92
Using Group Boxes.....	93
Using Check Boxes and Radio Buttons.....	93
Using Buttons.....	94
Using List Boxes and Combo Boxes.....	94
Using Scroll Bars.....	97
Using Pictures.....	98
Using Progress Bars.....	98
Using Spin Controls.....	98
Using Sliders.....	99
Using Tab Controls.....	99
Setting Return Values and Exiting.....	100
Using ActiveX* Controls.....	100
Using ActiveX* Controls Overview.....	101
Using the Resource Editor to Insert an ActiveX Control.....	101
Using the Intel® Fortran Module Wizard to Generate a Module.....	101
Adding Code to Your Application.....	102
Registering an ActiveX Control.....	104

# *Legal Information*

---

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL(R) PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER, AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS OTHERWISE AGREED IN WRITING BY INTEL, THE INTEL PRODUCTS ARE NOT DESIGNED NOR INTENDED FOR ANY APPLICATION IN WHICH THE FAILURE OF THE INTEL PRODUCT COULD CREATE A SITUATION WHERE PERSONAL INJURY OR DEATH MAY OCCUR.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or by visiting Intel's Web Site.

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See [http://www.intel.com/products/processor\\_number](http://www.intel.com/products/processor_number) for details.

Centrino, Cilk, Intel, Intel Atom, Intel Core, Intel NetBurst, Itanium, MMX, Pentium, Xeon are trademarks of Intel Corporation in the U.S. and/or other countries.

\* Other names and brands may be claimed as the property of others.

Copyright (C) 1996-2012, Intel Corporation. All rights reserved.

Copyright (C) 2012, Intel Corporation. All rights reserved.

Portions Copyright (C) 2001, Hewlett-Packard Development Company, L.P.

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

# Introduction

---

## Overview

---

This document describes how to use features specific to Windows\* OS when building applications using the Intel® Visual Fortran Compiler.

## Notational Conventions

---

This documentation uses the following conventions:

THIS TYPE	Indicates statements, data types, directives, and other language keywords. Examples of statement keywords are WRITE, INTEGER, DO, and OPEN.
<i>this type</i>	Indicates command-line or option arguments, new terms, or emphasized text. Most new terms are defined in the Glossary.
This type	Indicates a code example.
<b>This type</b>	Indicates what you type as input.
<b>File &gt; Open</b>	Indicates menu names, menu items, button names, dialog window names, and other user-interface items.
{value   value}	Menu names and menu items joined by a greater than (>) sign indicate a sequence of actions. For example, "Click <b>File&gt;Open</b> " indicates that in the <b>File</b> menu, click <b>Open</b> to perform this action.
[ <i>item</i> ]	Indicates a choice of items or values. You can usually only choose one of the values in the braces.
<i>item</i> [, <i>item</i> ]...	Indicates items that are optional. Brackets are also used in code examples to show arrays.
Windows* OS	Indicates that the item preceding the ellipsis (three dots) can be repeated. In some code examples, a horizontal ellipsis means that not all of the statements are shown.
Windows operating system	These terms refer to all supported Windows* operating systems.
compiler option	This term refers to Windows* OS options that can be used on the compiler command line.

---

## Related Information

For more information, see the Intel® Visual Fortran Compiler documentation set, and specifically the *Intel® Visual Fortran Compiler User and Reference Guides*.

These guides include the following information:

- Key features
- Compatibility and Portability
- Compilation
- Program Structure
- Compiler Reference
- Language Reference

# Creating Windowing Applications

## Creating Windowing Applications Overview

With Intel® Fortran, you can build Fortran applications that are also fully-featured Windows\*-based applications. You can create full Windows-based applications that use the familiar Windows interface, complete with tool bars, pull-down menus, dialog boxes, and other features. You can include data entry and mouse control, and interaction with programs written in other languages or commercial programs such as Microsoft\* Excel\*.

With full Windows-based applications programming you can:

- Deliver Fortran applications with a Windows Graphical User Interface (GUI). GUI applications typically use at least the Graphic Device Interface (GDI) and USER32 Windows API routines.
- Access all available Windows GDI calls with your Fortran applications. GDI functions use a 32-bit coordinate system, allowing coordinates in the +/- 2 GB range, and performs skewing, reflection, rotation and shearing.

Only the Fortran Windows project type provides access to the full set of Windows API routines needed to create GUI applications. Windows projects are much more complex than other kinds of Fortran projects. Before attempting to use the full capabilities of Windows programming, you should be comfortable with writing C applications and should familiarize yourself with the .NET Framework Software Development Kit (SDK).

To build your application as a Fortran Windows application in the visual development environment, choose **Windowing Application** from the list of Project types when you open a new project.

When using the command line, specify the /winapp option to search the commonly used link libraries.

Fortran Windows applications must use the IFWIN module or subset of IFWIN.

The following Fortran Windows application topics are discussed:

### See Also

[Understanding Coding Requirements for Fortran Windowing Applications](#)

[Using Menus and Dialogs in SDI and MDI Fortran Windowing Applications](#)

## Understanding Coding Requirements for Fortran Windowing Applications

This topic covers the following:

- General Coding Requirements: WinMain Function and USE Statements
- Code Generation Options Using the Fortran Windows Application Wizard
- Single Document Interface (SDI) or Multiple Document Interface (MDI) Sample Code

### General Coding Requirements: WinMain Function and USE Statements

Coding requirements for Fortran Windowing applications include (in the following order):

1. WinMain function declaration and interface

The WinMain function declaration and interface are required for Windows Graphical User Interface (GUI) applications (typically use at least the GDI and USER32 Windows API routines). An interface block for the function declaration can be provided. The following function must be defined by the user:

```
INTEGER(DWORD) function WinMain (hInstance, hPrevInstance, &
& lpszCmdLine, nCmdShow)
use IFWIN
!DEC$ ATTRIBUTES STDCALL, DECORATE, ALIAS:"WinMain" :: WinMain
INTEGER(HANDLE), INTENT(IN) :: hInstance, hPrevInstance
INTEGER(LPVOID), INTENT(IN) :: lpszCmdLine
INTEGER(DWORD), INTENT(IN) :: nCmdShow
```

In a program that includes a WinMain function, no program unit can be identified as the main program with the **PROGRAM** statement.

**2.** The statement **USE IFWIN** or other appropriate **USE** statements

The **USE IFWIN** statement makes available declarations of constants, derived types and procedure interfaces for much of the Windows Application Programming Interface (API) routines, also referred to as the Windows API. The Intel® Visual Fortran Compiler also provides individual modules for the various libraries that make up the Windows API, such as **KERNEL32** and **USER32**. Any Fortran program or subprogram that references declarations from the Windows API must include a **USE** statement for either **IFWIN**, which collects all the available modules, or the appropriate subset modules for the Windows API libraries that are used.

If you want to limit the type of parameters and interfaces for Windows applications or if unresolved references occur when linking your Fortran Windowing application, see the *Intel® Visual Fortran Compiler User and Reference Guides* for information on calling Windows API routines.

**3.** Data declarations for the WinMain function arguments.

**4.** Application-dependent code (other **USE** statements, variable declarations, and then executable code).

For example, consider the first lines of this sample, which uses free-form source code:

```
INTEGER(DWORD) function WinMain (hInstance, hPrevInstance, &
& lpszCmdLine, nCmdShow)
use IFWIN
!DEC$ ATTRIBUTES STDCALL, DECORATE, ALIAS:"WinMain" :: WinMain
INTEGER(HANDLE), INTENT(IN) :: hInstance, hPrevInstance
INTEGER(LPVOID), INTENT(IN) :: lpszCmdLine
INTEGER(DWORD), INTENT(IN) :: nCmdShow
.
.
.
```

IFWIN.F90 includes a Fortran version (a subset) of the Windows WINDOWS.H header file.

## Code Generation Options Using the Fortran Windowing Application Wizard

When you choose the Fortran Windowing Application project type, you will need to select the type of project.

The following choices are available:

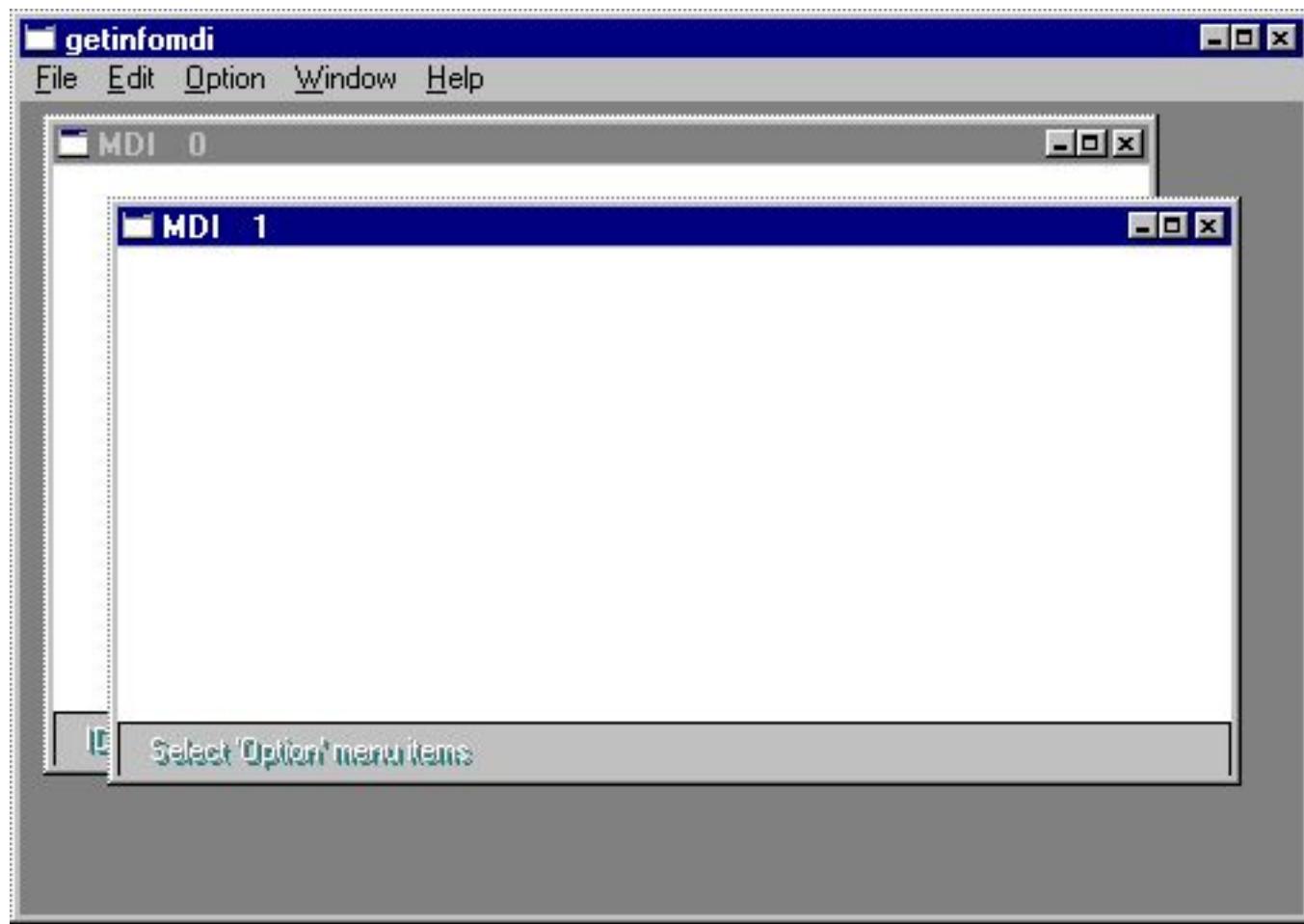
- Empty project
- Single Document Interface (SDI) sample code
- Multiple Document Interface (MDI) sample code
- Dialog-based sample code
- Single Document Interface (SDI) ActiveX\* sample code
- Multiple Document Interface (MDI) ActiveX sample code
- Dialog-based ActiveX sample code

The ActiveX AppWizards will add additional template code for supporting ActiveX controls in your dialog boxes.

## Single Document Interface (SDI) or Multiple Document Interface (MDI) Sample Code

Creating these types of application requires advanced programming expertise and knowledge of the Windows routines API. Such applications call certain library routines and require the statement `USE IFWIN`. SDI applications display a single window, whereas MDI application can display multiple windows (a main frame window with one or more child windows that appear within the frame window).

For example, select the MDI option from the Fortran AppWizard screen. After you build and run the application (without changing the source files), the following screen might appear after you create two child window by clicking New from the File menu twice:



If you selected the SDI option from the Fortran AppWizard screen and built and ran the application, you could not create child windows within the main window.

### For more information:

- On using menus and dialogs from SDI and MDI Fortran Windowing applications, see [Using Menus and Dialogs in SDI and MDI Fortran Windowing Applications](#)
- About SDI and MDI Samples that use the Fortran Windowing project type, see [Sample Fortran Windows Applications](#).

## Dialog-Based Sample Code

Dialog applications use a dialog box for the application's main window. Creating these applications requires some knowledge of the Windows routines API, but considerably less than for a SDI or MDI application. These applications call certain Intel Visual Fortran library routines and require the statement `USE IFLOGM`. Dialog-based applications usually do not have menus.

For example, select the Dialog-based applications from the Fortran AppWizard screen. After you build and run the application (without changing the source files), the following dialog box appears:



You can use dialogs in any project type. Dialogs don't require the use of a windowing application if you are using the module `IFLOGM`.

**For more information:**

- On using dialog boxes, see [Using Dialog Boxes for Application Controls Overview](#)

## Using Menus and Dialogs in SDI and MDI Fortran Windowing Applications

This section describes the following topics:

- [Creating the Menu](#)
- [Using the Menu](#)
- [Handling Menu Messages](#)
- [Using Dialogs in an SDI or MDI Application](#)

### Creating the Menu

When you create a new SDI or MDI application, a default menu bar is created for you. The default menu bar contains many of the menu entries that are common to Windows applications. You can modify the default menu, or create a new menu, by using the Menu Editor, which is one of the Visual Studio Resource Editors. The Resource Editor is not available with the Visual Studio Shell.

**To create a new menu resource (menu bar):**

1. From the Insert menu, select Resource.
2. Select Menu as the resource type.

The menu bar consists of multiple menu names, where each menu name contains one or more items. You can use the Menu Editor to create submenus (select the pop-up property).

**To edit an existing menu:**

1. Double-click on the project .RC file.
2. Expand the Menu item in the list of resource types.
3. Double click on the menu name.

For more information about the menu resource editor, see the Visual C++ User's Guide section on Resource Editors.

## Using the Menu

To use a menu bar in your Fortran application, you must load the menu resource and use it when creating the main window of the application. Code to do this is created automatically by the Fortran Windowing AppWizard. The code that loads the menu resource is:

```
ghMenu = LoadMenu(hInstance, LOC(lpszMenuName))
```

The returned menu handle is then used in the call to `CreateWindowEx`:

```
ghwndMain = CreateWindowEx( 0, lpszClassName,           &
                           lpszAppName,                 &
                           INT(WS_OVERLAPPEDWINDOW),   &
                           CW_USEDEFAULT,              &
                           0,                          &
                           CW_USEDEFAULT,              &
                           0,                          &
                           NULL,                      &
                           ghMenu,                    &
                           hInstance,                 &
                           NULL )
```

## Handling Menu Messages

Windows sends a `WM_COMMAND` message to the main window when the user selects an item from the menu. The `wParam` parameter to the `WM_COMMAND` message contains:

- The low-order word specifies the identifier of the menu item
- The high-order word specifies either 0 if the message is from a menu item, or 1 if the message is the result of an accelerator key. It is usually not important to distinguish between these two cases, but you must be careful to compare against only the low-order word as in the example below.

For example, the following code from the main window procedure generated by the Fortran Windowing AppWizard handles the `WM_COMMAND` messages from the File menu Exit item and the Help menu About item:

```
! WM_COMMAND: user command
case (WM_COMMAND)
  select case ( IAND(wParam, 16#ffff ) )

    case (IDM_EXIT)
      ret = SendMessage( hWnd, WM_CLOSE, 0, 0 )
      MainWndProc = 0
      return
    case (IDM_ABOUT)
      lpszName = "AboutDlg" C
      ret = DialogBoxParam(ghInstance,LOC(lpszName),hWnd,&
                           LOC(AboutDlgProc), 0)
      MainWndProc = 0
      return

  ...
```

For advanced techniques with using menus, refer to the online Platform SDK section on User Interface Services.

## Using Dialogs in an SDI or MDI Application

A Fortran Windowing SDI or MDI application that uses dialogs has the choice of using:

---

- Intel Visual Fortran Dialog routines
- native Windows APIs for creating dialog boxes

For any particular dialog box, you should use either the Intel Visual Fortran Dialog routines or the native Windows dialog box APIs. For example, if you create a dialog box using Windows APIs, you cannot use the Intel Visual Fortran dialog routines to work with that dialog box.

You should note, for example, that the code generated by the Fortran Windows AppWizard uses the native Windows APIs to display the About dialog box.

**For more information:**

- On using the Intel Visual Fortran Dialog routines, see [Using Dialog Boxes for Application Controls Overview](#)
- On using the Windows APIs, see the online Platform SDK section on User Interface Services

---

## Sample Fortran Windows Applications

The Intel Visual Fortran Samples folder contains many Fortran Windowing applications that demonstrate Windows\* functionality or a particular Windows function. See the product release notes for the location of the Samples folder.

If you are unfamiliar with full Windows applications, start by looking at:

- Sample SDI and MDI Fortran Windows Samples in the `WIN32` folder, such as Generic, Platform, or Angle.
- Sample dialog Fortran Windows Samples in the `DIALOG` folder, such as TEMP and WHIZZY. For more information about coding requirements for dialog boxes and using the Dialog Resource editor, see [Using Dialog Boxes for Application Controls Overview](#).

---

## Advanced Graphics Using OpenGL

OpenGL is a library of graphic functions that create sophisticated graphic displays such as 3-D images and animation. OpenGL is commonly available on workstations. Writing to this standard allows your program to be ported easily to other platforms.

OpenGL windows are used independently of and in addition to any console, QuickWin and regular Windows windows your application uses. Every window in OpenGL uses a pixel format, and the pixels carry, among other things, RGB values, opacity values, and depth values so that pixels with a small depth (shallow) overwrite deeper pixels. The basic steps in creating OpenGL applications are:

- Specify the pixel format
- Specify how the pixels will be rendered on the video device
- Call OpenGL commands

OpenGL programming is straightforward, but requires a particular initialization and order, like other software tools. References to get you started are:

- *The OpenGL Reference Manual*, Addison-Wesley, ISBN 0-201-46140-4.
- *The OpenGL Programming Guide*, Addison-Wesley, ISBN 0-201-46138-2.
- *OpenGL SuperBible: The Complete Guide to OpenGL Programming on Windows NT and Windows 95*, Richard Wright and Michael Sweet, Waite Group Press (Division of Sams Publishing), 1996, ISBN 1-57169-073-5.
- OpenGL documentation in the Platform SDK title in HTML Help Viewer.
- The OpenGL description from the Microsoft Visual C++ manuals.

---

**NOTE**

Microsoft no longer provides the `glAux` procedures.

Intel Visual Fortran provides an OpenGL module, IFOPNGL.MOD, invoked with the `USE` statement line:

```
USE IFOPNGL
```

When you use this module, all constants and interfaces that bind Fortran to the OpenGL routines become available. Any link libraries required to link with an OpenGL program are automatically searched if **USE IFOPNGL** is present in your Fortran program.

An OpenGL window can be opened from a console, Windows, or QuickWin application. The OpenGL window uses OpenGL calls exclusively, not normal Graphic Device Interface (GDI) calls. Likewise, OpenGL calls cannot be made within an ordinary Windows window or QuickWin child window, because special initialization is required for OpenGL calls.

The Fortran OpenGL identifiers are the same as the C identifiers (such as using a `GL_` prefix for constants), except that the `gl` prefix is changed to `fgl` for routines and identifier lengths are limited to 31 characters. The data types in the OpenGL C binding are translated to Fortran types as shown in the following table:

OpenGL/C Type	Fortran Data Type
<code>GLbyte</code>	<code>INTEGER(1)</code>
<code>GLshort</code>	<code>INTEGER(2)</code>
<code>GLint, GLsizei</code>	<code>INTEGER(4)</code>
<code>GLfloat, GLclampf</code>	<code>REAL(4)</code>
<code>GLdouble, GLclampd</code>	<code>REAL(8)</code>
<code>GLubyte</code>	<code>INTEGER(1)</code>
<code>GLboolean</code>	<code>INTEGER(1)</code>
<code>GLushort</code>	<code>INTEGER(2)</code>
<code>GLuint, GLenum, GLbitfield</code>	<code>INTEGER(4)</code>
<code>GLvoid</code>	<code>INTEGER(INT_PTR_KIND())</code>
pointers	<code>INTEGER(INT_PTR_KIND())</code>

If you include (`USE`) the parameter constant definitions from `IFOPNGLT.F90` (such as by `USE IFOPNGL`), you can use the constants to specify the kind type, such as `INTEGER(K_GLint)` instead of `INTEGER(4)`.

# Creating and Using DLLs

## Creating and Using Fortran DLLs Overview

A dynamic-link library is a collection of source and object code and is similar in many ways to a static library. The differences between the two libraries are:

- The DLL is associated with a main project during execution, not during linking. Unlike a static library where routines are included in the base executable image during linking, the routines in a DLL are loaded when an application that references that DLL is loaded (run time).

A dynamic-link library (DLL) contains one or more subprogram procedures (functions or subroutines) that are compiled, linked, and stored separately from the applications using them. Because the functions or subroutines are separate from the applications using them, they can be shared or replaced easily.

Other advantages of DLLs include:

- You can change the functions in a DLL without recompiling or relinking the applications that use them, as long as the functions' arguments and return types do not change.  
This allows you to upgrade your applications easily. For example, a display driver DLL can be modified to support a display that was not available when your application was created.
- When general functions are placed in DLLs, the applications that share the DLLs can have smaller executables.
- Multiple applications can access the same DLL. This reduces the overall amount of memory needed in the system, which results in fewer memory swaps to disk and improves performance.
- Common blocks or module data placed in a DLL can be shared across multiple processes.

To build a DLL in the integrated development environment, specify the Fortran Dynamic-Link Library project type. On the command line, specify the /dll option.

You cannot make a QuickWin application into a DLL (see [Using QuickWin Overview](#)) and QuickWin applications cannot be used with Fortran run-time routines in a DLL.

### See Also

[Coding Requirements for Sharing Procedures in DLLs](#)

[Coding Requirements for Sharing Data in DLLs](#)

[Building Dynamic-Link Libraries](#)

[Building Executables that Use DLLs](#)

## Coding Requirements for Sharing Procedures in DLLs

A dynamic-link library (DLL) contains one or more subprograms that are compiled, linked and stored separately from the applications using them.

Coding requirements include using the `cDEC$ ATTRIBUTES` compiler directive `DLLIMPORT` and `DLLEXPORT` options. Variables and routines declared in the main program and in the DLL are not visible to each other unless you use `DLLIMPORT` and `DLLEXPORT`.

This section discusses aspects of sharing subprogram procedures (functions and subroutines) in a Fortran DLL.

**To export and import each DLL subprogram:**

1. Within your Fortran DLL, export each subprogram that will be used outside the DLL. Add !DEC\$ ATTRIBUTES DLLEXPORT to declare that a function, subroutine, or data is being exported outside the DLL. For example:

```
SUBROUTINE ARRAYTEST(arr)
!DEC$ ATTRIBUTES DLLEXPORT :: ARRAYTEST
REAL arr(3, 7)
INTEGER i, j
DO i = 1, 3
DO j = 1, 7
arr (i, j) = 11.0 * i + j
END DO
END DO
END SUBROUTINE
```

2. Within your Fortran application, import each DLL subprogram. Add !DEC\$ ATTRIBUTES DLLIMPORT to declare that a function, subroutine, or data is being imported from outside the current image. For example:

```
INTERFACE
SUBROUTINE ARRAYTEST (rarray)
!DEC$ ATTRIBUTES DLLIMPORT :: ARRAYTEST
REAL rarray(3, 7)
END SUBROUTINE ARRAYTEST
END INTERFACE
CALL ARRAYTEST (rarray)
```

Or, not using an INTERFACE block:

```
PROGRAM TESTA
!DEC$ ATTRIBUTES DLLIMPORT::: ARRAYTEST
REAL rarray (3,7)
CALL ARRAYTEST(rarray)
END PROGRAM TESTA
```

The DLLEXPORT and DLLIMPORT options (for the cDEC\$ ATTRIBUTES directive) tell the linker that a procedure, variable or COMMON block is to be visible in a DLL, or that it can be found in a DLL.

The DLLEXPORT property declares that functions or data are being exported to other images or DLLs, usually eliminating the need for a Linker module definition (.DEF) file to export symbols for the functions or subroutines declared with DLLEXPORT. When you declare a function, subroutine, or data with the DLLEXPORT property, it must be defined in the same module of the same program.

A program that uses symbols defined in another image (such as a DLL) must import them. The DLL user needs to link with the import LIB file from the other image and use the DLLIMPORT property inside the application that imports the symbol. The DLLIMPORT option is used in a declaration, not a definition, because you do not define the symbol you are importing.

3. Build the DLL and then build the main program, as described in [Building Dynamic-Link Libraries](#).

Fortran and C applications can call Fortran and C DLLs provided the calling conventions are consistent.

## See Also

[Building Dynamic-Link Libraries](#) About building DLLs

[Coding Requirements for Sharing Data in DLLs](#) sharing either common block or module data in a DLL

[Exporting and Importing Data Objects in Modules](#)

## Coding Requirements for Sharing Data in DLLs

A dynamic-link library (DLL) is an executable file that can be used as a place to share data across processes.

Coding requirements include using the cDEC\$ ATTRIBUTES compiler directive DLLIMPORT and DLLEXPORT options. Variables and routines declared in the program and in the DLL are not visible to each other unless you use DLLIMPORT and DLLEXPORT.

When sharing data among multiple threads or processes, do the following:

- Declare the order, size, and data types of shared data consistently in the DLL and in all procedures importing the DLL exported data.
- If more than one thread or process can write to the common block simultaneously, use the appropriate features of the Windows\* operating system to control access to the shared data. Such features include critical sections (for single process, multiple thread synchronization) and mutex objects (for multi-process synchronization).

This section discusses:

- [Exporting and Importing Common Block Data](#)
- [Exporting and Importing Data Objects in Modules](#)

## Exporting and Importing Common Block Data

Data and code in a dynamic-link library is loaded into the same address space as the data and code of the program that calls it. However, variables and routines declared in the program and in the DLL are not visible to one another unless you use the **cDEC\$ ATTRIBUTES** compiler directive **DLLIMPORT** and **DLLEXPORT** options. These directive options enable the compiler and linker to map to the correct portions of the address space so that the data and routines can be shared, allowing use of common block data across multiple images.

You can use **DLLEXPORT** to declare that a common block in a DLL is being exported to a program or another DLL. Similarly, you can use **DLLIMPORT** within a calling routine to tell the compiler that a common block is being imported from the DLL that defines it.

### To export and import common block data:

1. Create a common block in the subprogram that will be built into a Fortran DLL. Export that common block with **!DEC\$ ATTRIBUTES DLLEXPORT**, followed by the **COMMON** statement, associated data declarations, and any procedure declarations to be exported. For example:

```
!DEC$ ATTRIBUTES DLLEXPORT :: /X/
COMMON /X/ C, B, A
REAL C, B, A
END
...
```

If the Fortran DLL procedure contains only a common block declaration, you can use the **BLOCK DATA** statement:

```
BLOCK DATA T
!DEC$ ATTRIBUTES DLLEXPORT :: /X/
COMMON /X/ C, B, A
REAL C, B, A
END
```

The Fortran procedure to be linked into a DLL can contain a procedure, such as the following:

```
SUBROUTINE SETA(I)
!DEC$ ATTRIBUTES DLLEXPORT :: SETA, /X/
COMMON /X/ C, B, A
REAL C, B, A
INTEGER I
A = A + 1.
I = I + 1
WRITE (6,*) 'In SETA subroutine, values of A and I:' , A, I
RETURN
END SUBROUTINE
```

2. Refer to the common block in the main program with **!DEC\$ ATTRIBUTES DLLIMPORT**, followed by the local data declarations and any procedure declarations defined in the exported DLL. For example:

```
PROGRAM COMMONX
!DEC$ ATTRIBUTES DLLIMPORT::: SETA, /X/
COMMON /X/ C, B, A
```

```

REAL C, B, A, Q
EQUIVALENCE (A,Q)
A = 0.
I = 0
WRITE (6,*) 'In Main program before calling SETA...'
WRITE (6,*) 'values of A and I:' , A, I
CALL SETA(I)
WRITE (6,*) 'In Main program after calling SETA...'
WRITE (6,*) 'values of A and I:' , Q, I      A
= A + 1.
I = I + 1
WRITE (6,*) 'In Main program after incrementing values'
END PROGRAM COMMONX

```

3. Build the DLL and then build the main program, as described in [Building Dynamic-Link Libraries](#).

## Exporting and Importing Data Objects in Modules

You can give data objects in a module the DLLEXPORT property, in which case the object is exported from a DLL.

When a module is used in other program units, through the `USE` statement, any objects in the module with the DLLEXPORT property are treated in the program using the module as if they were declared with the DLLIMPORT property. So, a main program that uses a module contained in a DLL has the correct import attributes for all objects exported from the DLL.

You can also give some objects in a module the DLLIMPORT property. Only procedure declarations in `INTERFACE` blocks and objects declared `EXTERNAL` or with `cDEC$ ATTRIBUTES EXTERN` can have the DLLIMPORT property. In this case, the objects are imported by any program unit using the module.

If you use a module that is part of a DLL and you use an object from that module that does not have the DLLEXPORT or DLLIMPORT property, the results are undefined.

### For more information:

- On building a DLL, see [Building Dynamic-Link Libraries](#).

## Building Dynamic-Link Libraries

When you first create a DLL, create a new project, and select Fortran Dynamic-Link Library as the project type.

To debug a DLL, you must use a main program that calls the library routines (or references the data). From the Project Property Pages dialog box, choose the Debugging category. A dialog box is available for you to specify the executable for a debug session.

### To build the DLL from the Microsoft integrated development environment (IDE):

1. A Fortran DLL project is created like any other project, but you must specify Dynamic-Link Library as the project type.
2. Add files to your Fortran DLL project. Include the DLL Fortran source that exports procedures or data as a file in your project.
3. If your DLL exports data, consistently specify the project settings options in the Fortran Data compiler option category for both the DLL and any image that references the DLL's exported data. In the Fortran Data compiler option category, specify the appropriate values for Common Element Alignment (common block data) and Structure Member Alignment (structures in a module). This sets the `/align` option, which specifies whether padding is needed to ensure that exported data items are naturally aligned.

For example, in the case of a common block containing four-byte variables, you might:

- Open the appropriate solution and select the project in the Solution View.
- From the **Project>Properties**, select the Fortran category.

- Select Data.
- In the Common Element Alignment box, select 4 Bytes.

4. If you need to specify linker options, use the Linker category of the Project Property Pages dialog box.

5. Build your Fortran DLL project.

The IDE automatically selects the correct linker instructions for loading the proper run-time library routines (located in a DLL themselves). Your DLL is created as a multithread-enabled library. An import library (.LIB) is created for use when you link images that reference the DLL.

#### To build the DLL from the command line:

1. If you build a DLL from the command line or use a makefile, you must specify the /dll option. For example, if the Fortran DLL source code is in the file `f90arr.f90`, use the following command line:

```
ifort /dll f90arr.f90
```

This command creates:

- A DLL named `f90arr.dll`.
- An import library, `f90arr.lib`, that you must link with applications that call your DLL.

If you also specify `/exe:file` or `/link /out:file`, the file name you specify is used for a .DLL rather than an .EXE file (the default file extension becomes `projectname.DLL` instead of `projectname.EXE`)

The `/dll` option selects, as the default, the DLL run-time libraries to support multithreaded operation.

2. If your DLL will export data, the procedures must be compiled and linked consistently. Consistently use the same `/align` option for the DLL export procedure and the application that references (imports) it. The goal is to specify padding to ensure that exported data items are naturally aligned, including common block data items and structure element alignment (structures in a module).

3. If you need to specify linker options, place them after the `/link` option on the `ifort` command line.

4. Build the application. For example, if your DLL exports a common block containing four-byte variables, you might use the following command line (specify the `/dll` option):

```
ifort /align:commons /dll dllfile.for
```

The `/dll` option automatically selects the correct linker instructions for loading the proper run-time library routines (located in a DLL themselves). Your DLL is created as a multithread-enabled library.

#### The DLL Build Output

When a DLL is built, two library files are typically created:

- An import library (.LIB), which the linker uses to associate a main program with the DLL.
- The .DLL file containing the library's executable code.

Both files have the same basename as the library project by default.

For a build from the command line, your library routines are contained in the file `projectname.DLL` located in the default directory for your project, unless you specified another name and location. Your import library file is `projectname.LIB`, located in the default directory for your project.

For a build from the Microsoft\* Visual Studio\* integrated development environment, both the library routines and the import library file are located in the output directory of the project configuration.

#### NOTE

If the DLL contains no exported routines or data, the import library is not created.

#### Checking the DLL Symbol Export Table

To make sure that everything that you want to be visible shows up in the export table, look at the export information of an existing DLL file by using QuickView in the Windows Explorer **File** menu or the following DUMPBIN command:

```
DUMPBIN /exports file.dll
```

## Building Executables that Use DLLs

---

When you build the executable that imports the procedures or data defined in the DLL, you must link using the import library, check certain project settings or command-line options, and then build the executable.

### To use the DLL from another image:

1. Add the import .LIB file with its path and library name to the other image.

In the integrated development environment, add the .LIB import library file to your project. In the Project menu, select Add Existing Item... . If the importing project and the DLL are in the same solution, you can add the DLL project as a dependency of the importing project instead.

On the command line, specify the .LIB file on the command line.

The import .LIB file contains information that your program needs to work with the DLL.

2. If your DLL exports data, consistently use the same property page options in the Fortran Data category /align option as was used to create the DLL. In the Fortran Data category, specify the appropriate values for Common Element Alignment (common block data) and Structure Member Alignment (structures in a module). This sets the /align option, which specifies whether padding is needed to ensure that imported data items are naturally aligned.
3. In the Project Property Pages dialog box, make sure the type of libraries specified is consistent with that specified for the Fortran DLL.
4. If you need to specify linker options:

- In the IDE, specify linker options in the Linker category.
- On the ifort command line, place linker options after the /link option.

5. Copy the DLL into your path.

For an application to access your DLL, it must be located in a directory included in the PATH system environment variable or in the same directory as the executable. If you have more than one program accessing your DLL, you can keep it in a convenient directory identified in the environment variable PATH. If you have several DLLs, you can place them all in the same directory to avoid adding numerous directories to the path specification.

You should log out and back in after modifying the system path.

6. Build the image that references the DLL.

When using the visual development environment:

- Like building other projects in the integrated development environment, use the **Build** menu items to create the executable.

When using the command line:

- Specify the import library at the end of the command line.
- If your DLL exports data that will be used by the application being built, specify the same /align options that were used to build the DLL.
- If you are building a main application, omit the /dll option.
- When building a Fortran DLL that references another DLL, specify the /dll option.

For example, to build the main application from the command line that references 4-byte items in a common block defined in dllfile.dll:

```
ifort /align:commons mainapp.f90 dllfile.lib
```

# Using QuickWin

## Using QuickWin Overview

This section introduces the major categories of QuickWin library routines. It gives an overview of QuickWin features and their use in creating and displaying graphics, and customizing your QuickWin applications with custom menus and mouse routines. [Drawing Graphics](#) and [Using Fonts from the Graphics Library Overview](#) cover graphics and fonts in more detail.

The Intel® Fortran QuickWin library helps you give traditional console-oriented Fortran programs a Windows look and feel, with a scrollable window and a menu bar. Though the full capability of Windows is not available through QuickWin, QuickWin is simpler to learn and to use. QuickWin applications support pixel-based graphics, real-coordinate graphics, text windows, character fonts, user-defined menus, mouse events, and editing (select/copy/paste) of text, graphics, or both.

You can use the QuickWin library to do the following:

- Compile console programs into simple applications for Windows.
- Minimize and maximize QuickWin applications like any Windows-based application.
- Call graphics routines.
- Load and save bitmaps.
- Select, copy and paste text, graphics, or a mix of both.
- Detect and respond to mouse clicks.
- Display graphics output.
- Alter the default application menus or add programmable menus.
- Create custom icons.
- Open multiple child windows.

In Intel Visual Fortran, graphics programs must be either Fortran QuickWin, Fortran Standard Graphics, Fortran Windows, or use OpenGL routines. [Fortran Standard Graphics Applications](#) are a subset of QuickWin that support only one window.

You can choose the Fortran QuickWin or Standard Graphics application type from the list of available project types when you create a new project in the visual development environment. Or you can use the `/libs:qwin` compiler option for Fortran QuickWin or the `/libs:qwins` compiler option for Fortran Standard Graphics.

Note that Fortran QuickWin and Standard Graphics applications cannot be DLLs, and QuickWin and Standard Graphics cannot be linked with run-time routines that are in DLLs. This means that the `/libs:qwin` option and the `/libs:dl1` with `/threads` options cannot be used together.

You can access the QuickWin routines library from Intel Fortran as well as other languages that support the Fortran calling conventions.

A program using the QuickWin routines must explicitly access the QuickWin graphics library routines with the statement **USE IFQWIN** (see [USE Statement Needed for Fortran QuickWin Applications](#)).

## Special Naming Convention for Certain QuickWin and Windows\* Graphics Routines

Most QuickWin routines have a QQ appended to their names to differentiate them from equivalent Windows operating system routines. However, a small group of QuickWin graphics routines have the same name as the Windows routines, causing a potential naming conflict if your program unit includes both USE IFLIBS (which includes QuickWin routine interface definitions) and USE IFWIN (which includes Windows API routine interface definitions).

The QuickWin routines perform the same functions as the SDK routines but take a unit number, or use the unit in focus at the time of call, instead of taking a device context (DC) as one of their arguments.

To handle this situation, a special MSFWIN\$ prefix is used for the Windows routines. These prefixed names must be used even if you only specify **USE IFWIN**.

For example, Rectangle is a QuickWin routine, not a Windows SDK routine, and you must use the name MSFWIN\$Rectangle to refer to the SDK routine:

QuickWin Routine	Windows API Routine
ARC	MSFWIN\$Arc
ELLIPSE	MSFWIN\$Ellipse
FLOODFILL	MSFWIN\$FloodFill
GETBKCOLOR	MSFWIN\$GetBkColor
GETPIXEL	MSFWIN\$GetPixel
GETTEXTCOLOR	MSFWIN\$GetTextColor
LINETO	MSFWIN\$LineTo
PIE	MSFWIN\$Pie
POLYGON	MSFWIN\$Polygon
RECTANGLE	MSFWIN\$Rectangle
SETBKCOLOR	MSFWIN\$SetBkColor
SETPIXEL	MSFWIN\$SetPixel
SETTEXTCOLOR	MSFWIN\$SetTextColor

## Comparing QuickWin with Windows\*-Based Applications

One decision you must make when designing a program is how it will be used. If the person using your program must interact with it, the method of interaction can be important. Anytime the user must supply data, that data must be validated or it could cause errors. One way to minimize data errors is to allow the user to select a value from a list. For example, if the data is one of several known values, the user can select the desired value instead of typing it in.

When you design programs to be interactive, you use a different structure than if you design them to be run in unattended batches. Interactive applications behave more like state machines than numerical algorithms, because they perform the actions you request when you request them. You may also find that once you can change what your program is doing while it runs, you will be more likely to experiment with it.

The QuickWin library lets you build simple Windows applications. Because QuickWin is a wrapper around a subset of the Windows API, there are limitations to what you can do, but it can fulfill the requirement of most users. If you need additional capabilities, you can call the Windows API directly rather than using QuickWin to build your program. You can also build a graphic user interface in either Microsoft\* Visual C++\* or Visual Basic\* that calls your Fortran code.

QuickWin applications do not provide the total capability of Windows\*-based applications. Although you can call many Windows APIs (Application Programming Interface) from QuickWin and console programs, many other Windows APIs (such as GDI functions) should be called only from a full Windows-based application. You need to use Windows-based applications, not QuickWin, if any of the following applies:

- Your application has an OLE\* (Object Linking and Embedding) container.
- You want direct access to GDI (Graphical Data Interface) functions.
- You want to add your own customized Help information to QuickWin Help.
- You want to create something other than a standard SDI (Single Document Interface) or MDI (Multiple Document Interface) application. (For example, if you want your application to have a dialog such as Windows Calculator in the client area.)
- You want to use a [Using Dialog Boxes for Application Controls Overview](#) rather than a modal dialog box.

## Using Windows API Routines with QuickWin

---

You can convert the unit numbers of QuickWin windows to Windows handles with the `GETHWNDOQ` QuickWin function. You should not use Windows GDI to draw on QuickWin windows because QuickWin keeps a window buffer and the altered window would be destroyed on redraw. You can use Windows OS subclassing to intercept graphics messages bound for QuickWin before QuickWin receives them.

## Types of QuickWin Programs

---

### QuickWin Programs Overview

You can create a Fortran Standard Graphics application or a Fortran QuickWin application, depending on the project type you choose. Standard Graphics (QuickWin single document) applications support only one window and do not support programmable menus. Fortran QuickWin applications support multiple windows and user-defined menus. Any Fortran program, whether it contains graphics or not, can be compiled as a QuickWin application. You can use the Microsoft integrated development environment (IDE) to create, debug, and execute Fortran Standard Graphics programs and Fortran QuickWin programs.

To build a Fortran QuickWin application in the IDE, select **QuickWin Application** from the list of available project types displayed when you create a new project. You can choose to create an Empty QuickWin project (multiple-windows) or a Fortran Standard Graphics application.

To build a Fortran QuickWin application from the command line, use the `/libs:qwin` option. For example:

```
ifort /libs:qwin qw_app.f90
```

To build a Fortran Standard Graphics application from the command line, use the `/libs:qwins` option. For example:

```
ifort /libs:qwins stdg_app.f90
```

### See Also

[Fortran Standard Graphics Applications](#)  
[Fortran QuickWin Graphics Applications](#)

## Fortran Standard Graphics Applications

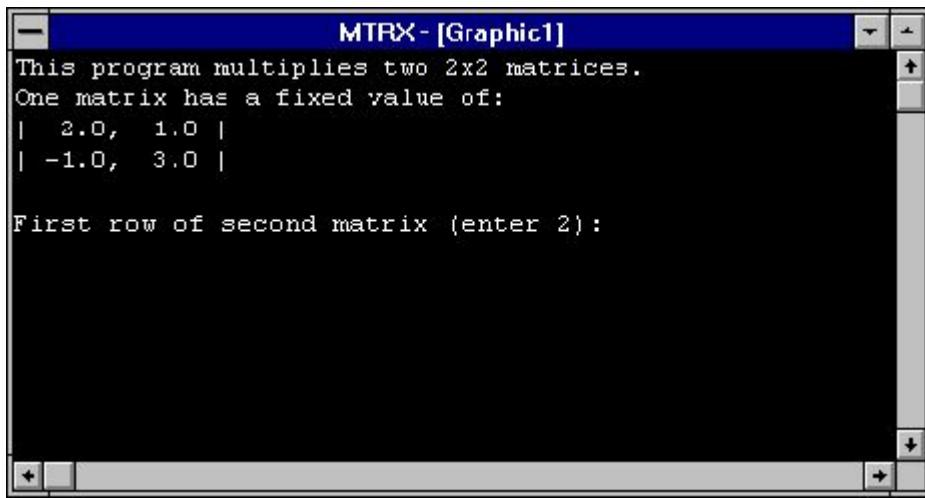
A Fortran standard graphics application has a single maximized application window covering the entire screen area, whose appearance resembles a MS-DOS\* screen without scroll bars or menus. The `Esc` key can be used to exit a program that does otherwise terminate. When the `Esc` key is pressed, the frame window appears with a border, title bar, scroll bars, and a menu item in the upper-left corner that allows you to close the application.

Programmable menus and multiple child windows cannot be created in this mode.

The following figure shows a typical Fortran Standard Graphics application, which resembles an MS-DOS application running in a window.

### **MTRX.F90 Compiled as a Fortran Standard Graphics Application**

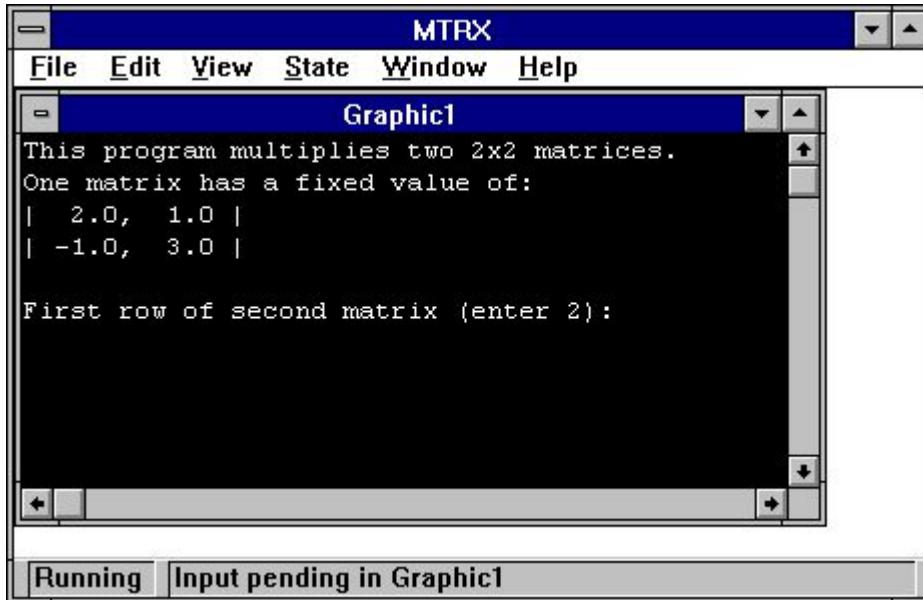
---



## Fortran QuickWin Graphics Applications

The following shows a typical Fortran QuickWin application. The frame window has a border, title bar, scroll bars, and default menu bar. You can modify, add, or delete the default menu items, respond to mouse events, and create multiple child windows within the frame window using QuickWin enhanced features. Routines to create enhanced features are listed in [Enhancing QuickWin Applications](#). Using these routines to customize your QuickWin application is described in [Customizing QuickWin Applications Overview](#).

### **MTRX.F90 Compiled as a QuickWin Application**



## The QuickWin User Interface

### QuickWin User Interface Overview

All QuickWin applications create an application or frame window; child windows are optional. Fortran Standard Graphics applications and Fortran QuickWin applications have these general characteristics:

- Window contents can be copied as bitmaps or text to the Clipboard for printing or pasting to other applications. In Fortran QuickWin applications, any portion of the window can be selected and copied.
- Vertical and horizontal scroll bars appear automatically, if needed.
- The base name of the application's .EXE file appears in the window's title bar.
- Closing the application window terminates the program.

In addition, the Fortran QuickWin application has a status bar and menu bar. The status bar at the bottom of the window reports the current status of the window program (for example, running or input pending).

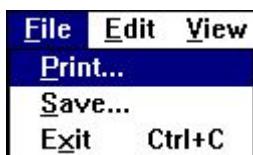
[Default QuickWin Menus](#) shows the default QuickWin menus.

### Default QuickWin Menus

The default MDI (Multiple Document Interface) menu bar has the following menus:

- [File](#)
- [Edit](#)
- [View](#)
- [State](#)
- [Window](#)

#### File Menu



## Edit Menu



For instructions on using the Edit options within QuickWin see [Editing Text and Graphics from the QuickWin Edit Menu](#).

## View Menu



The resulting graphics might appear somewhat distorted whenever the logical graphics screen is enlarged or reduced with the Size to Fit and Full Screen commands. While in Full Screen or Size To Fit mode, cursors are not scaled.

## State Menu



## Window Menu



For instructions on replacing the About default information within the Help menu with your own text message, see [Defining an About Box](#).

For instructions on how to create custom QuickWin menus, see [Customizing QuickWin Applications Overview](#).

## USE Statement Needed for Fortran QuickWin Applications

A program using the Fortran QuickWin or Standard Graphics features must explicitly access the QuickWin graphics library routines with the statement `USE IFQWIN`.

Any program using the QuickWin features must include the statement `USE IFQWIN` to access the QuickWin graphics library. The `IFQWIN.MOD` module file contains subroutine and function declarations in `INTERFACE` statements, derived-type declarations, and symbolic constant declarations for each QuickWin routine.

`USE` statements must immediately follow the `PROGRAM`, `SUBROUTINE` or `FUNCTION` statement, and precede any `IMPLICIT` statement.

Depending on the type of routines used by your application, other `USE` statements that include other Fortran modules may be needed. The description of each Intel Fortran routine in the *Language Reference* indicates the module that needs to be included for external routines (such as `USE IFCORE; USE IFFPORT`).

## Creating QuickWin Windows

### Creating QuickWin Windows Overview

The QuickWin library contains many routines to create and control your QuickWin windows.

#### See Also

[Accessing Window Properties](#)

[Creating Child Windows](#)

[Giving a Window Focus and Setting the Active Window](#)

[Keeping Child Windows Open](#)

[Controlling Size and Position of Windows](#)

### Accessing Window Properties

`SETWINDOWCONFIG` and `GETWINDOWCONFIG` set and get the current *virtual window* properties. Virtual window properties set by `SETWINDOWCONFIG` contain the maximum amount of text and graphics for that unit. The `SETWSIZEQQ` routine sets the properties of the *visible window*, which is generally smaller than a virtual window.

If the size of the virtual window (`SETWINDOWCONFIG`) is larger than the size of the visible window (`SETWSIZEQQ`), scroll bars are automatically provided to allow all the text and graphics in a virtual window to be displayed.

These virtual window properties are stored in the `windowconfig` derived type, which contains the following parameters:

```
TYPE windowconfig
  INTEGER(2) numxpixels           ! Number of pixels on x-axis.
  INTEGER(2) numypixels           ! Number of pixels on y-axis.
  INTEGER(2) numtextcols          ! Number of text columns available.
  INTEGER(2) numtextrows          ! Number of scrollable text lines available.
  INTEGER(2) numcolors            ! Number of color indexes.
  INTEGER(4) fontsize             ! Size of default font. Set to
                                  ! QWIN$EXTENDFONT when using multibyte
                                  ! characters, in which case
                                  ! extendfontsize sets the font size.
  CHARACTER(80) title              ! Window title, where title is a C string.
  INTEGER(2) bitsperpixel         ! Number of bits per pixel. This value
                                  ! is calculated by the system and is an
                                  ! output-only parameter.
                                  ! The next three parameters support multibyte
                                  ! character sets (such as Japanese)
  CHARACTER(32) extendfontname    ! Any non-proportionally spaced font
                                  ! available on the system.
  INTEGER(4) extendfontsize        ! Takes same values as fontsize, but
                                  ! used for multiple-byte character sets
```

```

        ! when fontsize set to QWIN$EXTENDFONT.
INTEGER(4) extendfontattributes ! Font attributes such as bold and
                                ! italic for multibyte character sets.
END TYPE windowconfig

```

If you use `SETWINDOWCONFIG` to set the variables in `windowconfig` to -1, the highest resolution will be set for your system, given the other fields you specify, if any. You can set the actual size of the window by specifying parameters that influence the window size -- the number of x and y pixels, the number of rows and columns, and the font size. If you do not call `SETWINDOWCONFIG`, the window defaults to the best possible resolution and a font size of 8 by 16. The number of colors depends on the video driver used.

The font size, x pixels, y pixels, and columns and rows are related and cannot all be set arbitrarily. The following example specifies the number of x and y pixels and the font size and accepts the system calculation for the best number of rows and columns for the window:

```

USE IFQWIN
  TYPE (windowconfig) wc
  LOGICAL status
  ! Set the x & y pixels to 800X600 and font size to 8x12.
  wc%numxpixels = 800           ! pixels on x-axis, window width
  wc%numypixels = 600           ! pixels on y-axis, window height
  wc%numtextcols = -1          ! -1 requests system default/calculation
  wc%numtextrows = -1
  wc%numcolors = -1
  wc%title = " "C
  wc%fontsize = #0008000C      ! Request 8x12 pixel fonts
  status = SETWINDOWCONFIG(wc)

```

In this example:

- The variables `wc%numxpixels` and `wc%numypixels` specify the size of the window, in this case 800 by 600 pixels. Within this window size, you can choose to specify either the font size (`wc%fontsize`) or the number of text columns (`wc%numtextcols`) and rows (`wc%numtextrows`).

This example specifies the window size and font size, and lets the system calculate the number of text columns and rows.

If you choose to specify the number of text columns and rows, you can let the system calculate (specify -1) either the font size or the window size.

- The variable `wc%fontsize` is given as hexadecimal constant of `#0008000C`, which is interpreted in two parts:
  - The left side of 0008 (8) specifies the width of the font, in pixels.
  - The right side of 000C (12 in decimal) specifies the height of the font, in pixels.
- The variable `wc%numtextrows` is -1 and `wc%numtextcols` is -1, which allows the system to calculate the best available number of text columns and text rows to be used, as follows:
  - The number of text columns is calculated as `wc%numypixels` (800) divided by the width of the font 8 (decimal) or 100.
  - The number of text rows is calculated as `wc%numxpixels` (600) divided by the width of the font, 12 (decimal) or 50.

The requested font size is matched to the nearest available font size. If the matched size differs from the requested size, the matched size is used to determine the number of columns and rows.

If scroll bars are needed (virtual window size exceeds the visible window size), because of the size required by horizontal and vertical scroll bars for a window, you may need to set the number of lines and columns to a value 1 or 2 greater than the number of rows and columns needed to display the application's information.

If the requested configuration cannot be set, `SETWINDOWCONFIG` returns .FALSE. and calculates parameter values that will work and best fit the requested configuration. Another call to `SETWINDOWCONFIG` establishes these values:

```
IF(.NOT.status) status = SETWINDOWCONFIG(wc)
```

For information on setting the graphics mode with `SETWINDOWCONFIG`, see [Setting the Graphics Mode](#).

Routines such as SETWINDOWCONFIG work on the window that is currently in focus. You can have multiple windows open as your application requires, but you need to decide which one gains focus. There is a single frame window and one or more child windows. A window is in focus right after it is opened, after I/O to it, and when FOCUSQQ is used. Clicking the mouse when the cursor is in a window will also bring the window into focus.

For example, to set the characteristics for the window associated with unit 10, either gain focus with either an OPEN, a subsequent READ or WRITE statement to unit 10, or FOCUSQQ. For example, use OPEN:

```
open(unit=10, file='user')
  result = setwindowconfig(wc)
```

After you open unit 10, focus can be regained by a READ or WRITE statement to that unit. For example:

```
write(10,*) "Hello, this is unit 10"
```

Or you can use FOCUSQQ:

```
result = focusqq(10)
  result = setwindowconfig(wc)
```

For more information about when a window gains focus, see [Giving a Window Focus and Setting the Active Window](#).

## Creating Child Windows

The FILE='USER' option in the OPEN statement opens a child window. The child window defaults to a scrollable text window, 30 rows by 80 columns. You can open up to 40 child windows.

When a file OPEN that specifies " file='user' " is issued for a program built with /libs:qwin (or /MW), special processing takes place to handle this as a graphics window. The user can then write and or read to this window by issuing READ and WRITE statements with the same unit number.

There are some api's that manipulate the window via unit number (e.g., setwsizeqq()), and others that manipulate it because focus has been set to that window. The FRTL automatically sets focus to the last window accessed. Thus, after an open, read, or write to unit number - focus is set to that window, and subsequent api calls such as setbkcolorrgb(), which sets the background color, works for this window.

Running a QuickWin application displays the frame window, but not the child window. You must call SETWINDOWCONFIG or execute an I/O statement or a graphics statement to display the child window. The window receives output by its unit number, as in:

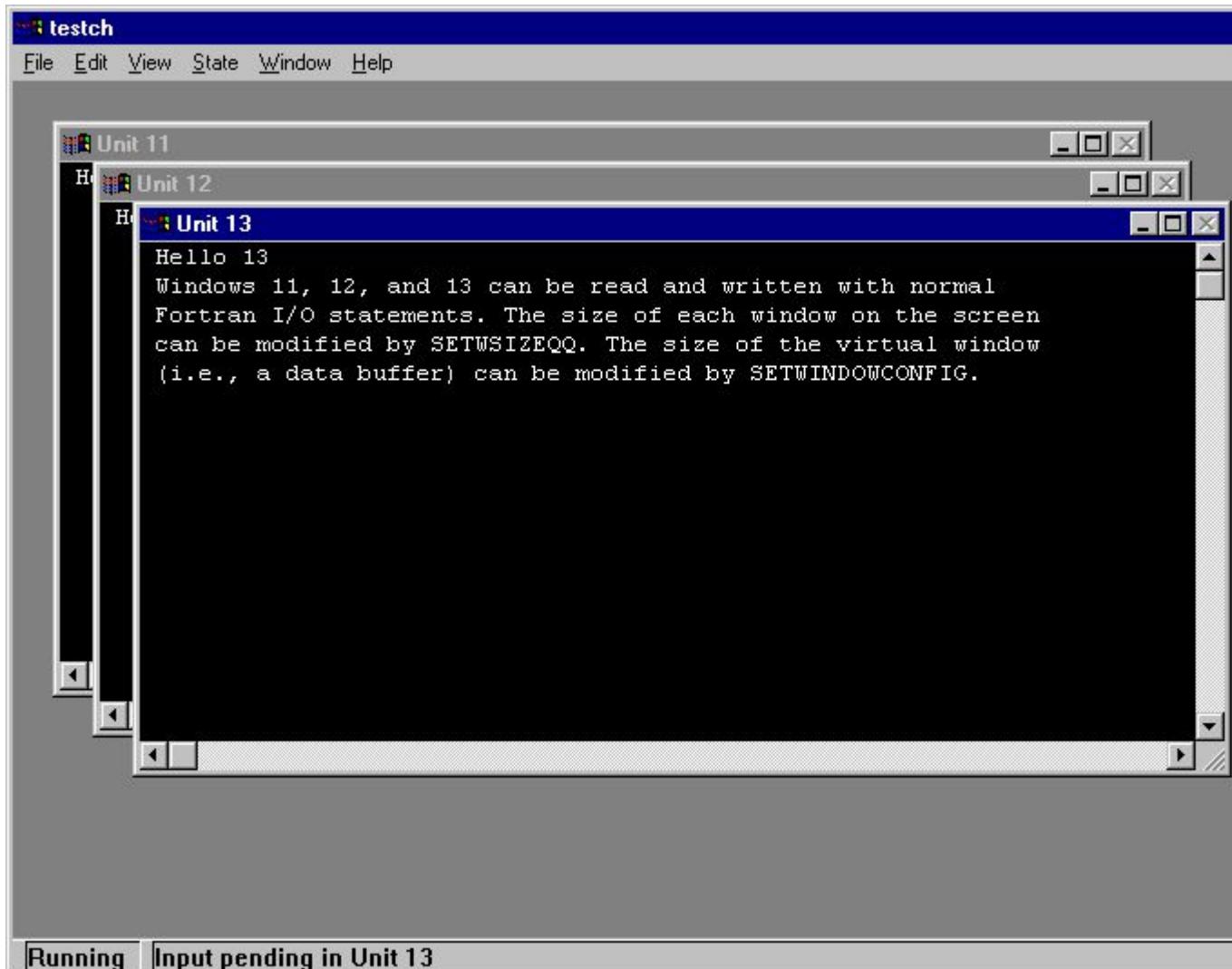
```
OPEN (UNIT= 12, FILE= 'USER', TITLE= 'Product Matrix')
  WRITE (12, *) 'Enter matrix type: '
```

Child windows opened with FILE='USER' must be opened as sequential-access formatted files (the default). Other file specifications (direct-access, binary, or unformatted) result in run-time errors.

The following example creates three child windows. A frame window is automatically created. Text is written to each so the child windows are visible:

```
program testch
use ifqwin
open(11,file="user")
write(11,*) "Hello 11"
open(12,file="user")
write(12,*) "Hello 12"
open(13,file="user")
write(13,*) "Hello 13"
write(13,*) "Windows 11, 12, and 13 can be read and written with normal"
write(13,*) "Fortran I/O statements. The size of each window on the screen"
write(13,*) "can be modified by SETWSIZEQQ. The size of the virtual window"
write(13,*) "(i.e., a data buffer) can be modified by SETWINDOWCONFIG."
read(13,*)
end
```

When this program is run, the output appears as follows:



To use the default graphics window, you should use units \*, 5, or 6.

In the example below, if you comment out the "open(7, ...)" statement, and substitute the existing unit 7's with either \*, or 6 for the WRITES and 5 for the READs, then the program should behave the same. API's such as "SETWSIZEQQ(7, ...)" should specify either 5 or 6, because \* is not a valid integer. One issue with using a default graphics window is that you cannot change the title of it from the default title.

```
ifort /threads /Qsave /traceback /libs:qwin simple_example.f90
```

```
PROGRAM OneWindow
USE IFQWIN
USE DFMT
USE DFLIB
USE DFPORT

type(windowconfig):: WIN_MainInput
type(qwininfo)      :: FrameSize, Win1Size
integer(2)          :: i2Status
integer(4)          :: i4Status,i4NumQ, i4Columns, i4LetterX, i4LetterY
logical(4)          :: L4Status
character(1)        :: c1YesNo

i4LetterX=8 ! Height and width of the text font
```

```

i4LetterY=16
!
! Frame-Window as wide as screen but half the height
!
i2Status=GETWSIZEQQ(QWIN$FRAMEWINDOW,QWIN$SIZEMAX,FrameSize)
FrameSize.H=FrameSize.H/2 !! set window height 1/2 of max height
FrameSize.W=FrameSize.W/3 !! set window width 1/3 of max width
i2Status=SETWSIZEQQ(QWIN$FRAMEWINDOW,FrameSize)
i4Columns=FrameSize.W/i4LetterX -1 ! number of possible columns in each window
!
! Input-window for Main part
!
open(7, file='user',title="Main Input" C)
Win_MainInput.title="Main Input" C !! in addition to OPEN, title can also be specified by
setwindowconfig()
  Win_MainInput.numtextrows=INT((FrameSize.H-40)/i4LetterY)
  Win_MainInput.numtextcols=i4Columns
  Win_MainInput.fontsize=65536*i4LetterX+i4LetterY
  L4Status=setwindowconfig(Win_MainInput)
  i4Status=setbkcolorrgb(#FFFFFF) !! white background
  i4Status=settextcolorrgb(#000000) !! black text
  call clearscreen($GCLEARSCREEN)
  Win1Size.X=0
  Win1Size.Y=0
  Win1Size.H=INT((FrameSize.H-40)/i4LetterY)
  Win1Size.W=i4Columns
  Win1Size.type=QWIN$SET
  i4Status=setwsizqq(7,Win1Size)

  write(7,("This is the Main Input window.",/))
10  write(7,("Type Y or y to Terminate this program: ",\))
  read(7,'(Q,A)') i4NumQ, c1YesNo
  if (i4NumQ /= 1) goto 10
  if (c1YesNo == 'Y' .or. c1YesNo == 'y') goto 20
  goto 10

20  continue
END PROGRAM OneWindow

```

## Giving a Window Focus and Setting the Active Window

When a window is made *active*, it receives graphics output (from `ARC`, `LINETO`, and `OUTGTEXT`, for example) but is not brought to the foreground and thus does not have the *focus*. When a window acquires focus, either by a mouse click, I/O to it, or by a `FOCUSQQ` call, it also becomes the *active* window. When a window gains focus, the window that previously had focus will lose focus.

If a window needs to be brought to the foreground, it must be given *focus*. The window that has the focus is always on top, and all other windows have their title bars grayed out. A window can have the focus and yet not be active and not have graphics output directed to it. Graphical output is independent of focus.

Under most circumstances, *focus* and *active* should apply to the same window. This is the default behavior of QuickWin and a programmer must consciously override this default.

Certain QuickWin routines (such as `GETCHARQQ`, `PASSDIRKEYSQQ`, and `SETWINDOWCONFIG`) that do not take a unit number as an input argument usually affect the *active* window whether or not it is in *focus*.

If another window is made *active* but is not in *focus*, these routines affect the window *active* at the time of the routine call. This may appear unusual to the user since a `GETCHARQQ` under these circumstances will expect input from a grayed, background window. The user would then have to click on that window before input could be typed to it.

To use these routines (that effect the *active* window), either do I/O to the unit number of the window you wish to put in *focus* (and also make *active*), or call FOCUSQQ (with a unit number specified). If only one window is open, then that window is the one affected. If several windows are opened, then the last one opened is the one affected since that window will get *focus* and *active* as a side effect of being opened.

The OPEN (IOFOCUS) parameter also can determine whether a window receives the focus when a I/O statement is executed on that unit. For example:

```
OPEN (UNIT = 10, FILE = 'USER', IOFOCUS = .TRUE.)
```

With an explicit OPEN with FILE='USER', IOFOCUS defaults to .TRUE. For child windows opened implicitly (no OPEN statement before the READ, WRITE, or PRINT) as unit 0, 5, or 6, IOFOCUS defaults to .FALSE..

If IOFOCUS=.TRUE., the child window receives focus prior to each READ, WRITE, or PRINT. Calls to OUTTEXT or graphics functions (for example, OUTGTEXT, LINETO, and ELLIPSE) do not cause the focus to shift. If you use IOFOCUS with any unit other than a QuickWin child window, a run-time error occurs.

The focus shifts to a window when it is given the focus with FOCUSQQ, when it is selected by a mouse click, or when an I/O operation other than a graphics operation is performed on it, unless the window was opened with IOFOCUS=.FALSE.. INQFOCUSQQ determines which unit has the focus. For example:

```
USE IFQWIN
INTEGER status, focusunit
OPEN(UNIT = 10, FILE = 'USER', TITLE = 'Child Window 1')
OPEN(UNIT = 11, FILE = 'USER', TITLE = 'Child Window 2')
! Give focus to Child Window 2 by writing to it:
WRITE (11, *) 'Giving focus to Child 2.'
! Give focus to Child Window 1 with the FOCUSQQ function:
status = FOCUSQQ(10)
...
! Find out the unit number of the child window that currently has focus:
status = INQFOCUSQQ(focusunit)
```

SETACTIVEQQ makes a child window active without bringing it to the foreground. GETACTIVEQQ returns the unit number of the currently active child window. GETHWNDQQ converts the unit number into a Windows handle for functions that require it.

## Keeping Child Windows Open

A child window remains open as long as its unit is open. The STATUS parameter in the CLOSE statement determines whether the child window remains open after the unit has been closed. If you set STATUS='KEEP', the associated window remains open but no further input or output is permitted. Also, the Close command is added to the child window's menu and the word Closed is appended to the window title. The default is STATUS='DELETE', which closes the window.

A window that remains open when you use STATUS='KEEP' counts as one of the 40 child windows available for the QuickWin application.

## Controlling Size and Position of Windows

SETWSIZEQQ and GETWSIZEQQ set and get the size and position of the visible representation of a window. The positions and dimensions of visible child windows are expressed in units of character height and width. The position and dimensions of the frame window are expressed in screen pixels. The position and dimensions are returned in the derived type `qwinfo` defined in IFQWIN.MOD as follows:

```
TYPE QWINFO
  INTEGER(2) TYPE      ! Type of action performed by SETWSIZEQQ.
  INTEGER(2) X        ! x-coordinate for upper left corner.
  INTEGER(2) Y        ! y-coordinate for upper left corner.
  INTEGER(2) H        ! Window height.
  INTEGER(2) W        ! Window width.
END TYPE QWINFO
```

The options for the `qwinfo` type are listed under SETWSIZEQQ in the *Language Reference*.

GETWSIZEQQ returns the position and the current or maximum window size of the current frame or child window. To access information about a child window, specify the unit number associated with it. Unit numbers 0, 5, and 6 refer to the default startup window if you have not explicitly opened them with the OPEN statement. To access information about the frame window, specify the unit number as the symbolic constant QWIN\$FRAMEWINDOW. For example:

```
USE IFQWIN
INTEGER status
TYPE (QWININFO) winfo
OPEN (4, FILE='USER')
...
! Get current size of child window associated with unit 4.
status = GETWSIZEQQ(4, QWIN$SIZECURR, winfo)
WRITE (*,*) "Child window size is ", winfo.H, " by ", winfo.W
! Get maximum size of frame window.
status = GETWSIZEQQ(QWIN$FRAMEWINDOW, QWIN$SIZEMAX, winfo)
WRITE (*,*) "Max frame window size is ", winfo.H, " by ", winfo.W
```

SETWSIZEQQ is used to set the visible window position and size. For example:

```
USE IFQWIN
INTEGER status
TYPE (QWININFO) winfo
OPEN (4, FILE='USER')
winfo.H = 30
winfo.W = 80
winfo.TYPE = QWIN$SET
status = SETWSIZEQQ(4, winfo)
```

## Using QuickWin Graphics Library Routines

### Using Graphics Library Routines

Graphics routines are functions and subroutines that draw lines, rectangles, ellipses, and similar elements on the screen. Font routines create text in a variety of sizes and styles. The QuickWin graphics library provides routines that:

- Change the window's dimensions.
- Set coordinates.
- Set color palettes.
- Set line styles, fill masks, and other figure attributes.
- Draw graphics elements.
- Display text in several character styles.
- Display text in fonts compatible with Microsoft Windows.
- Store and retrieve screen images.

### Selecting Display Options

The QuickWin run-time library provides a number of routines that you can use to define text and graphics displays. These routines determine the graphics environment characteristics and control the cursor.

To display graphics, you need to set the desired graphics mode using SETWINDOWCONFIG, and then call the routines needed to create the graphics. SETWINDOWCONFIG is the routine you use to configure window properties. You can use DISPLAYCURSOR to control whether the cursor will be displayed. The cursor becomes invisible after a call to SETWINDOWCONFIG. To display the cursor you must explicitly turn on cursor visibility with DISPLAYCURSOR(\$GCURSORON).

SETGTEXTROTATION sets the current orientation for font text output, and GETGTEXTROTATION returns the current setting. The current orientation is used in calls to OUTGTEXT.

For more information on these routines, see the *Language Reference* in the *Intel® Visual Fortran Compiler User and Reference Guides*.

## Checking the Current Graphics Mode

Call GETWINDOWCONFIG to get the child window settings.

GETWINDOWCONFIG uses the derived type, `windowconfig`, as a parameter:

```
TYPE windowconfig
  INTEGER(2) numxpixels      ! Number of pixels on x-axis
  INTEGER(2) numypixels      ! Number of pixels on y-axis
  INTEGER(2) numtextcols     ! Number of text columns available
  INTEGER(2) numtextrows     ! Number of text rows available
  INTEGER(2) numcolors       ! Number of color indexes
  INTEGER(4) fontsize        ! Size of default font
  CHARACTER(80) title        ! window title
  INTEGER(2) bitsperpixel   ! Number of bits per pixel
END TYPE windowconfig
```

By default, a QuickWin child window is a scrollable text window 640x480 pixels, has 30 lines and 80 columns, and a font size of 8x16. Also by default, a Standard Graphics window is Full Screen. You can change the values of window properties at any time with SETWINDOWCONFIG, and retrieve the current values at any time with GETWINDOWCONFIG.

## Setting the Graphics Mode

Use SETWINDOWCONFIG to configure the window for the properties you want. To set the highest possible resolution available with your graphics driver, assign a -1 value for `numxpixels`, `numypixels`, `numtextcols`, and `numtextrows` in the `windowconfig` derived type. This causes Fortran Standard Graphics applications to start in Full Screen mode.

If you specify less than the largest graphics area, the application starts in a window. You can use ALT+ENTER to toggle between Full Screen and windowed views. If your application is a QuickWin application and you do not call SETWINDOWCONFIG, the child window defaults to a scrollable text window with the dimensions of 640x480 pixels, 30 lines, 80 columns, and a font size of 8x16. The number of colors depends on the video driver used.

If SETWINDOWCONFIG returns .FALSE., the video driver does not support the options specified. The function then adjusts the values in the `windowconfig` derived type to ones that will work and are as close as possible to the requested configuration. You can then call SETWINDOWCONFIG again with the adjusted values, which will succeed. For example:

```
LOGICAL statusmode
TYPE (windowconfig) wc
wc%numxpixels = 1000
wc%numypixels = 300
wc%numtextcols = -1
wc%numtextrows = -1
wc%numcolors = -1
wc%title = "Opening Title" C
wc%fontsize = #000A000C ! 10 X 12
statusmode = SETWINDOWCONFIG(wc)
IF (.NOT. statusmode) THEN statusmode = SETWINDOWCONFIG(wc)
```

If you use SETWINDOWCONFIG, you should specify a value for each field ( -1 or your own number for numeric fields, and a C string for the title). Calling SETWINDOWCONFIG with only some of the fields specified can result in useless values for the other fields.

## Setting Figure Properties

The output routines that draw arcs, ellipses, and other primitive figures do not specify color or line-style information. Instead, they rely on properties set independently by other routines.

`GETCOLORRGB` (or `GETCOLOR`) and `SETCOLORRGB` (or `SETCOLOR`) obtain or set the current color value (or color index), which `FLOODFILLRGB` (or `FLOODFILL`), `OUTTEXT`, and the shape-drawing routines all use. Similarly, `GETBKCOLORRGB` (or `GETBKCOLOR`) and `SETBKCOLORRGB` (or `SETBKCOLOR`) retrieve or set the current background color.

`GETFILLMASK` and `SETFILLMASK` return or set the current fill mask. The mask is an 8-by-8-bit array with each bit representing a pixel. If a bit is 0, the pixel in memory is left untouched: the mask is transparent to that pixel. If a bit is 1, the pixel is assigned the current color value. The array acts as a template that repeats over the entire fill area. It "masks" the background with a pattern of pixels drawn in the current color, creating a large number of fill patterns. These routines are particularly useful for shading.

`GETWRITEMODE` and `SETWRITEMODE` return or set the current *logical write mode* used when drawing lines. The logical write mode, which can be set to `$GAND`, `$GOR`, `$GPRESET`, `$GPSET`, or `$GXOR`, determines the interaction between the new drawing and the existing screen and current graphics color. The logical write mode affects the `LINETO`, `RECTANGLE`, and `POLYGON` routines.

`GETLINESTYLE` and `SETLINESTYLE` retrieve and set the current line style. The line style is determined by a 16-bit-long mask that determines which of the five available styles is chosen. You can use these two routines to create a wide variety of dashed lines that affect the `LINETO`, `RECTANGLE`, and `POLYGON` routines.

### See Also

*Language Reference* for a description of these routines.

## Understanding Coordinate Systems

### Understanding Coordinate Systems Overview

Several different coordinate systems are supported by the Intel® Fortran QuickWin Library.

Text coordinates use a coordinate system that divides the screen into rows and columns.

Graphics coordinates are specified using one of three coordinate systems:

- Physical coordinates, which are determined by the hardware and the video mode used
- Viewport coordinates, which you can define in the application
- Window coordinates, which you can define to simplify scaling of floating-point data values

Physical coordinates serve as an absolute reference and as a starting place for creating custom window and viewport coordinates. Conversion routines make it simple to convert between different coordinate systems.

Unless you change it, the viewport-coordinate system is identical to the physical-coordinate system. The physical origin (0, 0) is always in the upper-left corner of the *display*.

For QuickWin, *display* means a child window's client area, not the actual monitor screen (unless you go to Full Screen mode). The x-axis extends in the positive direction left to right, while the y-axis extends in the positive direction top to bottom. The default viewport has the dimensions of the selected mode. In a QuickWin application, you can draw outside of the child window's current client area. If you then make the child window bigger, you will see what was previously outside the frame.

You can also use coordinate routines to convert between physical-, viewport-, and window-coordinate systems.

### See Also

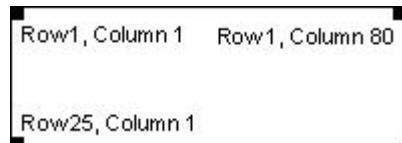
[Text Coordinates](#)

[Graphics Coordinates](#)

## Text Coordinates

The text modes use a coordinate system that divides the screen into rows and columns as shown in the following figure:

### Text Screen Coordinates



Text coordinates use the following conventions:

- Numbering starts at 1. An 80-column screen contains columns 1-80.
- The row is always listed before the column.

If the screen displays 25 rows and 80 columns (as shown in the above Figure), the rows are numbered 1-25 and the columns are numbered 1-80. The text-positioning routines, such as `SETTEXTPOSITION` and `SCROLLTEXTWINDOW`, use row and column coordinates.

## Graphics Coordinates

Three coordinate systems describe the location of pixels on the screen:

- Physical coordinates
- Viewport coordinates
- Window coordinates

This topic provides information on each of these coordinate systems.

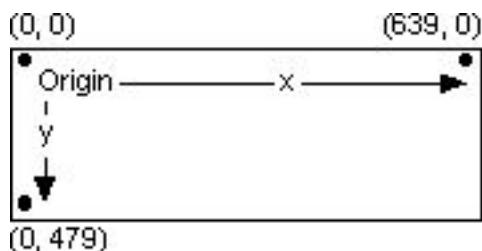
In all three coordinate systems, the x-coordinate is listed before the y-coordinate.

## Physical Coordinates

Physical coordinates are integers that refer to pixels in a window's client area. By default, numbering starts at 0, not 1. If there are 640 pixels, they are numbered 0-639.

Suppose your program calls `SETWINDOWCONFIG` to set up a client area containing 640 horizontal pixels and 480 vertical pixels. Each individual pixel is referred to by its location relative to the x-axis and y-axis, as shown in the following figure:

### Physical Coordinates



The upper-left corner is the *origin*. The x- and y-coordinates for the origin are always (0, 0).

Physical coordinates refer to each pixel directly and are therefore integers (that is, the window's client area cannot display a fractional pixel). If you use variables to refer to pixel locations, declare them as integers or use type-conversion routines when passing them to graphics functions. For example:

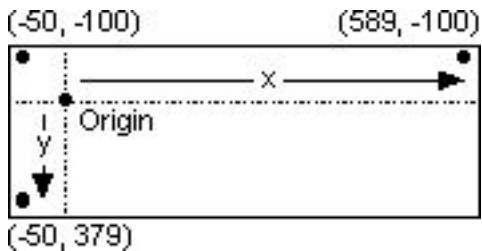
```
ISTATUS = LINETO( INT2(REAL_x), INT2(REAL_y) )
```

If a program uses the default dimension of a window, the *viewport* (drawing area) is equal to 640x480. **SETVIEWORG** changes the location of the viewport's origin. You pass it two integers, which represent the x and y physical screen coordinates for the new origin. You also pass it an **xycoord** type that the routine fills with the physical coordinates of the previous origin. For example, the following line moves the viewport origin to the physical screen location (50, 100):

```
TYPE (xycoord) origin
CALL SETVIEWORG(INT2(50), INT2(100), origin)
```

The effect on the screen is illustrated in the following figure:

### Origin Coordinates Changed by **SETVIEWORG**



The number of pixels hasn't changed, but the coordinates used to refer to the points have changed. The x-axis now ranges from -50 to +589 instead of 0 to 639. The y-axis now covers the values -100 to +379.

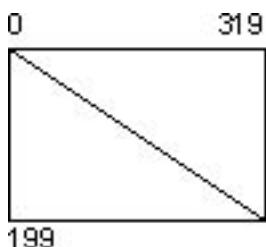
All graphics routines that use viewport coordinates are affected by the new origin, including **MOVETO**, **LINETO**, **RECTANGLE**, **ELLIPSE**, **POLYGON**, **ARC**, and **PIE**. For example, if you call **RECTANGLE** after relocating the viewport origin and pass it the values (0, 0) and (40, 40), the upper-left corner of the rectangle would appear 50 pixels from the left edge of the screen and 100 pixels from the top. It would not appear in the upper-left corner of the screen.

**SETCLIPRGN** creates an invisible rectangular area on the screen called a *clipping region*. You can draw inside the clipping region, but attempts to draw outside the region fail (nothing appears outside the clipping region).

The default clipping region occupies the entire screen. The QuickWin Library ignores any attempts to draw outside the screen.

You can change the clipping region by calling **SETCLIPRGN**. For example, suppose you entered a screen resolution of 320x200 pixels. If you draw a diagonal line from (0, 0) to (319, 199), the upper-left to the lower-right corner, the screen looks like the following figure:

### Line Drawn on a Full Screen

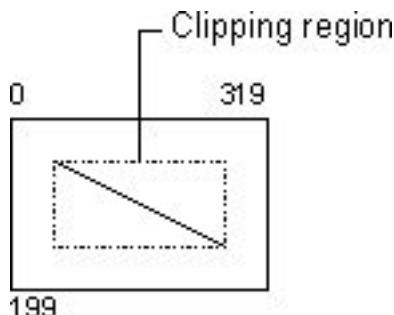


You could create a clipping region by entering:

```
CALL SETCLIPRGN(INT2(10), INT2(10), INT2(309), INT2(189))
```

With the clipping region in effect, the same LINETO command would put the line shown in the following figure on the screen:

### Line Drawn Within a Clipping Region



The dashed lines indicate the outer bounds of the clipping region and do not actually print on the screen.

### Viewport Coordinates

The viewport is the area of the screen displayed, which may be only a portion of the window's client area. Viewport coordinates represent the pixels within the current viewport. SETVIEWPORT establishes a new viewport within the boundaries of the physical client area. A standard viewport has two distinguishing features:

- The origin of a viewport is in the upper-left corner.
- The default clipping region matches the outer boundaries of the viewport.

SETVIEWPORT has the same effect as SETVIEWORGSETCLIPRGN and combined. It specifies a limited area of the screen in the same manner as SETCLIPRGN, then sets the viewport origin to the upper-left corner of the area.

### Window Coordinates

Functions that refer to coordinates on the client-area screen and within the viewport require integer values. However, many applications need floating-point values -- for frequency, viscosity, mass, and so on.

SETWINDOW lets you scale the screen to almost any size. In addition, window-related functions accept double-precision values.

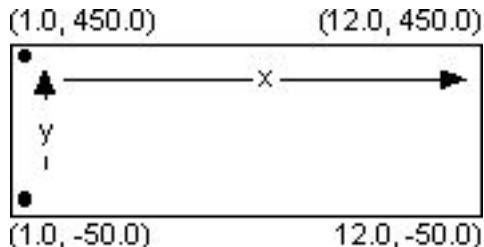
Window coordinates use the current viewport as their boundaries. A window overlays the current viewport. Graphics drawn at window coordinates beyond the boundaries of the window -- the same as being outside the viewport -- are clipped.

For example, to graph 12 months of average temperatures on the planet Venus that range from -50 to +450, add the following line to your program:

```
status = SETWINDOW(.TRUE., 1.0D0, -50.0D0, 12.0D0, 450.0D0)
```

The first argument is the invert flag, which puts the lowest y value in the lower-left corner. The minimum and maximum x- and y-coordinates follow; the decimal point marks them as floating-point values. The new organization of the screen is shown in the following figure:

### Window Coordinates



January and December plot on the left and right edges of the screen. In an application like this, numbering the x-axis from 0.0 to 13.0 provides some padding space on the sides and would improve appearance.

If you next plot a point with `SETPIXEL_W LINETO_W` or draw a line with, the values are automatically scaled to the established window.

#### To use window coordinates with floating-point values:

1. Set a graphics mode with `SETWINDOWCONFIG`.
2. Use `SETVIEWPORT` to create a viewport area. This step is not necessary if you plan to use the entire screen.
3. Create a real-coordinate window with `SETWINDOWDOUBLE PRECISION` invert flag and four `LOGICAL`, passing a x- and y-coordinates for the minimum and maximum values.
4. Draw graphics shapes with `RECTANGLE_W` and similar routines. Do not confuse `RECTANGLE` (the viewport routine) with `RECTANGLE_W` (the window routine for drawing rectangles). All window function names end with an underscore and the letter `W` (`_W`).

Real-coordinate graphics give you flexibility and device independence. For example, you can fit an axis into a small range (such as 151.25 to 151.45) or into a large range (-50000.0 to +80000.0), depending on the type of data you graph. In addition, by changing the window coordinates, you can create the effects of zooming in or panning across a figure. The window coordinates also make your drawings independent of the computer's hardware. Output to the viewport is independent of the actual screen resolution.

### Setting Graphics Coordinates

You can set the pixel dimensions of the x- and y-axes with `SETWINDOWCONFIG`. You can access these values through the `wc%numxpixels` and `wc%numypixels` values returned by `GETWINDOWCONFIG`. Similarly, `GETWINDOWCONFIG` also returns the range of colors available in the current mode through the `wc%numcolors` value.

You can also define the graphics area with `SETCLIPRGN` and `SETVIEWPORT`. Both of these functions define a subset of the available window area for graphics output. `SETCLIPRGN` does not change the viewport coordinates, but merely masks part of the screen. `SETVIEWPORT` resets the viewport bounds to the limits you give it and sets the origin to the upper-left corner of this region.

The origin of the viewport-coordinate system can be moved to a new position relative to the physical origin with `SETVIEWORG`. Regardless of the viewport coordinates, however, you can always locate the current graphics output position with `GETCURRENTPOSITION` and `GETCURRENTPOSITION_W`.

Using the window-coordinate system, you can easily scale any set of data to fit on the screen. You define any range of coordinates (such as 0 to 5000) that works well for your data as the range for the window-coordinate axes. By telling the program that you want the window-coordinate system to fit in a particular area on the screen (map to a particular set of viewport coordinates), you can scale a chart or drawing to any size you want. `SETWINDOW` defines a window-coordinate system bounded by the specified values.

`GETPHYSCOORD` converts viewport coordinates to physical coordinates, and `GETVIEWCOORD` translates from physical coordinates to viewport coordinates. Similarly, `GETVIEWCOORD_W` converts window coordinates to viewport coordinates, and `GETWINDOWCOORD` converts viewport coordinates to window coordinates.

#### For more information:

- On these routines, see their descriptions in the *Language Reference*.

### Real Coordinates Sample Program

The program `REALG.F90` shows how to create multiple window-coordinate sets, each in a separate viewport, on a single screen.

```
! REALG.F90 (main program) - Illustrates coordinate graphics.
!
USE IFQWIN
LOGICAL          statusmode
TYPE (windowconfig) myscreen
```

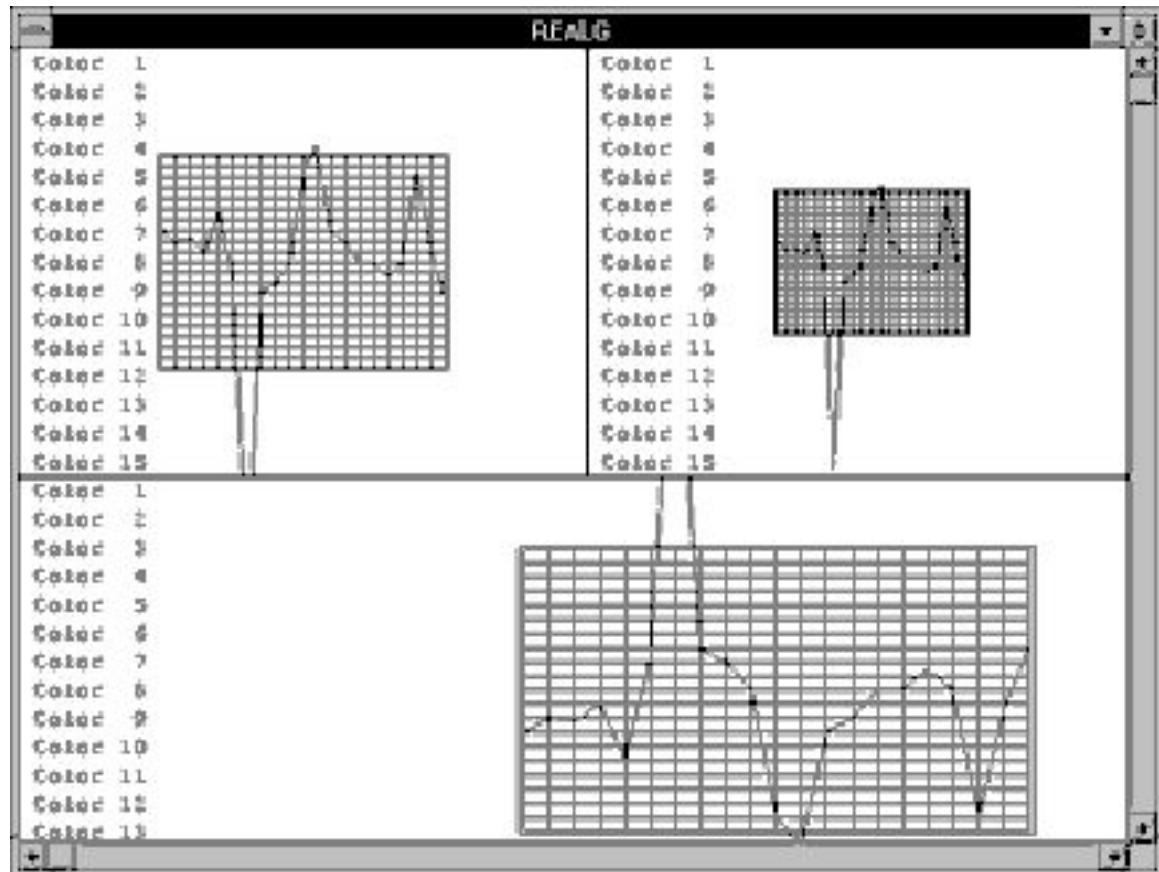
```

COMMON           myscreen
!
!   Set the screen to the best resolution and maximum number of
!   available colors.
myscreen.numxpixels = -1
myscreen.numypixels = -1
myscreen.numtextcols = -1
myscreen.numtextrows = -1
myscreen.numcolors = -1
myscreen.fontsize = -1
myscreen.title = " "C
statusmode = SETWINDOWCONFIG(myscreen)
IF(.NOT. statusmode) statusmode = SETWINDOWCONFIG(myscreen)
statusmode = GETWINDOWCONFIG( myscreen )
CALL threegraphs( )
END
.
.
.

```

The main body of the program is very short. It sets the window to the best resolution of the graphics driver (by setting the first four fields to -1) and the maximum number of colors (by setting `numcolors` to -1). The program then calls the `threegraphs` subroutine that draws three graphs. The program output is shown in the following figure:

#### REALG Program Output



The `gridshape` subroutine, which draws the graphs, uses the same data in each case. However, the program uses three different coordinate windows.

The two viewports in the top half are the same size in physical coordinates, but have different window sizes. Each window uses different maximum and minimum values. In all three cases, the graph area is two units wide. The window in the upper-left corner has a range in the x-axis of four units (4 units wide); the window in the upper-right corner has a range in the x-axis of six units, which makes the graph on the right appear smaller.

In two of the three graphs, one of the lines goes off the edge, outside the clipping region. The lines do not intrude into the other viewports, because defining a viewport creates a clipping region.

Finally, the graph on the bottom inverts the data with respect to the two graphs above it.

The next section describes and discusses the subroutine invoked by REALG.F90:

## Drawing the Graphs

The main program calls `threegraphs`, which prints the three graphs:

```

SUBROUTINE threegraphs()
USE IFQWIN
INTEGER(2)          status, halfx, halfy
INTEGER(2)          xwidth, yheight, cols, rows
TYPE (windowconfig) myscreen
COMMON             myscreen
CALL CLEARSCREEN( $GCLEARSCREEN )
xwidth  = myscreen.numxpixels
yheight = myscreen.numypixels
cols    = myscreen.numtextcols
rows    = myscreen.numtextrows
halfx   = xwidth / 2
halfy   = (yheight / rows) * ( rows / 2 )

!
! First window
!
CALL SETVIEWPORT( INT2(0), INT2(0), halfx - 1, halfy - 1 )
CALL SETTEXTWINDOW( INT2(1), INT2(1), rows / 2, cols / 2 )
status = SETWINDOW( .FALSE., -2.0_8, -2.0_8, 2.0_8, 2.0_8 )
! The 2.0_8 notation makes these constants REAL(8)
CALL gridshape( rows / 2 )
status = RECTANGLE( $GBORDER, INT2(0), INT2(0), halfx-1, halfy-1 )
!
! Second window
!
CALL SETVIEWPORT( halfx, INT2(0), xwidth - 1, halfy - 1 )
CALL SETTEXTWINDOW( INT2(1), (cols/2) + 1, rows/2, cols )
status = SETWINDOW( .FALSE., -3.0D0, -3.0D0, 3.0D0, 3.0D0 )
! The 3.0D0 notation makes these constants REAL(8)
CALL gridshape( rows / 2 )
status = RECTANGLE_W( $GBORDER, -3.0_8, -3.0_8, 3.0_8, 3.0_8 )
!
! Third window
!
CALL SETVIEWPORT( 0, halfy, xwidth - 1, yheight - 1 )
CALL SETTEXTWINDOW( (rows / 2) + 1, 1_2, rows, cols )
status = SETWINDOW( .TRUE., -3.0_8, -1.5_8, 1.5_8, 1.5_8 )
CALL gridshape( INT2( (rows / 2) + MOD( rows, INT2(2) ) ) )
status = RECTANGLE_W( $GBORDER, -3.0_8, -1.5_8, 1.5_8, 1.5_8 )
END SUBROUTINE

```

Although the screen is initially clear, `threegraphs` makes sure by calling the `CLEARSCREEN` routine to clear the window:

```
CALL CLEARSCREEN( $GCLEARSCREEN )
```

The `$GCLEARSCREEN` constant clears the entire window. Other options include `$GVIEWPORT` and `$GWINDOW`, which clear the current viewport and the current text window, respectively.

After assigning values to some variables, `threegraphs` creates the first window:

```
CALL SETVIEWPORT( INT2(0), INT2(0), halfx - 1, halfy - 1 )
CALL SETTEXTWINDOW( INT2(1), INT2(1), rows / 2, cols / 2 )
status = SETWINDOW( .FALSE., -2.0_8, -2.0_8, 2.0_8, 2.0_8 )
```

The first instruction defines a viewport that covers the upper-left quarter of the screen. The next instruction defines a text window within the boundaries of that border. Finally, the third instruction creates a window with both x and y values ranging from -2.0 to 2.0. The `.FALSE.` constant causes the y-axis to increase from top to bottom, which is the default. The `_8` notation identifies the constants as `REAL(8)`.

Next, the function `gridshape` inserts the grid and plots the data, and a border is added to the window:

```
CALL gridshape( rows / 2 )
status = RECTANGLE( $GBORDER, INT2(0), INT2(0), halfx-1, halfy-1 )
```

This is the standard `RECTANGLE` routine, which takes coordinates relative to the viewport, not the window.

The `gridshape` subroutine plots the data on the screen.

```
! GRIDSHAPE - This subroutine plots data for REALG.F90
!
SUBROUTINE gridshape( numc )

USE IFQWIN
INTEGER(2)          numc, i, status
INTEGER(4)          rgbcOLOR, oldcolor
CHARACTER(8)         str
REAL(8)             bananas(21), x
TYPE (windowconfig) myscreen
TYPE (wxycoord)     wxy
TYPE (rccoord)      curpos
COMMON              myscreen
!
! Data for the graph:
!
DATA bananas / -0.3, -0.2, -0.224, -0.1, -0.5, 0.21, 2.9, &
& 0.3, 0.2, 0.0, -0.885, -1.1, -0.3, -0.2, &
& 0.001, 0.005, 0.14, 0.0, -0.9, -0.13, 0.31 /
!
! Print colored words on the screen.
!
IF(myscreen.numcolors .LT. numc) numc = myscreen.numcolors-1
DO i = 1, numc
    CALL SETTEXTPOSITION( i, INT2(2), curpos )
    rgbcOLOR = 12**i -1
    rgbcOLOR = MODULO(rgbcOLOR, #FFFFFF)
    oldcolor = SETTEXTCOLORRGB( rgbcOLOR )
    WRITE ( str, '(I8)' ) rgbcOLOR
    CALL OUTTEXT( 'Color ' // str )
END DO
!
! Draw a double rectangle around the graph.
!
oldcolor = SETCOLORRGB( #0000FF ) ! full red
status = RECTANGLE_W( $GBORDER, -1.00_8, -1.00_8, 1.00_8, 1.00_8 )
! constants made REAL(8) by appending _8
status = RECTANGLE_W( $GBORDER, -1.02_8, -1.02_8, 1.02_8, 1.02_8 )
!
! Plot the points.
!
x = -0.90
DO i = 1, 19
```

```

oldcolor = SETCOLORRGB( #00FF00 ) ! full green
CALL MOVETO_W( x, -1.0_8, wxy )
status = LINETO_W( x, 1.0_8 )
CALL MOVETO_W( -1.0_8, x, wxy )
status = LINETO_W( 1.0_8, x )
oldcolor = SETCOLORRGB( #FF0000 ) ! full blue
CALL MOVETO_W( x - 0.1_8, bananas( i ), wxy )
status = LINETO_W( x, bananas( i + 1 ) )
x = x + 0.1
END DO
CALL MOVETO_W( 0.9_8, bananas( i ), wxy )
status = LINETO_W( 1.0_8, bananas( i + 1 ) )
oldcolor = SETCOLORRGB( #00FFFF ) ! yellow
END SUBROUTINE

```

The routine names that end with `_W` work in the same way as their viewport equivalents, except that you pass double-precision floating-point values instead of integers. For example, you pass `INTEGER(2)` to `LINETO`, but `REAL(8)` values to `LINETO_W`.

The two other windows are similar to the first. All three call the `gridshape` function, which draws a grid from location  $(-1.0, -1.0)$  to  $(1.0, 1.0)$ . The grid appears in different sizes because the coordinates in the windows vary. The second window ranges from  $(-3.0, -3.0)$  to  $(3.0, 3.0)$ , and the third from  $(-3.0, -1.5)$  to  $(1.5, 1.5)$ , so the sizes change accordingly.

The third window also contains a `.TRUE.` inversion argument. This causes the y-axis to increase from bottom to top, instead of top to bottom. As a result, this graph appears upside down with respect to the other two.

After calling `gridshape`, the program frames each window, using a statement such as the following:

```
status = RECTANGLE_W( $GBORDER, -3.0_8, -1.5_8, 1.5_8, 1.5_8 )
```

The first argument is a fill flag indicating whether to fill the rectangle's interior or just to draw its outline. The remaining arguments are the x and y coordinates for the upper-left corner followed by the x and y coordinates for the lower-right corner. `RECTANGLE` takes integer arguments that refer to the viewport coordinates. `RECTANGLE_W` takes four double-precision floating-point values referring to window coordinates.

After you create various graphics elements, you can use the font-oriented routines to polish the appearance of titles, headings, comments, or labels. [Using Fonts from the Graphics Library Overview](#) describes in more detail how to print text in various fonts with font routines.

## Adding Color

### Adding Color Overview

The Intel® Fortran QuickWin Library supports color graphics. The number of total available colors depends on the current video driver and video adapter you are using. The number of available colors you use depends on the graphics functions you choose.

If you have a VGA machine, you are restricted to displaying at most 256 colors at a time. These 256 colors are held in a palette. You can choose the palette colors from a range of 262,144 colors (256K), but only 256 at a time. The palette routines `REMAPPALETTERGB` and `REMAPALLPALETTERGB` assign Red-Green-Blue (RGB) colors to palette indexes.

Functions and subroutines that use color indexes create graphic outputs that depend on the mapping between palette indexes and RGB colors. `REMAPPALETTERGB` remaps one color index to an RGB color, and `REMAPALLPALETTERGB` remaps the entire palette, up to 236 colors, (20 colors are reserved by the system). You cannot remap the palette on machines capable of displaying 20 colors or fewer.

SVGA and true color video adapters are capable of displaying 262,144 (256K) colors and 16.7 million colors respectively. If you use a palette, you are restricted to the colors available in the palette.

To access the entire set of available colors, not just the 256 or fewer colors in the palette, you should use functions that specify a color value directly. These functions end in RGB and use Red-Green-Blue color values, not indexes to a palette. For example, `SETCOLORRGB`, `SETTEXTCOLORRGB`, and `SETPIXELRGB` specify a direct color value, while `SETCOLOR`, `SETTEXTCOLOR`, and `SETPIXEL` each specify a palette color index. If you are displaying more than 256 colors simultaneously, you need to use the RGB direct color value functions exclusively.

To set the physical display properties of your monitor, open the Control Panel and click the Display icon.

QuickWin only supports a 256-color palette, regardless of the number of colors set for the monitor.

The different color modes and color functions are discussed and demonstrated in the following sections:

## See Also

[Color Mixing](#)

[VGA Color Palette](#)

[Using Text Colors](#)

## Color Mixing

If you have a VGA machine, you are restricted to displaying at most 256 colors at a time. These 256 colors are held in a palette. You can choose the palette colors from a range of 262,144 colors (256K), but only 256 at a time. Some display adapters (most SVGAs) are capable of displaying all of the 256K colors and some (true color display adapters) are capable of displaying  $256 * 256 * 256 = 16.7$  million colors.

If you use a palette, you are restricted to the colors available in the palette. In order to access all colors available on your system, you need to specify an explicit Red-Green-Blue (RGB) value, not a palette index.

When you select a color index, you specify one of the colors in the system's predefined palette. `SETCOLOR`, `SETBKCOLOR`, and `SETTEXTCOLOR` set the current color, background color, and text color to a palette index.

`SETCOLORRGB`, `SETBKCOLORRGB`, and `SETTEXTCOLORRGB` set the colors to a color value chosen from the entire available range. When you select a color value, you specify a level of intensity with a range of 0 - 255 for each of the red, green, and blue color values. The long integer that defines a color value consists of 3 bytes (24 bits) as follows:

MSB	LSB
BBBBBBBB	GGGGGGG
RRRRRRR	

where R, G, and B represent the bit values for red, green, and blue intensities. To mix a light red (pink), turn red all the way up and mix in some green and blue:

```
10000000 10000000 11111111
```

In hexadecimal notation, this number equals #8080FF. To set the current color to this value, you can use the function:

```
i = SETCOLORRGB (#8080FF)
```

You can also pass decimal values to this function. Keep in mind that 1 (binary 00000001, hex 01) represents a low color intensity and that 255 (binary 11111111, hex FF) equals full color intensity. To create pure yellow (100-percent red plus 100-percent green) use this line:

```
i = SETCOLORRGB( #00FFFF )
```

For white, turn all of the colors on:

```
i = SETCOLORRGB( #FFFFFF )
```

For black, set all of the colors to 0:

```
i = SETCOLORRGB( #000000 )
```

RGB values for example colors are in the following table.

### RGB Color Values

Color	RGB Value	Color	RGB Value
Black	#000000	Bright White	#FFFFFF

## RGB Color Values

Color	RGB Value	Color	RGB Value
Dull Red	#000080	Bright Red	#0000FF
Dull Green	#008000	Bright Green	#00FF00
Dull Yellow	#008080	Bright Yellow	#00FFFF
Dull Blue	#800000	Bright Blue	#FF0000
Dull Magenta	#800080	Bright Magenta	#FF00FF
Dull Turquoise	#808000	Bright Turquoise	#FFFF00
Dark Gray	#808080	Light Gray	#C0C0C0

If you have a 64K-color machine and you set an RGB color value that is not equal to one of the 64K preset RGB color values, the system approximates the requested RGB color to the closest available RGB value. The same thing happens on a VGA machine when you set an RGB color that is not in the palette. (You can remap your VGA color palette to different RGB values; see [VGA Color Palette](#).)

However, although your graphics are drawn with an approximated color, if you retrieve the color with `GETCOLORRGB`, `GETBKCOLORRGB`, or `GETTEXTCOLORRGB`, the color you specified is returned, not the actual color used. This is because the `SETCOLORRGB` functions do not execute any graphics, they simply set the color and the approximation is made when the drawing is made (by `ELLIPSE` or `ARC`, for example).

`GETPIXELRGB` and `GETPIXELSRGB` do return the approximated color actually used, because `SETPIXELRGB` and `SETPIXELSRGB` actually set a pixel to a color on the screen and the approximation, if any, is made at the time they are called.

## VGA Color Palette

A VGA machine is capable of displaying at most 256 colors at a time. QuickWin provides support for VGA monitors and more advanced monitors that are set at 256 colors. Only a 256-color palette (or less) is supported internally regardless of the current number of colors set for the display (in the Control Panel). The number of colors you select for your VGA palette depends on your application, and is set by setting the `wc %numcolors` variable in the `windowconfig` derived type to 2, 16, or 256 with `SETWINDOWCONFIG`.

An RGB color value must be in the palette to be accessible to your VGA graphic displays. You can change the default colors and customize your color palette by using `REMAPPALETTERGB` to change a palette color index to any RGB color value. The following example remaps the color index 1 (default blue color) to the pure red color value given by the RGB value `#0000FF`. After this is executed, whatever was displayed as blue will appear as red:

```
USE IFQWIN
INTEGER status
status = REMAPPALETTERGB( 1, #0000FF ) ! Reassign color index 1
                                         ! to RGB red
```

`REMAPALLPALETTERGB` remaps one or more color indexes simultaneously. Its argument is an array of RGB color values that are mapped into the palette. The first color number in the array becomes the new color associated with color index 0, the second with color index 1, and so on. At most 236 indexes can be mapped, because 20 indexes are reserved for system use.

If you request an RGB color that is not in the palette, the color selected from the palette is the closest approximation to the RGB color requested. If the RGB color was previously placed in the palette with `REMAPPALETTERGB` or `REMAPALLPALETTERGB`, then that exact RGB color is available.

Remapping the palette has no effect on 64K-color machines, SVGA, or true-color machines, unless you limit yourself to a palette by using color index functions such as `SETCOLOR`. On a VGA machine, if you remap all the colors in your palette and display that palette in graphics, you cannot then remap and simultaneously display a second palette.

For instance, in VGA 256-color mode, if you remap all 256 palette colors and display graphics in one child window, then open another child window, remap the palette and display graphics in the second child window, you are attempting to display more than 256 colors at one time. The machine cannot do this, so whichever child window has the focus will appear correct, while the one without the focus will change color.

#### NOTE

Machines that support more than 256 colors will not be able to do animation by remapping the palette. Windows operating systems create a logical palette that maps to the video hardware palette. On video hardware that supports a palette of 256 colors or less, remapping the palette maps over the current palette and redraws the screen in the new colors.

On large hardware palettes that support more than 256 colors, remapping is done into the unused portion of the palette. It does not map over the current colors nor redraw the screen. So, on machines with large palettes (more than 256 colors), the technique of changing the screen through remapping, called palette animation, cannot be used. See the *MSDN\* Platform SDK Manual* for more information.

Symbolic constants (names) for the default color numbers are supplied in the graphics modules. The names are self-descriptive; for example, the color numbers for black, yellow, and red are represented by the symbolic constants \$BLACK, \$YELLOW, and \$RED.

## Using Text Colors

`SETTEXTCOLORRGB` (or `SETTEXTCOLOR`) and `SETBKCOLORRGB` (or `SETBKCOLOR`) set the foreground and background colors for text output. All use a single argument specifying the color value (or color index) for text displayed with `OUTTEXT` and `WRITE`. For the color index functions, colors are represented by the range 0-31. Index values in the range of 16-31 access the same colors as those in the range of 0-15.

You can retrieve the current foreground and background color values with `GETTEXTCOLORRGB` and `GETBKCOLORRGB` or the color indexes with `GETTEXTCOLOR` and `GETBKCOLOR`. Use `SETTEXTPOSITION` to move the cursor to a particular row and column. `OUTTEXT` and `WRITE` print the text at the current cursor location.

For more information on these routines, see the appropriate routines in the *Language Reference*.

## Writing a Graphics Program

### Writing a Graphics Program Overview

Like many programs, graphics programs work well when written in small units. Using discrete routines aids debugging by isolating the functional components of the program. The following example program and its associated subroutines show the steps involved in initializing, drawing, and closing a graphics program.

The SINE program draws a sine wave. Its procedures call many of the common graphics routines. The main program calls five subroutines that carry out the actual graphics commands (also located in the SINE.F90 file):

```
! SINE.F90 - Illustrates basic graphics commands.
!  USE IFQWIN
CALL graphicsmode( )
CALL drawlines( )
CALL sinewave( )
CALL drawshapes( )
END
.
.
.
```

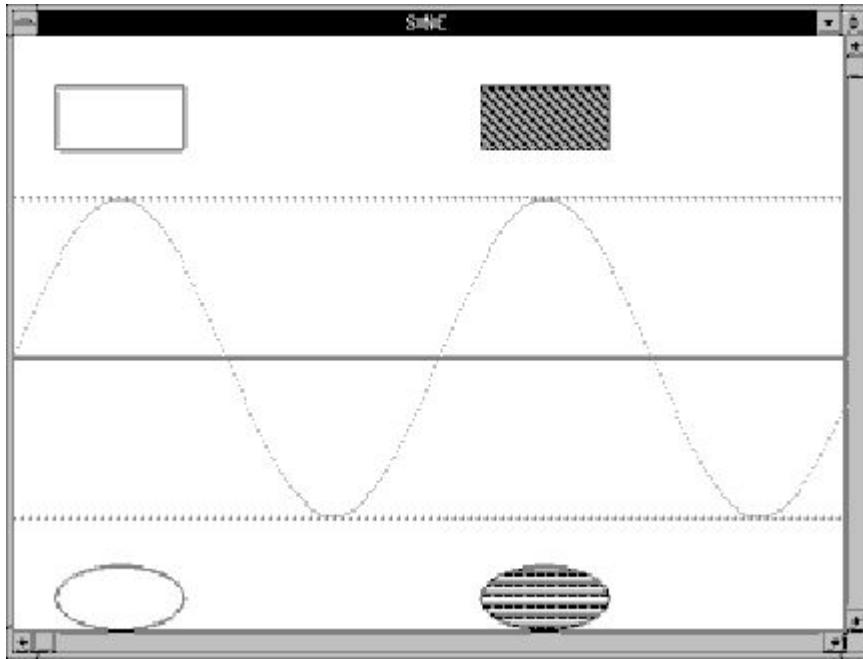
For information on the subroutines used in the SINE program, see:

- `graphicsmode` in section [Activating a Graphics Mode](#)
- `drawlines` in section [Drawing Lines on the Screen](#)

- `sinewave` in section [Drawing a Sine Curve](#)
- `drawshapes` in section [Adding Shapes](#)

The SINE program's output appears in the following figure. The project is built as a Fortran Standard Graphics application.

### Sine Program Output



### Activating a Graphics Mode

If you call a graphics routine without setting a graphics mode with `SETWINDOWCONFIG`, QuickWin automatically sets the graphics mode with default values.

The [Writing a Graphics Program Overview](#) program shown in the previous topic selects and sets the graphics mode in the subroutine `graphicsmode`, which selects the highest possible resolution for the current video driver:

```

SUBROUTINE graphicsmode( )
USE IFQWIN
LOGICAL           modestatus
INTEGER(2)        maxx, maxy
TYPE (windowconfig) myscreen
COMMON           maxx, maxy
! Set highest resolution graphics mode.
myscreen.numxpixels=-1
myscreen.numypixels=-1
myscreen.numtextcols=-1
myscreen.numtextrows=-1
myscreen.numcolors=-1
myscreen.fontsize=-1
myscreen.title = " "C ! blank
modestatus=SETWINDOWCONFIG(myscreen)
! Determine the maximum dimensions.
modestatus=GETWINDOWCONFIG(myscreen)
maxx=myscreen.numxpixels - 1
maxy=myscreen.numypixels - 1
END SUBROUTINE

```

Pixel coordinates start at zero, so, for example, a screen with a resolution of 640 horizontal pixels has a maximum x-coordinate of 639. Thus, maxx (the highest available x-pixel coordinate) must be 1 less than the total number of pixels. The same applies to maxy.

To remain independent of the video mode set by `graphicsmode`, two short functions convert an arbitrary screen size of 1000x1000 pixels to whatever video mode is in effect. From now on, the program assumes it has 1000 pixels in each direction. To draw the points on the screen, `newx` and `newy` map each point to their physical (pixel) coordinates:

```

! NEWX - This function finds new x-coordinates.
INTEGER(2) FUNCTION newx( xcoord )
  INTEGER(2) xcoord, maxx, maxy
  REAL(4) tempx
  COMMON maxx, maxy
  tempx = maxx / 1000.0
  tempx = xcoord * tempx + 0.5
  newx = tempx
END FUNCTION

! NEWY - This function finds new y-coordinates.
!
INTEGER(2) FUNCTION newy( ycoord )
  INTEGER(2) ycoord, maxx, maxy
  REAL(4) tempy
  COMMON maxx, maxy
  tempy = maxy / 1000.0
  tempy = ycoord * tempy + 0.5
  newy = tempy
END FUNCTION

```

You can set up a similar independent coordinate system with *window coordinates*, described in [Understanding Coordinate Systems Overview](#).

## Drawing Lines on the Screen

[Writing a Graphics Program Overview](#) next calls the subroutine `drawlines`, which draws a rectangle around the outer edges of the screen and three horizontal lines that divide the screen into quarters. (See [Writing a Graphics Program Overview](#).)

```

! DRAWLINES - This subroutine draws a box and
! several lines.
SUBROUTINE drawlines( )  USE IFQWIN    EXTERNAL      newx, newy
  INTEGER(2)      status, newx, newy, maxx, maxy
  TYPE (xycoord)  xy
  COMMON         maxx, maxy
!
! Draw the box.
status = RECTANGLE( $GBORDER, INT2(0), INT2(0), maxx, maxy )
CALL SETVIEWORG( INT2(0), newy( INT2( 500 ) ), xy )
! This sets the new origin to 0 for x and 500 for y.
! Draw the lines.
CALL MOVETO( INT2(0), INT2(0), xy )
status = LINETO( newx( INT2( 1000 )), INT2(0) )
CALL SETLINESTYLE( INT2( #AA3C ) )
CALL MOVETO( INT2(0), newy( INT2( -250 )), xy )
status = LINETO( newx( INT2( 1000 )), newy( INT2( -250 ) ) )
CALL SETLINESTYLE( INT2( #8888 ) )
CALL MOVETO( INT2(0), newy( INT2( 250 )), xy )
status = LINETO( newx( INT2( 1000 )), newy( INT2( 250 ) ) )
END SUBROUTINE

```

The first argument to `RECTANGLE` is the *fill flag*, which can be either `$GBORDER` or `$GFILLINTERIOR`. Choose `$GBORDER` if you want a rectangle of four lines (a border only, in the current line style), or `$GFILLINTERIOR` if you want a solid rectangle (filled in with the current color and fill pattern). Choosing the color and fill pattern is discussed in [Adding Color Overview](#) and [Adding Shapes](#).

The second and third `RECTANGLE` arguments are the x- and y-coordinates of the upper-left corner of the rectangle. The fourth and fifth arguments are the coordinates for the lower-right corner. Because the coordinates for the two corners are ( 0, 0 ) and ( `maxx`, `maxy` ), the call to `RECTANGLE` frames the entire screen.

The program calls `SETVIEWORG` to change the location of the viewport origin. By resetting the origin to ( 0, 500 ) in a 1000x1000 viewport, you effectively make the viewport run from ( 0, -500 ) at the top left of the screen to ( 1000, 500 ) at the bottom right of the screen:

```
CALL SETVIEWORG( INT2(0), newy( INT2( 500 ) ), xy )
```

Changing the coordinates illustrates the ability to alter the viewport coordinates to whatever dimensions you prefer. (Viewports and the `SETVIEWORG` routine are explained in more detail in [Understanding Coordinate Systems Overview](#).)

The call to `SETLINESTYLE` changes the line style from a solid line to a dashed line. A series of 16 bits tells the routine which pattern to follow. Five possible line patterns are available. For more information, see `SETLINESTYLE` in the Intel Fortran Language Reference.

When drawing lines, first set an appropriate line style. Then, move to where you want the line to begin and call `LINETO`, passing to it the point where you want the line to end. The `drawlines` subroutine uses the following code:

```
CALL SETLINESTYLE(INT2( #AA3C ) )
CALL MOVETO( INT2(0), newy( INT2( -250 ) ), xy )
dummy = LINETO( newx( INT2( 1000 ) ), newy( INT2( -250 ) ) )
```

`MOVETO` positions an imaginary pixel cursor at a point on the screen (nothing appears on the screen), and `LINETO` draws a line. When the program called `SETVIEWORG`, it changed the viewport origin, and the initial y-axis range of 0 to 1000 now corresponds to a range of -500 to +500. Therefore, the negative value -250 is used as the y-coordinate of `LINETO` to draw a horizontal line across the center of the top half of the screen, and the value of 250 is used as the y-coordinate to draw a horizontal line across the center of the bottom half of the screen.

## Drawing a Sine Curve

With the axes and frame in place, [Writing a Graphics Program Overview](#) is ready to draw the sine curve. The `sinewave` routine calculates the x and y positions for two cycles and plots them on the screen:

```
! SINEWAVE - This subroutine calculates and plots a sine wave.
SUBROUTINE sinewave( )
  USE IFQWIN
  INTEGER(2)    dummy, newx, newy, locx, locy, i
  INTEGER(4)    color
  REAL          rad
  EXTERNAL      newx, newy
  PARAMETER    ( PI = 3.14159 )
!
! Calculate each position and display it on the screen.
  color = #0000FF ! red
!
  DO i = 0, 999, 3
    rad = -SIN( PI * i / 250.0 )
    locx = newx( i )
    locy = newy( INT2( rad * 250.0 ) )
    dummy = SETPIXELRGB( locx, locy, color )
  END DO
END SUBROUTINE
```

`SETPIXELRGB` takes the two location parameters, `locx` and `locy`, and sets the pixel at that position with the specified color value (red).

## Adding Shapes

After drawing the sine curve, [Writing a Graphics Program Overview](#) calls `drawshapes` to put two rectangles and two ellipses on the screen. The fill flag alternates between `$GBORDER` and `$GFILLINTERIOR`:

```

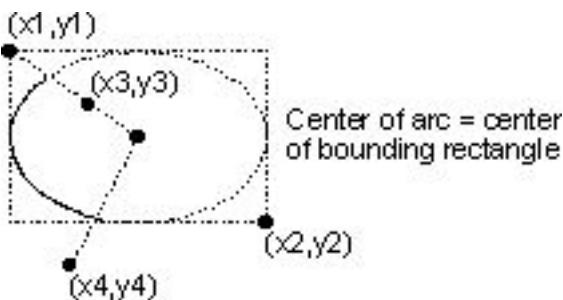
! DRAWSHAPES - Draws two boxes and two ellipses.
!
SUBROUTINE drawshapes( )
  USE IFQWIN
  EXTERNAL    newx, newy
  INTEGER(2)  dummy, newx, newy
!
! Create a masking (fill) pattern.
!
  INTEGER(1) diagmask(8), horzmask(8)
  DATA diagmask / #93, #C9, #64, #B2, #59, #2C, #96, #4B /
  DATA horzmask / #FF, #00, #7F, #FE, #00, #00, #00, #CC /
!
! Draw the rectangles.
!
  CALL SETLINESTYLE( INT2(#FFFF) )
  CALL SETFILLMASK( diagmask )
  dummy = RECTANGLE( $GBORDER, newx(INT2(50)), newy(INT2(-325)), &
  & newx(INT2(200)), newy(INT2(-425)))
  dummy = RECTANGLE( $GFILLINTERIOR, newx(INT2(550)), &
  & newy(INT2(-325)), newx(INT2(700)), newy(INT2(-425)))
!
! Draw the ellipses.
!
  CALL SETFILLMASK( horzmask )
  dummy = ELLIPSE( $GBORDER, newx(INT2(50)), newy(INT2(325)), &
  & newx(INT2(200)), newy(INT2(425)))
  dummy = ELLIPSE( $GFILLINTERIOR, newx(INT2(550)), &
  & znewy(INT2(325)), newx(INT2(700)), newy(INT2(425)))
END SUBROUTINE

```

The call to `SETLINESTYLE` resets the line pattern to a solid line. Omitting this routine causes the first rectangle to appear with a dashed border, because the `drawlines` subroutine called earlier changed the line style to a dashed line.

`ELLIPSE` draws an ellipse using parameters similar to those for `RECTANGLE`. It, too, requires a fill flag and two corners of a bounding rectangle. The following figure shows how an ellipse uses a bounding rectangle:

### Bounding Rectangle



The `$GFILLINTERIOR` constant fills the shape with the current fill pattern. To create a pattern, pass the address of an 8-byte array to `SETFILLMASK`. In `drawshapes`, the `diagmask` array is initialized with the pattern shown in the following table:

## Fill Patterns

Bit pattern	Value in diagmask
Bit No. 7 6 5 4 3 2 1 0	
x o o x o o <b>x x</b>	diagmask(1) = #93
<b>x x</b> o o x o o x	diagmask(2) = #C9
o <b>x x</b> o o x o o	diagmask(3) = #64
x o <b>x x</b> o o x o	diagmask(4) = #B2
o x o <b>x x</b> o o x	diagmask(5) = #59
o o x o <b>x x</b> o o	diagmask(6) = #2C
x o o x o <b>x x</b> o	diagmask(7) = #96
o x o o x o <b>x x</b>	diagmask(8) = #4B

## Displaying Graphics Output

### Displaying Graphics Output Overview

The run-time graphics library routines can draw geometric features, display text, display font-based characters, and transfer images between memory and the screen.

The graphics routines provided with Intel® Visual Fortran set points, draw lines, draw text, change colors, and draw shapes such as circles, rectangles, and arcs.

This section uses the following terms:

- The *origin* (point 0, 0) is the upper-left corner of the screen or the client area (defined user area) of the child window being written to. The x-axis and y-axis start at the origin. You can change the origin in some coordinate systems.
- The horizontal direction is represented by the *x-axis*, increasing to the right.
- The vertical direction is represented by the *y-axis*, increasing down.
- Some graphics adapters offer a *color palette* that can be changed.
- Some graphics adapters (VGA and SVGA) allow you to change the color that a color index refers to by providing a *color value* that describes a new color. The color value indicates the mix of red, green, and blue in a screen color. A color value is always an INTEGER number.

### See Also

[Drawing Graphics](#)

[Displaying Character-Based Text](#)

[Displaying Font-Based Characters](#)

### Drawing Graphics

If you want anything other than the default line style (solid), mask (no mask), background color (black), or foreground color (white), you must call the appropriate routine before calling the drawing routine. Subsequent output routines employ the same attributes until you change them or open a new child window.

The following is a list of routines that provide information on the current graphics settings, set new graphics settings, and draw graphics:

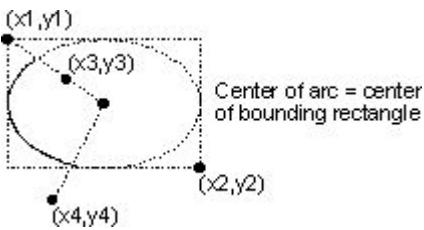
Routine	Description
ARC, ARC_W	Draws an arc
CLEARSCREEN	Clears the screen, viewport, or text window
ELLIPSE, ELLIPSE_W	Draws an ellipse or circle
FLOODFILL, FLOODFILL_W	Fills an enclosed area of the screen with the current color index using the current fill mask

Routine	Description
FLOODFILLRGB, FLOODFILLRGB_W	Fills an enclosed area of the screen with the current RGB color using the current fill mask
GETARCINFO	Determines the endpoints of the most recently drawn arc or pie
GETCURRENTPOSITION, GETCURRENTPOSITION_W	Returns the coordinates of the current graphics-output position
GETPIXEL, GETPIXEL_W	Returns a pixel's color index
GETPIXELRGB, GETPIXELRGB_W	Returns a pixel's Red-Green-Blue color value
GETPIXELS	Gets the color indices of multiple pixels
GETPIXELSRGB	Gets the Red-Green-Blue color values of multiple pixels
GRSTATUS	Returns the status (success or failure) of the most recently called graphics routine
INTEGERTORGB	Convert a true color value into its red, green, and blue components
LINETO, LINETO_W	Draws a line from the current graphics-output position to a specified point
LINETOAR, LINETOAREX	Draws lines from arrays at x,y coordinate points
MOVETO, MOVETO_W	Moves the current graphics-output position to a specified point
PIE, PIE_W	Draws a pie-slice-shaped figure
POLYGON, POLYGON_W	Draws a polygon
RECTANGLE, RECTANGLE_W	Draws a rectangle
RGBTOINTEGER	Convert a trio of red, green, and blue values to a true color value for use with RGB functions and subroutines
SETPIXEL, SETPIXEL_W	Sets a pixel at a specified location to a color index
SETPIXELRGB, SETPIXELRGB_W	Sets a pixel at a specified location to a Red-Green-Blue color value
SETPIXELS	Set the color indices of multiple pixels
SETPIXELSRGB	Set the Red-Green-Blue color value of multiple pixels

Most of these routines have multiple forms. Routine names that end with \_W use the window-coordinate system and REAL(8) argument values. Routines without this suffix use the viewport-coordinate system and INTEGER(2) argument values.

Curved figures, such as arcs and ellipses, are centered within a *bounding rectangle*, which is specified by the upper-left and lower-right corners of the rectangle. The center of the rectangle becomes the center for the figure, and the rectangle's borders determine the size of the figure. In the following figure, the points (x1, y1) and (x2, y2) define the bounding rectangle.

### Bounding Rectangle



## Displaying Character-Based Text

The routines in the following table ask about screen attributes that affect text display, prepare the screen for text and send text to the screen. To print text in specialized fonts, see [Displaying Font-Based Characters](#) and [Using Fonts from the Graphics Library Overview](#).

In addition to these general text routines, you can customize the text in your menus with `MODIFYMENUSTRINGQQ`. You can also customize any other string that QuickWin produces, including status bar messages, the state message (for example, "Paused" or "Running"), and dialog box messages, with `SETMESSAGEQQ`. Use of these customization routines is described in [Customizing QuickWin Applications Overview](#).

The following routines recognize text-window boundaries:

Routine	Description
<code>CLEARSCREEN</code>	Clears the screen, viewport, or text window
<code>DISPLAYCURSOR</code>	Sets the cursor on or off
<code>GETBKCOLOR</code>	Returns the current background color index
<code>GETBKCOLORRGB</code>	Returns the current background Red-Green-Blue color value
<code>GETTEXTCOLOR</code>	Returns the current text color index
<code>GETTEXTCOLORRGB</code>	Returns the current text Red-Green-Blue color value
<code>GETTEXTPOSITION</code>	Returns the current text-output position
<code>GETTEXTWINDOW</code>	Returns the boundaries of the current text window
<code>OUTTEXT</code>	Sends text to the screen at the current position
<code>SCROLLTEXTWINDOW</code>	Scrolls the contents of a text window
<code>SETBKCOLOR</code>	Sets the current background color index
<code>SETBKCOLORRGB</code>	Sets the current background Red-Green-Blue color value
<code>SETTEXTCOLOR</code>	Sets the current text color to a new color index
<code>SETTEXTCOLORRGB</code>	Sets the current text color to a new Red-Green-Blue color value
<code>SETTEXTPOSITION</code>	Changes the current text position
<code>SETTEXTWINDOW</code>	Sets the current text-display window
<code>WRAPON</code>	Turns line wrapping on or off

These routines do not provide text-formatting capabilities. If you want to print integer or floating-point values, you must convert the values into a string (using an internal `WRITE` statement) before calling these routines. The text routines specify all screen positions in character-row and column coordinates.

SETTEXTWINDOW is the text equivalent of the SETVIEWPORT graphics routine, except that it restricts only the display area for text printed with OUTTEXT, PRINT, and WRITE. GETTEXTWINDOW returns the boundaries of the current text window set by SETTEXTWINDOW. SCROLLTEXTWINDOW scrolls the contents of a text window. OUTTEXT, PRINT, and WRITE display text strings written to the current text window.

---

**NOTE**

The WRITE statement sends its carriage return (CR) and line feed (LF) to the screen at the beginning of the first I/O statement following the WRITE statement. This can cause unpredictable text positioning if you mix the graphics routines SETTEXTPOSITION and OUTTEXT with the WRITE statement. To minimize this effect, use the backslash ( \ ) or dollar sign ( \$ ) format descriptor (to suppress CR-LF) in the associated FORMAT statement.

---

See more information on routines mentioned here, see the routine descriptions in the *Language Reference*.

## Displaying Font-Based Characters

Because the Intel Visual Fortran Graphics Library provides a variety of fonts, you must indicate which font to use when displaying font-based characters. After you select a font, you can make inquiries about the width of a string printed in that font or about font characteristics.

The following functions control the display of font-based characters:

Routine	Description
GETFONTINFO	Returns the current font characteristics
GETGTEXTTEXT ENT	Determines the width of specified text in the current font
GETGTEXTROT ATION	Gets the current orientation for font text output in 0.1° increments
INITIALIZEF ONTS	Initializes the font library
OUTGTEXT	Sends text in the current font to the screen at the current graphics output position
SETFONT	Finds a single font that matches a specified set of characteristics and makes it the current font used by OUTGTEXT
SETGTEXTROT ATION	Sets the current orientation for font text output in 0.1° increments

Characters may be drawn ("mapped") in one of two ways: as bitmapped letters (a "picture" of the letter) or as TrueType characters. See [Using Fonts from the Graphics Library Overview](#), for detailed explanations and examples of how to use the font routines from the QuickWin Library.

For more information on these routines, see the *Language Reference*.

## Using Fonts from the Graphics Library

### Using Fonts from the Graphics Library Overview

The Intel® Fortran Graphics Library includes routines that print text in various sizes and type styles. These routines provide control over the appearance of your text and add visual interest to your screen displays.

This section assumes you have read [Displaying Graphics Output Overview](#) and that you understand the general terminology it introduces. You should also be familiar with the basic properties of both the SETWINDOWCONFIG and MOVETO routines. Also, remember that graphics programs containing graphics routines must be built as Fortran QuickWin or Fortran Standard Graphics applications.

The project type is set in the visual development environment when you select New from the File menu, then click on the Projects tab, and select Fortran QuickWin or Fortran Standard Graphics Application from the application types listed. Graphics applications can also be built with the `/libs:qwin` or `/libs:qwins` compiler option.

## See Also

[Available Typefaces](#)

[Initializing Fonts](#)

[Setting the Font and Displaying Text](#)

[SHOWFONT.F90 Example](#)

## Available Typefaces

A *font* is a set of text characters of a particular size and style.

A *typeface* (or *type style*) refers to the style of the displayed characters -- Arial, for example, or Times New Roman.

*Type size* measures the screen area occupied by individual characters. The term comes from the printer's lexicon, but uses screen pixels as the unit of measure rather than the traditional points. For example, "Courier 12 9" denotes the Courier typeface, with each character occupying a screen area of 12 vertical pixels by 9 horizontal pixels. The word "font", therefore implies both a typeface and a type size.

The QuickWin Library font routines use all Windows operating system installed fonts. The first type of font used is a *bitmap* (or *raster-map*) font. Bitmap fonts have each character in a binary data map. Each bit in the map corresponds to a screen pixel. If the bit equals 1, its associated pixel is set to the current screen color. Bit values of 0 appear in the current background color.

The second type of font is called a TrueType font. Some screen fonts look different on a printer, but TrueType fonts print exactly as they appear on the screen. TrueType fonts may be bitmaps or soft fonts (fonts that are downloaded to your printer before printing), depending on the capabilities of your printer. TrueType fonts are scalable and can be sized to any height. It is recommended that you use TrueType fonts in your graphics programs.

Each type of font has advantages and disadvantages. Bitmapped characters appear smoother on the screen because of the predetermined pixel mapping. However, they cannot be scaled. You can scale TrueType text to any size, but the characters sometimes do not look quite as solid as the bitmapped characters on the screen. Usually this screen effect is hardly noticeable, and when printed, TrueType fonts are as smooth or smoother than bitmapped fonts.

The bitmapped typefaces come in preset sizes measured in pixels. The exact size of any font depends on screen resolution and display type.

## Initializing Fonts

A program that uses fonts must first organize the fonts into a list in memory, a process called initializing. The list gives the computer information about the available fonts.

Initialize the fonts by calling the `INITIALIZEFONTS` routine:

```
USE IFQWIN
INTEGER(2) numfonts
numfonts = INITIALIZEFONTS( )
```

If the computer successfully initializes one or more fonts, `INITIALIZEFONTS` returns the number of fonts initialized. If the function fails, it returns a negative error code.

## Setting the Font and Displaying Text

Before a program can display text in a particular font, it must know which of the initialized fonts to use. `SETFONT` makes one of the initialized fonts the current (or "active") font. `SETFONT` has the following syntax:

```
result =SETFONT (options)
```

The function's argument consists of letter codes that describe the desired font: typeface, character height and width in pixels, fixed or proportional, and attributes such as bold or italic. These options are discussed in detail in the SETFONT entry in the *Language Reference* in the *Intel® Visual Fortran Compiler User and Reference Guides*. For example:

```
USE IFQWIN
INTEGER(2) index, numfonts
numfonts = INITIALIZEFONTS ( )
index = SETFONT('t''Cottage''h18w10')
```

This sets the typeface to Cottage, the character height to 18 pixels and the width to 10 pixels.

The following example sets the typeface to Arial, the character height to 14, with proportional spacing and italics (the pi codes):

```
index = SETFONT('t''Arial''h14pi')
```

If SETFONT successfully sets the font, it returns the font's index number. If the function fails, it returns a negative integer. Call GRSTATUS to find the source of the problem; its return value indicates why the function failed. If you call SETFONT before initializing fonts, a run-time error occurs.

SETFONT updates the font information when it is used to select a font. GETFONTINFO can be used to obtain information about the currently selected font. SETFONT sets the user fields in the fontinfo type (a derived type defined in DFLIB.MOD), and GETFONTINFO returns the user-selected values. The following user fields are contained in fontinfo:

```
TYPE fontinfo
  INTEGER(2) type ! 1 = truetype, 0 = bit map
  INTEGER(2) ascent ! Pixel distance from top to baseline
  INTEGER(2) pixwidth ! Character width in pixels, 0=prop
  INTEGER(2) pixheight ! Character height in pixels
  INTEGER(2) avgwidth ! Average character width in pixels
  CHARACTER(32) facename ! Font name
END TYPE fontinfo
```

To find the parameters of the current font, call GETFONTINFO. For example:

```
USE IFQWIN
TYPE (fontinfo) font
INTEGER(2) i, numfonts
numfonts = INITIALIZEFONTS()
i = SETFONT ( ' t ' 'Arial' ')
i = GETFONTINFO(font)
WRITE (*,*) font.avgwidth, font.pixheight, font.pixwidth
```

After you initialize the fonts and make one the active font, you can display the text on the screen.

#### To display text on the screen after selecting a font:

1. Select a starting position for the text with MOVETO.
2. Optionally, set a text display angle with SETGTEXTROTATION.
3. Send the text to the screen (in the current font) with OUTGTEXT.

MOVETO moves the current graphics point to the pixel coordinates passed to it when it is invoked. This becomes the starting position of the upper-left corner of the first character in the text. SETGTEXTROTATION can set the text's orientation in increments of one-tenth of a degree.

#### SHOWFONT.F90 Example

The program SHOWFONT.F90 displays text in the fonts available on your system. (Once the screen fills with text, press Enter to display the next screen.) An abbreviated version follows. SHOWFONT calls SETFONT to specify the typeface. MOVETO then establishes the starting point for each text string. The program sends a message of sample text to the screen for each font initialized:

```
! Abbreviated version of SHOWFONT.F90.
USE IFQWIN
INTEGER(2) grstat, numfonts, indx, curr_height
```

```

TYPE (xycoord) xyt
TYPE (fontinfo) f
CHARACTER(6) str      ! 5 chars for font num
                  ! (max. is 32767), 1 for 'n'
! Initialization.
numfonts=INITIALIZEFONTS( )
IF (numfonts.LE.0) PRINT *, "INITIALIZEFONTS error"
IF (GRSTATUS().NE.$GROK) PRINT *, 'INITIALIZEFONTS GRSTATUS error.'
CALL MOVETO (0,0,xyt)
grstat=SETCOLORRGB (#FF0000)
grstat=FLOODFILLRGB (0, 0, #00FF00)
grstat=SETCOLORRGB (0)
! Get default font height for comparison later.
grstat = SETFONT('n1')
grstat = GETFONTINFO(f)
curr_height = f.pixheight
! Done initializing, start displaying fonts.
DO indx=1,numfonts
  WRITE(str,10) indx
  grstat=SETFONT(str)
  IF (grstat.LT.1) THEN
    CALL OUTGTEXT('SetFont error.')
  ELSE
    grstat=GETFONTINFO(f)
    grstat=SETFONT('n1')
    CALL OUTGTEXT(f.facename(:len_trim(f.facename)))
    CALL OUTGTEXT(' ')
  END IF
! Go to next line.
  IF (f.pixheight .GT. curr_height) curr_height=f.pixheight
  CALL GETCURRENTPOSITION(xyt)
  CALL MOVETO(0,INT2(xyt.ycoord+curr_height),xyt)
END DO
10 FORMAT ('n',I5.5)
END

```

## Storing and Retrieving Images

### Working With Screen Images

The routines described in the following topics offer the following ways to store and retrieve images:

- [Transferring Images in Memory](#)

Transferring images from buffers is a quick and flexible way to move things around the screen. Memory images can interact with the current screen image; for example, you can perform a logical AND of a memory image and the current screen or superimpose a negative of the memory image on the screen.

- [Loading and Saving Images to Files](#)

Transferring images from files gives access to images created by other programs, and saves graphs and images for later use. However, images loaded from bitmap files overwrite the portion of the screen they are pasted into and retain the attributes they were created with, such as the color palette, rather than accepting current attributes.

- [Editing Text and Graphics from the QuickWin Edit Menu](#)

Editing screen images from the QuickWin **Edit** menu is a quick and easy way to move and modify images interactively on the screen, retaining the current screen attributes, and also provides temporary storage (the Clipboard) for transferring images among applications.

These routines allow you to cut, paste, and move images around the screen.

## Transferring Images in Memory

The `GETIMAGE` and `PUTIMAGE` routines transfer images between memory and the screen and give you options that control the way the image and screen interact. When you hold an image in memory, the application allocates a memory buffer for the image. The `IMAGESIZE` routines calculate the size of the buffer needed to store a given image.

Routines that end with `_W` use window coordinates; the other functions use viewport coordinates.

Routine	Description
<code>GETIMAGE</code> , <code>GETIMAGE_W</code>	Stores a screen image in memory
<code>IMAGESIZE</code> , <code>IMAGESIZE_W</code>	Returns image size in bytes
<code>PUTIMAGE</code> , <code>PUTIMAGE_W</code>	Retrieves an image from memory and displays it

## Loading and Saving Images to Files

The `LOADIMAGE` and `SAVEIMAGE` routines transfer images between the screen and Windows bitmap files:

Routine	Description
<code>LOADIMAGE</code> , <code>LOADIMAGE_W</code>	Reads a Windows bitmap file (.BMP) from disk and displays it as specified coordinates
<code>SAVEIMAGE</code> , <code>SAVEIMAGE_W</code>	Captures a screen image from the specified portion of the screen and saves it as a Windows bitmap file

You can use a Windows format bitmap file created with a graphics program as a backdrop for graphics that you draw with the Intel Visual Fortran graphics functions and subroutines.

## Editing Text and Graphics from the QuickWin Edit Menu

From the QuickWin Edit menu you can choose the Select Text, Select Graphics, or Select All options. You can then outline your selection with the mouse or the keyboard arrow keys. When you use the Select Text option, your selection is highlighted. When you use the Select Graphics or Select All option, your selection is marked with a box whose dimensions you control.

Once you have selected a portion of the screen, you can copy it onto the Clipboard by using the Edit/Copy option or by using the `Ctrl+INS` key combination. If the screen area you have selected contains only text, it is copied onto the Clipboard as text. If the selected screen area contains graphics, or a mix of text and graphics, it is copied onto the Clipboard as a bitmap.

The Edit menu's Paste option will only paste text. Bitmaps can be pasted into other Windows applications from the Clipboard (with the `Ctrl+V` or `Shift+INS` key combinations).

Remember the following when selecting portions of the screen:

- If you have chosen the Select All option from the Edit menu, the whole screen is selected and you cannot then select a portion of the screen.
- Text selections are not bounded by the current text window set with `SETTEXTWINDOW`.
- When text is copied to the Clipboard, trailing blanks in a line are removed.
- Text that is written to a window can be overdrawn by graphics. In this case, the text is still present in the screen text buffer, though not visible on the screen. When you select a portion of the screen to copy, you can select text that is actually present but not visible, and that text will be copied onto the Clipboard.
- When you choose Select Text or Select Graphics from the Edit menu, the application is paused, a caret (^) appears at the top left corner of the currently active window, all user-defined callbacks are disabled, and the window title changes to "Mark Text - *windowname*" or "Mark Graphics - *windowname*", where *windowname* is the name of the currently active window.

As soon as you begin selection (by pressing an arrow key or a mouse button), the Window title changes to "Select Text - *windowname*" or "Select Graphics - *windowname*" and selection begins at that point. If you do not want selection to begin in the upper-left corner, your first action when "Mark Text" or "Mark Graphics" appears in the title is to use the mouse to place the cursor at the position where selection is to be begin.

## Customizing QuickWin Applications

### Customizing QuickWin Applications Overview

The QuickWin library is a set of routines you can use to create graphics programs or simple applications for Windows. For a general overview of QuickWin and a description of how to create and size child windows, see the beginning of this section. For information on how to compile and link QuickWin applications, see the *Intel® Visual Fortran Compiler User and Reference Guides*.

The following topics describe how to customize and fine-tune your QuickWin applications:

- [Enhancing QuickWin Applications](#)
- [Controlling Menus](#)
- [Changing Status Bar and State Messages](#)
- [Displaying Message Boxes](#)
- [Defining an About Box](#)
- [Using Custom Icons](#)
- [Using a Mouse](#)

### Enhancing QuickWin Applications

In addition to the basic QuickWin features, you can optionally customize and enhance your QuickWin applications with the features described in the following table. These features let you create customized menus, respond to mouse events, and add custom icons.

Category	QuickWin Function	Description
Initial settings	INITIALSETTINGS	Controls initial menu settings and/or initial frame window
Display/add box	MESSAGEBOXQQ	Displays a message box
	ABOUTBOXQQ	Adds an About Box with customized text
Menu items	CLICKMENUQQ	Simulates the effect of clicking or selecting a menu item
	APPENDMENUQQ	Appends a menu item
	DELETEMENUQQ	Deletes a menu item
	INSERTMENUQQ	Inserts a menu item
	MODIFYMENUFLAGSQQ	Modifies a menu item's state
	MODIFYMENROUTINEQQ	Modifies a menu item's callback routine
	MODIFYMENUSTRINGQQ	Changes a menu item's text string
	SETWINDOWMENUQQ	Sets the menu to which a list of current child window names are appended
	PASSDIRKEYSQQ	Enables (or disables) use of the arrow directional keys and page keys as input

Category	QuickWin Function	Description
QuickWin messages	SETMESSAGEQQ	Changes any QuickWin message, including status bar messages, state messages and dialog box messages
Mouse actions	REGISTERMOUSEEVENT	Registers the application defined routines to be called on mouse events
	UNREGISTERMOUSEEVENT	Removes the routine registered by REGISTERMOUSEEVENT
	WAITONMOUSEEVENT	Blocks return until a mouse event occurs

## Controlling Menus

You do not have to use the default QuickWin menus. You can eliminate and alter menus, menu item lists, menu titles or item titles. The QuickWin functions that control menus are described in the following sections:

- [Controlling the Initial Menu and Frame Window](#)
- [Deleting, Inserting, and Appending Menu Items](#)
- [Modifying Menu Items](#)
- [Creating a Menu List of Available Child Windows](#)
- [Simulating Menu Selections](#)

### Controlling the Initial Menu and Frame Window

You can change the initial appearance of an application's default frame window and menus by defining an INITIALSETTINGS function. If no user-defined INITIALSETTINGS function is supplied, QuickWin calls a predefined (default) INITIALSETTINGS routine that provides a default frame window and menu.

Your application does not call INITIALSETTINGS. If you supply the function in your project, QuickWin calls it automatically.

If you supply it, INITIALSETTINGS can call QuickWin functions that set the initial menus and the size and position of the frame window. Besides the menu functions, SETWSIZEQQ can be called from your INITIALSETTINGS function to adjust the frame window size and position before the window is first drawn.

The following is a sample of INITIALSETTINGS:

```

LOGICAL FUNCTION INITIALSETTINGS( )
  USE IFQWIN
  LOGICAL result
  TYPE (qwinfo) qwi
! Set window frame size.
  qwi%x = 0
  qwi%y = 0
  qwi%w = 400
  qwi%h = 400
  qwi%type = QWIN$SET
  i = SetWSizeQQ( QWIN$FRAMEWINDOW, qwi )
! Create first menu called Games.
  result = APPENDMENUQQ(1, $MENUNABLED, '&Games'C, NUL )
! Add item called TicTacToe.
  result = APPENDMENUQQ(1, $MENUNABLED, '&TicTacToe'C, WINPRINT)
! Draw a separator bar.
  result = APPENDMENUQQ(1, $MENUSEPARATOR, ''C, NUL )
! Add item called Exit.
  result = APPENDMENUQQ(1, $MENUNABLED, 'E&xit'C, WINEXIT )
! Add second menu called Help.
  result = APPENDMENUQQ(2, $MENUNABLED, '&Help'C, NUL )

```

```

result = APPENDMENUQQ(2, $MENUNABLED, '&QuickWin Help'C, WININDEX)
INITIALSETTINGS= .true.
END FUNCTION INITIALSETTINGS

```

QuickWin executes your `INITIALSETTINGS` function during initialization, before creating the frame window. When your function is done, control returns to QuickWin and it does the remaining initialization. The control then passes to the Fortran application.

You only need to include the code for an `INITIALSETTINGS` function in your project. If it is part of your project, you do not need to call your `INITIALSETTINGS` function.

The `INITIALSETTINGS` function can specify the position and size of the frame window and the contents of the menus. Because the `INITIALSETTINGS` function is executed before creating the frame window, it must not call any routines that require that frame window initialization be complete. For example, routines that refer to the child window in focus (such as `SETWINDOWCINFIG`) or a specific child window unit number (such as `OPEN`) should not be called from the `INITIALSETTINGS` function.

Your `INITIALSETTINGS` function should return `.TRUE.` if it succeeds, and `.FALSE.` otherwise. The QuickWin default function returns a value of `.TRUE.` only.

Note that default menus are created after `INITIALSETTINGS` has been called, and only if you do not create your own menus. Therefore, using `DELETENUQQ`, `INSERTMENUQQ`, `APPENDMENUQQ`, and the other menu configuration QuickWin functions while in `INITIALSETTINGS` affects your custom menus, not the default QuickWin menus.

## Deleting, Inserting, and Appending Menu Items

Menus are defined from left to right, starting with 1 at the far left. Menu items are defined from top to bottom, starting with 0 at the top (the menu title itself). Within `INITIALSETTINGS`, if you supply it, you can delete, insert, and append menu items in custom menus. Outside `INITIALSETTINGS`, you can alter the default QuickWin menus as well as custom menus at any point in your application. (Default QuickWin menus are not created until after `INITIALSETTINGS` has run and only if you do not create custom menus.)

To delete a menu item, specify the menu number and item number in `DELETENUQQ`. To delete an entire menu, delete item 0 of that menu. For example:

```

USE IFQWIN
LOGICAL status
status = DELETENUQQ(1, 2) ! Delete the second menu item from
                           ! menu 1 (the default FILE menu).
status = DELETENUQQ(5, 0) ! Delete menu 5 (the default Windows
                           ! menu).

```

`INSERTMENUQQ` inserts a menu item or menu and registers its callback routine. QuickWin supplies several standard callback routines such as `WINEXIT` to terminate a program, `WININDEX` to list QuickWin Help, and `WINCOPY` which copies the contents of the current window to the Clipboard. A list of available callbacks is given in the *Language Reference* for `INSERTMENUQQ` and `APPENDMENUQQ`.

Often, you will supply your own callback routines to perform a particular action when a user selects something from one of your menus.

In general, you should not assign the same callback routine to more than one menu item because a menu item's state might not be properly updated when you change it (put a check mark next to it, gray it out, or disable, or enable it). You cannot insert a menu item or menu beyond the existing number; for example, inserting item 7 when 5 and 6 have not been defined yet. To insert an entire menu, specify menu item 0. The new menu can take any position among or immediately after existing menus.

If you specify a menu position occupied by an existing menu, the existing menu and any menus to the right of the one you add are shifted right and their menu numbers are incremented.

For example, the following code inserts a fifth menu item called `Position` into menu 5 (the default Windows menu):

```
USE IFQWIN
LOGICAL status
status = INSERTMENUQQ (5, 5, $MENUCHECKED, 'Position'C, WINPRINT)
```

The next code example inserts a new menu called `My List` into menu position 3. The menu currently in position 3 and any menus to the right (the default menus `View`, `State`, `Windows`, and `Help`) are shifted right one position:

```
USE IFQWIN
LOGICAL status
status = INSERTMENUQQ (3, 0, $MENUNABLED, 'My List'C, WINSTATE)
```

You can append a menu item with `.`. The item is added to the bottom of the menu list. If there is no item yet for the menu, your appended item is treated as the top-level menu item, and the string you assign to it appears on the menu bar.

The QuickWin menu routines like `INSERTMENUQQ` and `APPENDMENUQQ` let you to create a single level of menu items beneath a menu name. You cannot create submenus with the QuickWin project type.

The following code uses `APPENDMENUQQ` to append the menu item called `Cascade Windows` to the first menu (the default `File` menu):

```
USE IFQWIN
LOGICAL status
status = APPENDMENUQQ (1, $MENUCHECKED, 'Cascade Windows'C,   &
& WINCASCADE)
```

The `$MENUCHECKED` flag in the example puts a check mark next to the menu item. To remove the check mark, you can set the flag to `$MENUUNCHECKED` in the `MODIFYMENUFLAGSQQ` function. Some predefined routines (such as `WINSTATUS`) take care of updating their own check marks. However, if the routine is registered to more than one menu item, the check marks might not be properly updated. See `APPENDMENUQQ` or `INSERTMENUQQ` in the *Language Reference* for the list of callback routines and other flags.

## Modifying Menu Items

`MODIFYMENUSTRINGQQ` can modify the string identifier of a menu item, `MODIFYMENROUTINEQQ` can modify the callback routine called when the item is selected, and `MODIFYMENUFLAGSQQ` can modify a menu item's state (such as enabled, grayed out, checked, and so on).

The following example code uses `MODIFYMENUSTRINGQQ` to modify the menu string for the fourth item in the first menu (the `File` menu by default) to `Tile Windows`, it uses `MODIFYMENROUTINEQQ` to change the callback routine called if the item is selected to `WINTILE`, and uses `MODIFYMENUFLAGSQQ` to put a check mark next to the menu item:

```
status = MODIFYMENUSTRINGQQ( 1, 4, 'Tile Windows'C)
status = MODIFYMENROUTINEQQ( 1, 4, WINTILE)
status = MODIFYMENUFLAGSQQ( 1, 4, $MENUCHECKED)
```

## Creating a Menu List of Available Child Windows

By default, the Windows menu contains a list of all open child windows in your QuickWin applications. `SETWINDOWMENUQQ` changes the menu which lists the currently open child windows to the menu you specify. The list of child window names is appended to the end of the menu you choose and deleted from any other menu that previously contained it. For example:

```
USE IFQWIN
LOGICAL status
...
! Append list of open child windows to menu 1 (the default File menu)
status = SETWINDOWMENUQQ(1)
```

## Simulating Menu Selections

CLICKMENUQQ simulates the effect of clicking or selecting a menu command from the Window menu. The QuickWin application behaves as though the user had clicked or selected the command. The following code fragment simulates the effect of selecting the Tile item from the Window menu:

```
USE IFQWIN
INTEGER status
status = CLICKMENUQQ (QWIN$TITLE)
```

Items from the Window menu can be specified in CLICKMENUQQ. Other predefined routines such as WINFULLSCREEN and WINSIZETOFIT (see the callback subroutine names listed in APPENDMENUQQ) can be invoked by calling CLICKMENUQQ with an argument containing the LOC intrinsic function before the callback routine name. For example, the following program calls WINSIZETOFIT:

```
! Some of the callback subroutine names listed in APPENDMENUQQ may not
! work or be useful in this context, but they will be "called."
! Run the program and note how the scroll bars disappear
use IFQWIN
integer result
character*1 ch
print *, 'type a character'
read(*,*) ch
result = clickmenuqq(loc(WINSIZETOFIT))
print *, 'type a character'
read(*,*) ch
end
```

## See Also

Related Information

## Changing Status Bar and State Messages

Any string QuickWin produces can be changed by calling SETMESSAGEQQ with the appropriate message ID. Unlike other QuickWin message functions, SETMESSAGEQQ uses regular Fortran strings, not null-terminated C strings. For example, to change the PAUSED state message to I am waiting:

```
USE IFQWIN
CALL SETMESSAGEQQ('I am waiting', QWIN$MSG_PAUSED)
```

This function is useful for localizing your QuickWin applications for countries with different native languages. A list of message IDs is given in SETMESSAGEQQ in the *Language Reference* in the *Intel® Visual Fortran Compiler User and Reference Guides*.

## Displaying Message Boxes

MESSAGEBOXQQ causes your program to display a message box. You can specify the message the box displays and the caption that appears in the title bar. Both strings must be null-terminated C strings. You can also specify the type of message box. Box types are symbolic constants defined in DFLIB.MOD, and can be combined by means of the IOR intrinsic function or the .OR. operator. The available box types are listed under MESSAGEBOXQQ in the *Language Reference*. For example:

```
USE IFQWIN
INTEGER response
response = MESSAGEBOXQQ('Retry or Cancel?'C, 'Smith Chart     &
& Simulator'C, MB$RETRYCANCELQWIN .OR. MB$DEFBUTTON2)
```

## Defining an About Box

The `ABOUTBOXQQ` function specifies the message displayed in the message box that appears when the user selects the About command from a QuickWin application's Help menu. (If your program does not call `ABOUTBOXQQ`, the QuickWin run-time library supplies a default string.) The message string must be a null-terminated C string. For example:

```
USE IFQWIN
INTEGER status
status = ABOUTBOXQQ ('Sound Speed Profile Tables Version 1.0'C)
```

## Using Custom Icons

The QuickWin run-time library provides default icons that appear when the user minimizes the application's frame window or its child windows. You can add custom-made icons to your executable files, and Windows will display them instead of the default icons.

### To add a custom child window icon to your QuickWin program:

1. From the **File** >menu, select **Add New Item...**
2. Select **Resource** and enter a new name. Click **Open**.
3. From the **Edit** menu, select **Add Resource...**

From the list of possible resources, select **Icon**. Click **New**. The screen becomes an icon drawing tool.

4. Draw the icon. (For more information about using the Graphics Editor in the integrated development environment, see the *Visual C++ User's Guide*.)

-- or --

If your icon already exists (for example, as a bitmap) and you want to import it, not draw it, select **Resource** from the **Insert** menu, then select **Import** from the buttons in the **Resource** dialog. You will be prompted for the file containing your icon.

5. Display the **Icon Properties** dialog box by double-clicking in the icon editor area outside the icon's grid or pressing **ALT+ENTER**.

In the **ID** field on the **General** tab of **Icon Properties** dialog box, replace the default icon name with either "frameicon" or "childicon." The frame window's icon must have the name "frameicon," and the child window's icon must have the name "childicon." These names must be entered with quotation marks in order to be interpreted as strings.

Your icon will be saved in a file with the extension **.ICO**.

6. Create an **.RC** file to hold your icons. Select **File>Save As**. You will be prompted for the name of the file that will contain your icons. It must end with the extension **.RC**; for example, **myicons.rc**. Using this method, the icons and their string values will be automatically saved in the **.RC** file. (Alternatively, you can create an **.RC** file with any editor and add the icon names and their string values by hand.)
7. Add the file to the project that contains your QuickWin application. Select **Build** and the **.RC** file will be built into the application's executable.

When you run your application, the icon you created will take the place of the default child or frame icon. Your custom icon appears in the upper-left corner of the window frame. When you minimize the window, the icon appears on the left of the minimized window bar.

## Using a Mouse

Your applications can detect and respond to mouse events, such as left mouse button down, right mouse button down, or double-click. Mouse events can be used as an alternative to keyboard input or for manipulating what is shown on the screen.

QuickWin provides two types of mouse functions:

1. **Event-based functions**, which call an application-defined callback routine when a mouse click occurs
2. **Blocking (sequential) functions**, which provide blocking functions that halt an application until mouse input is made

The mouse is an asynchronous device, so the user can click the mouse anytime while the application is running (mouse input does not have to be synchronized to anything). When a mouse-click occurs, Windows sends a message to the application, which takes the appropriate action. Mouse support in applications is most often event-based, that is, a mouse-click occurs and the application does something.

However, an application can use blocking functions to wait for a mouse-click. This allows an application to execute in a particular sequential order and yet provide mouse support. QuickWin performs default processing based on mouse events.

To change the shape of the mouse cursor, use the `SETMOUSECURSOR` routine.

## Event-Based Functions

The QuickWin function `REGISTERMOUSEEVENT` registers the routine to be called when a particular mouse event occurs (left mouse button, right mouse button, double-click, and so on). You define what events you want it to handle and the routines to be called if those events occur. `UNREGISTERMOUSEEVENT` unregisters the routines so that QuickWin doesn't call them but uses default handling for the particular event.

By default, QuickWin typically ignores events except when mouse-clicks occur on menus or dialog controls. Note that no events are received on a minimized window. A window must be restored or maximized in order for mouse events to happen within it.

For example:

```
USE IFQWIN
INTEGER result
OPEN (4, FILE= 'USER')
...
result = REGISTERMOUSEEVENT (4, MOUSE$LBUTTONDBLCLK, CALCULATE)
```

This registers the routine `CALCULATE`, to be called when the user double-clicks the left mouse button while the mouse cursor is in the child window opened as unit 4. The symbolic constants available to identify mouse events are:

Mouse Event <sup>1</sup>	Description
MOUSE\$LBUTTONDOWN	Left mouse button down
MOUSE\$LBUTTONUP	Left mouse button up
MOUSE\$LBUTTONDBLCLK	Left mouse button double-click
MOUSE\$RUTTONDOWN	Right mouse button down
MOUSE\$RUTTONUP	Right mouse button up
MOUSE\$RUTTONDBLCLK	Right mouse button double-click
MOUSE\$MOVE	Mouse moved

<sup>1</sup> For every `BUTTONDOWN` and `BUTTONDBLCLK` event there is an associated `BUTTONUP` event. When the user double-clicks, four events happen: `BUTTONDOWN` and `BUTTONUP` for the first click, and `BUTTONDBLCLK` and `BUTTONUP` for the second click. The difference between getting `BUTTONDBLCLK` and `BUTTONDOWN` for the second click depends on whether the second click occurs in the double-click interval, set in the system's CONTROL PANEL/MOUSE.

To unregister the routine in the preceding example, use the following code:

```
result = UNREGISTERMOUSEEVENT (4, MOUSE$LBUTTONDBLCLK)
```

If `REGISTERMOUSEEVENT` is called again without unregistering a previous call, it overrides the first call. A new callback routine is then called on the specified event.

The callback routine you create to be called when a mouse event occurs should have the following prototype:

```
INTERFACE
  SUBROUTINE MouseCallBackRoutine (unit, mouseevent, keystate, &
  & MouseXpos,MouseYpos)
    INTEGER unit
    INTEGER mouseevent
    INTEGER keystate
    INTEGER MouseXpos
    INTEGER MouseYpos
  END SUBROUTINE
END INTERFACE
```

The `unit` parameter is the unit number associated with the child window where events are to be detected, and the `mouseevent` parameter is one of those listed in the preceding table. The `MouseXpos` and the `MouseYpos` parameters specify the x and y positions of the mouse during the event. The `keystate` parameter indicates the state of the shift and control keys at the time of the mouse event, and can be any ORed combination of the following constants:

Keystate Parameter	Description
MOUSE\$KS_LBUTTON	Left mouse button down during event
MOUSE\$KS_RBUTTON	Right mouse button down during event
MOUSE\$KS_SHIFT	Shift key held down during event
MOUSE\$KS_CONTROL	Control key held down during event

QuickWin callback routines for mouse events should do a minimum of processing and then return. While processing a callback, the program will appear to be non-responsive because messages are not being serviced, so it is important to return quickly. If more processing time is needed in a callback, another thread should be started to perform this work; threads can be created by calling the Windows API `CreateThread`. If a callback routine does not start a new thread, the callback will not be re-entered until it is done processing.

#### NOTE

In event-based functions, there is no buffering of events. Therefore, issues such as multithreading and synchronizing access to shared resources must be addressed. To avoid multithreading problems, use blocking functions rather than event-based functions. Blocking functions work well in applications that proceed sequentially. Applications where there is little sequential flow and the user jumps around the application are probably better implemented as event-based functions.

## Blocking (Sequential) Functions

The QuickWin blocking function `WAITONMOUSEEVENT` blocks execution until a specific mouse input is received. This function is similar to `INCHARQQ`, except that it waits for a mouse event instead of a keystroke.

For example:

```
USE IFQWIN
INTEGER mouseevent, keystate, x, y, result
...
mouseevent = MOUSE$RBUTTONDOWN .OR. MOUSE$LBUTTONDOWN
result = WAITONMOUSEEVENT (mouseevent, keystate, x, y) ! Wait
! until right or left mouse button clicked, then check the keystate
! with the following:
if ((MOUSE$KS_SHIFT .AND. keystate) == MOUSE$KS_SHIFT) then      &
& write (*,*) 'Shift key was down'
if ((MOUSE$KS_CONTROL .AND. keystate) == MOUSE$KS_CONTROL) then &
& write (*,*) 'Ctrl key was down'
```

Your application passes a mouse event parameter, which can be any ORed combination of mouse events, to `WAITONMOUSEEVENT`. The function then waits and blocks execution until one of the specified events occurs. It returns the state of the Shift and Ctrl keys at the time of the event in the parameter `keystate`, and returns the position of the mouse when the event occurred in the parameters `x` and `y`.

A mouse event must happen in the window that had focus when `WAITONMOUSEEVENT` was initially called. Mouse events in other windows will not end the wait. Mouse events in other windows cause callbacks to be called for the other windows, if callbacks were previously registered for those windows.

## Default QuickWin Processing

QuickWin performs some actions based on mouse events. It uses mouse events to return from the FullScreen mode and to select text and/or graphics to copy to the Clipboard. Servicing the mouse event functions takes precedence over return from FullScreen mode. Servicing mouse event functions does not take precedence over Cut/Paste selection modes. Once selection mode is over, processing of mouse event functions resumes.

## QuickWin Programming Precautions

### QuickWin Programming Precautions Overview

Two features of QuickWin programming need to be applied thoughtfully to avoid non-responsive programs that halt an application. For example, an application may halt while waiting for a process to execute or input to be entered in a child window.

#### See Also

[Using Blocking Procedures](#)

[Using Callback Routines](#)

### Using Blocking Procedures

Procedures that block execution of the program until a given event occurs, such as `READ` or `WAITONMOUSEEVENT`, both of which wait for user input, are called *blocking procedures*. QuickWin child processes can contain multiple callback routines; for example, a different routine to be called for each menu selection and each kind of mouse-click (left button, right button, double-click, and so on).

Problems can arise when a process and its callback routine, or two callback routines within the same process, both contain blocking procedures. This is because each QuickWin child process supports a primary and secondary thread.

As a result of selecting a menu item, a menu procedure may call a blocking procedure, while the main thread of the process has also called a blocking procedure. For example, say you have created a file menu, which contains an option to LOAD a file. Selecting the LOAD menu option calls a blocking function that prompts for a filename and waits for the user to enter the name. However, a blocking call such as `WAITONMOUSEEVENT` can be pending in the main process thread when the user selects the LOAD menu option, so two blocking functions are initiated.

When QuickWin has two blocking calls pending, it displays a message in the status bar that corresponds to the blocking call first encountered. If there are further callbacks with other blocking procedures in the two threads, the status bar may not correspond to the actual input pending, execution can appear to be taking place in one thread when it is really blocked in another, and the application can be confusing and misleading to the user.

To avoid this confusion, you should try not to use blocking procedures in your callback routines. QuickWin will not accept more than one `READ` or `INCHARQQ` request through user callbacks from the same child window at one time. If one `READ` or `INCHARQQ` request is pending, subsequent `READ` or `INCHARQQ` requests will be ignored and -1 will be returned to the caller.

If you have a child window that, in some user scenario, might call multiple callback routines containing `READ` or `INCHARQQ` requests, you need to check the return value to make sure the request has been successful, and if not, take appropriate action, for example, request again.

This protective QuickWin behavior does not guard against multiple blocking calls through mouse selection of menu input options. As a general rule, using blocking procedures in callback routines is not advised, since the results can lead to program flow that is unexpected and difficult to interpret.

## Using Callback Routines

All callback routines run in a separate thread from the main program. As a result, all multithread issues apply. In particular, sharing data, drawing to windows, and doing I/O must be properly coordinated and controlled.

QuickWin callback routines, both for menu callbacks and mouse callbacks, should do a minimum of processing and then return. While processing a callback, the program will appear to be non-responsive because messages are not being serviced. This is why it is important to return quickly.

If more processing time is needed in a callback, another thread should be started to perform this work; threads can be created by calling the Windows API CreateThread. If a callback routine does not start a new thread, the callback will not be reentered until it is done processing.

## Simulating Nonblocking I/O

QuickWin does not accept unsolicited input. You get beeps if you type into an active window if no `READ` or `GETCHARQQ` has been done. Because of this, it is necessary to do a `READGETCHARQQ` or in order for a character to be accepted. But this type of blocking I/O puts the program to sleep until a character has been typed.

In Fortran Console applications, `PEEKCHARQQ` can be used to see if a character has already been typed. However, `PEEKCHARQQ` does not work under Fortran QuickWin applications, since QuickWin has no console buffer to accept unsolicited input. Because of this limitation, `PEEKCHARQQC` cannot be used as it is with Fortran Console applications to see whether a character has already been typed.

One way to simulate `PEEKCHARQQ` with QuickWin applications is to add an additional thread:

- One thread does a `READGETCHARQQ` or and is blocked until a character typed.
- The other thread (the main program) is in a loop doing useful work and checking in the loop to see if the other thread has received input.

# Using Dialog Boxes for Application Controls

5

## Using Dialog Boxes for Application Controls Overview

Dialog boxes are a user-friendly way to solicit application control. As your application executes, you can make a dialog box appear on the screen and the user can click on a dialog box control to enter data or choose what happens next.

Using the dialog routines provided with Intel® Fortran, you can add dialog boxes to your application. These routines define dialog boxes and their controls (scroll bars, buttons, and so on), and call your subroutines to respond to user selections.

There are two types of dialog boxes:

- *Modal* dialog boxes, which you can use with any Fortran project type, including Fortran Windows, Fortran QuickWin (multiple document), Fortran Standard Graphics (QuickWin single document), Fortran Console, Fortran DLL, and Fortran Static library project types.
- *Modeless* dialog boxes, which are typically used with the Fortran Windows Application project type.

When your program displays a modal dialog box (any project type), the user must explicitly enter data and close the dialog box before your application resumes execution.

When your program displays a modeless dialog box, your application continues executing. Unlike a modal dialog box, the user can switch between the modeless dialog box and the other windows in the application.

There are two steps to make a dialog:

1. Specify the appearance of the dialog box and the names and properties of the controls it contains.
2. Write an application that activates those controls by recognizing and responding to user selections.

### See Also

[Designing a Dialog Box Overview](#)

[Writing a Dialog Application Overview](#)

[Summary of Dialog Routines](#)

[Understanding Dialog Controls Overview](#)

[Using Dialog Controls Overview](#)

[Using ActiveX\\* Controls Overview](#)

## Using the Resource Editor to Design a Dialog Box

### Designing a Dialog Box Overview

You design the appearance of the dialog box, choose and name the dialog controls within it, and set other control properties with the Dialog Editor. The Dialog Editor is one of the Resource Editors provided by the Microsoft Visual Studio\* integrated development environment (IDE).

---

#### NOTE

The Dialog Editor is not available from the Visual Studio Shell.

---

A program's resources are defined in a resource file (typically with an .rc extension). A Microsoft Visual Studio project typically contains a single resource file. The contents of the resource file are displayed in the Resource Editor by double-clicking on the .RC file. The resource file can be created by one of the following:

- When you create a project and use one of the Fortran AppWizards (for example, when using the Fortran Windows Application AppWizard).
- When you save the resources that you define using one of the Resource Editors.

If you create the resource file from the Resource Editors, be sure to add the resource file to your project. It is possible to include additional resource files in a project (see [Including Resources Using Multiple Resource Files](#)).

This section describes the steps needed to design a dialog box, and uses as an example a dialog box that converts temperatures between Celsius and Fahrenheit. The code in the example is explained as you read through this section.

In this section, there is an example of how to include the dialog box in a Fortran Console project.

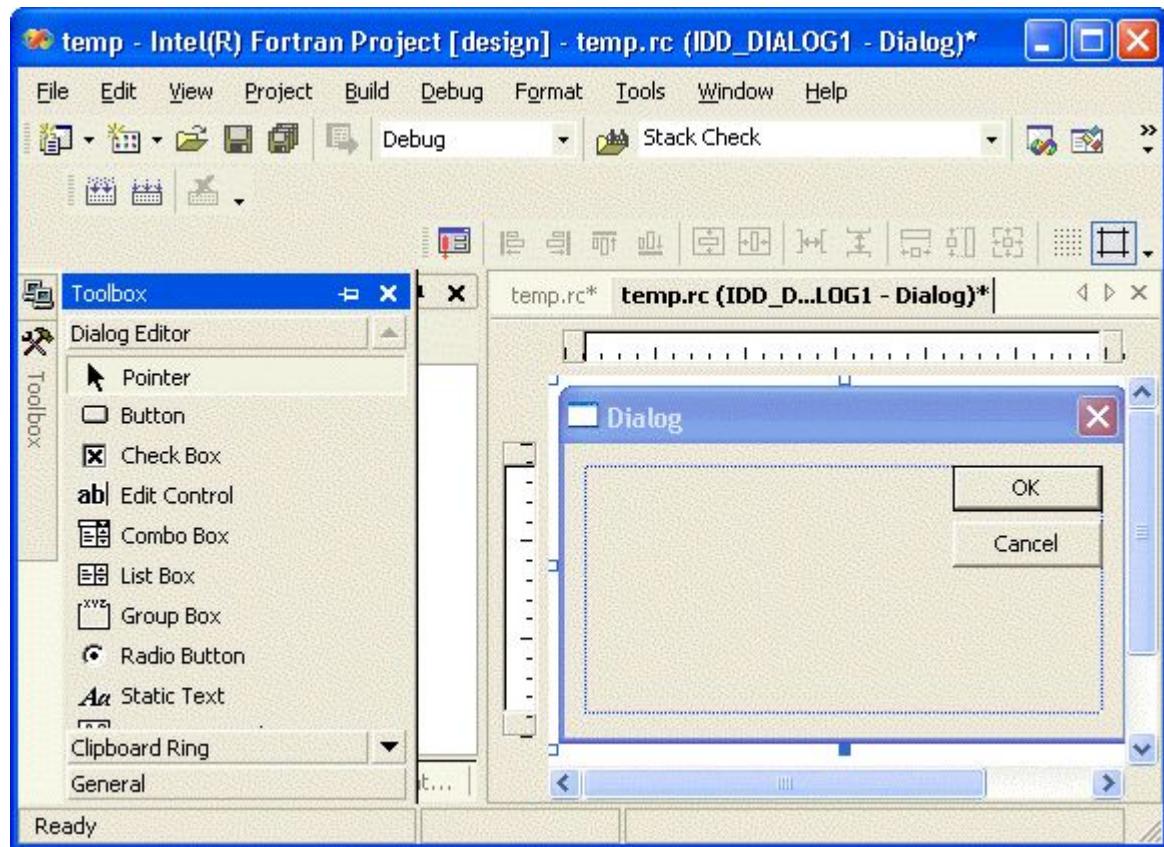
#### To create a Fortran Console application:

1. From the **File** menu, select **New>Project...**
2. Select the Intel(R) Fortran Projects item.
3. From the list of project types, select Console Application.
4. Enter `Temp` as the name for the project, verify where the project will be created, and click **OK**.
5. In the Fortran Console Application Wizard, click **Finish**.
6. The Solution View displays the solution.
7. Click the plus sign (+) next to the project name to display the categories of source files, if necessary .

#### To open the Dialog Editor:

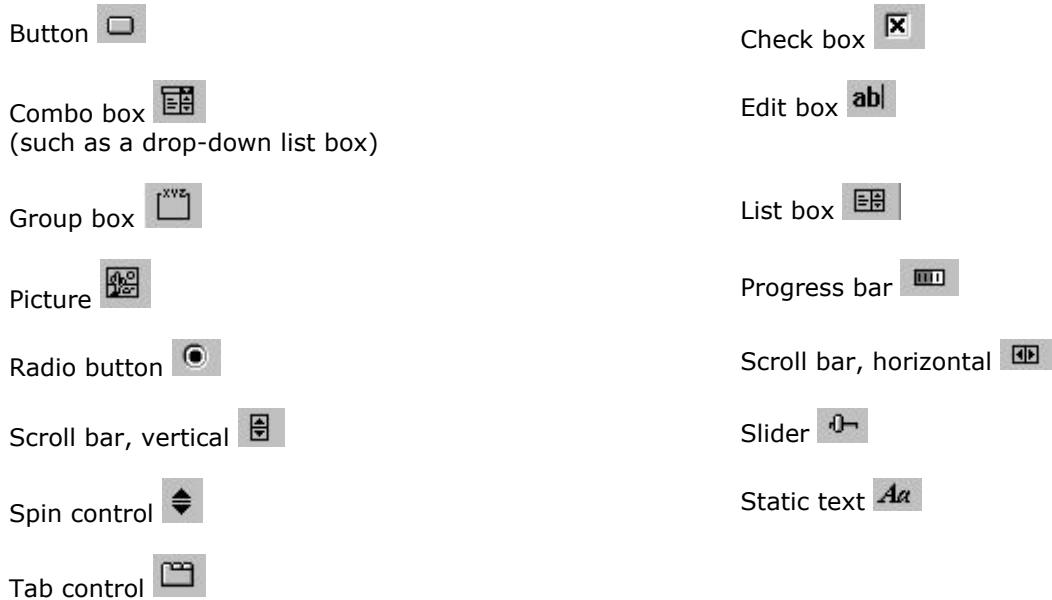
1. From the **File** menu, select **Add New Item...**
2. Select **Resource** and change the name to `Temp.rc`. Click **Open**.
3. Right-click on the .rc file in the Solution View, select **Open With>Resource Editor**.
4. From the **Edit** >menu, select **Add Resource...** From the list of possible resources, select **Dialog**.
5. Click the **New** button. The Dialog Editor (one of the resource editors) appears on the screen as shown below.

#### Dialog Editor Sample 1



A blank dialog box appears along with a toolbox of available controls. If the toolbox does not appear, select **View>Toolbox**.

The controls that are supported by Intel Visual Fortran follow:



You can also add ActiveX\* controls to your dialog box (see [Using ActiveX\\* Controls Overview](#)).

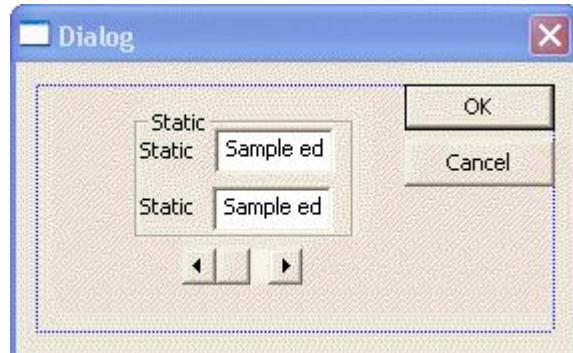
#### To add controls to the dialog box:

1. Point at one of the available controls in the Toolbox, then hold down the left mouse button and drag the control to the dialog box.
2. Place the dialog control where you want it on the dialog box and release the mouse button. You can delete controls by selecting them with the mouse, then pressing the Delete (or DEL) key.

The following figure shows the dialog box after adding two Static text lines (which currently say "Static"), two Edit boxes (which currently say "Sample edit"), a Horizontal Scroll bar, and a Group box. The Group box is the outlined rectangular area in the dialog box that encloses the other related controls.

The OK and CANCEL buttons were added for you by the Resource Editor. You can delete (select the control and press DEL key), move (drag the control), resize (drag one of the anchor points), or rename the OK and CANCEL buttons or any of the controls that you add.

#### Dialog Editor Sample 2

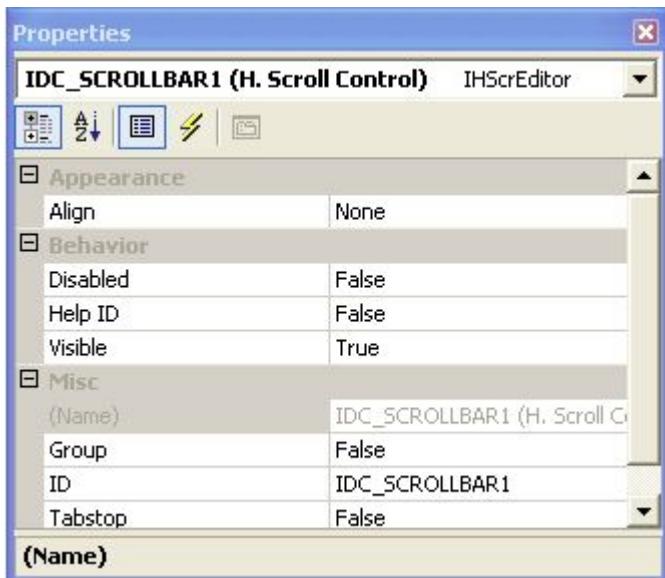


#### To specify the names and properties of the added controls:

1. Click on one of the controls in your dialog box and select **Properties** from the pop-up (right-click) menu. A Properties window appears showing the default name and properties for that control.

The following figure shows the Properties box for the Horizontal Scroll bar.

#### Dialog Editor Sample 3



2. Change the control name by modifying the ID property (currently, `IDC_SCROLLBAR1`) to another name (for example, `IDC_SCROLLBAR_TEMPERATURE`).
3. Select the available options in the left column to change the control's properties.

Repeat the same process for each control and for the dialog box itself.

To use the controls from within a program, you need symbolic names for each of them. In the previous series of steps, the Horizontal Scroll bar symbolic name has been changed in the Properties box to `IDC_SCROLLBAR_TEMPERATURE`. Use this name to refer to the control; for example:

```
INTEGER slide_position
retlog = DLGGET (dlg, IDC_SCROLLBAR_TEMPERATURE, &
                 slide_position, DLG_POSITION)
```

#### To save the dialog box as a resource file:

1. Select **File>Save All**.

Typically, only one resource file is used with each Intel Visual Fortran project (see [Including Resources Using Multiple Resource Files](#)).

2. When you save your resource file for the first time, the resource editor also creates a `Resource.h` file. This file is included by the `.RC` file. To create the Fortran equivalent of this file (`resource.fd`), do the following:
  - a. Add `Resource.h` to your project using **File>Add Existing Item....**
  - b. Select the `Resource.h` file in the Solution View and the select **View>Property Pages** from the main menu bar.
  - c. Set the Command Line option to use the `deftofd` tool by entering:
 

```
deftofd resource.h resource.fd
```

 (For more information on the `deftofd` tool, see [The Include \(.FD and .H\) Files](#).)
  - d. Set the Description option to **Generating Fortran include file...**
  - e. Set the Outputs option to `resource.fd`.
  - f. Click **OK**.

#### To open an existing dialog box in the Resource Editor:

1. From the **File** menu, open the project .
2. Double-click the `RC` file.
3. Click the plus sign (+) next to **Dialog**.
4. Double-click the appropriate dialog name, such as `IDD_DIALOG1`.

5. Use the Resource Editor to [add a new control](#) or modify an existing control. To modify an existing control, use the Tab key to select the appropriate control. Now select **View>Properties Window** (or, on the pop-up menu, click **Properties**) to view or modify its properties.

At this point, the appearance of the dialog box is finished and the controls are named, but the box cannot function on its own. An application must be created to run it.

Not all the controls on the Resource Editor Controls toolbar are supported by Intel Visual Fortran dialog routines. The supported dialog controls are:

- [Using Buttons](#)
- [Using Check Boxes and Radio Buttons](#)
- [Using List Boxes and Combo Boxes](#) (such as a drop-down list box)
- [Using Edit Boxes](#)
- [Using Group Boxes](#)
- [Using List Boxes and Combo Boxes](#)
- [Using Pictures](#)
- [Using Progress Bars](#)
- [Using Check Boxes and Radio Buttons](#)
- [Using Scroll Bars](#) (Horizontal and Vertical)
- [Using Sliders](#)
- [Using Spin Controls](#)
- [Using Static Text](#)
- [Using Tab Controls](#)

You can also add ActiveX controls to your dialog box. For information, see [Using ActiveX\\* Controls Overview](#).

For further information on resources and control properties, see:

- [Setting Control Properties](#)
- [Including Resources Using Multiple Resource Files](#)
- [The Include \(.FD and .H\) Files](#)

For information on creating an application for your dialog box, see [Writing a Dialog Application Overview](#).

## Setting Control Properties

In addition to changing the properties of its individual controls, you can change the properties of the dialog box itself. To change the dialog box properties, select the dialog box and then right-click and select Properties from the pop-up menu in any clear area in the box. The Properties window opens for the dialog.

**To specify the location of your dialog box on the screen, do one of the following:**

- In the Properties window (in the Position category), you can change the X Pos and Y Pos values. These specify the pixel position of the dialog box's upper-left corner, relative to its parent window. For a modal or a popup modeless dialog box, the parent window is the screen. For example, specifying the X position as 40 and Y position as 40 would place a modal dialog box in the upper-left corner of the screen.
- You can also center the dialog box by setting the Center option to True in the Position category. This displays the dialog box in the center of its parent window. If you set the Center Mouse option to True in the Misc category, the dialog is centered at the current mouse pointer position.

To change the size of the dialog box, hold down the left mouse button as you drag the right or lower perimeter of the box. If you have sized your dialog window to be larger than the edit window, use the scroll bars to move the view region.

Help is available at the bottom of the Properties window to explain the options for each of the dialog controls.

You can edit the appearance of the dialog box later. For more information, see [Designing a Dialog Box Overview](#).

## Including Resources Using Multiple Resource Files

Normally it is easy and convenient to work with the default arrangement of all resources in one resource definition (.RC) file. However, you can add resources in other files to your current project at compile time by listing them in the compile-time directives box in the Resource Includes dialog box.

There are several reasons to place resources in a file other than the main .RC file:

- To include resources that have already been developed and tested and do not need further modification.
- To include resources that are being used by several different projects, or that are part of a source code version-control system, and thus must exist in a central location where modifications will affect all projects.
- To include resources that are in a custom format.
- To include statements in your resource file that execute conditionally at compile time using compiler directives, such as #ifdef and #else. For example, your project may have a group of resources that are bracketed by #ifdef \_DEBUG ... #endif and are thus included only if the constant \_DEBUG is defined at compile time.
- To include statements in your resource file that modify resource-file syntax by using the #define directive to implement simple macros.

If you have sections in your existing .RC files that meet any of these conditions, you should place the sections in one or more separate .RC files and include them in your project using the Resource Includes dialog box.

### To include resource files that will be added to your project at compile time:

1. Place the resources in an RC file with a unique filename. (Do not use *projectname.rc*, since this is the default filename used for the main resource script file.)
2. From the Edit menu, choose Resource Includes.
3. In the Compile-time directives box, use the #include compiler directive to include the new resource file in the main resource file in the development environment. The resources in files included in this way are made a part of your executable file at compile time. They are not directly available for editing or modification when you are working on your project's main .RC file. You need to open included .RC files separately.
4. Click **OK**.

## The Include (.FD and .H) Files

Each control in a dialog box has a unique integer identifier. When the Resource Editor creates the C language include file (.H), it assigns each control and the dialog box an integer value. You can read the list of names and values in your dialog boxes include file (for example, RESOURCE.H). To view and modify the named constants, click Resource Symbols in the Edit menu.

Intel Fortran provides a tool named DEFTOFD that recognizes the definitions in a C language include file (.H) and creates a corresponding Fortran include file (.FD). The Fortran include file uses the PARAMETER attribute to define named constants for each resource.

The resource .H file must be added to your project and assigned a Custom Build step in order to recreate the resource.fd file when resource.h changes. (See [Designing a Dialog Box Overview](#) for more information.)

When your application uses a control, it can refer to the control or dialog box by its name (for example, IDC\_SCROLLBAR\_TEMPERATURE or IDD\_TEMP), or by its integer value. If you want to rename a control or make some other change to your dialog box, you should make the change through the Resource Editor in the integrated development environment. Do not use a text editor to alter your .H or .FD include file because the dialog resource will not be able to access the changes.

## Writing a Dialog Application

---

## Writing a Dialog Application Overview

When creating a dialog box with the Resource Editor, you specify the types of controls that are to be included in the box. You then must provide procedures to make the dialog box active. These procedures use both dialog routines and your subroutines to control your program's response to the user's dialog box input.

You give your application access to your dialog resource by adding the .RC file to your project, giving your application access to the dialog include file, and associating the dialog properties in these files with the dialog type (see [Initializing and Activating the Dialog Box](#)).

Your application must include the statement `USE IFLOGM` to access the dialog routines, and it must include the .FD file that the Resource Editor created for your dialog using `DEFTOFD`. For example:

```
PROGRAM TEMPERATURE
USE IFLOGM
IMPLICIT NONE
INCLUDE 'RESOURCE.FD'
.
. ! Call dialog routines, such as DlgInit, DlgModal, and DlgUninit
.
END PROGRAM TEMPERATURE
```

The following sections describe how to code a dialog application:

- [Initializing and Activating the Dialog Box](#)
- [Using Dialog Callback Routines](#)
- [Using a Modeless Dialog Box](#)
- [Using Fortran AppWizards to Help Add Modal Dialog Box Coding](#)
- [Using Fortran AppWizards to Help Add Modeless Dialog Box Coding](#)
- [Using Dialog Controls in a DLL](#)

## Initializing and Activating the Dialog Box

Each dialog box has an associated variable of the derived type `dialog`. The `dialog` derived type is defined in the IFLOGM.F90 module; you access it with **USE IFLOGM**. When you write your dialog application, refer to your dialog box as a variable of type `dialog`. For example:

```
USE IFLOGM
INCLUDE 'RESOURCE.FD'
TYPE (dialog) dlg
LOGICAL return

return = DLGINIT( IDD_TEMP, dlg )
```

This code associates the `dialog` type with the dialog (`IDD_TEMP` in this example) defined in your resource and include files (`TEMP.RC` and `RESOURCE.FD` in this example).

You give your application access to your dialog resource by adding the .RC file to your project. You give your application access to the dialog include file by including the .FD file in each subprogram. You associate the dialog properties in these files with the `dialog` type by calling `DLGINIT` with your dialog name.

An application that controls a dialog box should perform the following actions:

1. Call `DLGINIT` or `DLGINITWITHRESOURCEHANDLE` to initialize the `dialog` type and associate your dialog and its properties with the type.
2. Initialize the controls with the dialog set routines, such as `DLGSET`.
3. Set the callback routines to be executed when a user manipulates a control in the dialog box with `DLGSETSUB`.
4. Depending on whether you want a modal or modeless dialog type:
  - To use a modal dialog, run the dialog with `DLGMODAL`.

- To use a modeless dialog, call `DLGMODELESS` and use `DLGISDLGMESSAGE` in your message loop.

5. Retrieve control information with the dialog get functions, such as `DLGGET`.

6. Free resources from the dialog with `DLGUNINIT`.

As an example of activating a dialog box and controls, the following code initializes the temperature dialog box and controls created in the TEMP project example. It also sets the callback routine as `UpdateTemp`, displays the dialog box, and releases the dialog resources when done:

```

SUBROUTINE DoDialog( )
USE IFLOGM
IMPLICIT NONE
INCLUDE 'RESOURCE.FD'
INTEGER retint
LOGICAL retlog
TYPE (dialog) dlg
EXTERNAL UpdateTemp
! Initialize.
IF ( .not. DlgInit( idd_temp, dlg ) ) THEN
  WRITE (*,*) "Error: dialog not found"
ELSE
! Set up temperature controls.
  retlog = DlgSet( dlg, IDC_SCROLLBAR_TEMPERATURE, 200, DLG_RANGEMAX)
  retlog = DlgSet( dlg, IDC_EDIT_CELSIUS, "100" )
  CALL UpdateTemp( dlg, IDC_EDIT_CELSIUS, DLG_CHANGE )
  retlog = DlgSetSub( dlg, IDC_EDIT_CELSIUS, UpdateTemp )
  retlog = DlgSetSub( dlg, IDC_EDIT_FAHRENHEIT, UpdateTemp )
  retlog = DlgSetSub( dlg, IDC_SCROLLBAR_TEMPERATURE, UpdateTemp )
! Activate the modal dialog.
  retint = DlgModal( dlg )
! Release dialog resources.
  CALL DlgUninit( dlg )
END IF
END SUBROUTINE DoDialog

```

The dialog routines, such as `DLGSETDLGSETSUB` and, refer to the dialog controls by the names you assigned to them in the Properties box while creating the dialog box in the Resource Editor. For example:

```
retlog = DlgSet( dlg, IDC_SCROLLBAR_TEMPERATURE, 200, DLG_RANGEMAX)
```

In this statement, the dialog function `DLGSET` assigns the control named `IDC_SCROLLBAR_TEMPERATURE` a value of 200. The index `DLG_RANGEMAX` specifies that this value is a scroll bar maximum range. Consider the following:

```
retlog = DlgSet( dlg, IDC_EDIT_CELSIUS, "100" )
CALL UpdateTemp( dlg, IDC_EDIT_CELSIUS, DLG_CHANGE)
```

The preceding statements set the dialog's top Edit box, named `IDC_EDIT_CELSIUS` in the Resource Editor, to an initial value of 100, and calls the routine `UpdateTemp` to inform the application that the value has changed. Consider the following:

```
retlog = DlgSetSub( dlg, IDC_EDIT_CELSIUS, UpdateTemp )
retlog = DlgSetSub( dlg, IDC_EDIT_FAHRENHEIT, UpdateTemp )
retlog = DlgSetSub( dlg, IDC_SCROLLBAR_TEMPERATURE, UpdateTemp )
```

The preceding statements associate the callback routine `UpdateTemp` with the three controls. This results in the `UpdateTemp` routine being called whenever the value of any of the three controls changes.

Routines are assigned to the controls with the function `DLGSETSUB`. Its first argument is the dialog variable, the second is the control name, the third is the name of the routine you have written for the control, and the optional fourth argument is an index to select between multiple routines. You can set the callback routines for your dialog controls anywhere in your application: before opening your dialog with either `DLGMODAL` or `DLGMODELESS`, or from within another callback routine.

In the TEMP example, the main program calls the `DoDialog` subroutine to display the Temperature Conversion dialog box.

## Using Dialog Callback Routines

All callback routines should have the following interface:

```
SUBROUTINE callback ( dlg, control_name, callbacktype)
!DEC$ ATTRIBUTES DEFAULT:callback-routine-name
```

Where:

*dlg* Refers to the dialog box and allows the callback to change values of the dialog controls.

*control\_name* Is the name of the control that caused the callback.

*callbacktype* Indicates what callback is occurring (for example, DLG\_CLICKED, DLG\_CHANGE, DLG\_DBCLICK).

In the !DEC\$ ATTRIBUTES directive, the *callback-routine-name* is the name of the callback routine.

The last two arguments let you write a single subroutine that can be used with multiple callbacks from more than one control. Typically, you do this for controls comprising a logical group. For example, all the controls in the temperature dialog in the TEMP example are associated with the same callback routine, `UpdateTemp`. You can also associate more than one callback routine with the same control, but you must then provide an index parameter to indicate which callback is to be used.

The following is an example of a callback routine:

```
SUBROUTINE UpdateTemp( dlg, control_name, callbacktype )
!DEC$ ATTRIBUTES DEFAULT:UpdateTemp
USE IFLOGM
IMPLICIT NONE
TYPE (dialog) dlg
INTEGER control_name
INTEGER callbacktype
INCLUDE 'RESOURCE.FD'
CHARACTER(256) text
INTEGER cel, far, retint
LOGICAL retlog
! Suppress compiler warnings for unreferenced arguments.
INTEGER local_callbacktype
local_callbacktype = callbacktype
SELECT CASE (control_name)
CASE (IDC_EDIT_CELSIUS)
! Celsius value was modified by the user so
! update both Fahrenheit and Scroll bar values.
retlog = DlgGet( dlg, IDC_EDIT_CELSIUS, text )
READ (text, *, iostat=retint) cel
IF ( retint .eq. 0 ) THEN
    far = (cel-0.0)*((212.0-32.0)/100.0)+32.0
    WRITE (text,*) far

retlog = DlgSet( dlg, IDC_EDIT_FAHRENHEIT,
&                TRIM(ADJUSTL(text)) )
&
retlog = DlgSet( dlg, IDC_SCROLLBAR_TEMPERATURE, cel,
&                DLG_POSITION )
END IF
CASE (IDC_EDIT_FAHRENHEIT)
! Fahrenheit value was modified by the user so
! update both celsius and Scroll bar values.
retlog = DlgGet( dlg, IDC_EDIT_FAHRENHEIT, text )
READ (text, *, iostat=retint) far
IF ( retint .eq. 0 ) THEN
```

```

cel = (far-32.0)*(100.0/(212.0-32.0))+0.0
WRITE (text,*) cel
retlog = DlgSet( dlg, IDC_EDIT_CELSIUS, TRIM(ADJUSTL(text)) )
retlog = DlgSet( dlg, IDC_SCROLLBAR_TEMPERATURE, cel,           &
&                           DLG_POSITION )
END IF
CASE (IDC_SCROLLBAR_TEMPERATURE)
! Scroll bar value was modified by the user so
! update both Celsius and Fahrenheit values.
retlog = DlgGet( dlg, IDC_SCROLLBAR_TEMPERATURE, cel,           &
&                           DLG_POSITION )
far = (cel-0.0)*((212.0-32.0)/100.0)+32.0
WRITE (text,*) far
retlog = DlgSet( dlg, IDC_EDIT_FAHRENHEIT, TRIM(ADJUSTL(text)) )
WRITE (text,*) cel
retlog = DlgSet( dlg, IDC_EDIT_CELSIUS, TRIM(ADJUSTL(text)) )
END SELECT
END SUBROUTINE UpdateTemp

```

Each control in a dialog box, except a pushbutton, has a default callback that performs no action. The default callback for a pushbutton's click event sets the return value of the dialog to the pushbutton's name and then exits the dialog. This makes all pushbuttons exit the dialog by default, and gives the OK and CANCEL buttons good default behavior. A routine that calls `DLGMODAL` can then test to see which pushbutton caused the modal dialog to exit.

Callbacks for a particular control are called after the value of the control has been changed by the user's action. Calling `DLGSET` does not cause a callback to be called for the changing value of a control. In particular, when inside a callback, performing a `DLGSET` on a control will not cause the associated callback for that control to be called.

Calling `DLGSET` before or after `DLGMODELESS` or `DLGMODAL` has been called also does not cause the callback to be called. If the callback needs to be called, it can be called manually using `CALL` after the `DLGSET` is performed.

## Using a Modeless Dialog Box

When an application displays a modeless dialog box, the application does not halt, waiting for user input, but continues executing. The user can freely switch between the modeless dialog box and the other windows in the application.

To display a modeless dialog box, call the `DLGMODELESS` function. A modeless dialog box remains displayed until the `DLGEXIT` routine is called, either explicitly or by a default button callback. The application must provide a message loop to process Windows messages and must call the `DLGISDLGMESSAGE` function at the beginning of the message loop.

The variable of type `DIALOG` passed to `DLGMODELESS` must remain in memory for the duration of the dialog box (from the `DLGINIT` call through the `DLGUNINIT` call). The variable can be declared as global data in a Fortran module, as a variable with the `STATIC` attribute (or statement), or in a calling procedure that is active for the duration on the dialog box. For more information, see the Syntax for `DLGMODELESS`.

Modeless dialog boxes are typically used in a Fortran Windows project. A modeless dialog box can be used in a Fortran Console, Fortran DLL, or Fortran Static Library application as long as the requirements for using a modeless dialog box (discussed in the previous paragraphs) are met.

As an example of using a modeless dialog box, the following code is the `WinMain` function of an application that displays a modeless dialog box as its main window:

```

INTEGER(DWORD) function WinMain (hInstance, hPrevInstance, &
& lpszCmdLine, nCmdShow)
!DEC$ ATTRIBUTES STDCALL, DECORATE, ALIAS:"WinMain" :: WinMain
use IFWIN
use IFLOGM
INTEGER(HANDLE), INTENT(IN) :: hInstance, hPrevInstance
INTEGER(LPVOID), INTENT(IN) :: lpszCmdLine

```

```

INTEGER(DWORD), INTENT(IN) :: nCmdShow
! Include the constants provided by the Resource Editor
include 'resource.fdf'
! A dialog box callback
external ThermometerSub
! Variables
type (dialog) dlg
type (T_MSG) mesg
integer ret
logical lret
! Create the thermometer dialog box and set up the controls and callbacks
lret = DlgInit(IDD_THERMOMETER, dlg_thermometer)
lret = DlgSetSub(dlg_thermometer, IDD_THERMOMETER, ThermometerSub)
lret = DlgSet(dlg_thermometer, IDC_PROGRESS1, 32, DLG_RANGEMIN)
lret = DlgSet(dlg_thermometer, IDC_PROGRESS1, 212, DLG_RANGEMAX)
lret = DlgSet(dlg_thermometer, IDC_PROGRESS1, 32)
lret = DlgModeless(dlg_thermometer, nCmdShow)

! Read and process messages until GetMessage returns 0 because
! PostQuitMessage has been called
do while( GetMessage (mesg, NULL, 0, 0) )
    ! Note that DlgIsDlgMessage must be called in order to give
    ! the dialog box first chance at the message.
    if ( DlgIsDlgMessage(mesg) .EQV. .FALSE. ) then
        lret = TranslateMessage( mesg )
        ret = DispatchMessage( mesg )
    end if
end do
! Cleanup dialog box memory
call DlgUninit(dlg)
! The return value is the wParam of the Quit message
WinMain = mesg.wParam
return
end function

```

## Using Fortran AppWizards to Help Add Modal Dialog Box Coding

When an application displays a modal dialog box, the user must explicitly enter data and close the dialog box before the application resumes execution. Any Fortran project type can use a modal dialog box.

The following creates a "Hello World" Fortran Console application that uses a modal dialog box to display "Hello World!" The first step may vary, depending on your version of Visual Studio\*.

1. From the list of Fortran project types, select **Console Application**. In the right pane, select **Main Program Code**. At the bottom of the window, specify a file name (`HelloDlg`) and location. Your project and source file (`HelloDlg.f90`) will be created for you.
2. In the **File** menu, select **Add New Item...** and select **Resource**. Specify a name of `HelloDlg.rc` and click **Open**. Select **Edit>Add Resource...**, select **Dialog**, and click **New**. Create the box using the dialog resource editor, as follows:
  - a. Delete the **Cancel** button (click the **Cancel** button and press the **Delete** key).
  - b. Add a new static text control to the dialog box.
  - c. Enlarge or resize the static text control if needed.
  - d. Select the static text control, then select **View>Properties Window** or (right-click and choose Properties) to edit its properties. Change the Caption to "Hello World!." You may also want to change the **Align Text** option to Center.
  - e. Dismiss the dialog box by clicking the x in the upper-right corner of the window.
3. In the **File** menu, select **Save All**.
4. In the **Project** menu, select **Add Existing Item....** Change the **Files of Type:** selection to **All Files** and select `Resource.h`. Click **Open**.

5. Select the Resource.h file in the Solution View and the select **View>Property Pages**.
6. Set the options as follows:
  - Command Line: deftofd resource.h resource.fd.
  - Description: Generating Fortran include file...
  - Outputs: resource.fd.
7. Click **OK**.
8. Edit the file HelloDlg.f90 as follows:

- After the program HELLODLG line, add the following line:

```
USE IFLOGM
```

- Replace the line: print \*, 'Hello World'

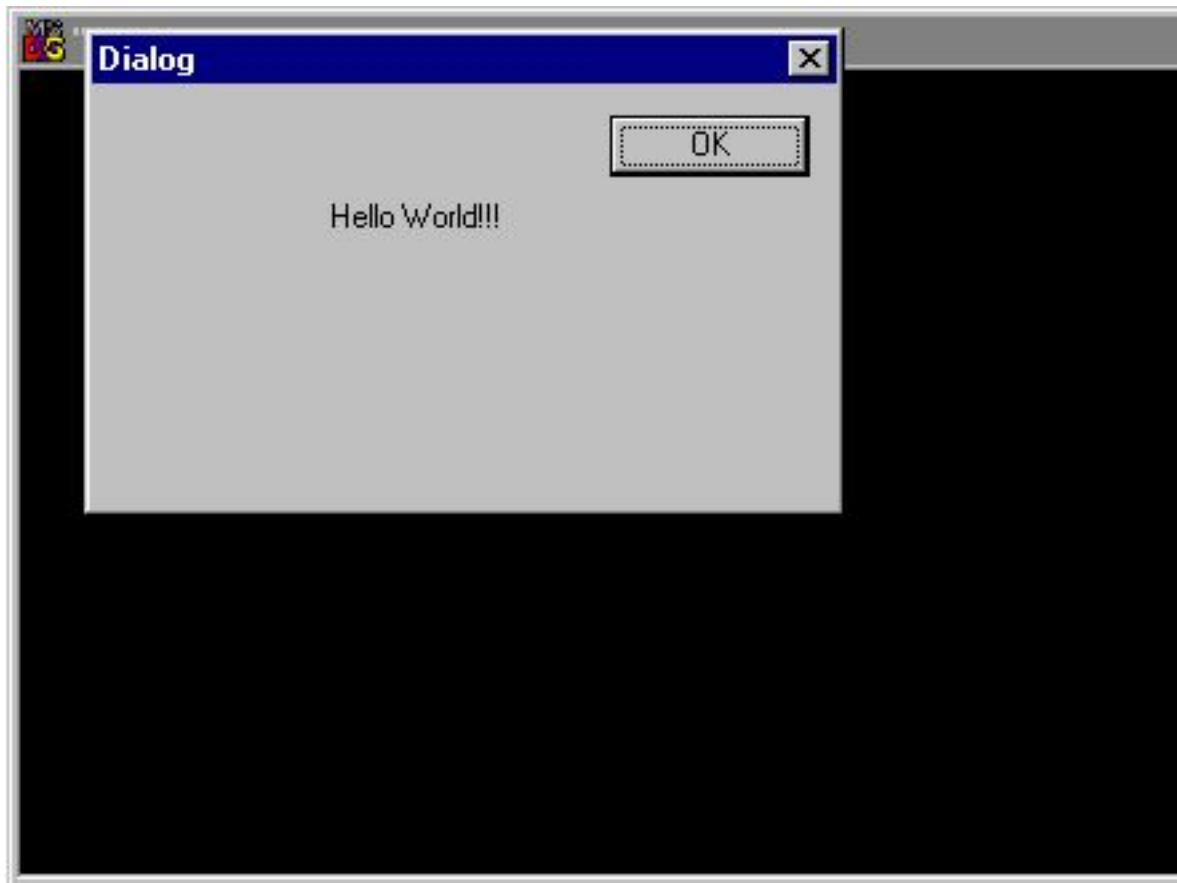
With the following lines:

```
include 'resource.fd'
type (DIALOG) dlg
logical lret
integer iret
lret = DlgInit(IDD_DIALOG1, dlg)
iret = DlgModal(dlg)
call DlgUninit(dlg)
```

In the code above:

- The `USE IFLOGM` line includes the IFLOGM module interfaces to the Dialog routines.
- The line `include 'resource.fd'` [The Include \(.FD and .H\) Files](#).
- The function reference to `DLGINIT` initializes the dialog box.
- The function reference to `DLGMODAL` displays the dialog box.
- The call to `DLGUNINIT` frees the dialog box resources.

9. Build the HelloDlg Fortran Console project application. When you execute the application, the dialog box you created appears in front of the Console window:



10. Click **OK** to dismiss the dialog box.

For Intel Visual Fortran applications using the Fortran Windows project type, you can use the Fortran Windows Project AppWizard to help you add dialog coding for a [Using Fortran AppWizards to Help Add Modeless Dialog Box Coding](#).

For information about coding requirements for modal and modeless dialog boxes, see [Initializing and Activating the Dialog Box](#).

## Using Fortran AppWizards to Help Add Modeless Dialog Box Coding

To use a [Using a Modeless Dialog Box](#), you typically use a Fortran Windows project type. The Fortran Windows Project AppWizard helps you add coding for using a modeless dialog box.

When you create a project by selecting **Fortran Windows Application>Windowing Application**, a number of wizards are available. However, only two allow creation of a dialog box that serves as the main window of the application. These are:

- Sample SDI (Single Document Interface) code

To create an application where a dialog box is the main window of the application with a menu bar, choose the SDI Code wizard or ActiveX SDI Code wizard.

This also creates the skeleton of an entire application that you can immediately build and run. You can add a dialog box to the client area of the main window (as explained later).

- Sample Dialog Code

To create an application where a dialog box is the main window of the application, without a menu bar, choose the Dialog Code wizard or ActiveX Dialog Code wizard.

This creates the skeleton of an entire application that you can immediately build and run to display a sample dialog box. You can add controls to the dialog box and add dialog procedure calls to manipulate the controls and handle dialog callbacks.

## Single Document Interface Sample Code

In the template-like code generated when you select the SDI Code or ActiveX SDI Code option, do the following to add the dialog box to the client area of the main window:

1. Double-click the .rc file, select **Edit>Add Resource...** and create a new Dialog box. Edit the Dialog Properties. Set Style to Child, Border to Thin, and Title Bar to False .
2. In the main source file, add the following USE statement:

```
USE iflsgm
```

3. In the main source file, in the function MainWndProc, add a case to handle the WM\_CREATE message. In this case, initialize the dialog box in the normal manner. To display the dialog box, call:

```
lret = DlgModeless(dlg, SW_SHOWNA, hwndParent)
```

In this call, hwndParent is the window handle of the application's main window.

4. In the main source file, add a call to DlgIsDlgMessage to the message loop, before the call to the Windows API routine TranslateAccelerator, as shown in the following:

```
! Read and process messages
do while( GetMessage( mesg, NULL, 0, 0) )
  if ( DlgIsDlgMessage(mesg, dlg) .EQV. .FALSE. ) then
    if ( TranslateAccelerator (mesg%hwnd, haccel, mesg) == 0) then
      lret = TranslateMessage( mesg )
      ret = DispatchMessage( mesg )
    end if
  end if
end do
```

5. Optionally, if you want to allow the user to resize the main window, add a case to handle the WM\_RESIZE message and change the layout of the dialog box based upon its size.

## Dialog-Based Sample Code

In the template-like code generated when you select the Dialog code or ActiveX Dialog code option, do the following:

- Build the project and execute it. The following dialog box is displayed:



- Some of the code specific to the dialog routine interfaces and data declarations follows. For this example, the project name is FWin. The project name is used in some of the data declarations:

```
use ifllogm
use FWin_dialogGlobals
.
.
.
include 'resource.fd'
external FWin_dialogSub
external FWin_dialogApply
! Variables
type (T_MSG) mesg
integer    ret
logical    lret
```

The FWin\_dialogGlobals module is defined in a separate source file in that project. The FWin\_dialogSub and FWin\_dialogApply are subroutines defined later in the main source file that are callback routines for different controls for the dialog box.

- The code specific to creating the dialog follows:

```
lret = DlgInit(IDD_FWIN_DIALOG_DIALOG, gdlg)           1
if (lret == .FALSE.) goto 99999
lret = DlgSetSub(gdlg, IDD_FWIN_DIALOG_DIALOG, FWin_dialogSub) 2
lret = DlgSetSub(gdlg, IDM_APPLY, FWin_dialogApply)      3
lret = DlgModeless(gdlg, nCmdShow)                      4
if (lret == .FALSE.) goto 99999
```

Notes for this example:

**1** DlgInit initializes the dialog box.

**2** The first call to DlgSetSub assigns a callback subroutine to the Exit button. It associates the FWin\_dialogSub subroutine with the dialog box identifier IDD\_FWIN\_DIALOG\_DIALOG (project name is FWin\_Dialog). The FWin\_dialogSub routine contains code to terminate the program.

**3** The second call to DlgSetSub associates FWin\_dialogApply with the Apply button identifier IDM\_APPLY. The user should add code in the FWin\_dialogApply subroutine to take appropriate action.

**4** DlgModeless displays the initialized modeless dialog box, which is ready for user input.

- The code specific to processing messages (message loop) to react to user input follows:

```
! Read and process messages
do while( GetMessage (mesg, NULL, 0, 0) )           1
if ( DlgIsDlgMessage(mesg) .EQV. .FALSE. ) then  2
lret = TranslateMessage( mesg )                     3
ret  = DispatchMessage( mesg )                     4
end if
end do
```

Notes for this example:

**1** The GetMessage Windows API call inside a DO WHILE loop returns a message from the calling thread's message queue.

**2** DlgIsDlgMessage determines whether the specified message is intended for one of the currently displayed modeless dialog boxes, or a specific dialog box.

**3** The TranslateMessage Windows API call translates virtual-key messages into character messages.

**4** The DispatchMessage Windows API call dispatches a message to a window procedure.

- The dialog box is terminated and its resources are released by calling DlgUninit:

```
call DlgUninit(gdlg)
```

## Using Dialog Controls in a DLL

You can use a dialog box that is defined in a DLL. To do so, you must inform the dialog routines that the dialog resource is located in the DLL, rather than in the main application. The dialog routines will look for the dialog resource in the main application by default.

To do this, initialize your dialog box using DlgInitWithResourceHandleDlgInit rather than DlgInit. As compared to DlgInit, DlgInitWithResourceHandle takes an additional argument named "hinst". The "hinst" argument is the module instance handle in which the dialog resource can be found. For a DLL, this handle is passed into the DLL entry point, DllMain.

An example of a DllMain function follows:

```
module dll_globals
  integer ghInst    ! DLL instance handle
end module dll_globals
!*****
!*   FUNCTION: DllMain(HANDLE, DWORD, LPVOID)
!*
!*   PURPOSE: DllMain is called by Windows when
!*           the DLL is initialized, Thread Attached, and other times.
!*           Refer to SDK documentation, as to the different ways this
!*           may be called.
!*
!*           The DllMain function should perform additional initialization
!*           tasks required by the DLL. DllMain should return a value of 1
!*           if the initialization is successful.
!*
!*****
integer(DWORD) function DllMain (hInstDLL, fdwReason, lpvReserved)
!DEC$ ATTRIBUTES STDCALL, DECORATE, ALIAS:"DllMain" :: DllMain
  use IFWIN
  use dll_globals
  integer(HANDLE), intent(IN) :: hinstFDLL
  integer(DWORD), intent(IN) :: fswReason
  integer(LPVOID), intent(IN) :: lpvReserved
  ! Save the module instance handle in a global variable
```

```

! This would typically be in a Module or a COMMON block.
ghInst = hInst
D1lMain = 1
return
end

```

One way to use `DlgInitWithResourceHandle` is to build a resource-only DLL. A resource-only DLL contains an .RC file, but no code. It is useful for building an application that supports multiple languages. You can create a main application and several resource-only DLLs (one for each language) and call the Windows API `LoadLibrary` routine at the beginning of your application to load the appropriate resource-only DLL. To use a dialog box from the resource-only DLL, first call `LoadLibrary` (see the Platform SDK online documentation) to return the instance handle that you can use when you call `DlgInitWithResourceHandle`.

When you create a Fortran DLL project, you can create a resource-only DLL using the Fortran Dynamic Link Library AppWizard.

To create a resource-only DLL:

1. Select **Library** as the Intel(R) Fortran project type.
2. Select **Dynamic-link Library** in the right pane.
3. Complete creating the project.
4. In the Project menu, select Add to Project... Files to add your .RC file and the RESOURCE.H file that defines the identifiers of the controls.
5. In the Project menu:
  - Select Properties
  - Select **Linker>Advanced**
  - Set **Resource Only DLL** to **Yes**

## Summary of Dialog Routines

You can use dialog routines as you would any intrinsic procedure or run-time routine.

As described in [Using Dialog Boxes for Application Controls Overview](#), Intel Fortran supports two types of dialog boxes: modal and modeless. You can use a modal dialog box with any Fortran project type. You can use a modeless dialog box only with the Fortran Windows project types.

The dialog routines can:

- Initialize and close the dialog box
- Retrieve user input from a dialog box
- Display data in the dialog box
- Modify the dialog box controls

The include file (.FD) of the dialog box contains the names of the dialog controls that you specified in the Properties Window of the Resource Editor when you created the dialog box. The module IFLOGM.MOD contains predefined variable names and type definitions. These control names, variables, and type definitions are used in the dialog routine argument lists to manage your dialog box.

The dialog routines are listed in the following table:

Dialog Routine	Description
DLGEXIT	Closes an open dialog
DLGFLUSH	Updates the dialog display
DLGGET	Gets the value of a control variable
DLGGETCHAR	Gets the value of a character control variable
DLGGETINT	Gets the value of an integer control variable

Dialog Routine	Description
DLGGETLOG	Gets the value of a logical control variable
DLGINIT	Initializes the dialog
DLGINITWITHRESOURCEHANDLE	Initializes the dialog (alternative to <code>DLGINIT</code> )
DLGISDLGMESSAGE	Determines whether a message is intended for a modeless dialog box
DLGISDLGMESSAGEWITHDLG	Determines whether a message is intended for a modeless dialog box (alternative to <code>DLGISDLGMESSAGE</code> )
DLGMODAL	Displays a modal dialog box
DLGMODALWITHPARENT	Displays a modal dialog box (alternative to <code>DLGMODAL</code> )
DLGMODELESS	Displays a modeless dialog box
DLGSENDCTRLMESSAGE	Sends a message to a control
DLGSET	Assigns a value to a control variable
DLGSETCHAR	Assigns a value to a character control variable
DLGSETCTRLEVENTHANDLER	Assigns a routine to handle an ActiveX control event
DLGSETINT	Assigns a value to an integer control variable
DLGSETLOG	Assigns a value to a logical control variable
DLGSETRETURN	Sets the return value for <code>DLGMODAL</code>
DLGSETSUB	Assigns a defined callback routine to a control
DLGSETTITLE	Sets the dialog title
DLGUNINIT	Deallocates memory for an initialized dialog

These routines are described in the *Language Reference* (see also *Dialog Procedures: table*).

## Understanding Dialog Controls

### Understanding Dialog Controls Overview

Each dialog control in a dialog box has a unique integer identifier and name. You specify the name in the Properties window for each control within the Resource Editor, and the Resource Editor assigns an integer value to each control name. You can refer to a control by its name, for example `IDC_SCROLLBAR_TEMPERATURE`, or by its integer value, which you can read from the include (.FD) file.

Each dialog control has one or more variables associated with it, called *control indexes*. These indexes can be integer, logical, character, or external. For example, a plain Button has three associated variables: one is a logical value associated with its current enabled state, one is a character variable that determines its title, and the third is an external variable that indicates the subroutine to be called if a mouse click occurs.

Dialog controls can have multiple variables of the same type. For example, the scroll bar control has four integer variables associated with it:

- Scroll bar position

- Scroll bar minimum range
- Scroll bar maximum range
- Position change if the user clicks on the scroll bar space next to the slide (big step)

## See Also

[Using Control Indexes](#)

[Available Indexes for Each Dialog Control](#)

[Specifying Control Indexes](#)

## Using Control Indexes

The value of a dialog control's index is set with the `DLGSET` functions: `DLGSET`, `DLGSETSUB`, and `DLGSETCHAR`, `DLGSETLOG`, `DLGSETINT`. The control name and control index name are arguments to the `DLGSET` functions and specify the particular control index being set. For example:

```
retlog = DlgSet( dlg, IDC_SCROLLBAR_TEMPERATURE, 45, DLG_POSITION )
```

The index `DLG_POSITION` specifies the scroll bar position is set to 45. Consider the following:

```
retlog = DlgSet( dlg, IDC_SCROLLBAR_TEMPERATURE, 200, DLG_RANGEMAX )
```

In this statement, the index `DLG_RANGEMAX` specifies the scroll bar maximum range is set to 200. The `DLGSET` functions have the following syntax:

```
result = DLGSET (dlg, control_name, value, control_index_name)
```

The `control_index_name` determines what the `value` in the `DLGSET` function means.

The control index names are declared in the module `IFLOGM.MOD` and should not be declared in your routines. Available control indexes and how they specify the interpretation of the `value` argument are listed in the following Control Indexes table.

Control Index	How the Value is Interpreted
<code>DLG_ADDSTRING</code>	Used with <code>DLGSETCHAR</code> to add an entry to a List box or Combo box
<code>DLG_BIGSTEP</code>	The amount of change that occurs in a Scroll bar's or Slider's position when the user clicks beside the Scroll bar's or slider's slide (default = 10)
<code>DLG_CHANGE</code>	A subroutine called after the user has modified a control and the control has been updated on the screen
<code>DLG_CLICKED</code>	A subroutine called when the control receives a mouse-click
<code>DLG_DBCLICK</code>	A subroutine called when a control is double-clicked
<code>DLG_DEFAULT</code>	Same as not specifying a control index
<code>DLG_ENABLE</code>	The enable state of the control ( <code>value</code> = <code>.TRUE.</code> means enabled, <code>value</code> = <code>.FALSE.</code> means disabled)
<code>DLG_GAINFOCUS</code>	A subroutine called when an Edit Box receives input focus.
<code>DLG_IDISPATCH</code>	The object pointer of an ActiveX control
<code>DLG_LOSEFOCUS</code>	A subroutine called when an Edit Box loses input focus
<code>DLG_NUMITEMS</code>	The total number of items in a List box, Combo box, or Tab control
<code>DLG_POSITION</code>	The current position of the Scroll bar, Spin, Slider, or Progress bar. Also, the current cursor position in the edit box.
<code>DLG_RANGEMIN</code>	The minimum value of a Scroll bar's, Spin's, Slider's, or Progress' position (default = 1 for scroll bar, 0 for other controls)

Control Index	How the Value is Interpreted
DLG_RANGEMAX	The maximum value of a Scroll bar's, Spin's, Slider's, or Progress' position (default = 100)
DLG_SELCHANGE	A subroutine called when the selection in a List Box or Combo Box changes
DLG_SELCHANGING	A subroutine called when the selected Tab control is about to be changed. In this subroutine, calling <code>DLGGETINT</code> with the index <code>DLG_STATE</code> refers to the Tab that was active before the change.
DLG_SMALLSTEP	The amount of change that occurs in a Slider's position when the user presses the keyboard arrow keys (default = 1)
DLG_STATE	The user changeable state of a control
DLG_TEXTLENGTH	The length of text in an edit box
DLG_TICKFREQ	The interval frequency for tick marks in a Slider (default = 1)
DLG_TITLE	The title text associated with a control
DLG_UPDATE	A subroutine called after the user has modified the control state but before the control has been updated on the screen

The index names associated with dialog controls do not need to be used unless there is more than one variable of the same type for the control and you do not want the default variable. For example:

```
retlog = DlgSet(dlg, IDC_SCROLLBAR_TEMPERATURE, 45, DLG_POSITION)
retlog = DlgSet(dlg, IDC_SCROLLBAR_TEMPERATURE, 45)
```

These statements both set the Scroll bar position to 45, because `DLG_POSITION` is the default control index for the scroll bar.

## Dialog Indexes

The control identifier specified in `DLGSETSUB` can also be the identifier of the dialog box. In this case, the index must be one of the values listed in the Dialog Indexes table:

Dialog Index	How the Value is Interpreted
DLG_INIT	A subroutine called after the dialog box is created but before it is displayed (with <code>callbacktype=DLG_INIT</code> ) and immediately before the dialog box is destroyed (with <code>callbacktype=DLG_DESTROY</code> ).
DLG_SIZECHANGE	A subroutine called after the dialog box is resized.

For more information on dialog controls, see [Available Indexes for Each Dialog Control](#).

## Available Indexes for Each Dialog Control

The available indexes and defaults for each of the controls are listed in the following table:

### Dialog Controls and Their Indexes

Control Type	Integer Index Name	Logical Index Name	Character Index Name	Subroutine Index Name
Using ActiveX *	DLG_IDISPATCH	DLG_ENABLE		

Control Type	Integer Index Name	Logical Index Name	Character Index Name	Subroutine Index Name
Controls Overview				
Using Buttons		DLG_ENABLE	DLG_TITLE	DLG_CLICKED
Using Check Boxes and Radio Buttons		DLG_STATE (default) DLG_ENABLE	DLG_TITLE	DLG_CLICKED
Using List Boxes and Combo Boxes	DLG_NUMITEMS Sets or returns the total number of items in a list	DLG_ENABLE	Use DLG_STATE, DLG_ADDSTRING, or an index: DLG_STATE By default, sets or returns the text of the selected item or first item in the list DLG_ADDSTRING Used with DLGSETCHAR to add a new item. It automatically increments DLG_NUMITEMS. An index, 1 to <i>n</i> Sets or returns the text of a particular item	DLG_SELCHANGE (default) DLG_DBCLICK DLG_CHANGE DLG_UPDATE
Using List Boxes and Combo Boxes	Use DLG_NUMITEMS or DLG_STATE: DLG_NUMITEMS (default) Sets or returns the total number of items in a list DLG_STATE Sets or returns the index of the selected item	DLG_ENABLE	Use DLG_STATE, DLG_ADDSTRING, or an index: DLG_STATE By default, sets or returns the text of the selected item or first item in the list, or you can include an index, 1 to <i>n</i> , to set or return indicates the text of a particular item DLG_ADDSTRING Used with DLGSETCHAR to add a new item. It automatically increments DLG_NUMITEMS.	DLG_SELCHANGE (default) DLG_DBCLICK
Using Edit Boxes	DLG_TEXTLENGTH (default) Sets or returns the length of the text in the edit box. DLG_POSITION	DLG_ENABLE	DLG_STATE	DLG_CHANGE (default) DLG_UPDATE DLG_GAINFOCUS

Control Type	Integer Index Name	Logical Index Name	Character Index Name	Subroutine Index Name
	Sets or returns the cursor position			DLG_LOSEFOCUS
Using Group Boxes		DLG_ENABLE	DLG_TITLE	
Using List Boxes and Combo Boxes	Use DLG_NUMITEMS or an index: DLG_NUMITEMS Sets or returns the total number of items in a list An index, 1 to <i>n</i> Determines which list items have been selected and their order	DLG_ENABLE DLG_NUMITEMS Sets or returns the total number of items in a list An index, 1 to <i>n</i> Determines which list items have been selected and their order	Use DLG_STATE, DLG_ADDSTRING, or an index: DLG_STATE By default, returns the text of the first selected item DLG_ADDSTRING Used with DLGSETCHAR to add a new item. It automatically increments DLG_NUMITEMS. An index, 1 to <i>n</i> Sets or returns the text of a particular item	DLG_SELCHANGE (default) DLG_DBLCHECK
Using Pictures		DLG_ENABLE		
Using Progress Bars	DLG_POSITION (default) DLG_RANGEMIN DLG_RANGEMAX	DLG_ENABLE		
Using Check Boxes and Radio Buttons		DLG_STATE (default) DLG_ENABLE	DLG_TITLE	DLG_CLICKED
Using Scroll Bars	DLG_POSITION (default) DLG_RANGEMIN DLG_RANGEMAX DLG_BIGSTEP	DLG_ENABLE		DLG_CHANGE
Using Sliders	DLG_POSITION (default) DLG_RANGEMIN DLG_RANGEMAX DLG_SMALLSTEP DLG_BIGSTEP DLG_TICKFREQ	DLG_ENABLE		DLG_CHANGE

Control Type	Integer Index Name	Logical Index Name	Character Index Name	Subroutine Index Name
Using Spin Controls	DLG_POSITION (default) DLG_RANGEMIN DLG_RANGEMAX	DLG_ENABLE		DLG_CHANGE
Using Static Text		DLG_ENABLE	DLG_TITLE	
Using Tab Controls	Use DLG_NUMITEMS (default), DLG_STATE, or an index:  DLG_NUMITEMS Sets or returns the total number of tabs  DLG_STATE Sets or returns the currently selected tab  An index, 1 to <i>n</i>  Sets or returns the dialog name of the dialog box associated with a particular tab	DLG_ENABLE	Use DLG_STATE or an index:  DLG_STATE By default, sets or returns the currently selected tab  An index, 1 to <i>n</i>  Sets or returns the text of a particular Tab	DLG_SELCHANGE (default) DLG_SELCHANGING

For an overview on control indexes, see [Using Control Indexes](#).

## Specifying Control Indexes

Where there is only one possibility for a particular dialog control's index type (integer, logical, character, or subroutine), you do not need to specify the control index name in an argument list. For example, you can set the Static text control `IDC_TEXT_CELSIUS` to a new value with either of the following statements:

```
retlog = DLGSETCHAR (dlg, IDC_TEXT_CELSIUS, "New Celsius Title", &
& DLG_TITLE)
retlog = DLGSET (dlg, IDC_TEXT_CELSIUS, "New Celsius Title")
```

You do not need the control index `DLG_TITLE` because there is only one character index for a Static text control. The generic function `DLGSET` chooses the control index to change based on the argument type, in this case `CHARACTER`.

For each type of index, you can use the generic `DLGSET` function or the specific `DLGSET` function for that type: `DLGSETINT`, `DLGSETLOG`, or `DLGSETCHAR`.

For example, you can disable the Static text control `IDC_TEXT_CELSIUS` by setting its logical value to `.FALSE.` with either `DLGSET` or `DLGSETLOG`:

```
retlog = DLGSETLOG (dlg, IDC_TEXT_CELSIUS, .FALSE., DLG_ENABLE)
retlog = DLGSET (dlg, IDC_TEXT_CELSIUS, .FALSE., DLG_ENABLE)
```

In both these cases, the control index `DLG_ENABLE` can be omitted because there is only one logical control index for Static text controls.

You can query the value of a particular control index with the `DLGGET` functions, `DLGGET`, `DLGGETINT`, `DLGGETLOG`, and `DLGGETCHAR`. For example:

```
INTEGER current_val
LOGICAL are_you_enabled
retlog = DLGGET (dlg, IDC_SCROLLBAR_TEMPERATURE, current_val, &
```

```

&           DLG_RANGEMAX)
retlog = DLGGET (dlg, IDC_SCROLLBAR_TEMPERATURE, are_you_enabled,  &
&           DLG_ENABLE)

```

This code returns the maximum range and the enable state of the scroll bar. The arguments you declare (current\_val and are\_you\_enabled in the preceding example) to hold the queried values must be of the same type as the values retrieved. If you use specific DLGGET functions such as DLGGETINT or DLGGETCHAR, the control index value retrieved must be the appropriate type. For example, you cannot use DLGGETCHAR to retrieve an integer or logical value. The DLGGET functions return .FALSE. for illegal type combinations. You cannot query for the name of an external callback routine.

In general, it is better to use the generic functions DLGSET and DLGGET rather than their type-specific variations because then you do not have to worry about matching the function to the type of value set or retrieved. DLGSET and DLGGET perform the correct operation automatically, based on the type of argument you pass to them.

More information on these routines is available in the *Language Reference*.

## Using Dialog Controls

### Using Dialog Controls Overview

The dialog controls provided in the Resource Editor are versatile and flexible; when used together, they can provide a sophisticated user-friendly interface for your application. This section discusses the available dialog controls.

Any control can be disabled by your application at any time, so that it no longer changes or responds to the user. This is done by setting the control index DLG\_ENABLE to .FALSE. using DLGSET or DLGSETLOG. For example:

```

LOGICAL retlog
retlog = DLGSET (dlg, IDC_CHECKBOX1, .FALSE., DLG_ENABLE)

```

This example disables the control named IDC\_CHECKBOX1.

When you create your dialog box in the Resource Editor, the dialog controls are given a tab order. When the user hits the Tab key, the dialog box focus shifts to the next control in the tab order. By default, the tab order of the controls follows the order in which they were created. This may not be the order you want.

You can change the order by opening the Format menu and choosing Tab Order (or by pressing the key combination Ctrl+D) in the Resource Editor. A tab number will appear next to each control. Click the mouse on the control you want to be first, then on the control you want to be second in the tab order and so on. Tab order also determines which control gets the focus if the user presses the Group box hotkey. (See [Using Group Boxes](#).)

The following sections describe the function and use of the dialog controls:

- [Using Static Text](#)
- [Using Edit Boxes](#)
- [Using Group Boxes](#)
- [Using Check Boxes and Radio Buttons](#)
- [Using Buttons](#)
- [Using List Boxes and Combo Boxes](#)
- [Using Scroll Bars](#)
- [Using Pictures](#)
- [Using Progress Bars](#)
- [Using Spin Controls](#)
- [Using Sliders](#)
- [Using Tab Controls](#)

- [Setting Return Values and Exiting](#)

For information on using ActiveX controls in a dialog, see [Using ActiveX\\* Controls Overview](#).

## Using Static Text

Static text is an area in the dialog that your application writes text to. The user cannot change it. Your application can modify the Static text at any time, for instance to display a current user selection, but the user cannot modify the text. Static text is typically used to label other controls or display messages to the user.

## Using Edit Boxes

An Edit box is an area that your application can write text to at anytime. However, unlike Static Text, the user can write to an Edit box by clicking the mouse in the box and typing. The following statements write to an Edit box:

```
CHARACTER(20) text /"Send text"/  
retlog = DLGSET (dlg, IDC_EDITBOX1, text)
```

The next statement reads the character string in an Edit box:

```
retlog = DLGGET (dlg, IDC_EDITBOX1, text)
```

The values a user enters into the Edit box are always retrieved as character strings, and your application needs to interpret these strings as the data they represent. For example, numbers entered by the user are interpreted by your application as character strings. Likewise, numbers you write to the Edit box are sent as character strings. You can convert between numbers and strings by using internal read and write statements to make type conversions.

To read a number in the Edit box, retrieve it as a character string with `DLGGET` or `DLGGETCHAR`, and then execute an internal read using a variable of the numeric type you want (such as integer or real). For example:

```
REAL x  
LOGICAL retlog  
CHARACTER(256) text  
retlog = DLGGET (dlg, IDC_EDITBOX1, text)  
READ (text, *) x
```

In this example, the real variable `x` is assigned the value that was entered into the Edit box, including any decimal fraction.

Complex and double complex values are read the same way, except that your application must separate the Edit box character string into the real part and imaginary part. You can do this with two separate Edit boxes, one for the real and one for the imaginary part, or by requiring the user to enter a separator between the two parts and parsing the string for the separator before converting. If the separator is a comma (,) you can read the string with two real edit descriptors without having to parse the string.

To write numbers to an Edit box, do an internal write to a string, then send the string to the Edit box with `DLGSET`. For example:

```
INTEGER j  
LOGICAL retlog  
CHARACTER(256) text  
WRITE (text,'(I4)') j  
retlog = DLGSET (dlg, IDC_EDITBOX1, text)
```

Use the `DLG_TEXTLENGTH` control index to get or set the length of the characters in the edit box. The length is automatically updated when:

- Your program calls `DLGSET` to set the text in the edit box (trailing blanks are stripped before setting the edit box).
- The user modifies the text in the edit box.

If you want to set the text with significant trailing blanks, call `DLGSET` to set the text followed by `DLGSET` with the `DLG_TEXTLENGTH` index to set the length that you want.

Use the `DLG_POSITION` index to get or set the current cursor position in the edit box. Note that setting the cursor position cancels any current selection in the edit box.

## Using Group Boxes

A Group box visually organizes a collection of controls as a group. When you select Group box in Resource Editor, you create an expanding (or shrinking) box around the controls you want to group and give the group a title. You can add a hotkey to your group title with an ampersand (&). For example, consider the following group title:

```
&Temperature
```

This causes the "T" to be underlined in the title and makes it a hotkey. When the user presses the key combination `ALT+T`, the focus of the dialog box shifts to the next control after the Group box in the tab order. This control should be a control in the group. (You can view and change the tab order from the Format>Tab Order menu option in the Resource Editor.)

Disabling the Group box disables the hotkey, but does not disable any of the controls within the group. As a matter of style, you should generally disable the controls in a group when you disable the Group box.

## Using Check Boxes and Radio Buttons

Check boxes and Radio buttons present the user with an either-or choice. A Radio button is pushed or not, and a Check box is checked or not. You use `DLGGET` or `DLGGETLOG` to check the state of these controls. Their state is a logical value that is `.TRUE.` if they are pushed or checked, and `.FALSE.` if they are not. For example:

```
LOGICAL pushed_state, checked_state, retlog
retlog = DLGGET (dlg, IDC_RADIOBUTTON1, pushed_state)
retlog = DLGGET (dlg, IDC_CHECKBOX1, checked_state)
```

If you need to change the state of the button, for initialization or in response to other user input, you use `DLGSET` or `DLGSETLOG`. For example:

```
LOGICAL retlog
retlog = DLGSET (dlg, IDC_RADIOBUTTON1, .TRUE.)
retlog = DLGSET (dlg, IDC_CHECKBOX1, .TRUE.)
```

Radio buttons are typically used in a group where the user can select only one of a set of options. When using Radio buttons with the Dialog routines, use the following guidelines:

- Each Radio button should have the "Auto" style set. This is the default for a new Radio button.
- The first Radio button in a group should have the "Group" style set. This is not the default for a new Radio button.
- The remaining Radio buttons in the group should not have the "Group" style set, and should immediately follow the first button in the dialog box "Tab order." The default tab order is the order in which you create the controls. You can view and change the tab order from the Format>Tab Order menu option in the Resource Editor.
- When the user selects a Radio button in a group, its state is set to `.TRUE.` and the state of the other Radio buttons in the group is set to `.FALSE..`
- To set the currently selected Radio button from your code, call `DLGSETLOG` to set the selected Radio button to `.TRUE..` Do not set the other Radio buttons to `.FALSE..` This is handled automatically.

## Using Buttons

Unlike Check boxes and Radio buttons, Buttons do not have a state. They do not hold the value of being pushed or not pushed. When the user clicks on a Button with the mouse, the Button's callback routine is called. Thus, the purpose of a Button is to initiate an action. The external procedure you assign as a callback determines the action initiated. For example:

```
LOGICAL retlog
EXTERNAL DisplayTime
retlog = DlgSetSub( dlg, IDC_BUTTON_TIME, DisplayTime)
```

Intel Visual Fortran dialog routines do not support user-drawn Buttons.

## Using List Boxes and Combo Boxes

List boxes and Combo boxes are used when the user needs to select a value from a set of many values. They are similar to a set of Radio buttons except that List boxes and Combo boxes are scrollable and can contain more items than a set of Radio buttons which are limited by the screen display area. Also, unlike Radio buttons, the number of entries in a List box or Combo box can change at run-time.

The difference between a List box and a Combo box is that a List box is simply a list of items, while a Combo box is a combination of a List box and an Edit box. A List box allows the user to choose multiple selections from the list at one time, while a Combo box allows only a single selection, but a Combo box allows the user to edit the selected value while a List box only allows the user to choose from the given list.

A Drop-down list box looks like a Combo box since it has a drop-down arrow to display the list. Like a Combo box, only one selection can be made at a time in a Drop-down list box, but, like a List box, the selected value cannot be edited. A Drop-down list box serves the same function as a List box except for the disadvantage that the user can choose only a single selection, and the advantage that it takes up less dialog screen space.

Intel Visual Fortran dialog routines do not support user-drawn List boxes or user-drawn Combo boxes. You must create List boxes and Combo boxes with the Resource Editor.

The following sections describe how to use List boxes and Combo boxes:

- [Using List boxes](#)
- [Using Combo boxes](#)
- [Using Drop-down List boxes](#)

## Using List Boxes

For both List boxes and Combo boxes, the control index `DLG_NUMITEMS` determines how many items are in the box. Once this value is set, you set the text of List box items by specifying a character string for each item index. Indexes run from 1 to the total number of list items set with `DLG_NUMITEMS`. For example:

```
LOGICAL retlog
retlog = DlgSet( dlg, IDC_LISTBOX1, 3, DLG_NUMITEMS )
retlog = DlgSet( dlg, IDC_LISTBOX1, "Moe", 1 )
retlog = DlgSet( dlg, IDC_LISTBOX1, "Larry", 2 )
retlog = DlgSet( dlg, IDC_LISTBOX1, "Curly", 3 )
```

These function calls to `DLGSET` put three items in the List box. The initial value of each List box entry is a blank string and the value becomes nonblank after it has been set.

You can change the list length and item values at any time, including from within callback routines. If the list is shortened, the set of entries is truncated. If the list is lengthened, blank entries are added. In the preceding example, you could extend the list length and define the new item with the following:

```
retlog = DLGSET( dlg, IDC_LISTBOX1, 4)
retlog = DLGSET( dlg, IDC_LISTBOX1, "Shemp", 4)
```

Since List boxes allow selection of multiple entries, you need a way to determine which entries are selected. When the user selects a List box item, it is assigned an integer index. You can test which list items are selected by reading the selection indexes in order until a zero value is read. For example, if in the previous List box the user selected Moe and Curly, the List box selection indexes would have the following values:

Selection Index	Value
1	1 (for Moe)
2	3 (for Curly)
3	0 (no more selections)

If Larry alone had been selected, the List box selection index values would be:

Selection Index	Value
1	2 (for Larry)
2	0 (no more selections)

To determine the items selected, the List box values can be read with `DLGGET` until a zero is encountered.

For example:

```
INTEGER j, num, test
INTEGER, ALLOCATABLE :: values(:)
LOGICAL retlog
retlog = DLGGET (dlg, IDC_LISTBOX1, num, DLG_NUMITEMS)
ALLOCATE (values(num))
j = 1
test = -1
DO WHILE (test .NE. 0)
  retlog = DLGGET (dlg, IDC_LISTBOX1, values(j), j)
  test = values(j)
  j = j + 1
END DO
```

In this example, `j` is the selection index and `values(j)` holds the list numbers, of the items selected by the user, if any.

To read a single selection, or the first selected item in a set, you can use `DLG_STATE`, since for a List Box `DLG_STATE` holds the character string of the first selected item (if any). For example:

```
! Get the string for the first selected item.
retlog = DLGGET (dlg, IDC_LISTBOX1, str, DLG_STATE)
```

Alternatively, you can first retrieve the list number of the selected item, and then get the string associated with that item:

```
INTEGER value
CHARACTER(256) str
! Get the list number of the first selected item.
retlog = DLGGET (dlg, IDC_LISTBOX1, value, 1)
! Get the string for that item.
retlog = DLGGET (dlg, IDC_LISTBOX1, str, value)
```

In these examples, if no selection has been made by the user, `str` will be a blank string.

In the **Properties** Window in the Resource Editor, List boxes can be specified as sorted or unsorted. The default is sorted, which causes List box items to be sorted alphabetically starting with A. If a List box is specified as sorted, the items in the list are sorted whenever they are updated on the screen. This occurs when the dialog box is first displayed and when the items are changed in a callback.

The alphabetical sorting follows the ASCII collating sequence, and uppercase letters come before lowercase letters. For example, if the List box in the example above with the list "Moe," "Larry," "Curly," and "Shemp" were sorted, before a callback or after `DLGMODAL` returned, index 1 would refer to "Curly," index 2 to "Larry," index 3 to "Moe," and index 4 to "Shemp." For this reason, when using sorted List boxes, indexes should not be counted on to be the same once the dialog is displayed and any change is made to the list items.

You can also call `DLGSETCHAR` with the `DLG_ADDSTRING` index to add items to a List box or Combo box. For example:

```
retlog = DlgSet(dlgtab, IDC_LIST, "Item 1", DLG_ADDSTRING)
```

When you use `DLG_ADDSTRING`, the `DLG_NUMITEMS` control index of the List or Combo box is automatically incremented.

When adding items to a sorted list or Combo box, using `DLG_ADDSTRING` can be much easier than the alternative (setting `DLG_NUMITEMS` and then setting items using an index value), because you need not worry about the list being sorted and the index values changing between calls.

## Using Combo Boxes

A Combo box is a combination of a List box and an Edit box. The user can make a selection from the list that is then displayed in the Edit box part of the control, or enter text directly into the Edit box.

All dialog values a user enters are character strings, and your application must interpret these strings as the data they represent. For example, numbers entered by the user are returned to your application as character strings.

Because user input can be given in two ways, selection from the List box portion or typing into the Edit box portion directly, you need to register two callback types with `DLGSETSUB` for a Combo box. These callback types are `dlg_selchange` to handle a new list selection by the user, and `dlg_update` to handle text entered by the user directly into the Edit box portion. For example:

```
retlog = DlgSetSub( dlg, IDC_COMBO1, UpdateCombo, dlg_selchange )
retlog = DlgSetSub( dlg, IDC_COMBO1, UpdateCombo, dlg_update )
```

A Combo box list is created the same way a List box list is created, as described in the previous section, but the user can select only one item from a Combo box at a time. When the user selects an item from the list, Windows automatically puts the item into the Edit box portion of the Combo box. Thus, there is no need, and no mechanism, to retrieve the item list number of a selected item.

If the user is typing an entry directly into the Edit box part of the Combo box, again Windows automatically displays it and you do not need to. You can retrieve the character string of the selected item or Edit box entry with the following statement:

```
! Returns the character string of the selected item or Edit box entry as str.  retlog = DLGGET (dlg,
IDC_COMBO1, str)
```

Like List boxes, Combo boxes can be specified as sorted or unsorted. The notes about sorted List boxes also apply to sorted Combo boxes.

You have three choices for Combo box Type option in the Properties Window:

- Simple
- Drop list
- Drop-down

Simple and Drop-down are the same, except that a simple Combo box always displays the Combo box choices in a list, while a Drop-down list Combo box has a Drop-down button and displays the choices in a Drop-down list, conserving screen space. The Drop list type is halfway between a Combo box and a List box and is described below.

## Using Drop-Down List Boxes

To create a Drop-down list box, do the following:

1. Choose a Combo box from the control toolbar and place it in your dialog.
2. Select the **Combo box**, then select **View>Properties** to open the Properties Window.
3. Choose Drop List as the control type.

A Drop-down list box has a drop-down arrow to display the list. Like a Combo box, only one selection can be made at a time in the list, but like a List Box, the selected value cannot be edited. A Drop-down list box serves the same function as a List box except for the disadvantage that the user can choose only a single selection, and the advantage that it takes up less dialog screen space.

A Drop-down list box has the same control indexes as a Combo box with the addition of another INTEGER index to set or return the list number of the item selected in the list. For example:

```
INTEGER num
! Returns index of the selected item.
retlog = DLGGET (dlg, IDC_DROPDOWN1, num, DLG_STATE)
```

## Using Scroll Bars

With a Scroll bar, the user determines input by manipulating the slide up and down or right and left. Your application sets the range for the Scroll bar, and thus can interpret a position of the slide as a number. If you want to display this number to the user, you need to send the number (as a character string) to a Static text or Edit Box control.

You set the lower and upper limits of the Scroll bar range by setting the control index **DLG\_RANGEMIN** and **DLG\_RANGEMAX** with **DLGSET** or **DLGSETINT**. The default values are 1 and 100. For example:

```
LOGICAL retlog
retlog = DLGSET (dlg, IDC_SCROLLBAR1, 212, DLG_RANGEMAX)
```

You get the slide position by retrieving the control index **DLG\_POSITION** with **DLGGET** or **DLGGETINT**. For example:

```
INTEGER slide_position
retlog = DLGGET (dlg, IDC_SCROLLBAR1, slide_position, DLG_POSITION)
```

You can also set the increment taken when the user clicks in the blank area above or below the slide in a vertical Scroll bar, or to the left or right of the slide in a horizontal Scroll bar, by setting the control index **DLG\_BIGSTEP**. For example:

```
retlog = DLGSET (dlg, IDC_SCROLLBAR1, 20, DLG_BIGSTEP)
```

When the user clicks on the arrow buttons of the Scroll bar, the position is always incremented or decremented by 1.

The maximum value (**DLG\_POSITION**) that a scroll bar can report (that is, the maximum scrolling position) depends on the page size (**DLG\_BIGSTEP**). If the scroll bar has a page size greater than one, the maximum scrolling position is less than the maximum range value (**DLG\_RANGEMAX** or **DLG\_RANGE**). You can use the following formula to calculate the maximum scrolling position:

```
MaxScrollPos = MaxRangeValue - (PageSize - 1)
```

For example, if a scroll bar has **DLG\_RANGEMAX** = 100 (100 is the default value of **DLG\_RANGEMAX**) and **DLG\_BIGSTEP** = 10 (10 is the default value of **DLG\_BIGSTEP**), then the maximum **DLG\_POSITION** is 91 (100 - (10 - 1)).

This allows your application to implement a "proportional" scroll bar. The size of the scroll box (or thumb) is determined by the value of **DLG\_BIGSTEP** and should represent a "page" of data (that is, the amount of data visible in the window).

When the user clicks in the "shaft" of the scroll bar, the next (or previous) page is displayed. The top of the thumb (for a vertical scroll bar) or the left edge of the thumb (for a horizontal scroll bar) represents the position of the scroll bar (**DLG\_POSITION**).

The size of the thumb represents the amount of data currently visible. There is a minimum thumb size so as not to affect usability. When the scroll bar is at its maximum position, the position will represent the position in the data such that the last "page" of data is visible in the window. When the top (or left edge) of the scroll bar is at the mid-point of the shaft, **DLG\_POSITION** will be the mid-point of the range and the mid-point of the data should be displayed at the top of the window.

## Using Pictures

The Picture control is an area of your dialog box in which your application displays a picture.

The user cannot change it, since it is an output-only window. It does not respond to user input and therefore does not support any callbacks.

The picture displayed can be set using the Properties dialog box in the Resource Editor. The options that can be fully defined using the Resource Editor include a:

- Icon
- Bitmap
- Frame
- Rectangle

When using the Resource editor, you need to click on the border of the picture to select it, then select **View>Properties** to display the Properties window. The **Properties Window** allows you to select the type of picture as well as specify the image for certain picture types.

For example, to add an existing BMP (Bitmap) file to a dialog:

1. Open your project, double-click on the .rc file, and select **Edit>Add Resource**.
2. Select the Resource type (such as Icon or Bitmap) and then select whether it is a new resource, an Import (existing) resource, or Custom resource. In our example, we will specify an existing Bitmap file we have previously copied into our project directory, so will click Import.
3. After we specify the resource, its name appears in the **Resource Editor** under the appropriate resource type (such as bitmap).
4. Add a picture to the dialog box, by dragging the picture icon from the Control toolbar to the appropriate place in the dialog box. You can resize the picture as needed. The default picture type is frame.
5. Carefully click on the border of the picture area to display, then select **View>Properties**.
6. In the **Properties** Window, select the type of picture. If you select a type of Bitmap or Icon, for example, you can select the image from the list of available project resources using the Image property.
7. Move the picture as needed.

## Using Progress Bars

The Progress bar is a window that can be used to indicate the progress of a lengthy operation. It consists of a rectangle that is gradually filled as an operation progresses.

Your application sets the range of the Progress bar, using `DLG_RANGEMIN` and `DLG_RANGEMAX`, and the current position, using `DLG_POSITION`. Both the minimum and maximum range values must be between 0 and 65535.

A Progress bar is an output-only window. It does not respond to user input and therefore does not support any callbacks.

## Using Spin Controls

The Spin control contains up and down arrows that allow the user to step through values. Your application sets or gets the range of the Spin control's values, using `DLG_RANGEMIN` and `DLG_RANGEMAX`, and the current value, using `DLG_POSITION`.

The Spin control is usually associated with a companion control that is called a "buddy window." To the user, the Spin control and its buddy window often look like a single control. You can specify that the Spin control automatically position itself next to its buddy window and that it automatically set the title of its buddy window to its current value. This is accomplished by setting the "Auto buddy" and "Set buddy integer" properties on the Spin control.

The buddy window is usually an Edit Box or Static Text control. When the "Auto buddy" style is set, the Spin control automatically uses the previous control in the dialog box tab order as its buddy window.

The Spin Control calls the `DLG_CHANGE` callback whenever the user changes the current value of the control. The Spin control is named the "Up-down" control in Windows programming documentation.

## Using Sliders

The Slider Control is a window that contains a slider and optional tick marks. Your application sets or gets the range of the Slider control's values, using `DLG_RANGEMIN` and `DLG_RANGEMAX`, and the current value, using `DLG_POSITION`. Your application can also set:

- The number of logical positions the slider moves in response to keyboard input from the arrow keys using `DLG_SMALLSTEP`.
- The number of logical positions the slider moves in response to keyboard input, such as the PAGE UP or PAGE DOWN keys, or mouse input, such as clicks in the slider's channel, using `DLG_BIGSTEP`.
- The interval frequency for tick marks on the slider using `DLG_TICKFREQ`.

The Slider Control calls the `DLG_CHANGE` callback whenever the user changes the current value of the control.

The Slider control is named the "Trackbar" control in Windows programming documentation.

## Using Tab Controls

The Tab control is like the dividers in a notebook or the labels on a file cabinet. By using a Tab control, an application can define multiple pages for the same area of a dialog box. Each page is associated with a particular Tab and only one page is displayed at a time.

The control index `DLG_NUMITEMS` determines how many Tabs are contained in the Tab control. For each Tab, you specify the label of the Tab using `DLGSETCHAR` and an index value from 1 to the number of Tabs set with `DLG_NUMITEMS`. Each Tab has an associated dialog box that is displayed when the Tab is selected. You specify the dialog box using `DLGSETINT` with the dialog name and an index value corresponding to the the Tab. For example, the code below defines three Tabs in a Tab control. The Tab with the label "Family" is associated with the dialog box named `IDD_TAB_DIALOG1`, and so on.

```
! Set initial Tabs
lret = DlgSet(gdlg, IDC_TAB, 3)
lret = DlgSet(gdlg, IDC_TAB, "Family", 1)
lret = DlgSet(gdlg, IDC_TAB, "Style", 2)
lret = DlgSet(gdlg, IDC_TAB, "Size", 3)
lret = DlgSet(gdlg, IDC_TAB, IDD_TAB_DIALOG1, 1)
lret = DlgSet(gdlg, IDC_TAB, IDD_TAB_DIALOG2, 2)
lret = DlgSet(gdlg, IDC_TAB, IDD_TAB_DIALOG3, 3)
```

You define each of the Tab dialogs using the resource editor just as you do for the dialog box that contains the Tab control. In the Properties Window, you must make the following style settings for each Tab dialog:

1. Set the "Style" to "Child"
2. Set "Border" to "None"
3. Set "Title Bar" to "False."

Before displaying the dialog box that contains the Tab control (using `DLGMODAL` or `DLGMODELESS`):

1. Call `DLGSETSUB` to define a `DLG_INIT` callback for the dialog box
2. Call `DLGINIT` for each Tab dialog

In the `DLG_INIT` callback of the dialog box that contains the Tab control, if the `callbacktype` is `DLG_INIT`, call `DLGMODELESS` for each of the Tab dialog boxes. Specify `SW_HIDE` as the second parameter, and the window handle of the Tab control as the third parameter. After calling `DLGMODELESS`, call `DLGSET` with the `DLG_STATE` index to set the initial Tab. For example:

```
! When the Main dialog box is first displayed, call DlgModeless to
! display the Tab dialog boxes. Note the use of SW_HIDE. The
! Dialog Functions will "show" the proper Tab dialog box.
if (callbacktype == dlg_init) then
```

```

hwnd = GetDlgItem(dlg % hwnd, IDC_TAB)
lret = DlgModeless(gdlg_tab1, SW_HIDE, hwnd)
lret = DlgModeless(gdlg_tab2, SW_HIDE, hwnd)
lret = DlgModeless(gdlg_tab3, SW_HIDE, hwnd)
  ! Note that we must set the default Tab after the calls to
  ! DlgModeless. Otherwise, no Tab dialog box will be displayed
  ! initially.
lret = DlgSet(dlg, IDC_TAB, 1, dlg_state)

```

Call `DLGUNINIT` for each Tab dialog when you are done with it.

## Setting Return Values and Exiting

When the user selects the dialog's OK or CANCEL button, your dialog procedure is exited and the dialog box is closed. `DLGMODAL` returns the control name (associated with an integer identifier in your include (.FD) file) of the control that caused it to exit; for example, `IDOK` or `IDCANCEL`.

If you want to exit your dialog box on a condition other than the user selecting the OK or CANCEL button, you need to include a call to the dialog subroutine `DLGEXIT` from within your callback routine. For example:

```

SUBROUTINE EXITSUB (dlg, exit_button_id, callbacktype)
USE IFLOGM
TYPE (DIALOG) dlg
INTEGER exit_button_id, callbacktype
...
  CALL DLGEXIT (dlg)

```

The only argument for `DLGEXIT` is the dialog derived type. The dialog box is exited after `DLGEXIT` returns control back to the dialog manager, not immediately after calling `DLGEXIT`. That is, if there are other statements following `DLGEXIT` within the callback routine that contains it, those statements are executed and the callback routine returns before the dialog box is exited.

If you want `DLGMODAL` to return with a value other than the control name of the control that caused the exit, (or -1 if `DLGMODAL` fails to open the dialog box), you can specify your own return value with the subroutine `DLGSETRETURN`. For example:

```

TYPE (DIALOG) dlg
INTEGER altreturn
...
altreturn = 485
CALL DLGSETRETURN (dlg, altreturn)
CALL DLGEXIT(dlg)

```

To avoid confusion with the default failure condition, use return values other than -1.

It is not possible to return a value when a modeless dialog box exits. However, you can call `DLGSETSUB` to set the `DLG_INIT` callback routine to have a procedure called immediately before the dialog box is destroyed.

If you want the user to be able to close the dialog from the system menu or by pressing the ESC key, you need a control that has the ID of `IDCANCEL`. When a system escape or close is performed, it simulates pressing the dialog button with the ID `IDCANCEL`. If no control in the dialog has the ID `IDCANCEL`, then the close command will be ignored (and the dialog can not be closed in this way).

If you want to enable system close or ESC to close a dialog, but do not want a cancel button, you can add a button with the ID `IDCANCEL` to your dialog and then remove the visible property in the button's Properties Window . Pressing ESC will then activate the default click callback of the cancel button and close the dialog.

## Using ActiveX\* Controls

## Using ActiveX\* Controls Overview

The dialog routines support the use of ActiveX\* controls. This means that the dialog routines can act as an ActiveX control container.

Using an ActiveX control in a dialog box requires four steps discussed in the following sections:

1. [Using the Resource Editor to Insert an ActiveX Control](#) discusses using the resource editor to insert the ActiveX control into the dialog box.
2. [Using the Intel® Fortran Module Wizard to Generate a Module](#) discusses using the Intel® Fortran Module Wizard to generate a module that allows you to use the methods, properties, and events of the ActiveX control from Fortran.
3. [Adding Code to Your Application](#) discusses adding code to your application to manipulate the ActiveX control and respond to control events.
4. [Registering an ActiveX Control](#) describes how to ensure that the ActiveX control and the dialog procedure ActiveX container DLL are present and registered on the target system.

## Using the Resource Editor to Insert an ActiveX Control

**To add ActiveX controls to a dialog box:**

- In the Dialog Editor window, right click and hold to display the pop-up (shortcut) menu. Input focus must be in the dialog box or in the window.

---

**NOTE**

To display the Dialog Editor window, follow the steps in [Designing a Dialog Box Overview](#).

---

- Select Insert ActiveX Control... in the shortcut (right-click) menu. A dialog box displays the list of ActiveX controls that are registered on your system.
- Select one of the listed controls and click OK to add it to your dialog box.

Once you insert the ActiveX control, you can modify it, just like other controls using the resource editor. You can move, resize, and delete the ActiveX control. You can also modify its properties. ActiveX controls often support a large set of properties.

## Using the Intel® Fortran Module Wizard to Generate a Module

An ActiveX control is an Automation object. ActiveX controls typically support methods, properties, and events. ActiveX controls use events to notify an application that something has happened to the control. Common examples of events include clicks on the control, data entered using the keyboard, and changes in the control's state. When these actions occur, the control issues an event to alert the application.

The application, in return, uses methods and properties to communicate with the control. Methods are functions that perform an action on the ActiveX control. For example, you would use a method to tell an Internet Explorer ActiveX control to load a particular URL. Properties hold information about the state of an object, for example, the font being used by a control to draw text.

The Intel® Fortran Module Wizard generates Fortran 90 modules that simplify calling COM and Automation objects from Fortran programs.

**To run the wizard:**

1. Select Tools>Intel (R) Fortran Module Wizard in the main menu bar. Select the component of interest in the .COM tab. Select Generate code that uses Automation interfaces and click Next.
2. Select individual components of the ActiveX control to process using the module wizard or click Select All to process all components.
3. Select either of the code generation options as desired.
4. Enter a different module name than the one displayed, if desired.

## 5. Click Finish.

The module wizard now asks you for the name of the source file to be generated. Supply the name and make sure the Add file to Project checkbox is selected. COM will now open the type library and generate a file containing Fortran modules.

## Adding Code to Your Application

The structure of your application remains the same as when using a dialog box that does not contain an ActiveX control. See [Writing a Dialog Application Overview](#) for details. This section discusses programming specific to ActiveX controls.

Your application must call `COMINITIALIZE` before calling `DLGINIT` with a dialog box that contains an ActiveX control. Your application must include the statement `USE IFCOM` to access `COMINITIALIZE`. Your application must call `COMUNINITIALIZE` when you are done using ActiveX controls, but not before calling `DLGUNINIT` for the dialog box that contains the ActiveX control.

You can call the methods of an ActiveX control and set and retrieve its property values using the interfaces generated by the Intel Fortran Module Wizard or by using the `IFAUTO` routines. To do this, you must have the object's `IDispatch` interface pointer. Use the `DLGGET` function with the ActiveX control's name, the `DLG_IDISPATCH` control index, and an integer variable to receive the `IDispatch` pointer. For example:

```
retlog = DlgGet( dlg, IDC_ACTIVE, idispatch, DLG_IDISPATCH )
```

You do not need to specify the index `DLG_IDISPATCH` because it is the default integer index for an ActiveX control.

However, the control's `IDispatch` pointer is not available until after the control has been created and is only valid until the dialog box is closed. The control is created during the call to `DLGMODAL` or `DLGMODELESS`. If you call `DLGGET` to retrieve the `IDispatch` pointer before calling `DLGMODAL` or `DLGMODELESS`, the value returned will be 0.

Do not call `COMRELEASEOBJECT` with the `IDispatch` pointer returned by `DLGGET`. The dialog procedures use a reference counting optimization since the lifetime of the control is guaranteed to be less than the lifetime of the dialog box.

If you want to use a method or property of a control before the dialog box is displayed to your application's user, you can use a `DLG_INIT` callback. Call `DLGSETSUB` using the dialog box name and the `DLG_INIT` index to define the callback. For example:

```
retlog = DlgSetSub( dlg, IDD_DIALOG, DlgSub, DLG_INIT )
```

The `DLG_INIT` callback is called after the dialog box is created but before it is displayed (with `callbacktype=DLG_INIT`) and immediately before the dialog box is destroyed (with `callbacktype=DLG_DESTROY`). The `DLG_INIT` callback is the soonest that the control's `IDispatch` pointer is available. The `DLG_DESTROY` callback is the latest that this pointer is valid. After the `DLG_DESTROY` callback, the ActiveX control is destroyed.

The following example shows using a `DLG_INIT` callback to reset the state of a control property before it is destroyed:

```
SUBROUTINE mmplayerSub( dlg, id, callbacktype )
!DEC$ ATTRIBUTES DEFAULT :: mmplayerSub
use iflogm
use ifcom
use ifauto
implicit none
type (dialog) dlg
integer id, callbacktype
include 'resource.fd'
integer obj, iret
logical lret
if (callbacktype == dlg_init) then
    iret = DlgGet(dlg, IDC_ACTIVEVIDEOCONTROL1, obj)
    ! Add any method or property calls here before the
    ! dialog box is displayed
```

```

else if (callbacktype == dlg_destroy) then
    ! Reset the filename to "" to "close" the current file
    lret = DlgGet(dlg, IDC_ACTIVEVIDEOCONTROL1, obj)
    iret = AUTOSETPROPERTY(obj, "FileName", "")
endif
END SUBROUTINE mmplayerSub

```

The module generated by the Fortran Module Wizard for an ActiveX control contains a number of sections:

- ! CLSIDs  
Parameters of derived type GUID which identify the ActiveX control class. Your application typically doesn't need to use this parameter.
- ! IIDs  
Parameters of derived type GUID which identify source (event) interfaces of the ActiveX control. Your application can use these values in calls to DLGSETCTRLEVENTHANDLER (see below).
- ! Enums  
Parameters of type integer that identify constants used in the ActiveX control's interfaces.
- ! Interfaces  
Interfaces for the source (event) interfaces that are defined by the ActiveX control. There may be 0, 1, or more source interfaces implemented by the control. A control does not have to support events.
- ! Module Procedures  
Wrapper routines that make it easy to call the control's methods and get or retrieve the control's properties.

See the *Language Reference* for more information on using the method and property interfaces generated by the Intel Fortran Module Wizard.

In addition to methods and properties, ActiveX controls also define events to notify your application that something has happened to the control. The dialog procedures provide a routine, DLGSETCTRLEVENTHANDLER, that allows you to define a routine to be executed when an event occurs.

The DLGSETCTRLEVENTHANDLER function has the following interface:

```
integer DlgSetCtrlEventHandler( dlg, controlid, handler, dispid, iid )
```

The arguments are as follows:

---

dlg	(Input) Derived type DIALOG. Contains dialog box parameters.
controlid	(Input) Integer. Specifies the identifier of a control within the dialog box (from the .FD file).
lid	
handle	(Input) EXTERNAL. Name of the routine to be called when the event occurs.
r	
dispid	(Input) Integer. Specifies the member id of the method in the event interface that identifies the event
iid	(Input, Optional) Derived type (GUID). Specifies the Interface identifier of the source (event) interface. If not supplied, the default source interface of the ActiveX control is used.

---

Consider the following function call:

```
ret = DlgSetCtrlEventHandler( dlg, IDC_ACTIVEVIDEOCONTROL1, &
                           ActiveMovie_ReadyStateChange, -609, IID_DActiveMovieEvents2 )
```

In this function call:

- IDC\_ACTIVEVIDEOCONTROL1 identifies an ActiveMovie control in the dialog box.
- ActiveMovie\_ReadyStateChange is the name of the event handling routine.
- -609 is the member id of the ActiveMovie's control ReadyStateChange event. You can get this number from:

- The module that the Fortran Module Wizard generated. There is a "MEMBERID = nn" comment generated for each method in a source interface (see the example below).
- The documentation of the ActiveX control.
- A tool that allows you to examine the type information of the ActiveX control, for example, the OLE/COM Object Viewer in the Microsoft Visual Studio\* IDE.
- `IID_DActiveMovieEvents2` is the identifier of the source (event) interface.

The interface generated by the Intel Fortran Module Wizard for the `ReadyStateChange` event follows:

```
INTERFACE
  !Reports that the ReadyState property of the ActiveMovie Control
  !has changed
  ! MEMBERID = -609
  SUBROUTINE DActiveMovieEvents2_RaiseEvent($OBJECT, ReadyState)
    INTEGER(4), INTENT(IN)    :: $OBJECT      ! Object Pointer
    !DEC$ ATTRIBUTES VALUE    :: $OBJECT
    INTEGER(4)    :: ReadyState
    !DEC$ ATTRIBUTES VALUE    :: ReadyState
    !DEC$ ATTRIBUTES STDCALL :: DActiveMovieEvents2_RaiseEvent
  END SUBROUTINE DActiveMovieEvents2_RaiseEvent
END INTERFACE
```

The handler that you define in your application must have the same interface. Otherwise, your application will likely crash in unexpected ways because of the application's stack getting corrupted.

Note that an object is always the first parameter in an event handler. This object value is a pointer to the control's source (event) interface, not the `IDispatch` pointer of the control. You can use `DLGGET` as described above to retrieve the control's `IDispatch` pointer.

## Registering an ActiveX Control

Any ActiveX control that you use must be properly installed and registered on your machine and any machine that you distribute your application to. See the documentation for the ActiveX control for information on how to redistribute it.

The dialog routine ActiveX control container support is implemented in the files `IFDLGnnn.DLL`. This DLL must be present and registered on any machine that will run your application.

To register a DLL, use `REGSVR32.EXE`, located in the Windows system directory. `REGSVR32` takes a single argument: the path of the DLL.

# Index

.FD dialog file 75  
.RC files  
  dialog 75  
/dll compiler option 18  
/libs  
  qwin compiler option 54

## A

About box  
  routine defining 64  
ABOUTBOXQQ  
  using 64  
accessing window properties 27  
activating a graphics mode 47  
activating the dialog box 75  
ActiveX\* controls  
  inserting 101  
  programming practices 102  
  properties, methods, and events 101  
  system requirements 104  
  using (Fortran) 101  
adding color 43  
adding controls to dialogs 69  
adding shapes 50  
APPENDMENUQQ  
  using to append menu items 60  
Application Wizard 79, 81  
applications  
  creating Windows\* 8  
  sample windows 13  
AppWizard, see Application Wizard 8  
ATTRIBUTES  
  DLLIMPORT option 16  
available indexes for dialog controls 87  
available typefaces 55

## B

bitmap images 58  
blocking procedures  
  effect in QuickWin 67  
building dynamic-link library projects 15, 18  
building executables that use DLLs 20  
buttons 94

## C

C data types  
  OpenGL translated to Fortran types 13  
callback routines  
  effect on mouse events 64  
  example of dialog 77  
changing status bar and state messages 63  
character-based text  
  displaying in QuickWin 53  
character-font routines  
  using in QuickWin 33  
characters  
  displaying font-based in QuickWin 54  
  routine to check input of 68  
check boxes 93  
checking the current graphics mode 34

child window  
  creating 29  
  keeping open 32  
CLEARSCREEN  
  example of 39  
CLICKMENUQQ  
  using to simulate menu selections 60  
clip region 36  
closing dialogs 100  
color  
  adding to graphics 43  
  mixing 44  
  QuickWin routines for 35  
  text 46  
color indexes  
  setting and getting 46  
color mixing 44  
color values  
  setting and getting 46  
combo boxes 94  
common blocks  
  in Fortran DLLs 16  
comparing QuickWin with Windows-based applications 22  
control indexes  
  specifying 90  
controlling  
  the size and position of windows 32  
conventions  
  in the documentation 6  
coordinate graphics  
  sample program 39  
coordinate systems  
  understanding 35  
coordinates  
  setting in QuickWin 39  
  text 36  
creating  
  a menu list of available child windows 60  
  child windows 29  
  Fortran DLLs 15  
  QuickWin windows 27  
custom icons  
  using in QuickWin 64  
customizing QuickWin applications 59

## D

data types  
  OpenGL C translated to Fortran 13  
default quickwin menus 25  
defining an About box 64  
DELETEMENUQQ  
  using to delete menu items 60  
deleting menu items 60  
dialog applications  
  using Windows APIs 8  
  writing 75  
dialog boxes  
  adding controls 69  
  controls in 85  
  designing for Fortran applications 69  
  initializing and activating 75  
  saving as a resource file 69  
dialog callback routines 77

dialog controls  
  grouping 93  
  indexes 86, 87  
  setting properties of 73  
  using 91  
Dialog Editor  
  opening 69  
  using to insert an ActiveX\* control 101  
dialog routines 84  
dialogs  
  buttons in 94  
  callback routines 77  
  check boxes in 93  
  combo boxes in 94  
  control index in 86  
  control properties 73  
  designing for Fortran applications 69  
  edit boxes in 92  
  exiting 100  
  group boxes in 93  
  include files 74  
  list boxes in 94  
  modeless 78  
  pictures in 98  
  progress bars in 98  
  routines 84  
  scroll bars in 97  
  setting return values 100  
  sliders in 99  
  spin controls in 98  
  static text in 92  
  tab controls in 99  
  using ActiveX\* controls (Fortran) 101  
  using Fortran AppWizards 79  
  using Fortran Windows Project AppWizards 81  
  using in a DLL 83  
  writing application using 75  
display options  
  selecting in QuickWin 33  
displaying character-based text 53  
displaying font-based characters 54  
displaying graphics output 51  
displaying message boxes 63  
DLG\_index names 86, 87  
DLGEXIT  
  using 100  
DLGGET  
  example of 90  
  using to check the state of dialog controls 93  
  using with Edit boxes 92  
  using with scroll bars 97  
DLGGETCHAR  
  using with Edit boxes 92  
DLGGETINT  
  using with scroll bars 97  
DLGGETLOG  
  using to check the state of controls 93  
DLGINIT  
  using to initialize dialog box 75  
DLGISDLGMESSAGE  
  using with a modeless dialog box 78  
DLGMODAL  
  using to indicate a dialog type 75  
  using to return a dialog control name 100  
  using with callback routines 77  
DLGMODELESS  
  using to display a modeless dialog box 78  
DLGSET  
  using to change the button state 93  
  using to disable dialog controls 91  
  using to set the control index 90  
  using to set the scroll bar range 97  
  using to specify value for dialog control index 86  
  using to write to an Edit box 92  
DLGSETINT  
  using to set the scroll bar range 97  
DLGSETLOG  
  using to change the button state 93  
  using to disable dialog controls 91  
DLGSETRETURN  
  using to specify a return value 100  
DLGUNINIT  
  using to free resources 75  
DLL  
  See dynamic-link libraries (DLLs) 15  
DLLEXPORT  
  option for ATTRIBUTES directive 15, 16  
  using for common blocks 16  
  using in modules 16  
DLLIMPORT  
  option for ATTRIBUTES directive 15, 16  
documentation  
  notational conventions 6  
documentation, related 7  
drawing a sine curve 49  
drawing graphics 46, 51  
drawing graphs 39  
drawing lines on the screen 48  
dynamic-link libraries (DLLs)  
  and executables 20  
  behavior of 15, 18  
  building 18  
  building executables using 20  
  checking the export table 18  
  creating 15  
  organization of 18  
  overview of 15  
  sharing data 16  
  using dialogs in 83

## E

Edit boxes 92  
editing graphics  
  in QuickWin 58  
editing screen images from the QuickWin edit menu 57  
editing text  
  in QuickWin 58  
editing text and graphics from the QuickWin Edit menu 58  
enhancing QuickWin applications 59  
executables using DLLs 20

## F

figure properties  
  setting in QuickWin 35  
fill mask  
  QuickWin routines for 35  
FLOODFILL  
  using for figure properties 35  
FLOODFILLRGB  
  using for figure properties 35  
focus  
  using QuickWin to give 31  
FOCUSQQ  
  using to set focus 31  
font  
  definition of 55  
font-based characters

displaying in QuickWin 54  
 fonts  
   example program 56  
   initializing 55  
   setting 55  
   using from graphics library 54  
 Fortran Windowing applications  
   coding requirements 8  
   creating 8  
   using menus 11  
 frame window  
   controlling 60  
 functions  
   exported to other applications 15  
   imported from a DLL 15

**G**

GDI (Graphic Device Interface) program  
   writing 8  
 GETACTIVEQQ  
   using with active child window 31  
 GETBKCOLOR  
   using for figure properties 35  
   using for text colors 46  
 GETBKCOLORRGB  
   using for figure properties 35  
   using for text colors 46  
 GETCOLOR  
   using for figure properties 35  
 GETCOLORRGB  
   using for color mixing 44  
   using for figure properties 35  
 GETCURRENTPOSITION  
   using to locate graphics output position 39  
 GETCURRENTPOSITION\_W  
   using to locate graphics output position 39  
 GETFILLMASK  
   using for figure properties 35  
 GETFONTINFO  
   example of 55  
 GETGTEXTROTATION  
   overview of graphic display routines 33  
 GETHWNDQQ  
   overview of windows focus routines 31  
   using with Windows API routines 23  
 GETIMAGE  
   using to transfer images in memory 58  
 GETIMAGE\_W  
   using to transfer images in memory 58  
 GETLINESTYLE  
   using for figure properties 35  
 GETPHYSCOORD  
   overview of graphics coordinate routines 39  
 GETPIXELRGB  
   using to return color 44  
 GETPIXELSRGB  
   using to return color 44  
 GETTEXTCOLOR  
   using to get color values 46  
 GETTEXTCOLORRGB  
   using to get color values 46  
 GETTEXTWINDOW  
   using to get text window boundaries 53  
 GETVIEWCOORD  
   overview of graphics coordinate routines 39  
 GETVIEWCOORD\_W  
   overview of graphics coordinate routines 39  
 GETWINDOWCONFIG

using to get child window settings 34  
   using to get virtual window properties 27  
   using to get windows coordinates 39  
 GETWINDOWCOORD  
   overview of graphics coordinate routines 39  
 GETWRITEMODE  
   using to get logical write mode 35  
 GETWSIZEQQ  
   using to get size or position of window 32  
 giving a window focus 31  
 Graphic Device Interface (GDI) calls 8  
 Graphical User Interface (GUI) 8  
 graphics  
   adding color to 43  
   adding shapes to 50  
   coordinate systems in 35  
   displaying in QuickWin 51  
   drawing in QuickWin 51  
   drawing lines in 48  
   drawing sine curves 49  
   editing in QuickWin 58  
   mixing colors 44  
   OpenGL 13  
   physical coordinates in 36  
   QuickWin routines that draw 51  
   QuickWin routines to display 33  
   setting highest possible resolution 34  
   setting the mode of 34  
   text colors in 46  
   text coordinates in 36  
   using fonts from library 54  
   VGA color palette 45  
   viewport coordinates in 36  
   window coordinates in 36  
   writing programs 46  
 graphics applications  
   QuickWin 24  
 graphics coordinates  
   setting in QuickWin 39  
 graphics fonts  
   available typefaces 55  
   example program 56  
   initializing 55  
   setting and displaying 55  
 graphics mode  
   activating 47  
   checking the current 34  
 group boxes  
   using 93  
 GRSTATUS  
   using to fix font problems 55

**I**

I/O  
   simulating nonblocking 68  
 icons  
   using custom in QuickWin 64  
 IFOPNGL library module 13  
 images  
   loading and saving in QuickWin 58  
   transferring in memory 58  
   working with screen in QuickWin 57  
 IMAGESIZE  
   using to transfer images in memory 58  
 IMAGESIZE\_W  
   using to transfer images in memory 58  
 import library (.lib)  
   for DLL 15, 18  
 importing and exporting data with DLLs 15, 18

Include (.FD) file  
    for dialog boxes 74  
initial menu  
    controlling 60  
INITIALIZEFONTS  
    example of 55  
initializing fonts 55  
initializing the dialog box 75  
INITIALSETTINGS  
    using to define initial settings of window 60  
INQFOCUSQQ  
    example of 31  
inserting menu items 60  
Intel(R) Fortran  
    creating Fortran Windowing applications 8  
    creating QuickWin applications 21  
    using dialogs 69  
Intel(R) Fortran Module Wizard  
    using to generate modules 101  
IOFOCUS  
    specifier for OPEN 31

## K

keeping child windows open 32

## L

labels  
    platform 6  
language extensions  
    notational conventions 6  
line style  
    QuickWin routines for 35  
LINETO  
    example of 48  
    in physical coordinates 36  
LINETOAR  
    example of 48  
LINETOAREX  
    example of 48  
list boxes 94  
LOADIMAGE  
    using to transfer images 58  
LOADIMAGE\_W  
    using to transfer images 58  
loading and saving images to files 58

## M

MDI Fortran Windowing applications 8  
MDI menu bar 25  
menu items  
    use with Fortran Windowing applications 11  
    use with Fortran Windows applications 11  
menus  
    default QuickWin 25  
    modifying in QuickWin 60  
message box  
    displaying in QuickWin 63  
MESSAGEBOXQQ  
    example of 63  
MIDI Mapper 8  
modal dialogs  
    using Fortran project AppWizards 79  
modeless dialogs  
    using Fortran project AppWizards 81  
modeless dialogs (Fortran) 78  
MODIFYMENUFLAGSQQ  
    using to modify menu items 60

MODIFYMENUROUTINEQQ  
    using to modify a menu callback routine 60  
MODIFYMENUSTRINGQQ  
    using to customize text 53  
    using to modify a menu state 60  
modules  
    DLLEXPORT and DLLIMPORT in 16  
    in Fortran DLLs 16  
mouse  
    using in QuickWin 64  
mouse events  
    effect of callback routines on 64  
    in QuickWin 64  
MOVETO  
    example of 48, 56  
    overview of library routines 54  
MSFWIN\$ prefix for graphics routines 22  
multithread applications  
    simulating nonblocking I/O 68

## N

non-blocking I/O 68

## O

OPEN  
    FILE specifier  
        in QuickWin 29  
OpenGL applications 13  
OpenGL graphics 13  
OpenGL library 13  
OUTGTEXT  
    overview of setting display options 33  
    overview of setting figure properties 35  
OUTTEXT  
    and text color routines 46  
    overview of character display routines 53

## P

PEEKCHARQQ  
    simulating in QuickWin 68  
pictures  
    using 98  
program control of menus 60  
programs  
    Quickwin and Windows\* 22  
    Windows\* GDI 8  
    Windows\* GUI 8  
    writing graphics 46  
progress bars 98  
projects  
    building dynamic-link library 15, 18

## Q

QuickWin  
    about boxes in 64  
    callback routines in 68  
    capabilities of 21  
    changing messages 63  
    character-based text in 53  
    child windows in 29, 32  
    coding guidelines 26  
    compared to Windows-based applications 22  
    controlling menus in 60

creating windows 27  
 custom icons in 64  
 customizing 59  
 customizing applications 59  
 default menus 25  
 displaying graphics using 51  
 displaying message boxes 63  
 drawing graphics in 51  
 editing text and graphics 58  
 enhancing applications 59  
 font-based characters 54  
 giving focus to a window 31  
 loading and saving images 58  
 overview 21  
 position of windows 32  
 precautions when programming 67  
 restrictions to 22  
 screen images in 57  
 selecting display options in 33  
 setting active window in 31  
 setting figure properties in 35  
 setting graphics coordinates in 39  
 size of windows 32  
 standard graphics applications in 24  
 transferring images in memory 58  
 user interface 25  
 using character-font routines in 33  
 using graphics routines in 33  
 using mouse in 64  
 window properties 27  
 QuickWin functions 21  
 QuickWin graphics applications  
     characteristics of 25  
     example 24  
     how to build 23  
 QuickWin graphics library 21  
 QuickWin procedures 21  
 QuickWin programming precautions 67  
 QuickWin programs  
     overview 21  
 QuickWin routines  
     naming conventions 22  
 QuickWin subroutines 21

## R

real-coordinate graphics  
     sample program 39  
 RECTANGLE  
     example of 48  
 RECTANGLE\_W  
     using for windows coordinates with floating-point  
         values 36  
 related documentation 7  
 REMAPPALETTERGB  
     using to set VGA color 45  
 Resource Editor  
     dialog controls in 73, 85, 91  
     include files 74  
     include files for dialog boxes 74  
     list boxes and combo boxes in 94  
     using to design Fortran dialog boxes 69  
     using to insert an ActiveX\* control 101  
 resource files  
     using multiple 74  
 resources  
     using multiple RC files 74  
 RGB color values 45  
 routines ending in \_w 58

## S

samples  
     available on the kit 13  
 SAVEIMAGE  
     overview of routines to transfer images 58  
 SAVEIMAGE\_W  
     overview of routines to transfer images 58  
 screen images  
     retrieving 57  
     storing 57  
 SCROLLTEXTWINDOW  
     coordinates for 36  
     overview of routines affecting text display 53  
 SDI Fortran Windowing applications 8  
 selecting display options 33  
 SETACTIVEQQ  
     using with active child window 31  
 SETBKCOLOR  
     using for color mixing 44  
     using for figure properties 35  
     using for text colors 46  
 SETBKCOLORRGB  
     using for color mixing 44  
     using for figure properties 35  
     using for text colors 46  
 SETCLIPRGN  
     using for graphics coordinates 36, 39  
 SETCOLOR  
     using for color mixing 44  
     using to set a color index 45  
     using to set figure properties 35  
 SETCOLORRGB  
     using for color mixing 44  
     using to set figure properties 35  
 SETFILLMASK  
     example of 50  
     using for figure properties 35  
 SETFONT  
     example of 56  
     using 55  
 SETGTEXTROTATION  
     overview of graphic display routines 33  
 SETLINESTYLE  
     example of 48, 50  
     using for figure properties 35  
 SETMESSAGEQQ  
     using to change QuickWin strings 53, 63  
 SETPIXELRGB  
     example of 49  
     using for color mixing 44  
 SETPIXELSRGB  
     using for color mixing 44  
 SETTEXTCOLOR  
     using for color mixing 44  
     using for text colors 46  
 SETTEXTCOLORRGB  
     using for color mixing 44  
     using for text colors 46  
 SETTEXTPOSITION  
     coordinates for 36  
     using for text colors 46  
     using to customize text 53  
 SETTEXTWINDOW  
     using to customize text 53  
 setting control properties 73  
 setting figure properties 35  
 setting graphics coordinates 39  
 setting return values and exiting 100  
 setting the active window 31  
 setting the font and displaying text 55

setting the graphics mode 34  
SETVIEWORG  
example of 48  
using for graphics coordinates 36, 39

SETVIEWPORT  
using for graphics coordinates 36, 39  
using to customize text 53

SETWINDOW  
using for graphics coordinates 36, 39

SETWINDOWCONFIG  
overview of graphics fonts 54  
using for graphics coordinates 36  
using for VGA palette 45  
using to configure Windows properties 33, 34  
using to display child settings 29  
using to set virtual window properties 27  
using to set windows coordinates 39

SETWINDOWMENUQQ  
using to create a list of child windows 60

SETWRITEMODE  
using to set logical write mode 35

SETWSIZEQQ  
using to get size or position of window 32

sharing data using Fortran DLLs 16

SHOWFONT.F90 example 56

simulating nonblocking I/O 68

sliders

using 99

specifying control indexes 90

spin controls

using 98

standard graphics applications

characteristics of 25

how to build 23

state messages

QuickWin routine changing 63

static text

using 92

STATUS

specifier in CLOSE 32

status bar

QuickWin routine changing 63

## T

tab controls

using 99

text

displaying 55

editing in QuickWin 58

QuickWin routines to check or modify 53

QuickWin routines to customize 53

QuickWin routines to define 33

text coordinates 36

text output

setting foreground and background colors for 46

trackbar control 99

transferring images

in memory 58

type size

definition of 55

type style

definition of 55

typefaces 55

types of QuickWin programs 23

## U

understanding coordinate systems 35

unit numbers

converting to Windows handles 23

up-down control 98  
user interface in QuickWin 25  
using a mouse 64  
using Activex\* controls 101  
using buttons 94  
using check boxes and radio buttons 93  
using custom icons 64  
using dialog controls 91  
using dialogs 69  
using edit boxes 92  
using fonts 55  
using fonts from the graphics library 54  
using graphics and character-font routines 33  
using group boxes 93  
using list boxes and combo boxes 94  
using pictures 98  
using progress bars 98  
using QuickWin 21  
using scroll bars 97  
using sliders 99  
using spin controls 98  
using static text 92  
using tab controls 99  
using text colors 46  
using the Microsoft\* integrated development environment  
to build dlls 15  
using the Resource Editor to design a Fortran dialog 69  
using Windows API Routines with QuickWin 23

## V

VGA

color palette 45

display and resolution in QuickWin 45

## W

WAITONMOUSEEVENT

using 67

Windowing applications

coding requirements (Fortran) 8

creating (Fortran) 8

linking (Fortran) 8

WinMain function (Fortran) 8

windows properties

routines to set or get 27

Windows\*

creating and controlling QuickWin 27

creating graphics programs for 59

creating simple applications for 59

giving focus in QuickWin 31

OpenGL 13

QuickWin routines for size and position of 32

setting active in QuickWin 31

Windows\* APIs

using with QuickWin 23

Windows\* applications

compared to QuickWin 22

Windows\* graphics routines

naming conventions 22

Windows\* handles 23

WinMain function for Fortran Windowing applications 8

working with screen images 57

write mode

QuickWin routines for 35

writing a dialog application 75

writing a graphics program 46

writing a Windows\* GDI program 8