z i n c

VOLUME 1:

SUPPORT OBJECTS

APPLICATION FRAMEWORK™

VERSION 4.0

Programmer's Reference

Volume One
Support Objects

Zinc® Application Framework™
Version 4.0
Zinc Software Incorporated
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TABLE OF CONTENTS

INTRODUCTION

The *Programmer's Reference Volume 1* contains descriptions of Zinc Application Framework support classes, the calling conventions used to invoke the class member functions, short code samples using the class member functions, and information about other related classes or example programs. Support objects are those objects that are not window objects.

UI_SAMPLE_CLASS::SampleFunction

Syntax

returnValue SampleFunction(type1 *parameter1*, type2 **parameter2*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

NOTE: A blackened box indicates a supported environment.

Remarks

A brief description of what **SampleFunction( )** does.

- *returnValue*$_{out}$ gives a complete description of the return value. The subscript "out" indicates that the variable (the return value in this case) does not require an initial value and that it receives a value from the function.

- *parameter1*$_{in}$ gives a complete description of function parameter 1. The subscript "in" indicates that the variable requires an initial value and that it is not changed by the function.

- *parameter2*$_{in/out}$ gives a complete description of function parameter 2. The subscript "in/out" indicates that the variable requires an initial value, but that it may also receive a different value from the function.

Example

This section provides a coding example of how **SampleFunction( )** was used in the development of other library functions or development utilities. The function itself often appears in bold type within the example code.

CLASSES AND STRUCTURES

General purpose

```
attrib
FlagSet
FlagsSet
MaxValue
MinValue
ZIL_NULLF
ZIL_NULLH
ZIL_NULLP
TRUE
FALSE
ZIL_INT8
ZIL_UINT8
ZIL_INT16
ZIL_UINT16
ZIL_INT32
ZIL_UINT32
ZIL_VOIDF
ZIL_VOIDP

struct UI_ITEM

class UI_APPLICATION
class UI_ELEMENT
class UI_LIST
class UI_LIST_BLOCK
class UI_PATH
class UI_PATH_ELEMENT
class ZIL_BIGNUM
class ZIL_DATE
class ZIL_TIME
class ZIL_UTIME
```

Error system

```
class UI_ERROR_STUB
class UI_ERROR_SYSTEM
```

Event management

```
struct UI_EVENT
struct UI_EVENT_MAP
struct UI_KEY
struct UI_POSITION
struct UI_REGION
struct UI_SCROLL_INFORMATION

class UI_DEVICE
class UI_EVENT_MANAGER
class UI_QUEUE_BLOCK
class UI_QUEUE_ELEMENT
class UID_CURSOR
class UID_KEYBOARD
class UID_MOUSE
class UID_TIMER
```

Help system

```
class UI_HELP_STUB
class UI_HELP_SYSTEM
```

Internationalization

```
struct ZIL_BITMAP_ELEMENT
struct ZIL_LOCALE_ELEMENT
struct ZIL_LANGUAGE_ELEMENT
struct ZIL_TEXT_ELEMENT

class ZIL_DECORATION
class ZIL_DECORATION_MANAGER
class ZIL_I18N
class ZIL_I18N_MANAGER
class ZIL_INTERNATIONAL
class ZIL_LANGUAGE
class ZIL_LANGUAGE_MANAGER
class ZIL_LOCALE
class ZIL_LOCALE_MANAGER
class ZIL_MAP_CHARS
```

Printer

```
class UI_PRINTER
```

Screen display

```
struct UI_PALETTE
struct UI_PALETTE_MAP
struct UI_POSITION
struct UI_REGION

class UI_BGI_DISPLAY
class UI_DISPLAY
class UI_GRAPHICS_DISPLAY
class UI_MACINTOSH_DISPLAY
class UI_MSC_DISPLAY
class UI_MSWINDOWS_DISPLAY
class UI_NEXTSTEP_DISPLAY
class UI_OS2_DISPLAY
class UI_REGION_ELEMENT
class UI_REGION_LIST
class UI_TEXT_DISPLAY
class UI_WCC_DISPLAY
class UI_XT_DISPLAY
```

Storage

```
class ZIL_DELTA_STORAGE_OBJECT
class ZIL_DELTA_STORAGE_OBJECT_READ_ONLY
class ZIL_STORAGE
class ZIL_STORAGE_DIRECTORY
class ZIL_STORAGE_OBJECT
```

```
class ZIL_STORAGE_OBJECT_READ_ONLY
class ZIL_STORAGE_READ_ONLY
```

Window management

```
struct UI_SCROLL_INFORMATION

class UI_ATTACHMENT
class UI_CONSTRAINT
class UI_DIMENSION_CONSTRAINT
class UI_GEOMETRY_MANAGER
class UI_RELATIVE_CONSTRAINT
class UI_WINDOW_MANAGER
class UI_WINDOW_OBJECT
class UIW_BIGNUM
class UIW_BORDER
class UIW_BUTTON
class UIW_COMBO_BOX
class UIW_DATE
class UIW_FORMATTED_STRING
class UIW_GROUP
class UIW_HZ_LIST
class UIW_ICON
class UIW_INTEGER
class UIW_MAXIMIZE_BUTTON
class UIW_MINIMIZE_BUTTON
class UIW_NOTEBOOK
class UIW_POP_UP_ITEM
class UIW_POP_UP_MENU
class UIW_PROMPT
class UIW_PULL_DOWN_ITEM
class UIW_PULL_DOWN_MENU
class UIW_REAL
class UIW_SCROLL_BAR
class UIW_SPIN_CONTROL
class UIW_STATUS_BAR
class UIW_STRING
class UIW_SYSTEM_BUTTON
class UIW_TABLE
class UIW_TABLE_HEADER
class UIW_TABLE_RECORD
class UIW_TEXT
class UIW_TIME
class UIW_TITLE
class UIW_TOOL_BAR
class UIW_VT_LIST
class UIW_WINDOW
class ZAF_DIALOG_WINDOW
class ZAF_MESSAGE_WINDOW
```

INCLUDE FILE HIERARCHY

UI_ENV.HPP

```
// Version information
// General Zinc Switches
// Optimization switches for various compiler problems.
// Presentation switches for the library.
// Switches for the international language versions.
// Compiler/Environment Default Dependencies
// ZIL_NULLP, ZIL_NULLF, ZIL_NULLH, ZIL_VOIDF, ZIL_VOIDP
// BORLAND
// MICROSOFT
// IBM
// SYMANTEC & ZORTECH
// WATCOM
// DJGPP, GNU C++ port DOS (1.08)
// HP-UX, CC (cfront from HP) and Motif
// MS-DOS, Quarterdeck DESQview/X with Motif, DJGPP G++
// SCO UNIX 3.2 with Motif or Curses
// Solaris 2.1, CC (cfront from SunPro) and Motif
// Siemens/Nixdorf SINIX and Motif
// DEC 4000 OSF/1 1.3
// Compiler/Hardware Typedef Sizes
// TRUE/FALSE
// UIF_FLAGS
// UIS_STATUS
// Macros
// Version 3.6, 3.5, 3.0 compatibility
```

UI_GEN.HPP

```
#if !defined(UI_GEN_HPP)
#   define UI_GEN_HPP
#   if !defined(UI_ENV_HPP)
#       include <ui_env.hpp>
#   endif

// ZIL_OBJECTID
// EVENT_TYPE
// ZIL_INFO_REQUEST
// UI_ELEMENT
// UI_LIST
// UI_LIST_BLOCK
// ZIL_BIT_VECTOR
// ZIL_MESSAGE
// ZIL_I18N, ZIL_LOCALE, ZIL_LANGUAGE, & ZIL_DECORATION
// ZIL_MAP_CHARS
// ZIL_INTERNATIONAL
// ZIL_BIGNUM
// NMF_FLAGS
// NMI_RESULT
// ZIL_UTIME
// ZIL_DATE
// DTF_FLAGS
// DTI_RESULT
// ZIL_TIME
// TMF_FLAGS
// TMI_RESULT
// UI_PATH_ELEMENT & UI_PATH
// ZIL_STORAGE_OBJECT & ZIL_STORAGE
// UIS_FLAGS
// ZIL_DELTA_STORAGE_OBJECT
```

```
// Version 3.6, 3.5, 3.0 compatibility
```

UI_DSP.HPP

```
#if !defined(UI_DSP_HPP)
#   define UI_DSP_HPP
#   if !defined(UI_GEN_HPP)
#       include <ui_gen.hpp>
#   endif

// ZIL_SCREENID, ZIL_BITMAP_HANDLE, ZIL_ICON_HANDLE, ZIL_SCREEN_CELL
// UI_POSITION
// UI_REGION, UI_REGION_ELEMENT, UI_REGION_LIST
// Color information
// Font information
// Image information
// Pattern information
// UI_PALETTE
// UI_DISPLAY
// UI_BGI_DISPLAY
// UI_GRAPHICS_DISPLAY
// UI_XT_DISPLAY
// UI_MSC_DISPLAY
// UI_MSWINDOWS_DISPLAY
// UI_OS2_DISPLAY
// UI_TEXT_DISPLAY
// TDM_MODE
// UI_WCC_DISPLAY
// UI_MACINTOSH_DISPLAY
// UI_NEXTSTEP_DISPLAY
// UI_PRINTER
// Version 3.6 compatibility
```

UI_MAP.HPP

```
#if !defined(UI_MAP_HPP)
#   define UI_MAP_HPP
#   if !defined(UI_DSP_HPP)
#       include <ui_dsp.hpp>
#   endif

// Compiler/Environment Dependencies
// Special hotkey values
// ZIL_MSDOS
// ZIL_MSWINDOWS
// ZIL_OS2
// ZIL_X11
// ZIL_CURSES
// ZIL_MACINTOSH
// ZIL_NEXTSTEP
// Version 3.6 compatibility
```

UI_EVT.HPP

```
#if !defined(UI_EVT_HPP)
#   define UI_EVT_HPP
#   if !defined(UI_DSP_HPP)
#       include <ui_dsp.hpp>
#   endif
```

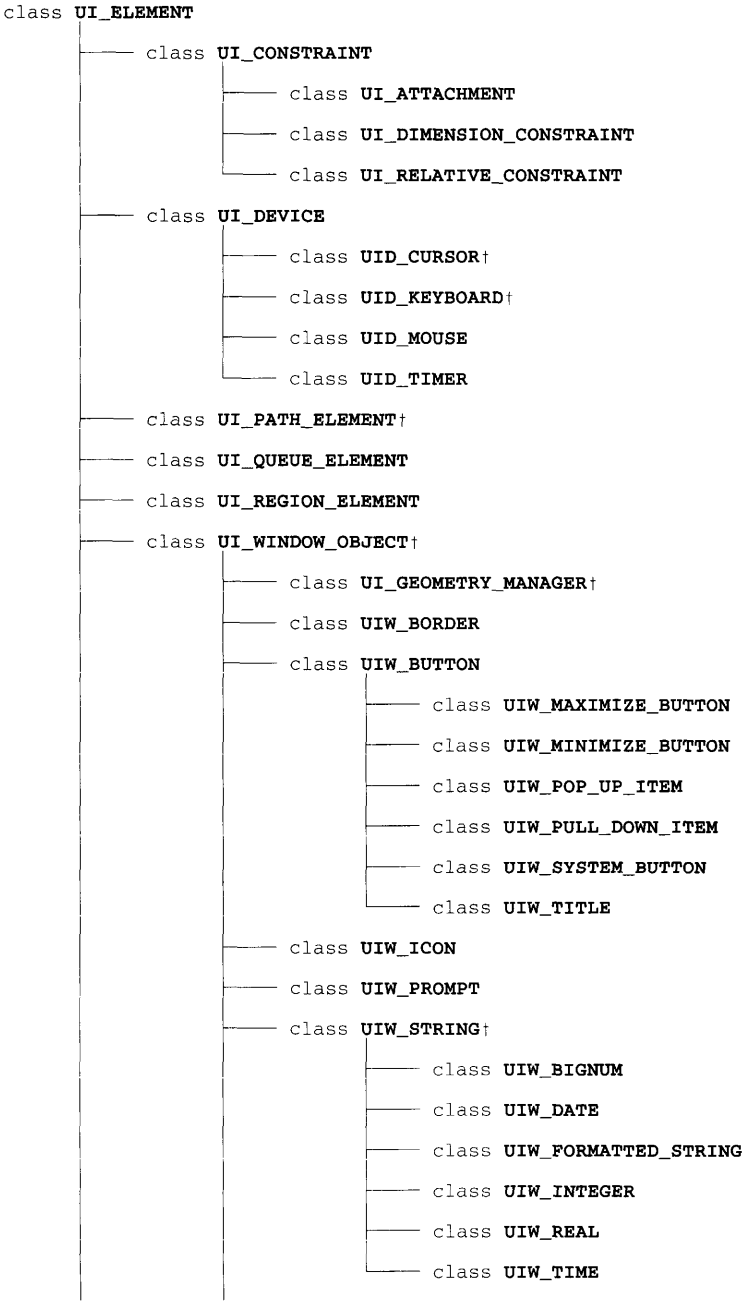
```
// EVENT_TYPE
// UI_KEY
// shiftState
// Mouse Information
// UI_SCROLL_INFORMATION
// UI_EVENT
// System wide messages
// ZIL_SYSTEM_EVENT
// ZIL_LOGICAL_EVENT
// UI_DEVICE
// Device type messages
// Device state messages
// Device image messages
// UID_CURSOR
// Cursor image messages
// UID_KEYBOARD
// UID_MOUSE
// Mouse image messages
// UID_TIMER
// TMR_FLAGS
// UI_QUEUE_ELEMENT & UI_QUEUE_BLOCK
// UI_EVENT_MANAGER
// Q_FLAGS
// Version 3.6 compatibility
```

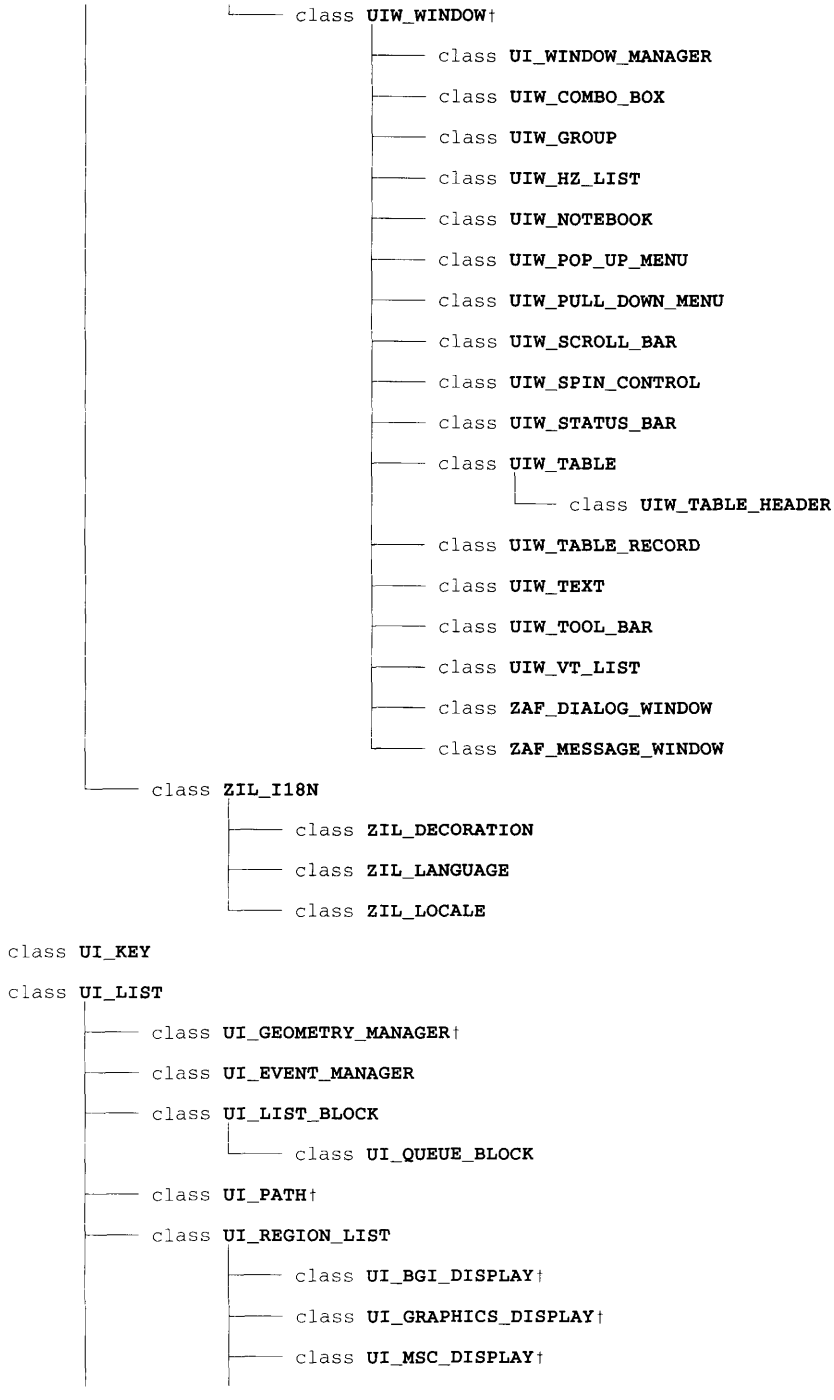
UI_WIN.HPP

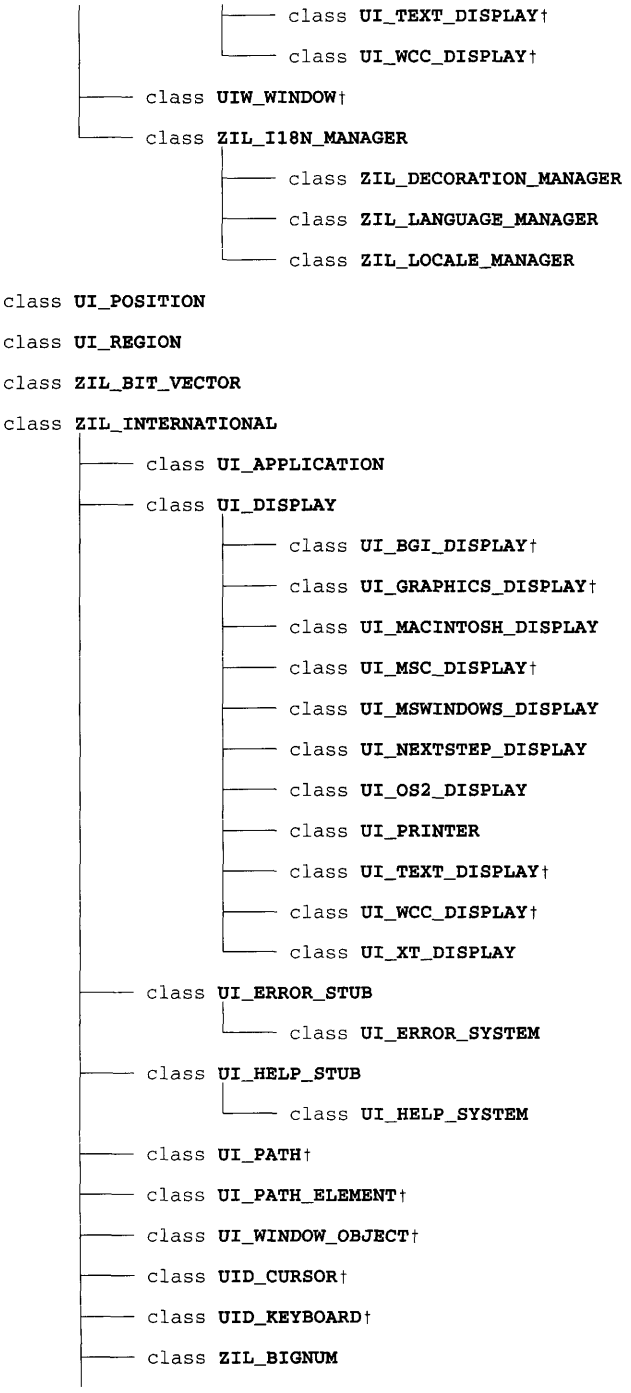
```
#if !defined(UI_WIN_HPP)
#   define UI_WIN_HPP
#   if !defined(UI_EVT_HPP)
#       include <ui_evt.hpp>
#   endif

// NUMBERID
// UI_ITEM
// Window object identifications
// ZIL_SIMPLE_OBJECTID
// ZIL_COMPLEX_OBJECTID
// ZIL_COMPOSITE_OBJECTID
// Window object system messages
// ZIL_SYSTEM_EVENT
// ZIL_LOGICAL_EVENT
// ZIL_DESIGNER_EVENT
// UI_PALETTE_MAP
// ZIL_LOGICAL_PALETTE
// UI_EVENT_MAP
// UI_WINDOW_OBJECT
// WOF_FLAGS
// WOAF_FLAGS
// WOS_STATUS
// UI_WINDOW_OBJECT::ZIL_INFO_REQUEST
// UI_HELP_CONTEXT
// Underline character information
// Border widths for WOF_BORDER flag option
// UIW_WINDOW
// WNF_FLAGS
// UIW_WINDOW::ZIL_INFO_REQUEST
// UI_WINDOW_MANAGER
// UIW_BORDER
// BDF_FLAGS
// UIW_PROMPT
// UIW_BUTTON
// BTF_FLAGS
// BTS_STATUS
// UIW_BUTTON::ZIL_INFO_REQUEST
// UIW_TITLE
```

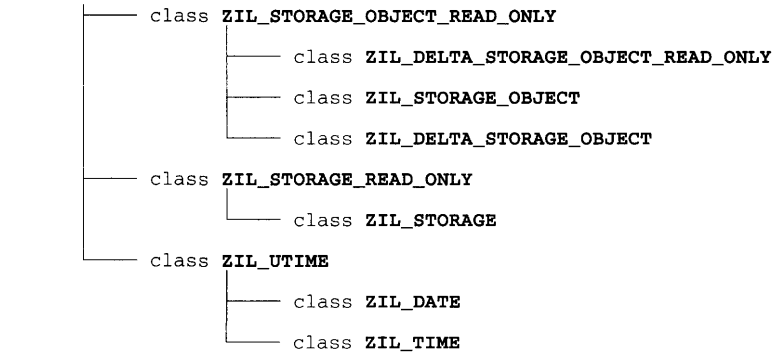
```
// UIW_MAXIMIZE_BUTTON
// UIW_MINIMIZE_BUTTON
// UIW_ICON
// ICF_FLAGS
// UIW_ICON::ZIL_INFO_REQUEST
// UIW_POP_UP_MENU
// UIW_POP_UP_ITEM
// MNIF_FLAGS
// UIW_PULL_DOWN_MENU
// UIW_PULL_DOWN_ITEM
// UIW_SYSTEM_BUTTON
// SYF_FLAGS
// UIW_STRING
// STF_FLAGS
// UIW_DATE
// UIW_FORMATTED_STRING
// FMI_RESULT
// UIW_BIGNUM
// UIW_INTEGER
// UIW_REAL
// UIW_TIME
// UIW_TEXT
// UIW_GROUP
// UIW_VT_LIST
// UIW_HZ_LIST
// UIW_COMBO_BOX
// UIW_COMBO_BOX::ZIL_INFO_REQUEST
// UIW_SPIN_CONTROL
// UIW_SCROLL_BAR
// sbFlags
// UIW_TOOL_BAR
// UIW_STATUS_BAR
// UIW_NOTEBOOK
// UIW_NOTEBOOK::ZIL_INFO_REQUEST
// UIW_TABLE
// UIW_TABLE::ZIL_INFO_REQUEST
// tblFlags
// thFlags
// UI_ERROR_SYSTEM
// UI_HELP_SYSTEM
// UI_APPLICATION
// ZAF_DIALOG_WINDOW
// ZIL_DIALOG_EVENT
// ZAF_MESSAGE_WINDOW
// UI_CONSTRAINT
// UI_CONSTRAINT::ZIL_INFO_REQUEST
// UI_ATTACHMENT
// ATCF_FLAGS
// UI_ATTACHMENT::ZIL_INFO_REQUEST
// UI_DIMENSION_CONSTRAINT
// DNCF_FLAG
// UI_DIMENSION_CONSTRAINT::ZIL_INFO_REQUEST
// UI_RELATIVE_CONSTRAINT
// RLCF_FLAG
// UI_RELATIVE_CONSTRAINT::ZIL_INFO_REQUEST
// UI_GEOMETRY_MANAGER
// Message indexes for the help and error system windows.
// Version 3.6 compatibility
```

CLASS HIERARCHY




class UIW_WINDOW†
class UI_WINDOW_MANAGER
class UIW_COMBO_BOX
class UIW_GROUP
class UIW_HZ_LIST
class UIW_NOTEBOOK
class UIW_POP_UP_MENU
class UIW_PULL_DOWN_MENU
class UIW_SCROLL_BAR
class UIW_SPIN_CONTROL
class UIW_STATUS_BAR
class UIW_TABLE
class UIW_TABLE_HEADER
class UIW_TABLE_RECORD
class UIW_TEXT
class UIW_TOOL_BAR
class UIW_VT_LIST
class ZAF_DIALOG_WINDOW
class ZAF_MESSAGE_WINDOW
class ZIL_I18N
class ZIL_DECORATION
class ZIL_LANGUAGE
class ZIL_LOCALE
class UI_KEY
class UI_LIST
class UI_GEOMETRY_MANAGER†
class UI_EVENT_MANAGER
class UI_LIST_BLOCK
class UI_QUEUE_BLOCK
class UI_PATH†
class UI_REGION_LIST
class UI_BGI_DISPLAY†
class UI_GRAPHICS_DISPLAY†
class UI_MSC_DISPLAY†


class UI_TEXT_DISPLAY†
class UI_WCC_DISPLAY†
class UIW_WINDOW†
class ZIL_I18N_MANAGER
class ZIL_DECORATION_MANAGER
class ZIL_LANGUAGE_MANAGER
class ZIL_LOCALE_MANAGER
class UI_POSITION
class UI_REGION
class ZIL_BIT_VECTOR
class ZIL_INTERNATIONAL
class UI_APPLICATION
class UI_DISPLAY
class UI_BGI_DISPLAY†
class UI_GRAPHICS_DISPLAY†
class UI_MACINTOSH_DISPLAY
class UI_MSC_DISPLAY†
class UI_MSWINDOWS_DISPLAY
class UI_NEXTSTEP_DISPLAY
class UI_OS2_DISPLAY
class UI_PRINTER
class UI_TEXT_DISPLAY†
class UI_WCC_DISPLAY†
class UI_XT_DISPLAY
class UI_ERROR_STUB
class UI_ERROR_SYSTEM
class UI_HELP_STUB
class UI_HELP_SYSTEM
class UI_PATH†
class UI_PATH_ELEMENT†
class UI_WINDOW_OBJECT†
class UID_CURSOR†
class UID_KEYBOARD†
class ZIL_BIGNUM



class **ZIL_MAP_CHARS**

class **ZIL_MESSAGE**

class **ZIL_STORAGE_DIRECTORY**

struct **directoryEntry**

struct **UI_EVENT**

struct **UI_EVENT_MAP**

struct **UI_ITEM**

struct **UI_KEY**

struct **UI_PALETTE**

struct **UI_PALETTE_MAP**

struct **UI_POSITION**

struct **UI_REGION**

struct **UI_SCROLL_INFORMATION**

struct **ZIL_BITMAP_ELEMENT**

struct **ZIL_ICON_HANDLE**

struct **ZIL_LANGUAGE_ELEMENT**

struct **ZIL_LOCALE_ELEMENT**

struct **ZIL_STATS_INFO**

struct **ZIL_TEXT_ELEMENT**

† - indicates multiple inheritance

CHAPTER 1 – UI_APPLICATION

The UI_APPLICATION class is used to initialize the standard control objects for an application built with Zinc Application Framework. The class sets up the display, the Event Manager and the Window Manager, and also provides a **main( )** function (or **WinMain( )** for Windows and Windows NT), removing these responsibilities from the programmer. This provides for a clean initialization module that is completely portable across platforms. Use of this class is optional (except for NEXTSTEP applications—discussed below), but if it is used, the programmer merely has to provide application-specific initialization and the main control loop to retrieve and dispatch events.

Application-specific initialization is performed in the **UI_APPLICATION::Main( )** function. The definition of **UI_APPLICATION::Main( )** must be provided by the programmer if the UI_APPLICATION class is to be used. The reference to the UI_-APPLICATION class when defining this function causes a **main( )** (or **WinMain( )**) function to be linked in with the program. This **main( )** function creates an instance of UI_APPLICATION and calls the programmer-defined **UI_APPLICATION::Main( )**.

NOTE: It is important that one, and only one, definition of **UI_APPLICATION::Main( )** is provided and that a definition is provided only if using the UI_APPLICATION class.

If this class is not used, the **main( )** (or **WinMain( )**) function must still be provided by the programmer, as in any C++ program. The display, Event Manager and Window Manager must then also be created manually.

NOTE: If the UI_APPLICATION class is not used, no reference should be made to the class, since the linker will then attempt to link in another **main( )**, resulting in a linker error.

Use of the UI_APPLICATION class is not required except for NEXTSTEP applications. Due to the event handling requirements of both Zinc Application Framework and NEXTSTEP, their interaction is not straightforward. The UI_APPLICATION class handles this interaction properly.

The UI_APPLICATION class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_APPLICATION : public ZIL_INTERNATIONAL
{
public:
    UI_DISPLAY *display;
    UI_EVENT_MANAGER *eventManager;
    UI_WINDOW_MANAGER *windowManager;
    UI_PATH *searchPath;
```

```
#if defined(ZIL_NEXTSTEP)
    DPSTimedEntry myTimedEvent;
#endif
#if defined(ZIL_MSWINDOWS)
    HANDLE hInstance;
    HANDLE hPrevInstance;
    LPSTR lpszCmdLine;
    int nCmdShow;
    UI_APPLICATION(HANDLE hInstance, HANDLE hPrevInstance,
        LPSTR lpszCmdLine, int nCmdShow);
#else
    UI_APPLICATION(int argc, char **argv);
#endif
    int argc;
    ZIL_ICHAR **argv;

    ~UI_APPLICATION(void);
    int Main(void);
    EVENT_TYPE Control(void);
    void LinkMain(void);

public:
    static ZIL_LANGUAGE_ELEMENT *_textSwitches;
    static ZIL_LANGUAGE_ELEMENT *_graphicSwitches;
};
```

General Members

This section describes those members that are used for general purposes.

- *display* is a pointer to the UI_DISPLAY that is created in the UI_APPLICATION constructor. The type of display created depends on which environment is being used. For DOS, the type of display created also depends on which graphics library is being used for the application. For example, if the DOS GFX library is used, *display* will be of type UI_GRAPHICS_DISPLAY. See "Appendix A—Compiler Considerations" in the *Getting Started* manual for more information on using graphics libraries in Zinc programs. *display* will be of type UI_MACINTOSH_-DISPLAY if the application is a Macintosh application, UI_MSWINDOWS_-DISPLAY if the application is a Windows application, UI_OS2_DISPLAY for an OS/2 application, UI_XT_DISPLAY for a Motif application and UI_NEXTSTEP_-DISPLAY for a NEXTSTEP application.

- *eventManager* is a pointer to the Event Manager created in the UI_APPLICATION constructor.

- *windowManager* is a pointer to the Window Manager created in the UI_-APPLICATION constructor.

- *searchPath* is a pointer to a UI_PATH object containing the program startup directory as supplied by argv[0], if the application is for DOS, OS/2 or Motif. *searchPath* will

also ensure that the current working directory is searched if access to files is required from within the program. If the application is a Windows application, *searchPath* does not maintain a pointer to the program startup directory but ensures that the current working directory is searched.

- *myTimedEvent* is the tag for the timed entry created in the **Control( )** function in a NEXTSTEP application. In NEXTSTEP applications, a timer is set up that calls a function at frequent intervals. This provides the main event loop for the Zinc program that allows the application to process events. *myTimedEvent* is the tag that identifies the timer created.

- *hInstance* is the instance handle of the application. This member is available only in Windows applications.

- *hPrevInstance* is the handle of another instance of the application, if one is running. This member is available only in Windows applications.

- *lpszCmdLine* is a pointer to the string entered at the command line. This member is available only in Windows applications.

- *nCmdShow* indicates how the application is to be displayed upon execution. This member is available only in Windows applications.

- *argc* is a count of the number of command-line arguments that were entered when running the application. This member is available only in non-Windows applications.

- *argv* is a pointer to an array of the command-line arguments that were entered when running the application. This member is available only in non-Windows applications.

- *_textSwitches* is a collection of strings that can be used as command-line arguments to cause the application to come up in text mode. The UI_APPLICATION class uses the strings maintained by *_textSwitches* to compare against any command-line arguments in order to determine if the user wanted to run the application in text mode. By default, the only text switch is "/text." This variable is used in DOS mode only.

- *_graphicSwitches* is a collection of strings that can be used as command-line arguments to cause the application to come up in a particular graphics mode. The UI_APPLICATION class uses the strings maintained by *_graphicSwitches* to compare against any command-line arguments in order to determine if the user wanted to run the application in a certain graphics mode. By default, the only graphics switch is

"/svga." This variable is used in DOS mode with the UI_GRAPHICS_DISPLAY only.

UI_APPLICATION::UI_APPLICATION

Syntax

#include <ui_win.hpp>

UI_APPLICATION(HANDLE *hInstance*, HANDLE *hPrevInstance*, LPSTR *lpszCmdLine*, int *nCmdShow*);
or
UI_APPLICATION(int *argc*, char ***argv*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded advanced constructors create a new UI_APPLICATION class object. The constructor initializes the *display*, *eventManager*, *windowManager* and *searchPath* member variables. By default, *eventManager* will have a UID_KEYBOARD, a UID_-MOUSE and a UID_CURSOR device attached to it.

These constructors should not be called by the programmer but are called from within the UI_APPLICATION class' **main( )** (or **WinMain( )**) function, which is linked in automatically when a reference to the UI_APPLICATION class is made.

The first constructor is specific to a Windows or Windows NT application. It takes the following arguments:

- $hInstance_{in}$ is the instance handle of the application. This parameter is automatically passed in to the application as a **WinMain( )** parameter.

- *hPrevInstance*$_{in}$ is the handle of another instance of the application, if one is running. This parameter is automatically passed in to the application as a **WinMain( )** parameter.

- *lpszCmdLine*$_{in}$ is a pointer to the string entered at the command line. This parameter is automatically passed in to the application as a **WinMain( )** parameter.

- *nCmdShow*$_{in}$ indicates if the application's initial window should display in a maximized state, a normal state or a minimized state upon execution of the application. This parameter is automatically passed in to the application as a **WinMain( )** parameter.

The second constructor is specific to non-Windows applications. It takes the following arguments:

- *argc*$_{in}$ is a count of the number of command-line arguments that were entered when running the application. This parameter is passed in to the application as a **main( )** parameter.

- *argv*$_{in}$ is a pointer to an array of the command-line arguments that were entered when running the application. This parameter is passed in to the application as a **main( )** parameter.

Example

```
#include <ui_win.hpp>

// Referencing UI_APPLICATION causes a main() or
// WinMain() to be linked in automatically.  This main() creates an
// instance of UI_APPLICATION and calls UI_APPLICATION::Main(),
// defined by the programmer.

// This main() is part of the UI_APPLICATION class.
int main(int argc, char **argv)
{
    UI_APPLICATION *application = new UI_APPLICATION(argc, argv);

    // Call the application program.
    int ccode = application->Main();

    // Restore the system.
    delete application;

    return(ccode);
}
```

UI_APPLICATION::~UI_APPLICATION

Syntax

#include <ui_win.hpp>

~UI_APPLICATION(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the *display*, *eventManager*, *windowManager* and *searchPath* members, if they exist. It is not recommended that the programmer modify these members; if they are changed, however, it is important to set these members to NULL if they are deleted prior to the destructor being called.

UI_APPLICATION::Control

Syntax

#include <ui_win.hpp>

EVENT_TYPE Control(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function acts as the main control loop used to get events from the Event Manager and to dispatch them to the Window Manager. Use of this function is optional. If this function is not used, the programmer must implement a loop that collects events from the Event Manager and passes them to the Window Manager.

- *returnValue*$_{out}$ is the event type that caused the event loop to exit (i.e., L_EXIT or S_NO_OBJECT).

Example

```
#include <ui_win.hpp>

// Referencing UI_APPLICATION causes a main() or
// WinMain() to be linked in automatically.  This main() creates an
// instance of UI_APPLICATION and calls UI_APPLICATION::Main(),
// defined by the programmer.

int UI_APPLICATION::Main(void)
{
    // The UI_APPLICATION constructor automatically initializes the
    // display, eventManager, and windowManager variables.

    // Create a window with basic window objects.
    UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
    *window
        + new UIW_BORDER
        + new UIW_MAXIMIZE_BUTTON
        + new UIW_MINIMIZE_BUTTON
        + &(*new UIW_SYSTEM_BUTTON
            + new UIW_POP_UP_ITEM("~Restore", MNIF_RESTORE)
            + new UIW_POP_UP_ITEM("~Move", MNIF_MOVE)
            + new UIW_POP_UP_ITEM("~Size", MNIF_SIZE))
        + new UIW_TITLE("Window 1");
    *windowManager + window;

    // Use Control() to get and dispatch events.
    EVENT_TYPE ccode = Control();

    // DO NOT delete the display, eventManager, or windowManager.
    // They are deleted in the UI_APPLICATION destructor.

    // Return the exit code.
    return (0);
}
```

UI_APPLICATION::LinkMain

Syntax

#include <ui_win.hpp>

void LinkMain(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function is a stub. Some linkers will not link in a module unless a function in that module is called. Calling the **LinkMain( )** function ensures that the module is linked in.

Example

```
#include <ui_win.hpp>

// Referencing UI_APPLICATION causes a main() or
// WinMain() to be linked in automatically.  This main() creates an
// instance of UI_APPLICATION and calls UI_APPLICATION::Main(),
// defined by the programmer.

int UI_APPLICATION::Main(void)
{
    // The UI_APPLICATION constructor automatically initializes the
    // display, eventManager, and windowManager variables.

    LinkMain();

    // Create a window with basic window objects.
    UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
    *window
        + new UIW_BORDER
        + new UIW_MAXIMIZE_BUTTON
        + new UIW_MINIMIZE_BUTTON
        + &(*new UIW_SYSTEM_BUTTON
            + new UIW_POP_UP_ITEM("~Restore", MNIF_RESTORE)
            + new UIW_POP_UP_ITEM("~Move", MNIF_MOVE)
            + new UIW_POP_UP_ITEM("~Size", MNIF_SIZE))
        + new UIW_TITLE("Window 1");
    *windowManager + window;

    EVENT_TYPE ccode = Control();

    // DO NOT delete the display, eventManager, or windowManager.
    // They are deleted in the UI_APPLICATION destructor.

    // Return the exit code.
    return (0);
}
```

UI_APPLICATION::Main

Syntax

#include <ui_win.hpp>

int Main(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is used to set up application-specific initialization and the main control loop. It is defined by the programmer. The **main( )** (or **WinMain( )**) function provided with the UI_APPLICATION class calls this function after first creating an instance of UI_APPLICATION. It is possible to modify the *display*, *eventManager*, *windowManager* and *searchPath* member variables from within the **Main( )** function, but it is not recommended. If these members are modified, it is important to consider the order in which the members are modified, as some of these members maintain pointers to the other members.

NOTE: The programmer must provide one, and only one, definition for this function if **main( )** or **WinMain( )** is not used. If no definition is provided, or if more than one definition is provided, a linker error will occur.

- $returnValue_{out}$ is the program exit code.

Example

```
#include <ui_win.hpp>

// Referencing UI_APPLICATION causes a main() or
// WinMain() to be linked in automatically.  This main() creates an
// instance of UI_APPLICATION and calls UI_APPLICATION::Main(),
// defined by the programmer.

int UI_APPLICATION::Main(void)
{
    // The UI_APPLICATION constructor automatically initializes the
    // display, eventManager, and windowManager variables.
```

```
    // Create a window with basic window objects.
    UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
    *window
        + new UIW_BORDER
        + new UIW_MAXIMIZE_BUTTON
        + new UIW_MINIMIZE_BUTTON
        + &(*new UIW_SYSTEM_BUTTON
            + new UIW_POP_UP_ITEM("~Restore", MNIF_RESTORE)
            + new UIW_POP_UP_ITEM("~Move", MNIF_MOVE)
            + new UIW_POP_UP_ITEM("~Size", MNIF_SIZE))
        + new UIW_TITLE("Window 1");
    *windowManager + window;

    EVENT_TYPE ccode = Control();

    // DO NOT delete the display, eventManager, or windowManager.
    // They are deleted in the UI_APPLICATION destructor.

    // Return the exit code.
    return (0);
}
```

CHAPTER 2 – UI_ATTACHMENT

The UI_ATTACHMENT class object is used for geometry management. Specifically, this class allows a managed object to be tied to an edge of its parent or to an edge of a sibling object. The UI_ATTACHMENT is added to the parent object's geometry manager. See "Chapter 14—UI_GEOMETRY_MANAGER" for more details on using the geometry manager.

The UI_ATTACHMENT class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class UI_ATTACHMENT : public UI_CONSTRAINT
{
public:
    UI_ATTACHMENT(UI_WINDOW_OBJECT *_object,
        ATCF_FLAGS _atcFlags = ATCF_NO_FLAGS, int _offset = 0);
    UI_ATTACHMENT(UI_WINDOW_OBJECT *_object, UI_WINDOW_OBJECT *_reference,
        ATCF_FLAGS _atcFlags, int _offset = 0);
    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);
    virtual void Modify(void);

#if defined(ZIL_LOAD)
    virtual ZIL_NEW_FUNCTION NewFunction(void);
    static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    UI_ATTACHMENT(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    virtual void Load(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
        ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif

protected:
    UI_WINDOW_OBJECT *reference;
    ZIL_NUMBERID refNumberID;
    ATCF_FLAGS atcFlags;
    int offset;
};
```

General Members

This section describes those members that are used for general purposes.

- *reference* is the sibling object to which the managed object is tied.
- *refNumberID* is the numberID of the reference object to which the attachment is tied.
- *atcFlags* are flags that define the operation of the UI_ATTACHMENT class. A full description of the attachment flags is given in the UI_ATTACHMENT constructor.
- *offset* is how far the managed object should be positioned from the object to which it is tied. This value is specified in cell dimensions.

UI_ATTACHMENT::UI_ATTACHMENT

Syntax

#include <ui_win.hpp>

UI_ATTACHMENT(UI_WINDOW_OBJECT *_*object*,
ATCF_FLAGS _*atcFlags* = ATCF_NO_FLAGS, int _*offset* = 0);
or
UI_ATTACHMENT(UI_WINDOW_OBJECT *_*object*,
UI_WINDOW_OBJECT *_*reference*, ATCF_FLAGS _*atcFlags*, int _*offset* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors create a new UI_ATTACHMENT class object.

The first overloaded constructor creates a new UI_ATTACHMENT object that ties the managed object to its parent.

- $\_object_{in}$ is the object to be managed.

- *_atcFlags*$_{in}$ are flags that define the operation of the UI_ATTACHMENT class. The following flags (declared in **UI_WIN.HPP**) control the general operation of a UI_-ATTACHMENT class object:

  ATCF_BOTTOM—Maintains the bottom edge of the managed object at the specified distance from the object to which it is tied.

  ATCF_LEFT—Maintains the left edge of the managed object at the specified distance from the object to which it is tied.

  ATCF_OPPOSITE—Causes the managed object to be tied to the opposite edge of the object to which it is tied. For example, if the ATCF_TOP flag is set, the top edge of the managed object will be tied to the bottom edge of the object to which it is tied.

  ATCF_NO_FLAGS—Does not associate any special flags with the UI_AT-TACHMENT class. This flag should not be used in conjunction with any other ATCF flags.

  ATCF_RIGHT—Maintains the right edge of the managed object at the specified distance from the object to which it is tied.

  ATCF_STRETCH—Causes the managed object to be stretched, if necessary, to maintain its attachments. For example, if the left and right edges of the object are tied to the parent window and the window is sized, the managed object must stretch or shrink to maintain its distance from the edges.

  ATCF_TOP—Maintains the top edge of the managed object at the specified distance from the object to which it is tied.

- *_offset*$_{in}$ is how far the managed object should be positioned from the object to which it is tied. This value is specified in cell dimensions.

The second overloaded constructor creates a new UI_ATTACHMENT object that ties the managed object to a sibling object.

- *_object*$_{in}$ is the object to be managed.

- *_reference*$_{in}$ is the sibling object to which the *object* should be tied.

- *_atcFlags*$_{in}$ are flags that define the operation of the UI_ATTACHMENT class. For more details, see the description of *_atcFlags* with the first constructor.

- *_offset*$_{in}$ is how far the managed object should be positioned from the object to which it is tied. This value is specified in cell dimensions.

UI_ATTACHMENT::~UI_ATTACHMENT

Syntax

#include <ui_win.hpp>

virtual ~UI_ATTACHMENT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_ATTACHMENT object.

UI_ATTACHMENT::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST *request*, void **data*,
ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the attachment object:

  I_CLEAR_FLAGS—Clears the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type ATCF_FLAGS that contains the flags to be cleared. This request only clears those flags that are passed in; it does not simply clear the entire field.

  I_GET_FLAGS—Requests the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type ATCF_FLAGS.

  I_GET_OFFSET—Returns the *offset* associated with the attachment. If this message is sent, *data* must be a pointer to a variable of type **int** where the attachment's offset will be copied.

  I_GET_REFERENCE_OBJECT—Returns the *reference* object associated with the attachment. If this message is sent, *data* should be a doubly indirected pointer to UI_WINDOW_OBJECT. *data* will be set to point to *reference*. If *data* is NULL, a pointer to *reference* is returned.

  I_SET_FLAGS—Sets the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type ATCF_FLAGS that contains the flags to be set. This request only sets those flags that are passed in; it does not clear any flags that are already set.

  I_SET_OFFSET—Sets the *offset* associated with the attachment. If this message is sent, *data* must be a pointer to a variable of type **int** that contains the attachment's new offset.

  I_SET_REFERENCE_OBJECT—Sets the *reference* object associated with the attachment. If this message is sent, *data* must be a pointer to the sibling object that the managed object should be tied to.

All other requests are passed to **UI_CONSTRAINT::Information( )** for processing.

- $data_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.

- $objectID_{in}$ is not used.

UI_ATTACHMENT::Modify

Syntax

```
#include <ui_win.hpp>

virtual void Modify(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function updates the managed object's position and, if necessary, size according to the constraints specified for the attachment. The geometry manager calls each constraint's **Modify( )** function whenever the parent object's position is changed.

Storage Members

This section describes those class members that are used for storage purposes.

UI_ATTACHMENT::UI_ATTACHMENT

Syntax

#include <ui_win.hpp>

UI_ATTACHMENT(const ZIL_ICHAR *_name_,
ZIL_STORAGE_READ_ONLY *_file_,
ZIL_STORAGE_OBJECT_READ_ONLY *_object_,
UI_ITEM *_objectTable_ = ZIL_NULLP(UI_ITEM),
UI_ITEM *_userTable_ = ZIL_NULLP(UI_ITEM));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced constructor creates a new UI_ATTACHMENT by loading the object from a data file. Typically, the programmer does not need to use this constructor. If a constraint is stored in a data file it is usually stored as part of a geometry manager and will be loaded when the geometry manager is loaded.

- $name_{in}$ is the name of the object to be loaded.
- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."
- $objectTable_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the

object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_ATTACHMENT::Load

Syntax

#include <ui_win.hpp>

virtual void Load(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*, ZIL_STORAGE_OBJECT_READ_ONLY **object*, UI_ITEM **objectTable*, UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a UI_ATTACHMENT from a persistent object data file. It is called by the persistent constructor and is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_ATTACHMENT::New

Syntax

```
#include <ui_win.hpp>

static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
    UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
    UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a persistent object from a data file. This function is a static class member so that its address can be placed in a table used by the library to load persistent objects from a data file.

NOTE: The application must first create a display if objects are to be loaded from a data file.

- *name*$_{in}$ is the name of the object to be loaded.
- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."
- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.
- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_ATTACHMENT::NewFunction

Syntax

```
#include <ui_win.hpp>

virtual ZIL_NEW_FUNCTION NewFunction(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns a pointer to the object's **New( )** function.

- *returnValue*$_{out}$ is a pointer to the object's **New( )** function.

UI_ATTACHMENT::Store

Syntax

#include <ui_win.hpp>

virtual void Store(const ZIL_ICHAR **name*, ZIL_STORAGE **file*,
ZIL_STORAGE_OBJECT **object*, UI_ITEM **objectTable*,
UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to write an object to a data file.

- *name*$_{in}$ is the name of the object to be stored.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE where the persistent object will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the persistent object information will be stored. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WIN-DOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

CHAPTER 3 – UI_BGI_DISPLAY

The UI_BGI_DISPLAY class implements a graphics display that uses the Borland BGI graphics library package to draw to the screen. Since the UI_BGI_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_BGI_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_BGI_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_BGI_DISPLAY : public UI_DISPLAY,
    public UI_REGION_LIST
{
public:
    struct BGIFONT
    {
        int font;
        int charSize;
        int multX, divX;
        int multY, divY;
        int maxWidth, maxHeight;
    };
    typedef char BGIPATTERN[8];

    static UI_PATH *searchPath;
    static BGIFONT fontTable[ZIL_MAXFONTS];
    static BGIPATTERN patternTable[ZIL_MAXPATTERNS];

    UI_BGI_DISPLAY(int driver = 0, int mode = 0);
    virtual ~UI_BGI_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon,   int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor =  FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
```

```
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        consy UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
    signed char _virtualCount;
    UI_REGION _virtualRegion;
    char _stopDevice;

    void SetFont(ZIL_LOGICAL_FONT logicalFont);
    void SetPattern(const UI_PALETTE *palette, int _xor);
};
```

General Members

This section describes those members that are used for general purposes.

- *BGIFONT* is a structure that contains the following font information:

  font contains the value of the font. FNT_SMALL_FONT (font is 0), FNT_-DIALOG_FONT (font is 1) and FNT_SYSTEM_FONT (font is 2) are predefined by Zinc.

  charSize can be used to magnify the size of a character. For more information see **settextstyle( )** in the *Borland C++ Library Reference.*

  multX, divX, multY and *divY* provide additional ways to scale the font. For more information see **setusercharsize( )** in the *Borland C++ Library Reference.*

maxHeight is the height of the tallest character.

maxWidth is the width of the widest character.

- *BGIPATTERN* is an array of 8 bytes that make up the 8x8 bitmap pattern. Each byte (8 bits) corresponds to 8 pixels in the pattern. The patterns defined by Zinc are: PTN_SOLID_FILL, PTN_INTERLEAVE_FILL and PTN_BACKGROUND_FILL. For more information see **setfillpattern( )** in the *Borland C++ Library Reference.*

- *searchPath* contains the path to be searched for the BGI drivers or CHR font files. The BGI graphics library must have access to the BGI drivers in order to initialize graphics mode. Unless the BGI drivers are linked in, they must be accessible at run-time. Similarly, an application may rely on CHR font definition files. These files provide font information and, if used, must be accessible at run-time. The default fonts used by Zinc are linked into the application and thus do not require CHR files. Setting *searchPath* to include a path node for the BGI or CHR files will allow the application to run properly in graphics mode.

- *fontTable* is an array of *BGIFONT.* The default array contains space for 10 *BGIFONT* entries. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A font used to display an icon's text string.

  FNT_DIALOG_FONT—A font used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.).

  FNT_SYSTEM_FONT—A sans-serif style font used to display a window's title.

  NOTE: When these three fonts are used, no CHR files are needed since they are linked into Zinc Application Framework. However, if other "stroked" fonts are added to this table, the proper CHR files must either be in the current path or be linked into the application.

  The remaining entries in *fontTable* are initially set to Borland's DEFAULT_FONT, a fixed-width, 8x8, bitmapped font.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *patternTable* is an array of *BGIPATTERN.* The default array contains space for 15 *BGIPATTERN* entries. The following entries are pre-defined by Zinc:

PTN_SOLID_FILL—A solid fill pattern.

PTN_INTERLEAVE_FILL—An interleaving line fill pattern.

PTN_BACKGROUND_FILL—The background fill pattern.

- *maxColors* is the maximum number of colors supported by the graphics mode that was initialized. For example, an EGA display might support sixteen colors. This member will be filled in according to information obtained from the BGI graphics library after it has initialized. The BGI graphics library has limited support for SVGA modes, including 256 color mode. Zinc will support whatever mode is initialized by the BGI graphics library.

- *_virtualCount* is a count of the number of virtual screen operations that have taken place. For example, when the **VirtualGet( )** function is called, *_virtualCount* is decremented. Additionally, when the **VirtualPut( )** function is called, *_virtualCount* is incremented.

- *_virtualRegion* is the region affected by either **VirtualGet( )** or **VirtualPut( )**.

- *_stopDevice* is a variable used to prevent recursive updates of device images on the display. If *_stopDevice* is TRUE, no drawing will be done to the screen. Otherwise, drawing will be made directly to the screen display.

UI_BGI_DISPLAY::UI_BGI_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_BGI_DISPLAY(int *driver* = 0, int *mode* = 0);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_BGI_DISPLAY object. When a new UI_BGI_-DISPLAY class is constructed, the system finds the associated BGI device driver and sets the screen display to the background color and pattern specified by the inherited variable *backgroundPalette*.

- $driver_{in}$ and $mode_{in}$ are arguments passed to the Borland **initgraph( )** function. The argument *driver* specifies the graphics driver to be used. (The value 0 indicates an auto-detection.) The argument *mode* specifies the initial graphics mode (used only if *driver* is not auto-detect). For more information on these arguments see **initgraph( )** in the *Borland C++ Library Reference* manual.

Example 1

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_BGI_DISPLAY;

    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);

    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

Example 2

This example shows how a different font can be installed into the *fontTable* so that it may be used by the system.

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_BGI_DISPLAY;
    if (display->installed)
```

```
    {
        // Set up a BGIFONT structure with the Borland default font.
        UI_BGI_DISPLAY::BGIFONT BGIFont = { DEFAULT_FONT, 1, 1, 1, 1, 1, 8, 8 };
        UI_BGI_DISPLAY::fontTable[5] = BGIFont;
    }

    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_BGI_DISPLAY::~UI_BGI_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_BGI_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_BGI_DISPLAY class. Care should be taken to only destroy a UI_BGI_DISPLAY class that is not attached to another associated object.

UI_BGI_DISPLAY::SetFont

Syntax

#include <ui_dsp.hpp>

void SetFont(ZIL_LOGICAL_FONT *logicalFont*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the font information used by the BGI graphics library. The information contained in the *logicalFont* entry of the *fontTable* array is used to set the font.

- $logicalFont_{in}$ is the font to be used. *logicalFont* is an entry into the *fontTable* array.

UI_BGI_DISPLAY::SetPattern

Syntax

#include <ui_dsp.hpp>

void SetPattern(const UI_PALETTE **palette*, int *_xor*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the pattern information used by the BGI graphics library. The information contained in *palette* is used to set the pattern.

- $palette_{in}$ contains the pattern style, foreground color, and background color to be used when setting the pattern.

- $\_xor_{in}$ indicates if the pattern should be drawn with the xor attribute on. If *_xor* is TRUE, the pattern will be an xor pattern. Otherwise, the pattern will not be xor.

CHAPTER 4 – UI_CONSTRAINT

The UI_CONSTRAINT class is the base class for all geometry management constraint classes used in Zinc. A constraint defines where an object can be positioned or how it can be sized in relation to its parent or sibling objects. Constraints are added to a geometry manager. The UI_CONSTRAINT class is an abstract class that defines the functionality that must exist in each derived constraint class. Only derived constraint classes, such as UI_ATTACHMENT, UI_DIMENSION_CONSTRAINT and UI_RELATIVE_CONSTRAINT, can be created.

The UI_CONSTRAINT class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class UI_CONSTRAINT : public UI_ELEMENT
{
public:
    UI_CONSTRAINT(UI_WINDOW_OBJECT *_object);
    virtual ~UI_CONSTRAINT(void);

    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);
    virtual void Modify(void) = 0;
    UI_GEOMETRY_MANAGER *Manager(UI_GEOMETRY_MANAGER *_manager =
        ZIL_NULLP(UI_GEOMETRY_MANAGER));
    ZIL_OBJECTID SearchID(void);

    // List members.
    UI_CONSTRAINT *Next(void);
    UI_CONSTRAINT *Previous(void);

#if defined(ZIL_LOAD)
    static UI_CONSTRAINT *New(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    UI_CONSTRAINT(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    virtual void Load(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
        ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif

protected:
    UI_WINDOW_OBJECT *object;
    ZIL_NUMBERID numberID;
    ZIL_OBJECTID searchID;
    UI_GEOMETRY_MANAGER *manager;
};
```

General Members

This section describes those members that are used for general purposes.

- *object* is the object being managed by the constraint.
- *numberID* is the numberID that identifies this constraint uniquely in the geometry manager's list.
- *searchID* is an objectID that identifies what type of constraint this is.
- *manager* is a pointer to the geometry manager with which this constraint is associated.

UI_CONSTRAINT::UI_CONSTRAINT

Syntax

#include <ui_win.hpp>

UI_CONSTRAINT(UI_WINDOW_OBJECT *_*object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_CONSTRAINT object.

- $\_object_{in}$ is the object to be managed by the constraint.

UI_CONSTRAINT::~UI_CONSTRAINT

Syntax

#include <ui_win.hpp>

virtual ~UI_CONSTRAINT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_CONSTRAINT object.

UI_CONSTRAINT::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST *request*, void **data*,
ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to

get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the constraint object:

  I_GET_NUMBERID—Returns the numberID of this constraint. If this request is sent, *data* should be a pointer to ZIL_NUMBERID.

  I_GET_OBJECT—Returns the *object* associated with the constraint. If this message is sent, *data* should be a doubly indirected pointer to UI_WINDOW_-OBJECT. *data* will be set to point to *object*. If *data* is NULL, a pointer to *object* is returned.

  I_SET_NUMBERID—Sets the numberID of this constraint. If this request is sent, *data* should be a pointer to ZIL_NUMBERID.

  I_SET_OBJECT—Sets the *object* associated with the constraint. If this message is sent, *data* must be a pointer to the object to be managed.

- *data*$_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.

- *objectID*$_{in}$ is not used.

UI_CONSTRAINT::Manager

Syntax

```
#include <ui_win.hpp>

UI_GEOMETRY_MANAGER *Manager(UI_GEOMETRY_MANAGER *_manager =
    ZIL_NULLP(UI_GEOMETRY_MANAGER));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is used to either set the *manager* member or get a pointer to it.

- *returnValue*$_{out}$ is a pointer to *manager*, the geometry manager with which this constraint is associated.

- *_manager*$_{in}$ is a pointer to the geometry manager with which this constraint is associated. If *_manager* is NULL, the *manager* member will not be modified, but a pointer to *manager* will be returned.

UI_CONSTRAINT::Modify

Syntax

```
#include <ui_win.hpp>

virtual void Modify(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function updates the managed object's position and, if necessary, size according to the constraints specified. The geometry manager calls each constraint's **Modify( )** function whenever the parent object's position is changed.

UI_CONSTRAINT::Next

Syntax

#include <ui_win.hpp>

UI_CONSTRAINT *Next(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the next constraint, if one exists, in the list of constraints.

- *returnValue*$_{out}$ is a pointer to the next constraint in the list. If there is not a next constraint, *returnValue* is NULL.

UI_CONSTRAINT::Previous

Syntax

#include <ui_win.hpp>

UI_CONSTRAINT *Previous(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the previous constraint, if one exists, in the list of constraints.

- *returnValue*$_{out}$ is a pointer to the previous constraint in the list. If there is not a previous constraint, *returnValue* is NULL.

UI_CONSTRAINT::SearchID

Syntax

#include <ui_win.hpp>

ZIL_OBJECTID SearchID(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the constraint's *searchID*.

Storage Members

This section describes those class members that are used for storage purposes.

UI_CONSTRAINT::UI_CONSTRAINT

Syntax

#include <ui_win.hpp>

UI_CONSTRAINT(const ZIL_ICHAR *_name_,
ZIL_STORAGE_READ_ONLY *_file_,
ZIL_STORAGE_OBJECT_READ_ONLY *_object_,
UI_ITEM *_objectTable_ = ZIL_NULLP(UI_ITEM),
UI_ITEM *_userTable_ = ZIL_NULLP(UI_ITEM));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced constructor creates a new UI_CONSTRAINT by loading the object from a data file. Typically, the programmer does not need to use this constructor. If a constraint is stored in a data file it is usually stored as part of a geometry manager and will be loaded when the geometry manager is loaded.

- $name_{in}$ is the name of the object to be loaded.
- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."
- $objectTable_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the

object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_CONSTRAINT::Load

Syntax

#include <ui_win.hpp>

virtual void Load(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*, ZIL_STORAGE_OBJECT_READ_ONLY **object*, UI_ITEM **objectTable*, UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a UI_CONSTRAINT from a persistent object data file. It is called by the persistent constructor and is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the

programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_CONSTRAINT::New

Syntax

```
#include <ui_win.hpp>

static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
    UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
    UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a persistent object from a data file. This function is a static class member so that its address can be placed in a table used by the library to load persistent objects from a data file.

NOTE: The application must first create a display if objects are to be loaded from a data file.

- *name*$_{in}$ is the name of the object to be loaded.
- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."
- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.
- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_CONSTRAINT::NewFunction

Syntax

```
#include <ui_win.hpp>

virtual ZIL_NEW_FUNCTION NewFunction(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns a pointer to the object's **New( )** function.

- *returnValue*$_{out}$ is a pointer to the object's **New( )** function.

UI_CONSTRAINT::Store

Syntax

```
#include <ui_win.hpp>

virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
    ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
    UI_ITEM *userTable);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to write an object to a data file.

- *name*$_{in}$ is the name of the object to be stored.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE where the persistent object will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

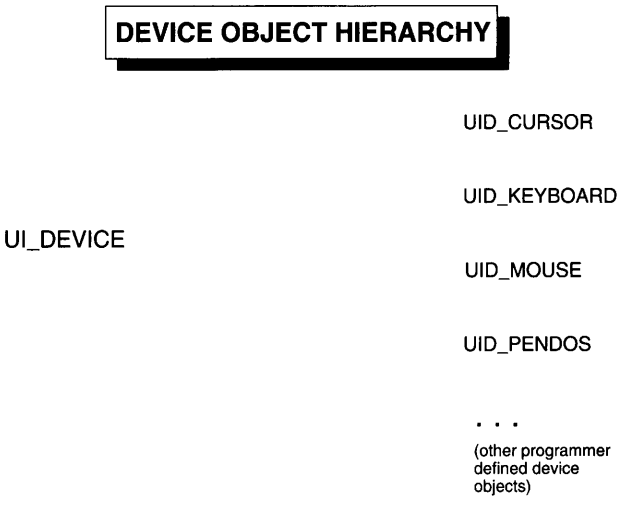
- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the persistent object information will be stored. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WIN-DOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

CHAPTER 5 – UI_DEVICE

The UI_DEVICE class is an abstract class that defines basic information associated with input devices (e.g., keyboard, mouse). Since the UI_DEVICE class is abstract, it cannot be used as a constructed class. Rather, derived classes, such as UID_KEYBOARD, UID_CURSOR, or UID_MOUSE must be used. The figure below shows the device object hierarchy:



Classes derived from the UI_DEVICE base class include:

UID_CURSOR—A blinking cursor shown on the screen. In text mode, this device is implemented as the hardware cursor. In graphics mode, this device paints a blinking cursor on the screen.

UID_KEYBOARD—A polled keyboard interface that retrieves keyboard information from the end-user.

UID_MOUSE—A polled mouse device that receives mouse information from the end-user.

UID_TIMER—A timer device that generates timer messages when a period of time specified by the programmer has expired.

Other programmer defined device objects—Any other programmer defined device that conforms to the operating protocol defined by the UI_DEVICE base class.

Input devices are attached to the Event Manager at run-time by the programmer. Once a device is attached, it feeds input information to the event queue when polled by the Event Manager, or it feeds directly to the event queue if it is an interrupt device.

The UI_DEVICE class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
enum ALT_STATE
{
    ALT_NOT_PRESSED,
    ALT_PRESSED_NO_EVENTS,
    ALT_PRESSED_EVENTS
};

class ZIL_EXPORT_CLASS UI_DEVICE : public UI_ELEMENT
{
public:
    static ALT_STATE altState;
    static UI_DISPLAY *display;
    static UI_EVENT_MANAGER *eventManager;

    int installed;
    ZIL_DEVICE_TYPE type;
    ZIL_DEVICE_STATE state;

    virtual ~UI_DEVICE(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event) = 0;

    // List members.
    UI_DEVICE *Next(void);
    UI_DEVICE *Previous(void);

protected:
    UI_DEVICE(ZIL_DEVICE_TYPE type, ZIL_DEVICE_STATE state);
    static int CompareDevices(void *device1, void *device2);
    virtual void Poll(void) = 0;
};
```

General Members

This section describes those members that are used for general purposes.

- *ALT_STATE* contains values that are used to indicate the status of the <ALT> key when an event occurs. The following values are used:

  ALT_NOT_PRESSED—The <ALT> key has not been pressed.

  ALT_PRESSED_NO_EVENTS—The <ALT> key has been pressed, but no other input information has been received since the key was pressed.

ALT_PRESSED_EVENTS—The <ALT> key continues to be pressed while another event has been received.

- *altState* is a static variable that indicates whether the keyboard <ALT> key is being pressed. It is used by the keyboard and mouse to detect the selection of <ALT> keys or else to send an <ALT> message if the <ALT> key is pressed and then released with no other keyboard or mouse event information.

- *display* is a pointer to a constructed display class. This variable is automatically set when the derived device is added to the Event Manager.

- *eventManager* is a pointer to a constructed Event Manager class. This variable is automatically set when the derived device is added to the Event Manager.

- *installed* indicates whether the input device was able to initialize itself. If installation is successful, *installed* is TRUE. If installation is not successful—for instance, if the mouse input device cannot find a mouse driver—*installed* is FALSE.

- *type* is the type of device that has been created. For example, the keyboard generates a type of E_KEY, the mouse generates a type of E_MOUSE and the cursor generates a type of E_CURSOR. Every device created either has a unique type or else it must have the generic device type E_DEVICE. The Event Manager uses the *type* information to route messages it receives to the proper device. The Event Manager receives device events via its **Event( )** member function.

- *state* describes the current state of the device. For example, the device may be on or off. The state can be any of several D_ codes, defined in **UI_EVT.HPP**. These codes are: D_OFF, D_ON, and D_HIDE. For example, if a keyboard device is in the D_OFF state, it will not generate any events. If a mouse is in the D_HIDE state, it will still be active, but it will not be visible on the screen.

UI_DEVICE::UI_DEVICE

Syntax

#include <ui_evt.hpp>

UI_DEVICE(ZIL_DEVICE_TYPE *type*, ZIL_DEVICE_STATE *state*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor initializes the information associated with all devices derived from the UI_DEVICE base class. The UI_DEVICE constructor is protected since UI_DEVICE is an abstract class (i.e., only derived instances of UI_DEVICE can be made.)

- *type*$_{in}$ specifies the type of derived device that is to be initialized. The contents of this argument are copied into the protected *type* member variable. Zinc Application Framework reserves the values 0 though 99 for raw input devices. The following devices are defined within Zinc Application Framework:

  E_CURSOR(50)—Identification for the UID_CURSOR class.

  E_DEVICE(99)—Identification used to define a generic device.

  E_KEY(10)—Identification for the UID_KEYBOARD class.

  E_MACINTOSH(4)—Identification for Macintosh events.

  E_MOTIF(3)—Identification for Motif events.

  E_MOUSE(30)—Identification for the UID_MOUSE class.

  E_MSWINDOWS(1)—Identification for MS Windows events.

  E_NEXTSTEP(11)—Identification for NEXTSTEP events.

  E_OS2(2)—Identification for OS/2 events.

  The *type* value associated with each device is significant, because the Event Manager polls devices in ascending order. Each derived device class must either use the E_DEVICE type or have a type that is unique and is within the 0-99 value restrictions. The following additional raw device identifications are reserved by Zinc

Application Framework for future use: 12-19, 31-39, 51-59, 70-79 and 90-98. The remaining values 5-9, 20-29, 40-49, 60-69 and 80-89 can be used by the programmer.

- *initialState*$_{in}$ specifies the initial state of the derived device. The information contained in this argument depends on the type of device created but should either be D_OFF or D_ON.

Example

```
#include <ui_evt.hpp>

UID_CURSOR::UID_CURSOR(ZIL_DEVICE_STATE initialState) :
    UI_DEVICE(E_CURSOR, initialState)
{
    .
    .
    .

}
```

UI_DEVICE::~UI_DEVICE

Syntax

#include <ui_evt.hpp>

virtual ~UI_DEVICE(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_DEVICE object. It is called when a derived device class is destroyed.

UI_DEVICE::CompareDevices

Syntax

#include <ui_evt.hpp>

static int CompareDevices(void *_device1_, void *_device2_);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function is used to compare two devices according to their types.

- *returnValue*$_{out}$ is 0 if the two devices have the same type. *returnValue* is positive if *device1* has a greater device type than *device2*. *returnValue* is negative if *device1* has a lower device type than *device2*.
- *device1*$_{in}$ is a pointer to a UI_DEVICE object.
- *device2*$_{in}$ is a pointer to a UI_DEVICE object.

Example

```
#include <ui_evt.hpp>

UI_EVENT_MANAGER::UI_EVENT_MANAGER(UI_DISPLAY *_display, int _noOfElements) :
    UI_LIST(UI_DEVICE::CompareDevices), queueBlock(_noOfElements), level(1)
{
    display = _display;
    UI_DEVICE::display = display;
    UI_DEVICE::eventManager = this;
}
```

UI_DEVICE::Event

Syntax

#include <ui_evt.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*) = 0;

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function is a pure virtual function, so it has no declaration. This means that every class which is derived from UI_DEVICE must have an **Event( )** function.

The **Event( )** function is used to communicate run-time state information to a particular device. For example, the **UID_KEYBOARD::Event( )** function can receive event information to turn on or off keyboard input. The type of information required by the **Event( )** function depends on the type of device that is to receive the message.

The *event.type* value contains the state information to be passed to the device. For example, if a programmer wanted to send the D_OFF message to all timer devices in the Event Manager, the following code could be used:

```
event.type = D_OFF;
event.region.left = 0;          // Define the whole screen.
event.region.top = 0;
event.region.right = display->columns - 1;
event.region.bottom = display->lines - 1;
eventManager->Event(event, E_TIMER);
```

The following general messages can be sent to a device:

D_HIDE—Hides the device while the application paints information to the screen. This advanced message prevents the device from leaving blank areas on the screen when low-level screen painting operations are performed. In general, a programmer should not use this message. Window objects and display classes automatically hide the input devices when they paint information to the screen. If the D_HIDE message is used, the *event.region* information must contain the region that will be re-painted.

This allows the affected device to only turn itself off when the affected region overlaps the device's screen position. This message must be used in conjunction with the D_ON message (described below) and should be used in the following order:

```
// Hide all devices before painting information to the screen.
UI_EVENT event;
event.type = D_HIDE;
event.region.left = 0;          // Define the whole screen.
event.region.top = 0;
event.region.right = display->columns - 1;
event.region.bottom = display->lines - 1;
eventManager->Event(event, E_DEVICE);
// Paint information directly to the screen.
.
.
.

// Show all devices that may have been shut off.
event.type = D_ON;              // event.region was defined previously
eventManager->Event(event, E_DEVICE);
```

D_OFF—Turns the device off.

D_ON—Turns the device on.

S_DEINITIALIZE—Serves as a warning that the device is being subtracted from the Event Manager. This allows the device to halt further execution and/or prepare to be deleted.

S_INITIALIZE—Initializes internal information associated with the device. This message can be used when the device cannot initialize all its information at the time that the class constructor is called.

S_POSITION—Changes the screen position of the device. If this message is sent, *event.position.column* and *event.position.line* must contain the run-time display position of the device on the screen. The values of *event.position.column* and *event.position.line* depend on the type of display mode in which the application is running. For example, if a UID_CURSOR object is to be positioned at the center of the screen while the application is running in text mode (e.g., an 80 column by 25 line screen) the position values should be:

```
event.position.column = 40;
event.position.line = 13;
```

If, on the other hand, the application is running in a 640 column by 480 line graphics mode, the position values should be:

```
event.position.column = 320;
event.position.line = 240;
```

If the device is in a D_OFF state, the position change should be reflected when the device is turned back on.

In addition to the messages described above, each device may be sent private messages defined by the programmer. Zinc Application Framework reserves message numbers 0x0000 through 0x00FF. (Programmers may use any unsigned values greater than 0x00FF.)

NOTE: The chapters for the UID_CURSOR, UID_KEYBOARD and UID_MOUSE classes contain more information about some messages specific to those classes.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard to the event manager.
    UI_TEXT_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER eventManager(display);
    eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // Turn all the devices off.
    UI_EVENT event;
    event.type = D_OFF;
    for (UI_DEVICE *device = eventManager.First(); device;
        device = device->Next())
        device->Event(event);
    .
    .
    .

}
```

UI_DEVICE::Next

Syntax

#include <ui_win.hpp>

UI_DEVICE *Next(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the next device, if one exists, in the list of devices.

Example

```
UI_DISPLAY *display = new UI_TEXT_DISPLAY;
UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
*eventManager
    + new UID_KEYBOARD
    + new UID_MOUSE
    + new UID_CURSOR;

for (UI_DEVICE *device = eventManager->First(); device;
    device = device->Next());
    .
    .
    .
```

UI_DEVICE::Poll

Syntax

#include <ui_evt.hpp>

virtual void Poll(void) = 0;

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function is a pure virtual function, so it has no declaration. This means that every class which is derived from UI_DEVICE must have a **Poll** function.

The **Poll( )** function is used by **UI_EVENT_MANAGER::Get( )** to give input devices time to put event information into the event queue. For example, in DOS the **UID_KEYBOARD::Poll( )** function gets information from the keyboard BIOS and enters that information, as UI_EVENT information, into the Event Manager's queue of events.

The **Poll( )** function is called every time an event is requested from the Event Manager unless the Q_NO_POLL flag was set when requesting the event.

Example

```
#include <ui_evt.hpp>

int UI_EVENT_MANAGER::Get(UI_EVENT &event, Q_FLAGS flags)
{
    // Stay in loop while no event conditions are met.
    int error = -1;
    do
    {
        // Call all the polled devices.
        UI_DEVICE *device;
        if (!FlagSet(flags, Q_NO_POLL))
            for (device = First(); device; device = device->Next())
                device->Poll();
        .
        .
        .

    } while (error);

    // Return the error status.
    return (error);
}
```

UI_DEVICE::Previous

Syntax

#include <ui_win.hpp>

UI_DEVICE *Previous(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the previous device, if one exists, in the list of devices.

Example

```
UI_DISPLAY *display = new UI_TEXT_DISPLAY;
UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
*eventManager
    + new UID_KEYBOARD
    + new UID_MOUSE
    + new UID_CURSOR;

for (UI_DEVICE *device = eventManager->Last(); device;
    device = device->Previous());


    .
    .
    .
```

CHAPTER 6 – UI_DIMENSION_CONSTRAINT

The UI_DIMENSION_CONSTRAINT class object is used for geometry management. Specifically, this class limits the width and height dimensions of a managed object. The UI_DIMENSION_CONSTRAINT is added to the parent object's geometry manager. See "Chapter 14—UI_GEOMETRY_MANAGER" for more details on using the geometry manager.

The UI_DIMENSION_CONSTRAINT class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class UI_DIMENSION_CONSTRAINT : public UI_CONSTRAINT
{
public:
    UI_DIMENSION_CONSTRAINT(UI_WINDOW_OBJECT *_object,
        DNCF_FLAGS _dncFlags = DNCF_NO_FLAGS, int _minimum = 0,
        int _maximum = 0);
    virtual ~UI_DIMENSION_CONSTRAINT(void);

    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);
    virtual void Modify(void);

#if defined(ZIL_LOAD)
    virtual ZIL_NEW_FUNCTION NewFunction(void);
    static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    UI_DIMENSION_CONSTRAINT(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    virtual void Load(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
        ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif

protected:
    DNCF_FLAGS dncFlags;
    int maximum;
    int minimum;
};
```

General Members

This section describes those members that are used for general purposes.

- *dncFlags* are flags that define the operation of the UI_DIMENSION_CONSTRAINT class. A full description of the dimension constraint flags is given in the UI_DIMENSION_CONSTRAINT constructor.

- *maximum* is the maximum size allowed by the constraint. This value is specified in cell dimensions.

- *minimum* is the minimum size allowed by the constraint. This value is specified in cell dimensions.

UI_DIMENSION_CONSTRAINT::UI_DIMENSION_CONSTRAINT

Syntax

#include <ui_win.hpp>

UI_DIMENSION_CONSTRAINT(UI_WINDOW_OBJECT *_*object*,
DNCF_FLAGS _*dncFlags* = DNCF_NO_FLAGS, int _*minimum* = 0,
int _*maximum* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_DIMENSION_CONSTRAINT object.

- $\_object_{in}$ is the object to be managed.

- *_dncFlags*$_{in}$ are flags that define the operation of the UI_DIMENSION_-CONSTRAINT class. The following flags (declared in **UI_WIN.HPP**) control the general operation of a UI_DIMENSION_CONSTRAINT class object:

  DNCF_HEIGHT—Causes the constraint to manage the height of the managed object.

  DNCF_NO_FLAGS—Does not associate any special flags with the UI_DIMEN-SION_CONSTRAINT class. This flag should not be used in conjunction with any other DNCF_ flags.

  DNCF_WIDTH—Causes the constraint to manage the width of the managed object.

- *_minimum*$_{in}$ is the minimum size allowed by the constraint. This value is specified in cell dimensions.

- *_maximum*$_{in}$ is the maximum size allowed by the constraint. This value is specified in cell dimensions.

UI_DIMENSION_CONSTRAINT::~UI_DIMENSION_CONSTRAINT

Syntax

#include <ui_win.hpp>

virtual ~UI_DIMENSION_CONSTRAINT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_DIMENSION_CONSTRAINT object.

UI_DIMENSION_CONSTRAINT::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST *request*, void **data*,
ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the attachment object:

  I_CLEAR_FLAGS—Clears the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type DNCF_FLAGS that contains the flags to be cleared. This request only clears those flags that are passed in; it does not simply clear the entire field.

  I_GET_FLAGS—Requests the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type DNCF_FLAGS. If *data* is NULL, a pointer to *dncFlags* will be returned.

  I_GET_MAXDIMENSION—Returns the *maximum* size allowed by the constraint. If this message is sent, *data* must be a pointer to a variable of type **int** where the constraint's *maximum* will be copied.

I_GET_MINDIMENSION—Returns the *minimum* size allowed by the constraint. If this message is sent, *data* must be a pointer to a variable of type **int** where the constraint's *minimum* will be copied.

I_SET_FLAGS—Sets the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type DNCF_FLAGS that contains the flags to be set. This request only sets those flags that are passed in; it does not clear any flags that are already set.

I_SET_MAXDIMENSION—Sets the *maximum* size allowed by the constraint. If this message is sent, *data* must be a pointer to a variable of type **int** that contains the constraint's new *maximum*.

I_SET_MINDIMENSION—Sets the *minimum* size allowed by the constraint. If this message is sent, *data* must be a pointer to a variable of type **int** that contains the constraint's new *minimum*.

All other requests are passed to **UI_CONSTRAINT::Information( )** for processing.

- $data_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.
- $objectID_{in}$ is not used.

UI_DIMENSION_CONSTRAINT::Modify

Syntax

```
#include <ui_win.hpp>

virtual void Modify(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function ensures that the managed object's size is within the range specified for the constraint. The geometry manager calls each constraint's **Modify( )** function whenever the parent object's position is changed.

Storage Members

This section describes those class members that are used for storage purposes.

UI_DIMENSION_CONSTRAINT::UI_DIMENSION_CONSTRAINT

Syntax

```
#include <ui_win.hpp>

UI_DIMENSION_CONSTRAINT(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file,
    ZIL_STORAGE_OBJECT_READ_ONLY *object,
    UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
    UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_DIMENSION_CONSTRAINT by loading the object from a data file. Typically, the programmer does not need to use this constructor. If a constraint is stored in a data file it is usually stored as part of a geometry manager and will be loaded when the geometry manager is loaded.

- $name_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_DIMENSION_CONSTRAINT::Load

Syntax

#include <ui_win.hpp>

virtual void Load(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*, ZIL_STORAGE_OBJECT_READ_ONLY **object*, UI_ITEM **objectTable*, UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a UI_DIMENSION_CONSTRAINT from a persistent object data file. It is called by the persistent constructor and is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_DIMENSION_CONSTRAINT::New

Syntax

```
#include <ui_win.hpp>

static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
```

UI_ITEM *_objectTable_ = ZIL_NULLP(UI_ITEM),
UI_ITEM *_userTable_ = ZIL_NULLP(UI_ITEM));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a persistent object from a data file. This function is a static class member so that its address can be placed in a table used by the library to load persistent objects from a data file.

NOTE: The application must first create a display if objects are to be loaded from a data file.

- $name_{in}$ is the name of the object to be loaded.

- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- $objectTable_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- $userTable_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table

created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_DIMENSION_CONSTRAINT::NewFunction

Syntax

#include <ui_win.hpp>

virtual ZIL_NEW_FUNCTION NewFunction(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function returns a pointer to the object's **New( )** function.

- *returnValue*$_{out}$ is a pointer to the object's **New( )** function.

UI_DIMENSION_CONSTRAINT::Store

Syntax

#include <ui_win.hpp>

virtual void Store(const ZIL_ICHAR **name*, ZIL_STORAGE **file*,
ZIL_STORAGE_OBJECT **object*, UI_ITEM **objectTable*,
UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to write an object to a data file.

- *name*$_{in}$ is the name of the object to be stored.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE where the persistent object will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

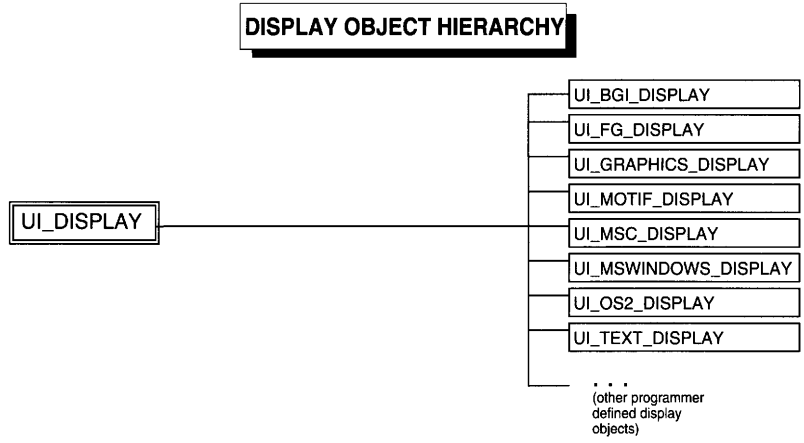
- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the persistent object information will be stored. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WIN-DOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

CHAPTER 7 – UI_DISPLAY

The UI_DISPLAY class is the base class for all display classes used in Zinc. A display class is used to draw to the screen, whether in graphics mode, in text mode or in a graphical operating system. The UI_DISPLAY class defines the functionality that must exist in each derived display class. While the UI_DISPLAY class is not technically abstract (i.e., it contains no pure virtual functions), it should not be used as a constructed class. Rather, derived classes, such as UI_BGI_DISPLAY, UI_MSWINDOWS_DISPLAY or UI_NEXTSTEP_DISPLAY must be used. The figure below shows the display object hierarchy:



Classes derived from the UI_DISPLAY base class include:

UI_BGI_DISPLAY—A DOS graphics display that uses the Borland BGI graphics library to draw on the screen. The UI_BGI_DISPLAY class provides support for CGA, EGA, VGA and Hercules monochrome display adapters running in graphics mode.

UI_GRAPHICS_DISPLAY—A graphics display that uses the GFX graphics library to draw on the screen. The UI_GRAPHICS_DISPLAY class provides support for CGA, EGA, VGA, SVGA and Hercules monochrome display adapters running in graphics mode.

UI_MACINTOSH_DISPLAY—A graphics display class that uses the Macintosh graphics interface to draw within the Macintosh environment.

UI_MSC_DISPLAY—A DOS graphics display that uses the Microsoft C Graphics library to draw on the screen. The UI_MSC_DISPLAY class provides support for CGA, EGA, VGA, SVGA and Hercules monochrome display adapters running in graphics mode.

UI_MSWINDOWS_DISPLAY—A graphics display that uses the Microsoft Windows graphics interface to draw within the Windows environment.

UI_NEXTSTEP_DISPLAY—A graphics display class that uses the NEXTSTEP graphics interface to draw within the NEXTSTEP environment.

UI_OS2_DISPLAY—A graphics display class that uses the OS/2 graphics interface to draw within the OS/2 environment.

UI_TEXT_DISPLAY—A text display that draws to screen memory. The UI_-TEXT_DISPLAY class provides support for MDA, CGA, EGA and VGA display adapters running DOS text mode or Curses. This includes the following modes of operation:

- 25 line x 40 column mode
- 25 line x 80 column mode
- 43 line x 80 column mode
- 50 line x 80 column mode

This class also contains support for snow checking (CGA monitors) and IBM TopView (which supports operation in the Microsoft Windows and Quarterdeck desqVIEW environments).

UI_WCC_DISPLAY—A DOS graphics display class that uses the Watcom graphics library to draw on the screen. The UI_WCC_DISPLAY class provides support for CGA, EGA, VGA, SVGA and Hercules monochrome display adapters running in graphics mode.

UI_XT_DISPLAY—A graphics display class that uses the Motif graphics interface to draw within the Motif environment.

Other programmer defined screen display objects—Any other programmer defined display class that conforms to the operating protocol defined by the UI_DISPLAY base class.

By abstracting the display class, an application does not need to know which display class has been created. If, for example, the application needs to draw a rectangle, it can simply

call the display's virtual **Rectangle( )** member function. The application can thus be written generically for all environments.

The UI_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_DISPLAY : public ZIL_INTERNATIONAL
{
public:
    int installed;
    int isText;
    int isMono;
    int columns, lines;
    int cellWidth, cellHeight;
    int preSpace, postSpace;
    ZIL_INT32 miniNumeratorX, miniDenominatorX;
    ZIL_INT32 miniNumeratorY, miniDenominatorY;
    ZIL_ICHAR *operatingSystem;
    ZIL_ICHAR *windowingSystem;

    static UI_PALETTE *backgroundPalette;
    static UI_PALETTE *xorPalette;
    static UI_PALETTE *colorMap;

#if defined(ZIL_MSDOS) || defined(ZIL_CURSES)
    static UI_PALETTE *markPalette;
#elif defined(ZIL_MSWINDOWS)
#if defined(ZIL_MSWINDOWS)
    HANDLE hInstance;
    HANDLE hPrevInstance;
    int nCmdShow;
#elif defined(ZIL_OS2)
    HAB hab;
#elif defined(ZIL_XT)
    XtAppContext appContext;
    Widget topShell;
    Display *xDisplay;
    Screen *xScreen;
    int xScreenNumber;
    GC xGc;
    GC xorGC;
    char *appClass;
    Pixmap interleaveStipple;
#endif

    virtual ~UI_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
```

```
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    static RGBColor MapRGBColor(ZIL_COLOR fromColor);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    void Rectangle(ZIL_SCREENID screenID, const UI_REGION &region,
        const UI_PALETTE *palette, int width = 1, int fill = FALSE,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    void RegionDefine(ZIL_SCREENID screenID, const UI_REGION &region);
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    int VirtualGet(ZIL_SCREENID screenID, const UI_REGION &region);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);


protected:
    struct ZIL_EXPORT_CLASS UI_DISPLAY_IMAGE
    {
        UI_REGION region;
        ZIL_UINT8 *image;
        ZIL_UINT8 *screen;
        ZIL_UINT8 *backup;
    };

    UI_DISPLAY_IMAGE displayImage[MAX_DISPLAY_IMAGES];

    UI_DISPLAY(int isText,
        const ZIL_ICHAR *operatingSystem = ZIL_NULLP(ZIL_ICHAR),
        const ZIL_ICHAR *windowingSystem = ZIL_NULLP(ZIL_ICHAR));
    int RegionInitialize(UI_REGION &region, const UI_REGION *clipRegion,
        int left, int top, int right, int bottom);
```

```
public:
    // Character encoding
    static ZIL_ICHAR codeSet[15];
};
```

General Members

This section describes those members that are used for general purposes.

- *installed* indicates if the display class has been successfully installed. *installed* is set to FALSE by the UI_DISPLAY class. Derived display classes will set this variable to TRUE if the display installs correctly.

- *isText* indicates whether the display is a text mode display or a graphics mode display. *isText* is TRUE if the application is running in text mode. Otherwise, *isText* is FALSE.

- *isMono* indicates if the display class is operating in monochrome mode. *isMono* is TRUE if the display is a monochrome display. Otherwise, it is FALSE.

- *columns* contains the number of columns that can be displayed in the current mode.

- *lines* contains the number of lines that can be displayed in the current mode.

- *cellWidth* is the width of a cell. Zinc logically divides the display into a grid of cells. Most objects are positioned based on cell coordinates. If the display is a text mode display, *cellWidth* is 1. Otherwise, *cellWidth* is a pixel value set in the display class constructor based on the width of characters in the font.

- *cellHeight* is the height of a cell. Zinc logically divides the display into a grid of cells. Most objects are positioned based on cell coordinates. If the display is a text mode display, *cellHeight* is 1. Otherwise, *cellHeight* is a pixel value set in the display class constructor based on the height of characters in the font.

- *preSpace* denotes the size (in pixels) of the white space between the top of an object and the top of a cell.

- *postSpace* denotes the size (in pixels) of the white space between the bottom of an object and the bottom of a cell.

- *miniNumeratorX* and *miniDenominatorX* are values used to determine the width of a minicell. A minicell is a fraction of a cell. By using minicells to size or position

objects instead of cells, more precise placement can be achieved. By default, *miniNumeratorX* is 1 and *miniDenominatorX* is 10. These values result in a minicell being 1/10th the width of a normal cell.

- *miniNumeratorY* and *miniDenominatorY* are values used to determine the height of a minicell. A minicell is a fraction of a cell. By using minicells to size or position objects instead of cells, more precise placement can be achieved. By default, *miniNumeratorY* is 1 and *miniDenominatorY* is 10. These values result in a minicell being 1/10th the height of a normal cell.

- *operatingSystem* identifies the operating system the application is running on. For example, when running in DOS, *operatingSystem* is "DOS." In MS-Windows it is "Windows."

- *windowingSystem* identifies the windowing system the application is using. For example, when using the UI_GRAPHICS_DISPLAY class, *windowingSystem* is "GFX." In MS-Windows, it is "Windows."

- *backgroundPalette* is a pointer to the color palette used to draw the background of the screen.

- *xorPalette* is a pointer to the color palette used when doing XOR drawing.

- *colorMap* is a palette table containing basic colors and their appropriate black-and-white or grayscale equivalents.

- *markPalette* is a palette table used to draw marked portions of editable fields. This member is only available in DOS and Curses.

- *hInstance* is a handle that identifies the current instance of the application. This member is only available in Windows.

- *hPrevInstance* indicates if the current instance of the application is the first instance. This member is only available in Windows.

- *nCmdShow* is a pointer to any parameters entered from the command line. This member is only available in Windows.

- *hab* is the OS/2 anchor block handle. This member is only available in OS/2.

- *appContext* is the Xt Intrinsics application context. This member is only available in Motif.

- *topShell* is the initial application shell instance returned by **XtAppInitialize( )**. This member is only available in Motif.

- *xDisplay* is the X Window display. This member is only available in Motif.

- *xScreen* is a pointer to the X Window screen. This member is only available in Motif.

- *xScreenNumber* is the X Window screen number. This member is only available in Motif.

- *xGc* is the X Window graphics context. This member is only available in Motif.

- *xorGC* is the X Window graphics context used when doing XOR drawing. This member is only available in Motif.

- *appClass* is the application class name used in the call to XtInitialize. This member is set to "ZincApp" by default but can be set to whatever the programmer wishes. X Windows looks for a resource file by the same name. This resource file can be used to set default values for fonts, colors and other values. Zinc distributes a file called **ZincApp** that contains the default values for a Zinc application. The programmer may alter this file as desired. This member is only available in Motif.

- *interleaveStipple* is a Pixmap specifying the interleave fill pattern. This member is only available in Motif.

- *UI_DISPLAY_IMAGE* is a structure used when drawing device images. It maintains the following: a region where the device image is located; the device image itself; an image of the screen before the device image is placed there; and a scratch pad used when getting or putting images from and to the screen.

  region is the region of the images being maintained.

  image is the device image.

  screen is a "picture" of the screen at the region specified by *region* before the device image was displayed in the region. This image is used to restore the display after the device image is moved to another location.

  backup is a "scratch pad" used when transferring images to and from the screen.

- *displayImage* is an array of UI_DISPLAY_IMAGE structures. This array maintains the information used to restore the region of the screen where a device image, such as the mouse pointer, has been displayed.

- *codeSet* identifies the code set the application is using. This is used to map characters between the hardware code set and the code set used internally by Zinc (e.g., either ISO8859-1 or Unicode).

UI_DISPLAY::UI_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_DISPLAY(int *isText*,
    const ZIL_ICHAR **operatingSystem* = ZIL_NULLP(ZIL_ICHAR),
    const ZIL_ICHAR **windowingSystem* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_DISPLAY object. The UI_DISPLAY constructor is protected, since only derived instances of UI_DISPLAY should be created.

- $isText_{in}$ indicates whether a text or graphics display is being created. *isText* is TRUE if a text mode display is being created. Otherwise, it is FALSE. *isText* is used to set the *isText* member variable.

- $operatingSystem_{in}$ identifies the operating system the application is running on. For example, when running in DOS, *operatingSystem* is "DOS." In MS-Windows it is "Windows."

- *windowingSystem*$_{in}$ identifies the windowing system the application is using. For example, when using the UI_GRAPHICS_DISPLAY class, *windowingSystem* is "GFX." In MS-Windows, it is "Windows."

Example 1

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

Example 2

```
#include <ui_dsp.hpp>

UI_MSC_DISPLAY::UI_MSC_DISPLAY(int mode):
    UI_DISPLAY(FALSE)
{
    .
    .
    .

}
```

UI_DISPLAY::~UI_DISPLAY

Syntax

#include <ui_dsp.hpp>

virtual ~UI_DISPLAY(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_DISPLAY object.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    UI_WINDOW_MANAGER *windowManager = UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_DISPLAY::Bitmap

Syntax

#include <ui_dsp.hpp>

virtual void Bitmap(ZIL_SCREENID *screenID*, int *column*, int *line*, int *bitmapWidth*,
int *bitmapHeight*, const ZIL_UINT8 **bitmapArray*,
const UI_PALETTE **palette* = ZIL_NULLP(UI_PALETTE),
const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION),
ZIL_BITMAP_HANDLE **colorBitmap* = ZIL_NULLP(ZIL_BITMAP_HANDLE),
ZIL_BITMAP_HANDLE **monoBitmap* = ZIL_NULLP(ZIL_BITMAP_HANDLE));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function draws a bitmap image. The bitmap is defined by either an array of **ZIL_UINT8** values, where each array element represents a bitmap pixel color, or by environment-specific bitmap handles.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's, there are two special screenID values that can be used:

  ID_DIRECT—Causes drawing to be done directly to the display, no matter where the drawing location is. This screenID may not have any effect in graphical operating systems since drawing outside the application's window regions may be restricted by the operating system.

  ID_SCREEN—Causes drawing to be done to the screen background. Clipping will be performed so that the drawing does not overlap any windows. This screenID may not have any effect in graphical operating systems since drawing outside the application's window regions may be restricted by the operating system.

- *column*$_{in}$ and *line*$_{in}$ is the upper-left corner of the bitmap, in pixel coordinates, relative to the upper-left corner of the region identified by the *screenID* that was passed in.

- *bitmapWidth*$_{in}$ and *bitmapHeight*$_{in}$ are the bitmap's pixel width and height.

- *bitmapArray*$_{in}$ is the bitmap pattern to be displayed. The bitmap pattern is mapped into an internal palette map (shown below). The color mapping is done to ensure that the bitmap can be shown as clearly as possible if the display is a monochrome or black-and-white display.

- *palette*$_{in}$ is a pointer to a palette table that overrides the default palette map. The default palette map is shown below:

```
static UI_PALETTE _colorMap[16] =
{
    { ' ', attrib(BLACK, BLACK), attrib(MONO_BLACK, MONO_BLACK),
      PTN_SOLID_FILL, BLACK, BLACK, BW_BLACK, BW_BLACK, GS_BLACK,
      GS_BLACK },
    { ' ', attrib(BLUE, BLUE), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, BLUE, BLUE, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(GREEN, GREEN), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, GREEN, GREEN, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(CYAN, CYAN), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, CYAN, CYAN, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(RED, RED), attrib(MONO_DIM, MONO_BLACK),
      PTN_SOLID_FILL, RED, RED, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(MAGENTA, MAGENTA), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, MAGENTA, MAGENTA, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(BROWN, BROWN), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, BROWN, BROWN, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(LIGHTGRAY, LIGHTGRAY), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, LIGHTGRAY, LIGHTGRAY, BW_BLACK, BW_BLACK,
      GS_GRAY,GS_GRAY},
    { ' ', attrib(DARKGRAY, DARKGRAY), attrib(MONO_DIM, MONO_DIM),
      PTN_SOLID_FILL, DARKGRAY, DARKGRAY, BW_BLACK, BW_BLACK, GS_GRAY,
      GS_GRAY },
    { ' ', attrib(LIGHTBLUE, LIGHTBLUE), attrib(MONO_NORMAL, MONO_DIM),
      PTN_SOLID_FILL, LIGHTBLUE, LIGHTBLUE, BW_WHITE, BW_WHITE,
      GS_WHITE, GS_WHITE },
    { ' ', attrib(LIGHTGREEN, LIGHTGREEN), attrib(MONO_NORMAL,
      MONO_DIM),  PTN_SOLID_FILL, LIGHTGREEN, LIGHTGREEN, BW_WHITE,
      BW_WHITE, GS_WHITE, GS_WHITE },
    { ' ', attrib(LIGHTCYAN, LIGHTCYAN), attrib(MONO_NORMAL, MONO_DIM),
      PTN_SOLID_FILL, LIGHTCYAN, LIGHTCYAN, BW_WHITE, BW_WHITE,
      GS_WHITE, GS_WHITE },
    { ' ', attrib(LIGHTRED, LIGHTRED), attrib(MONO_NORMAL, MONO_DIM),
      PTN_SOLID_FILL, LIGHTRED, LIGHTRED, BW_WHITE, BW_WHITE,
      GS_WHITE, GS_WHITE },
    { ' ', attrib(LIGHTMAGENTA, LIGHTMAGENTA), attrib(MONO_NORMAL,
      MONO_DIM),  PTN_SOLID_FILL, LIGHTMAGENTA, LIGHTMAGENTA,
      BW_WHITE, BW_WHITE, GS_WHITE, GS_WHITE },
    { ' ', attrib(YELLOW, YELLOW), attrib(MONO_NORMAL, MONO_DIM),
      PTN_SOLID_FILL, YELLOW, YELLOW, BW_WHITE, BW_WHITE, GS_WHITE,
      GS_WHITE },
    { ' ', attrib(WHITE, WHITE), attrib(MONO_NORMAL, MONO_DIM),
      PTN_SOLID_FILL, WHITE, WHITE, BW_WHITE, BW_WHITE, GS_WHITE,
      GS_WHITE }
};
```

NOTE: If a palette map is provided it must contain entries for all possible bitmap colors.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Bitmap( )** function. If *clipRegion* is NULL, no additional clipping is performed.

- *colorBitmap*$_{in}$ is a ZIL_BITMAP_HANDLE structure that is specific to the native environment. *colorBitmap* is the bitmap image to be displayed.

- *monoBitmap*$_{in}$ is a ZIL_BITMAP_HANDLE structure that is specific to the native environment. *monoBitmap* is a mask that specifies which pixels of the *colorBitmap* to draw and which ones to ignore. Those parts of the bitmap that are not drawn will appear transparent.

NOTE: Bitmaps do not have text screen equivalents. Thus, this function should be used with caution.

Example

```
#include <ui_win.hpp>
#include <string.h>

EVENT_TYPE UIW_ICON::Event(const UI_EVENT &event)
{
    // Switch on the event type.
    int redisplay = FALSE;
    int border = FlagSet(woFlags, WOF_BORDER) ? 1 : 0;
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_ICON);
    switch (ccode)
    {
        .
        .
        .

    }

    // Redisplay the object information.
    if (redisplay && ratioWidth == 1 && !display->istext)
        display->Bitmap(screenID, iconRegion.left, iconRegion.top, bitmapWidth,
            bitmapHeight, bitmapArray);
    .
    .
    .

    // Return the control code.
    return (ccode);
}
```

UI_DISPLAY::BitmapArrayToHandle

Syntax

#include <ui_dsp.hpp>

virtual void BitmapArrayToHandle(ZIL_SCREENID *screenID*, int *bitmapWidth*,
int *bitmapHeight*, const ZIL_UINT8 **bitmapArray*,
const UI_PALETTE **palette*, ZIL_BITMAP_HANDLE **colorBitmap*,
ZIL_BITMAP_HANDLE **monoBitmap*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function converts a bitmap array to two handles. Handles are pointers to environment specific storage structures that allow the bitmap to be drawn much faster than drawing individual pixels. The bitmap is defined by an array of **ZIL_UINT8** values where each array element represents a bitmap pixel color.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's, there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *bitmapWidth*$_{in}$ and *bitmapHeight*$_{in}$ are the bitmap's pixel width and height.

- *bitmapArray*$_{in}$ is the bitmap pattern to be converted. The bitmap pattern is mapped into an internal palette map. The color mapping is done to ensure that the bitmap can be shown as clearly as possible if the display is a monochrome or black-and-white display.

- *palette*$_{in}$ is a pointer to a palette table that overrides the default palette map.

- *colorBitmap*$_{out}$ is a ZIL_BITMAP_HANDLE structure that is specific to the native environment. *colorBitmap* is the bitmap image to be displayed.

- *monoBitmap*$_{out}$ is a ZIL_BITMAP_HANDLE structure that is specific to the native environment. *monoBitmap* is a mask that specifies which pixels of the *colorBitmap* to draw and which ones to ignore. Those parts of the bitmap that are not drawn will appear transparent.

NOTE: Bitmaps do not have text screen equivalents. Thus, this function should be used with caution.

Example

```
#include <ui_dsp.hpp>

void UI_OS2_DISPLAY::Bitmap(ZIL_SCREENID screenID, int left, int top,
    int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
    const UI_PALETTE *palette, const UI_REGION *,
    ZIL_BITMAP_HANDLE *_colorBitmap, ZIL_BITMAP_HANDLE *_monoBitmap)
{
    .
    .
    .

    // Convert the bitmap array then draw the bitmap.
    if (!colorBitmap)
        BitmapArrayToHandle(screenID, bitmapWidth, bitmapHeight, bitmapArray,
            palette, &colorBitmap, &monoBitmap);
    .
    .
    .

}
```

UI_DISPLAY::BitmapHandleToArray

Syntax

#include <ui_dsp.hpp>

virtual void BitmapHandleToArray(ZIL_SCREENID *screenID*,
ZIL_BITMAP_HANDLE *colorBitmap*, ZIL_BITMAP_HANDLE *monoBitmap*,
int **bitmapWidth*, int **bitmapHeight*, ZIL_UINT8 ***bitmapArray*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts an environment-specific bitmap handle to an array of **ZIL_UINT8** values where each array element represents a bitmap pixel color.

- $screenID_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified

by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *colorBitmap*$_{in}$ is a ZIL_BITMAP_HANDLE structure that is specific to the native environment. *colorBitmap* is the bitmap image to be displayed.

- *monoBitmap*$_{in}$ is a ZIL_BITMAP_HANDLE structure that is specific to the native environment. *monoBitmap* is a mask that specifies which pixels of the *colorBitmap* to draw and which ones to ignore. Those parts of the bitmap that are not drawn will appear transparent.

- *bitmapWidth*$_{out}$ and *bitmapHeight*$_{out}$ are the bitmap's pixel width and height.

- *bitmapArray*$_{out}$ is the bitmap pattern that was converted.

UI_DISPLAY::Ellipse

Syntax

#include <ui_dsp.hpp>

virtual void Ellipse(ZIL_SCREENID *screenID*, int *column*, int *line*, int *startAngle*,
int *endAngle*, int *xRadius*, int *yRadius*, const UI_PALETTE **palette*,
int *fill* = FALSE, int *_xor* = FALSE,
const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function draws and/or fills an ellipse. The ellipse is defined by starting and ending angles and horizontal and vertical radii.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *column*$_{in}$ and *line*$_{in}$ is the upper-left corner of the bitmap, in pixel coordinates, relative to the upper-left corner of the region identified by the *screenID* that was passed in.

- *startAngle*$_{in}$ and *endAngle*$_{in}$ are starting and ending angles, in degrees, of the ellipse. If a complete ellipse is desired, *startAngle* should be 0 and *endAngle* should be 360.

- *xRadius*$_{in}$ and *yRadius*$_{in}$ are the horizontal and vertical radii of the ellipse, in pixels.

- *palette*$_{in}$ is a pointer to the palette structure that defines the color to draw the ellipse. The palette's foreground color is used to draw the border of the ellipse. The palette's background color is used to fill the ellipse (if *fill* is TRUE).

- *fill*$_{in}$ indicates whether the ellipse should be filled. If *fill* is TRUE, the ellipse is filled according to the specified palette's fill pattern and background color. Otherwise the ellipse is not filled.

- *_xor*$_{in}$ indicates if the ellipse should be XOR'ed with the image it overwrites. If *_xor* is TRUE, the ellipse is drawn using an XOR attribute. Otherwise it simply draws over the existing image.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Ellipse( )** function. If *clipRegion* is NULL, no additional clipping is performed.

NOTE: Ellipses do not have text screen equivalents. Thus, this function should be used with caution.

Example

```
#include <ui_dsp.hpp>

class CIRCLE : public UI_WINDOW_OBJECT
{
public:
     .
     .
     .
```

```
    int fill;
};

EVENT_TYPE CIRCLE::Event(const UI_EVENT &event)
{
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_CIRCLE);

    switch (ccode)
    {
    case S_DISPLAY_INACTIVE:
    case S_DISPLAY_ACTIVE:
        if (display->isText || !UI_WINDOW_OBJECT::NeedsUpdate(event, ccode))
            break;

        // Set up a temporary clip region then draw the circle.
        display->RegionDefine(screenID | 0x1000, true);
        int column = true.left + (relative.right - relative.left) / 2;
        int line = true.top + (relative.bottom - relative.top) / 2;
        int radius = (relative.bottom - relative.top) / 2;
        if (radius < (relative.right - relative.left) / 2)
            radius = (relative.right - relative.left) / 2;
        display->Ellipse(screenID, column, line, 0, 360, radius,
            radius, lastPalette, fill);
        // Restore the normal region.
        display->RegionDefine(screenID, true);
        break;
    .
    .
    .

    }

    // Return the control code.
    return (ccode);
}
```

UI_DISPLAY::IconArrayToHandle

Syntax

#include <ui_dsp.hpp>

virtual void IconArrayToHandle(ZIL_SCREENID *screenID*, int *iconWidth*, int *iconHeight*, const ZIL_UINT8 **iconArray*, const UI_PALETTE **palette*, ZIL_ICON_HANDLE **icon*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function converts an icon image array to an icon handle. A handle is a pointer to an environment specific storage structure that allows the icon to be drawn much faster than drawing individual pixels. The bitmap is defined by an array of **ZIL_UINT8** values where each array element represents a pixel color.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *iconWidth*$_{in}$ and *iconHeight*$_{in}$ are the icon's pixel width and height.

- *iconArray*$_{in}$ is the icon image pattern. The icon image pattern is mapped into an internal palette map. The color mapping is done to ensure that the image can be shown as clearly as possible if the display is a monochrome or black-and-white display.

- *palette*$_{in}$ is a pointer to a palette table that overrides the default palette map.

- *icon*$_{out}$ is an operating system-specific icon handle. Wherever possible, the icon array is converted to a format that the operating system or graphics library can process more efficiently than a bitmap array.

NOTE: Icons do not have text screen equivalents. Thus, this function should be used with caution.

UI_DISPLAY::IconHandleToArray

Syntax

#include <ui_dsp.hpp>

virtual void IconHandleToArray(ZIL_SCREENID *screenID*, ZIL_ICON_HANDLE *icon*, int **iconWidth*, int **iconHeight*, ZIL_UINT8 ***iconArray*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function converts an icon handle to an array of **ZIL_UINT8** values where each array element represents an icon image pixel color.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *icon*$_{in}$ is an operating system-specific icon handle that is to be converted. Wherever possible, the icon array is converted to a format that the operating system or graphics library can process more efficiently than a bitmap array.

- *iconWidth*$_{out}$ and *iconHeight*$_{out}$ are the pixel width and height of the icon array.

- *iconArray*$_{out}$ is the icon image pattern that was converted.

NOTE: Icons do not have text screen equivalents. Thus, this function should be used with caution.

UI_DISPLAY::Line

Syntax

#include <ui_dsp.hpp>

virtual void Line(ZIL_SCREENID *screenID*, int *column1*, int *line1*, int *column2*, int *line2*,
const UI_PALETTE **palette*, int *width* = 1, int *_xor* = FALSE,
const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function draws a line. The line is defined by a starting point and an ending point. Care should be taken when using this function in text mode, as diagonal lines will not display as expected.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it: The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *column1*$_{in}$ and *line1*$_{in}$ is the starting position of the line relative to the upper-left corner of the region identified by the *screenID* that was passed in. These values should be in pixel coordinates if the display is a graphics display or in text coordinates if it is a text mode display.

- *column2*$_{in}$ and *line2*$_{in}$ is the ending position of the line relative to the upper-left corner of the region identified by the *screenID* that was passed in. These values should be in pixel coordinates if the display is a graphics display or in text coordinates if it is a text mode display.

- *palette*$_{in}$ is a pointer to the palette structure that defines the color to draw the line. The palette's foreground color is used to draw the line.

- *width*$_{in}$ is the width of the line. If the application is running in text mode, *width* is in cell widths. Otherwise, *width* is in pixel coordinates.

- *_xor*$_{in}$ indicates if the line should be XOR'ed with the image it overwrites. If *_xor* is TRUE, the line is drawn using an XOR attribute. Otherwise it simply draws over the existing image.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Line( )** function. If *clipRegion* is NULL, no additional clipping is performed.

Example

```
void UI_WINDOW_OBJECT::Border(EVENT_TYPE ccode, UI_REGION &region,
    const UI_PALETTE *palette)
{
    // Determine the border and update the region.
    region = true;
    .
    .
    .

    int displayBorder = (ccode == S_DISPLAY_ACTIVE ||
        ccode == S_NON_CURRENT || ccode == S_DISPLAY_INACTIVE ||
        ccode == S_CURRENT) ? TRUE : FALSE;


    if (displayBorder && palette)
    {
        UI_PALETTE tPalette = *palette;
        tPalette.colorForeground = tPalette.colorBackground;
        tPalette.bwForeground = tPalette.bwBackground;
        tPalette.grayScaleForeground = tPalette.grayScaleBackground;
        display->Line(screenID, region.left, region.top, region.left,
            region.bottom, &tPalette);
        display->Line(screenID, region.right, region.top, region.right,
            region.bottom, &tPalette);
        .
        .
        .

    }
    region.left++;
    region.right--;
    .
    .
    .

}
```

UI_DISPLAY::MapColor

Syntax

#include <ui_dsp.hpp>

virtual ZIL_COLOR MapColor(const UI_PALETTE **palette*, int *isForeground*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function returns the mapped color from a palette according to the type of display and the programmer request. For example, if the display is a black-and-white display, the appropriate black-and-white color will be returned.

- *returnValue*$_{out}$ is the color that was mapped to, according to the type of display and the type of request.
- *palette*$_{in}$ is the palette from which the colors are to be mapped.
- *isForeground*$_{in}$ indicates whether the palette's foreground or background color is desired. If *isForeground* is TRUE, the foreground color will be returned. Otherwise, the background color will be returned.

UI_DISPLAY::Polygon

Syntax

```
#include <ui_dsp.hpp>

virtual void Polygon(ZIL_SCREENID screenID, int numPoints, const int *polygonPoints,
    const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
    const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function draws and/or fills a polygon. The polygon is defined by a set of vertices.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *numPoints*$_{in}$ is the number of points in the polygon.

- *polygonPoints*$_{in}$ is a pointer to an array of integers (i.e., *numPoints* x 2). Each integer pair gives a column and line point on the polygon. These values should be in pixel coordinates relative to the upper-left corner of the region identified by the *screenID* that was passed in.

- *palette*$_{in}$ is a pointer to the palette structure that defines the color to draw the polygon. The palette's foreground color is used to draw the border of the polygon. The palette's background color is used to fill the polygon (if *fill* is TRUE).

- *fill*$_{in}$ indicates whether the polygon should be filled. If *fill* is TRUE, the polygon is filled according to the specified palette's fill pattern and background color. Otherwise the polygon is not filled.

- *_xor*$_{in}$ indicates if the polygon should be XOR'ed with the image it overwrites. If *_xor* is TRUE, the polygon is drawn using an XOR attribute. Otherwise it simply draws over the existing image.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Polygon( )** function. If *clipRegion* is NULL, no additional clipping is performed.

NOTE: Polygons do not have text screen equivalents. Thus, this function should be used with caution.

Example

```
#include <ui_dsp.hpp>

class TRIANGLE : public UI_WINDOW_OBJECT
{
```

```
public:
    .
    .
    .

    int fill;
};

EVENT_TYPE TRIANGLE::Event(const UI_EVENT &event)
{
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_TRIANGLE);
    switch (ccode)
    {
    case S_DISPLAY_INACTIVE:
    case S_DISPLAY_ACTIVE:
        if (display->isText || !UI_WINDOW_OBJECT::NeedsUpdate(event, ccode))
            break;

        // Set up a temporary clip region then draw the triangle.
        display->RegionDefine(screenID | 0x1000, true);
        int triangle[8];
        triangle[0] = triangle[6] =
            true.left + (relative.right - relative.left) / 2;
        triangle[1] = triangle[7] = true.top;
        triangle[2] = true.left;
        triangle[3] = triangle[5] = true.top + relative.bottom;
        triangle[4] = true.left + relative.right;
        display->Polygon(screenID, 4, triangle, lastPalette, fill);
        // Restore the normal region.
        display->RegionDefine(screenID, true);
        break;
    .
    .
    .

    }

    // Return the control code.
    return (ccode);
}
```

UI_DISPLAY::Rectangle

Syntax

#include <ui_dsp.hpp>

void Rectangle(ZIL_SCREENID *screenID*, const UI_REGION &*region*,
const UI_PALETTE **palette*, int *width* = 1, int *fill* = FALSE, int *_xor* = FALSE,
const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION));
or

virtual void Rectangle(ZIL_SCREENID *screenID*, int *left*, int *top*, int *right*, int *bottom*,
const UI_PALETTE **palette*, int *width* = 1, int *fill* = FALSE, int *_xor* = FALSE,
const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions draw and/or fill a bar or rectangle.

The first virtual function draws a rectangular box determined by the region specified.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *region*$_{in}$ is the region that defines the coordinates of the rectangle. The region should be specified in pixels if in graphics mode or in screen coordinates if in text mode. The region is relative to the upper-left corner of the region identified by the *screenID* that was passed in.

- *palette*$_{in}$ is a pointer to the palette structure that defines the color to draw the rectangle. The palette's foreground color is used to draw the border of the rectangle. The palette's background color is used to fill the rectangle (if *fill* is TRUE).

- *width*$_{in}$ specifies the width of the rectangle's border. If the application is running in text mode, *width* is in cell widths. Otherwise, *width* is in pixel coordinates.

- *fill*$_{in}$ indicates whether the rectangle should be filled. If *fill* is TRUE, the rectangle is filled according to the specified palette's fill pattern and background color. Otherwise the rectangle is not filled.

- *_xor*$_{in}$ indicates if the rectangle should be XOR'ed with the image it overwrites. If *_xor* is TRUE, the rectangle is drawn using an XOR attribute. Otherwise it simply draws over the existing image.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Rectangle( )** function. If *clipRegion* is NULL, no additional clipping is performed.

The second virtual function draws a rectangular box defined by the corners specified.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *left*$_{in}$ and *top*$_{in}$ is the starting position of the rectangle relative to the upper-left corner of the region identified by the *screenID* that was passed in. These values should be in pixel coordinates if the display is a graphics display or in text coordinates if it is a text mode display.

- *right*$_{in}$ and *bottom*$_{in}$ are the ending position of the rectangle relative to the upper-left corner of the region identified by the *screenID* that was passed in. These values should be in pixel coordinates if the display is a graphics display or in text coordinates if it is a text mode display.

- *palette*$_{in}$ is a pointer to the palette structure that defines the color to draw the rectangle. The palette's foreground color is used to draw the border of the rectangle. The palette's background color is used to fill the rectangle (if *fill* is TRUE).

- *width*$_{in}$ specifies the width of the rectangle's border. If the application is running in text mode, *width* is in cell widths. Otherwise, *width* is in pixel coordinates.

- *fill*$_{in}$ indicates whether the rectangle should be filled. If *fill* is TRUE, the rectangle is filled according to the specified palette's fill pattern and background color. Otherwise the rectangle is not filled.

- *_xor*$_{in}$ indicates if the rectangle should be XOR'ed with the image it overwrites. If *_xor* is TRUE, the rectangle is drawn using an XOR attribute. Otherwise it simply draws over the existing image.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Rectangle( )** function. If *clipRegion* is NULL, no additional clipping is performed.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_BORDER::Event(const UI_EVENT &event)
{
    // Switch on the event type.
    UI_REGION region;
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_BORDER);
    switch (ccode)
    {
    case S_DISPLAY_INACTIVE:
    case S_DISPLAY_ACTIVE:
        // Draw the borders around the object.
        if (!display->isText && !UI_WINDOW_OBJECT::NeedsUpdate(event, ccode))
            break;
        UI_PALETTE *palette = UI_WINDOW_OBJECT::LogicalPalette(ccode);
        lastPalette = palette;
        if (display->isText)
            display->Rectangle(screenID, true, palette,
                (ccode == S_DISPLAY_ACTIVE) ? 2 : 1);
        else
        {
            region = parent->true;
            eventManager->DevicesHide(parent->true);
            UI_PALETTE *outlinePalette = MapPalette(paletteMapTable,
                PM_ACTIVE, ID_BLACK_SHADOW);
            display->Rectangle(screenID, true, outlinePalette);
            display->Rectangle(screenID, region, outlinePalette);
            UI_WINDOW_OBJECT::Shadow(region, 1);

            // Display the top and bottom lines.
            int temp = region.bottom;
            region.bottom = true.top - 1;
            display->Rectangle(screenID, region, palette, 0, TRUE);
            region.bottom = temp;

            temp = region.top;
            region.top = true.bottom + 1;
            display->Rectangle(screenID, region, palette, 0, TRUE);
            region.top = temp;
        .
        .
        .

    }

    // Return the control code.
    return (ccode);
}
```

UI_DISPLAY::RectangleXORDiff

Syntax

#include <ui_dsp.hpp>

virtual void RectangleXORDiff(const UI_REGION *&oldRegion*,
    const UI_REGION *&newRegion*, ZIL_SCREENID *screenID* = ID_SCREEN,
    const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced virtual function draws an XOR rectangle at two locations: an original region and a new region. An example of when this function may be necessary is when dragging the thumb button of a scroll bar. Often, the original thumb button position is highlighted by drawing an XOR rectangle at that location, and the current location it is being dragged to is also highlighted by an XOR rectangle.

- *oldRegion*$_{in}$ defines the original rectangle that is to be drawn.
- *newRegion*$_{in}$ defines the new rectangle that is to be drawn.
- *screenID*$_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.
- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **RectangleXORDiff( )** function. If *clipRegion* is NULL, no additional clipping is performed.

Example

```
#include <ui_win.hpp>

void UI_WINDOW_MANAGER::Modify(UI_WINDOW_OBJECT *object,
    const UI_EVENT &event)
{
    UI_REGION newRegion = object->true;
    UI_REGION oldRegion = newRegion;

    .
    .
    .

    // Update the new region.
    if (oldRegion.left != newRegion.left ||
        oldRegion.top != newRegion.top ||
        oldRegion.right != newRegion.right ||
```

```
        oldRegion.bottom != newRegion.bottom)
    {
        // Compute the lower-right coordinates.
        newRegion.right = newRegion.left + width - 1;
        newRegion.bottom = newRegion.top + height - 1;

        // Remove the old region and update the new region.
        if (eventManager->Get(tEvent, Q_NO_BLOCK | Q_NO_DESTROY) != 0 ||
            MapEvent(eventMapTable, tEvent, ID_WINDOW_OBJECT, ID_WINDOW_OBJECT)
            != L_CONTINUE_SELECT)
        {
            display->RectangleXORDiff(oldRegion, newRegion);
            oldRegion = newRegion;
        }
    }
    .
    .
    .
}
```

UI_DISPLAY::RegionDefine

Syntax

#include <ui_dsp.hpp>

void RegionDefine(ZIL_SCREENID *screenID*, const UI_REGION &*region*);
or
virtual void RegionDefine(ZIL_SCREENID *screenID*, int *left*, int *top*, int *right*, int *bottom*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These advanced overloaded functions are used to reserve a specified region of the screen for a particular screenID. The region is added to the display's region list. While this function exists for all environments, it performs no action except for DOS and Curses displays.

The first function defines a region determined by the region specified.

- *screenID*$_{in}$ is the identification associated with the defined region. Once a region has been defined, only those objects with the same screenID will be allowed to write to that screen region.

- *region*$_{in}$ defines the rectangular region to be reserved.

The second virtual function defines a region determined by the corners specified.

- *screenID*$_{in}$ is the identification associated with the defined region. Once a region has been defined, only those objects with the same screenID will be allowed to write to that screen region.

- *left*$_{in}$, *top*$_{in}$, *right*$_{in}$ and *bottom*$_{in}$ define the rectangular region to be reserved.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_ICON::Event(const UI_EVENT &event)
{
    // Switch on the event type.
    int redisplay = FALSE;
    int border = FlagSet(woFlags, WOF_BORDER) ? 1 : 0;
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_ICON);
    switch (ccode)
    {
    case S_DEFINE_REGION:
        if (!parent)
        {
            if (!display->isText)
                display->RegionDefine(screenID, iconRegion);
            if (string)
                display->RegionDefine(screenID, stringRegion);
        }
        break;
    .
    .
    .

    }

    // Return the control code.
    return (ccode);
}
```

UI_DISPLAY::RegionInitialize

Syntax

#include <ui_dsp.hpp>

virtual void RegionInitialize(UI_REGION *&region*, const UI_REGION **clipRegion*, int *left*, int *top*, int *right*, int *bottom*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function initializes *region* with the region defined by *left*, *top*, *right* and *bottom*.

- *returnValue*$_{out}$ indicates if the region has a positive area. *returnValue* is TRUE if the upper-left corner of the region is above and to the left of the lower-right corner. Otherwise, it is FALSE.

- *region*$_{out}$ is the region that is to be initialized.

- *clipRegion*$_{in}$ is a region that specifies a clipping boundary. The region defined by *left*, *top*, *right* and *bottom* is clipped by *clipRegion* before being placed in *region*. If *clipRegion* is NULL, no additional clipping is performed.

- *left*$_{in}$, *top*$_{in}$, *right*$_{in}$ and *bottom*$_{in}$ define the rectangular region to be initialized.

UI_DISPLAY::RegionMove

Syntax

#include <ui_dsp.hpp>

virtual void RegionMove(const UI_REGION &*oldRegion*, int *newColumn*, int *newLine*,

ZIL_SCREENID *oldScreenID* = ID_SCREEN,
ZIL_SCREENID *newScreenID* = ID_SCREEN);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function copies the screen image from one region to another region.

- *oldRegion*$_{in}$ is the screen region to be moved.
- *newColumn*$_{in}$ and *newLine*$_{in}$ is the upper-left corner of the new screen location for the screen image.
- *oldScreenID*$_{in}$ is the screenID of the original screen image location.
- *newScreenID*$_{in}$ is the screenID of the destination screen location.

Example

```
#include <ui_win.hpp>

void UI_WINDOW_OBJECT::Modify(UI_WINDOW_OBJECT *object,
    const UI_EVENT &event)
{
    UI_REGION newRegion = object->true;
    UI_REGION oldRegion = newRegion;
    .
    .
    .

    // Move the region.
    if (!sizeObject)
        display->RegionMove(object->true, newRegion.left, newRegion.top);
}
```

UI_DISPLAY::Text

Syntax

#include <ui_dsp.hpp>

virtual void Text(ZIL_SCREENID *screenID*, int *left*, int *top*, const ZIL_ICHAR **text*, const UI_PALETTE **palette*, int *length* = -1, int *fill* = TRUE, int *_xor* = FALSE, const UI_REGION **clipRegion* = ZIL_NULLP(UI_REGION), ZIL_LOGICAL_FONT *font* = FNT_DIALOG_FONT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function draws a text string.

- $screenID_{in}$ is the screenID of the object in whose region the drawing should take place. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- $left_{in}$ and top_{in} is the starting position of the text relative to the upper-left corner of the region identified by the *screenID* that was passed in. These values should be in pixel coordinates if the display is a graphics display or in text coordinates if it is a text mode display.

- $text_{in}$ is a pointer to the text that is to be displayed.

- $palette_{in}$ is a pointer to the palette structure that defines the color to draw the text. The palette's foreground color is used to draw the text. The palette's background color is used to draw the background of the text (if *fill* is TRUE).

- *fill*$_{in}$ indicates whether the text background should be filled. If *fill* is TRUE, the text background is filled according to the specified palette's fill pattern and background color. Otherwise the text background is not filled.

- *_xor*$_{in}$ indicates if the text should be XOR'ed with the image it overwrites. If *_xor* is TRUE, the text is drawn using an XOR attribute. Otherwise it simply draws over the existing image.

- *clipRegion*$_{in}$ is a region that specifies an additional clipping boundary (in addition to the boundary automatically determined by *screenID*) for the **Text( )** function. If *clipRegion* is NULL, no additional clipping is performed.

- *font*$_{in}$ is the font to be used when drawing the text. *font* is an index into the display's *fontTable* array.

Example

```
#include <ui_win.hpp>

EVENT_TYPE GRAPH::DrawItem(const UI_EVENT &, EVENT_TYPE )
{
    // Virtualize the display;
    display->VirtualGet(screenID, true);

    display->Text(screenID, true.left, true.top + display->cellHeight / 2,
        " Item 1", &redPalette, -1, FALSE);
    display->Text(screenID, true.left, true.top + display->cellHeight * 3 / 2,
        " Item 2", &bluePalette, -1, FALSE);
    display->Text(screenID, true.left, true.top + display->cellHeight * 5 / 2,
        " Item 2", &greenPalette, -1, FALSE);

    // Un-virtualize the display;
    display->VirtualPut(screenID);

    return (TRUE);
}
```

UI_DISPLAY::TextHeight

Syntax

#include <ui_dsp.hpp>

virtual int TextHeight(const ZIL_ICHAR **string*,
    ZIL_SCREENID *screenID* = ID_SCREEN,
    ZIL_LOGICAL_FONT *font* = FNT_DIALOG_FONT);

Portability

This virtual function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the height of a specified string.

- *returnValue*$_{out}$ is the height of the string. If the application is running in text mode, this value is always 1. Otherwise, *returnValue* is the pixel height of the string.
- *string*$_{in}$ is a pointer to the string whose height is to be determined.
- *screenID*$_{in}$ is the screenID of an object or of the screen (i.e., ID_SCREEN). In some environments, the screenID is required to calculate the text parameters.
- *font*$_{in}$ is the font to be used when measuring the text string.

Example

```
#include <ui_win.hpp>

void UI_WINDOW_OBJECT::Text(char *string, int depth, int ccode,
    const UI_PALETTE *palette)
{
    // Display the text to the screen.
    .
    .
    .

    // Make sure it is a valid string.
    if (string == 0 || string[0] == '\0')
        return;

    // See if the string will fit.
    int height = display->TextHeight(string);
    if (region.bottom - region.top + 1 < height)
        return;

    char scrapBuffer[128];
    strncpy(scrapBuffer, string, 128);
    scrapBuffer[127] = '\0';
    char *hotKey = strchr(scrapBuffer, '~');
    if (hotKey)
        strcpy(hotKey, hotKey + 1);


    int width = display->TextWidth(scrapBuffer);
    if (width > region.right - region.left + 1)
    {
```

```
            width = region.right - region.left;
            scrapBuffer[width / display->cellWidth] = '\0';
        }
        .
        .
        .
}
```

UI_DISPLAY::TextWidth

Syntax

#include <ui_dsp.hpp>

virtual int TextWidth(const ZIL_ICHAR *_string_,
    ZIL_SCREENID _screenID_ = ID_SCREEN,
    ZIL_LOGICAL_FONT _font_ = FNT_DIALOG_FONT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns the width of a specified string.

- $returnValue_{out}$ is the width of the string. If the application is running in text mode, this value is in screen coordinates. Otherwise, *returnValue* is the pixel width of the string.
- $string_{in}$ is a pointer to the string whose width is to be determined.
- $screenID_{in}$ is the screenID of an object or of the screen (i.e., ID_SCREEN). In some environments, the screenID is required to calculate the text parameters.
- $font_{in}$ is the font to be used when measuring the text string.

Example

```
#include <ui_win.hpp>

void UI_WINDOW_OBJECT::Text(char *string, int depth, int ccode,
    const UI_PALETTE *palette)
{
    // Display the text to the screen.
    .
    .
    .

    // Make sure it is a valid string.
    if (string == 0 || string[0] == '\0')
        return;


    // See if the string will fit.
    int height = display->TextHeight(string);
    if (region.bottom - region.top + 1 < height)
        return;

    char scrapBuffer[128];
    strncpy(scrapBuffer, string, 128);
    scrapBuffer[127] = '\0';
    char *hotKey = strchr(scrapBuffer, '~');
    if (hotKey)
        strcpy(hotKey, hotKey + 1);
    int width = display->TextWidth(scrapBuffer);
    if (width > region.right - region.left + 1)
    {
        width = region.right - region.left;
        scrapBuffer[width / display->cellWidth] = '\0';
    }
    .
    .
    .

}
```

UI_DISPLAY::VirtualGet

Syntax

#include <ui_dsp.hpp>

int VirtualGet(ZIL_SCREENID *screenID*, const UI_REGION &*region*);
or
virtual int VirtualGet(ZIL_SCREENID *screenID*, int *left*, int *top*, int *right*, int *bottom*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions attempt to optimize multiple successive drawing calls. In some environments, all drawing done to a region after a call to **VirtualGet( )** will be performed on a virtual buffer that is not displayed until **VirtualPut( )** is called. This function may remove the images of all devices that are within the region specified, thus preventing the device images from having to erase and redraw numerous times. Some environments use this call to obtain information from the operating system that will allow subsequent drawing to be performed properly.

This function must be called before any calls are made to display primitives (e.g., **Rectangle( )**, **Bitmap( )**, etc.). The **VirtualPut( )** function must be called when done drawing.

The first overloaded function prepares for drawing within the region specified by *region*.

- *returnValue*$_{out}$ is always TRUE.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing will be done. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- *region*$_{in}$ is the region where drawing is to occur. This region is relative to the upper-left corner of the region identified by the *screenID* that was passed in.

The second overloaded function prepares for drawing within the region specified by *left*, *top*, *right* and *bottom*.

- *returnValue*$_{out}$ is always TRUE.

- *screenID*$_{in}$ is the screenID of the object in whose region the drawing will be done. Each object has a screenID that identifies it. The screenID is used to ensure that

drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

- $left_{in}$, top_{in}, $right_{in}$ and $bottom_{in}$ is the region where drawing is to occur. This region is relative to the upper-left corner of the region identified by the *screenID* that was passed in.

Example

```
WO_GRAPH::DrawX(UI_DISPLAY *display)
{
    // Copy the screen into the virtual buffer.
    display->VirtualGet(screenID, 0, 0, 100, 100);

    display->Line(screenID, 0, 0, 100, 100);
    display->Line(screenID, 0, 100, 100, 0);

    // Copy the virtual buffer back to the screen.
    display->VirtualPut(screenID);
}
```

UI_DISPLAY::VirtualPut

Syntax

#include <ui_dsp.hpp>

virtual int VirtualPut(ZIL_SCREENID *screenID*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function completes the process started with the call to **VirtualGet( )**. In those environments that did subsequent drawing to a virtual buffer, this function causes the buffer to be displayed. In those environments whose device images were disabled, they will be enabled.

This function must be called after drawing has been completed.

- *returnValue*$_{out}$ is always TRUE.

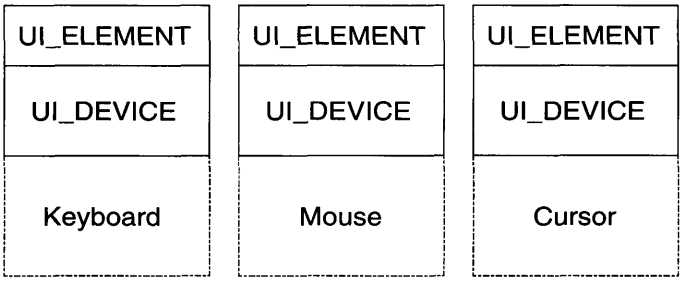
- *screenID*$_{in}$ is the screenID of the object in whose region the drawing was done. Each object has a screenID that identifies it. The screenID is used to ensure that drawing takes place only on those parts of the screen where the object identified by *screenID* is visible. In addition to objects' screenID's there are two special screenID values, ID_DIRECT and ID_SCREEN, that can be used. See the description of the **Bitmap( )** function for details.

Example

```
WO_GRAPH::DrawX(UI_DISPLAY *display)
{
    // Copy the screen into the virtual buffer.
    display->VirtualGet(screenID, 0, 0, 100, 100);

    display->line(0, 0, 100, 100);
    display->line(0, 100, 100, 0);

    // Copy the virtual buffer back to the screen.
    display->VirtualPut(screenID);
}
```

CHAPTER 8 – UI_ELEMENT

The UI_ELEMENT class serves as the base class to all window object classes, all input device classes and several other specialized classes in Zinc Application Framework. The UI_ELEMENT class works with the UI_LIST class to form a doubly-linked list. Objects derived from UI_ELEMENT are added to a list derived from UI_LIST. This allows for the simple creation of a doubly-linked list containing any types of objects. Classes derived from the UI_ELEMENT base class can be viewed in the following manner:



NOTE: In the figure above, the solid line denotes the base class (i.e., UI_ELEMENT) and the dotted line shows the possible logical extensions of a derived class.

The UI_ELEMENT class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_ELEMENT
{
public:
    virtual ~UI_ELEMENT(void);
    virtual ZIL_ICHAR *ClassName(void);
    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);
    int ListIndex(void);
    UI_ELEMENT *Next(void);
    UI_ELEMENT *Previous(void);

protected:
    UI_ELEMENT *previous, *next;

    UI_ELEMENT(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *previous* and *next* are pointers to the siblings of the element. If the sibling doesn't exist, the pointer will be NULL.

UI_ELEMENT::UI_ELEMENT

Syntax

#include <ui_gen.hpp>

UI_ELEMENT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_ELEMENT object. As the UI_ELEMENT class cannot contain any information specific to the list being created, it is of little use by itself; rather, Zinc Application Framework uses the element class as a base class, relying on class members of derived classes for data storage and manipulation. This constructor is called when constructing one of these derived objects.

Example 1

```
#include <ui_evt.hpp>
UI_DEVICE::UI_DEVICE(RAW_EVENT _type, ZIL_DEVICE_STATE _state) : UI_ELEMENT(),
    installed(FALSE), enabled(TRUE), type(_type), state(_state),
    display(NULL), eventManager(NULL)
{
    .
    .
    .
}
```

Example 2

```
#include <ui_win.hpp>

UI_WINDOW_OBJECT::UI_WINDOW_OBJECT(int left, int top, int width, int height,
    WOF_FLAGS _woFlags, WOAF_FLAGS _woAdvancedFlags) : UI_ELEMENT(),
    woFlags(_woFlags), woAdvancedFlags(_woAdvancedFlags)
{
    .
    .
    .

}
```

UI_ELEMENT::~UI_ELEMENT

Syntax

#include <ui_gen.hpp>

virtual ~UI_ELEMENT(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_ELEMENT object. The destructor is declared virtual so that derived list element destructors can be called. (If the destructor for the UI_ELEMENT class were not declared virtual, the programmer would need to call the destroy function associated with each derived class.)

Example

```
#include <ui_gen.hpp>

ElementFunction()
{
    UI_ELEMENT element1;
    UI_ELEMENT *element2;
    .
    .
    .
```

```
    // The element1 destructor is automatically called when the function ends.
    delete element2;
}
```

UI_ELEMENT::ClassName

Syntax

#include <ui_win.hpp>

virtual ZIL_ICHAR *ClassName(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is a stub. Since all objects derived from UI_ELEMENT use a virtual **ClassName( )** function, this stub is necessary. If this function does get called, it simply returns NULL.

- *returnValue*$_{out}$ is NULL.

UI_ELEMENT::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST *request*, void **data*,
    ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is a stub. Since all objects derived from UI_ELEMENT use a virtual **Information( )** function, this stub is necessary. If this function does get called, it simply returns NULL.

UI_ELEMENT::ListIndex

Syntax

```
#include <ui_win.hpp>

int ListIndex(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the ordinal position of the element in its parent UI_LIST.

UI_ELEMENT::Next

Syntax

```
#include <ui_win.hpp>

UI_ELEMENT *Next(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the next element, if one exists, in the list of elements.

- *returnValue*$_{out}$ is a pointer to the next element in the list. If there is not a next element, *returnValue* is NULL.

NOTE: The **Next( )** function is also used by window objects and input devices. In each case, the function is overloaded to return an object pointer typecast according to the context. For example, window objects generally return a UI_WINDOW_OBJECT pointer when **Next( )** is called:

```
UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
*window
    + new UIW_BORDER
    + new UIW_MAXIMIZE_BUTTON
    + new UIW_MINIMIZE_BUTTON
    + new UIW_SYSTEM_BUTTON
    + new UIW_TITLE("Window 1")
    + new UIW_TEXT(1, 1, 10, 5, "Hello world.", 256);

for (UI_WINDOW_OBJECT *object = window->First(); object;
    object = object->Next())
    .
    .
    .
```

Input devices, however, return a UI_DEVICE pointer:

```
UI_DISPLAY *display = new UI_TEXT_DISPLAY;
UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
*eventManager
    + new UID_KEYBOARD
    + new UID_MOUSE
    + new UID_CURSOR;

for (UI_DEVICE *device = eventManager->First(); device;
    device = device->Next());
    .
    .
    .
```

Some other class objects return specific element pointers (e.g., UI_QUEUE_ELEMENT, UI_REGION_ELEMENT, UIW_POP_UP_ITEM). Refer to each class definition for information about the return value of **Next( )**.

UI_ELEMENT::Previous

Syntax

#include <ui_win.hpp>

UI_ELEMENT *Previous(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the previous element, if one exists, in the list of elements.

- *returnValue*$_{out}$ is a pointer to the previous element in the list. If there is not a previous element, *returnValue* is NULL.

NOTE: The **Previous( )** function is also used by window objects and input devices. In each case, the function is overloaded to return an object pointer typecast according to the context. For example, window objects generally return a UI_WINDOW_OBJECT pointer when **Previous( )** is called:

```
UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
*window
    + new UIW_BORDER
    + new UIW_MAXIMIZE_BUTTON
    + new UIW_MINIMIZE_BUTTON
    + new UIW_SYSTEM_BUTTON
    + new UIW_TITLE("Window 1")
    + new UIW_TEXT(1, 1, 10, 5, "Hello world.", 256);

for (UI_WINDOW_OBJECT *object = window->Last(); object;
    object = object->Previous())
    .
    .
    .
```

Input devices, however, return a UI_DEVICE pointer:

```
UI_DISPLAY *display = new UI_TEXT_DISPLAY;
UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
```

```
*eventManager
    + new UID_KEYBOARD
    + new UID_MOUSE
    + new UID_CURSOR;

for (UI_DEVICE *device = eventManager->Last(); device;
    device = device->Previous());


    .
    .
    .
```

Some other class objects return specific element pointers (e.g., UI_QUEUE_ELEMENT, UI_REGION_ELEMENT, UIW_POP_UP_ITEM). Refer to each class definition for information about the return value of **Previous( )**.

CHAPTER 9 – UI_ERROR_STUB

The UI_ERROR_STUB class is the base class for the error system. The error system is used to display an error message and to get a response from the end-user. The UI_-ERROR_STUB class defines the functionality that must exist in the error system. It is an abstract class, so only classes derived from UI_ERROR_STUB, such as UI_ERROR_-SYSTEM, can be created.

The UI_ERROR_STUB class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_ERROR_STUB : public ZIL_INTERNATIONAL
{
public:
    virtual ~UI_ERROR_STUB(void);
    static void Beep(void);
    UIS_STATUS ReportError(UI_WINDOW_MANAGER *windowManager,
        UIS_STATUS errorStatus, ZIL_ICHAR *format, ...);
    UIS_STATUS ReportError(UI_WINDOW_MANAGER *windowManager,
        ZIL_ICHAR *titleMessage, UIS_STATUS errorStatus, ZIL_ICHAR *format,
        ...);
    virtual UIS_STATUS ErrorMessage(UI_WINDOW_MANAGER *windowManager,
        UIS_STATUS errorStatus, ZIL_ICHAR *message,
        ZIL_ICHAR *titleMessage = ZIL_NULLP(ZIL_ICHAR)) = 0;
};
```

General Members

This section describes those members that are used for general purposes.

UI_ERROR_STUB::~UI_ERROR_STUB

Syntax

#include <ui_win.hpp>

virtual ~UI_ERROR_STUB(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_ERROR_-STUB object.

UI_ERROR_STUB::Beep

Syntax

```
#include <ui_win.h>

static void Beep(void);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function produces a beep.

UI_ERROR_STUB::ErrorMessage

Syntax

```
#include <ui_win.h>

virtual UIS_STATUS ErrorMessage(UI_WINDOW_MANAGER *windowManager,
    UIS_STATUS errorStatus, ZIL_ICHAR *message,
```

ZIL_ICHAR *_titleMessage_ = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This pure virtual function displays the error window. See "Chapter 10—UI_ERROR_-SYSTEM" for details on the error system's implementation of this function.

NOTE: This function does not accept a variable length argument format. If **printf** style formatting is required, use the **ReportError( )** function.

- *returnValue*$_{out}$ identifies the user's action on the error window. *returnValue* is WOS_INVALID if the "OK" button is pressed or WOS_NO_STATUS if the "Cancel" button is pressed.

- *windowManager*$_{in}$ is a pointer to the Window Manager.

- *errorStatus*$_{in}$ specifies what error window button options to present to the end-user. *errorStatus* can be set to one of the following:

  WOS_INVALID—If this status is set, the error window will contain "OK" and "CANCEL" buttons. Selecting "OK" causes the error window to be deleted and the field's value to be restored to the value it contained before the invalid entry was made. Pressing the "CANCEL" button causes the error window to be deleted and the invalid field entry to remain.

  WOS_NO_STATUS—If this status is set, the error window will contain only an "OK" button. Pressing the "OK" button causes the error window to be deleted and the field's value to be restored to the value it contained before the invalid entry was made.

- *message*$_{in}$ is the message to be displayed on the window.

- *titleMessage*$_{in}$ is the string to be displayed in the error window's title bar.

UI_ERROR_STUB::ReportError

Syntax

```
#include <ui_win.h>

UIS_STATUS ReportError(UI_WINDOW_MANAGER *windowManager,
    UIS_STATUS errorStatus, ZIL_ICHAR *format, ...);
    or
UIS_STATUS ReportError(UI_WINDOW_MANAGER *windowManager,
    ZIL_ICHAR *titleMessage, UIS_STATUS errorStatus, ZIL_ICHAR *format, ...);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions display the error window using a variable-length argument list. These functions create a string from the argument list and call **ErrorMessage( )**.

The first overloaded function can be used to specify the button options and the message.

- *returnValue*$_{out}$ identifies the user's action on the error window. For more details, see the description of *returnValue* with the **ErrorMessage( )** function description.
- *windowManager*$_{in}$ is a pointer to the Window Manager.
- *errorStatus*$_{in}$ specifies what error window button options to present to the end-user. For more details, see the description of *errorStatus* with the **ErrorMessage( )** function description.
- *format*$_{in}$ is the **printf** style format string that specifies how the error string is to be displayed.
- ...$_{in}$ is the variable-length argument list that contains any arguments required by *format*.

The second overloaded function can be used to specify the button options, the error message and the title bar string.

- *returnValue*$_{out}$ identifies the user's action on the error window. For more details, see the description of *returnValue* with the **ErrorMessage( )** function description.

- *windowManager*$_{in}$ is a pointer to the Window Manager.

- *titleMessage*$_{in}$ is the string to be displayed in the error window's title bar.

- *errorStatus*$_{in}$ specifies what error window button options to present to the end-user. For more details, see the description of *errorStatus* with the **ErrorMessage( )** function description.

- *format*$_{in}$ is the **printf** style format string that specifies how the string is to be displayed.

- ...$_{in}$ is the variable-length argument list that contains any arguments required by *format*.

CHAPTER 10 – UI_ERROR_SYSTEM

The UI_ERROR_SYSTEM class is used to report run-time errors. It displays an error window with one or more buttons allowing the end-user to specify what action to take. The programmer provides a message to be displayed in the error window as well as the title for the error window, if desired. If the environment where the application is running (e.g., Windows) has a native error system, then UI_ERROR_SYSTEM calls that error system.

The UI_ERROR_SYSTEM class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_ERROR_SYSTEM : public UI_ERROR_STUB
{
public:
    static ZIL_ICHAR _className[];
    static int defaultInitialized;

    UI_ERROR_SYSTEM(void);
    virtual ~UI_ERROR_SYSTEM(void);
    virtual UIS_STATUS ErrorMessage(UI_WINDOW_MANAGER *windowManager,
        UIS_STATUS errorStatus, ZIL_ICHAR *message,
        ZIL_ICHAR *titleMessage = ZIL_NULLP(ZIL_ICHAR));

    void SetLanguage(const ZIL_ICHAR *languageName);

protected:
    const ZIL_LANGUAGE *myLanguage;
};
```

General Members

This section describes those members that are used for general purposes.

- *_className* contains a string identifying the class. The string is always the same name as the class, is always in English, and never changes. For example, for the UI_ERROR_SYSTEM class, *_className* is "UI_ERROR_SYSTEM."

- *defaultInitialized* indicates if the default language strings for this object have been set up. The default strings are located in the file **LANG_DEF.CPP**. If *defaultInitialized* is TRUE, the strings have been set up. Otherwise they have not been. *defaultInitialized* is set to TRUE when the strings are set up in the object's constructor.

- *myLanguage* is the ZIL_LANGUAGE object that contains the string translations for this object.

UI_ERROR_SYSTEM::UI_ERROR_SYSTEM

Syntax

#include <ui_win.hpp>

UI_ERROR_SYSTEM(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new UI_ERROR_SYSTEM class object.

Example

```
#include <ui_win.hpp>

main()
{
    .
    .
    .

    // Install the error system.
    UI_ERROR_SYSTEM *errorSystem = new UI_ERROR_SYSTEM();
    UI_WINDOW_OBJECT::errorSystem = errorSystem;
    .
    .
    .

    // Clean up.
    delete errorSystem;
    delete windowManager;
    delete eventManager;
    delete display;
}
```

UI_ERROR_SYSTEM::~UI_ERROR_SYSTEM

Syntax

#include <ui_win.hpp>

virtual ~UI_ERROR_SYSTEM(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_ERROR_-SYSTEM object.

Example

```
#include <ui_win.hpp>

main()
{
    .
    .
    .

    // Install the error system.
    UI_ERROR_SYSTEM *errorSystem = new UI_ERROR_SYSTEM();
    UI_WINDOW_OBJECT::errorSystem = errorSystem;
    .
    .
    .

    // Clean up.
    delete errorSystem;
    delete windowManager;
    delete eventManager;
    delete display;
}
```

UI_ERROR_SYSTEM::ErrorMessage

Syntax

#include <ui_win.h>

virtual UIS_STATUS ErrorMessage(UI_WINDOW_MANAGER **windowManager*,
UIS_STATUS *errorStatus*, ZIL_ICHAR **message*,
ZIL_ICHAR **titleMessage* = ZIL_NULLP(ZIL_ICHAR));

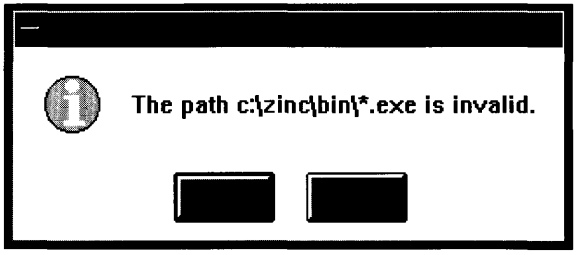
Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function beeps and displays an error window. The programmer can specify a message and a title to appear on the window. If no title is specified, an appropriate language-specific error title will be displayed. This function is declared virtual so that any derived error system class can override its default operation. The figure below shows a graphical UI_ERROR_SYSTEM presentation window:



NOTE: This function does not accept a variable length argument format. If printf-type formatting is required, use the **UI_ERROR_STUB::ReportError( )** function.

- *returnValue*$_{out}$ identifies the user's action on the error window. *returnValue* is WOS_INVALID if the "OK" button is pressed or WOS_NO_STATUS if the "Cancel" button is pressed.

- *windowManager*$_{in}$ is a pointer to the Window Manager.

- *errorStatus*$_{in}$ specifies what error window button options to present to the end-user. *errorStatus* can be set to one of the following:

  WOS_INVALID—If this status is set, the error window will contain "OK" and "CANCEL" buttons. Selecting "OK" causes the error window to be deleted and the field's value to be restored to the value it contained before the invalid entry was made. Pressing the "CANCEL" button causes the error window to be deleted and the invalid field entry to remain.

  WOS_NO_STATUS—If this status is set, the error window will contain only an "OK" button. Pressing the "OK" button causes the error window to be deleted and the field's value to be restored to the value it contained before the invalid entry was made.

- *message*$_{in}$ is the message to be displayed on the window.

- *titleMessage*$_{in}$ is the string to be displayed in the error window's title bar.

NOTE: In DOS mode the **ErrorMessage( )** function looks for an icon called "ASTERISK." This icon must be in the *UI_WINDOW_OBJECT::defaultStorage* **.DAT** file in order for the error icon to be displayed. This icon is placed in any **.DAT** file created by a Zinc utility, including the Designer.

Example

```
#include <ui_win.hpp>

ExampleFunction(UI_WINDOW_OBJECT *item)
{
    item->errorSystem->ErrorMessage(item->windowManager, WOS_INVALID,
        "The path c:\\zinc\\bin\\*.exe is invalid.", "Invalid Path");
    .
    .
    .
}
```

UI_ERROR_SYSTEM::SetLanguage

Syntax

```
#include <ui_win.hpp>

void SetLanguage(const ZIL_ICHAR *languageName);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the language to be used by the object. The string translations for the object will be loaded and the object's *myLanguage* member will be updated to point to the new ZIL_LANGUAGE object. By default, the object uses the language identified in the **LANG_DEF.CPP** file, which compiles into the library. (If a different default language is desired, simply copy a **LANG_<ISO>.CPP** file from the ZINC\SOURCE\-INTL directory to the \ZINC\SOURCE directory, and rename it to **LANG_DEF.CPP** before compiling the library.) The language translations are loaded from the **I18N.DAT** file, so it must be shipped with your application.

- $languageName_{in}$ is the two-letter ISO language code identifying which language the object should use.

CHAPTER 11 – UI_EVENT

The UI_EVENT structure manages all information pertaining to an event. The UI_EVENT structure is used to pass events through Zinc Application Framework (from the Event Manager to the Window Manager).

The UI_EVENT structure is declared in **UI_EVT.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_EVENT
{
    // Declaration of classes used by UI_EVENT.
    friend class ZIL_EXPORT_CLASS UI_DEVICE;
    friend class ZIL_EXPORT_CLASS UI_DISPLAY;
    friend class ZIL_EXPORT_CLASS UI_EVENT_MANAGER;
    friend class ZIL_EXPORT_CLASS UI_WINDOW_OBJECT;
    friend class ZIL_EXPORT_CLASS UIW_WINDOW;
    friend class ZIL_EXPORT_CLASS UI_WINDOW_MANAGER;

    EVENT_TYPE type;
    ZIL_RAW_CODE rawCode;
    ZIL_RAW_CODE modifiers;
#if defined(ZIL_MSWINDOWS)
    MSG message;
#elif defined(ZIL_OS2)
    QMSG message;
#elif defined(ZIL_MOTIF)
    XEvent message;
#elif defined(ZIL_MACINTOSH)
    EventRecord message;
#elif defined(ZIL_NEXTSTEP)
    NXEvent message;
#endif

    union
    {
        UI_KEY key;
        UI_REGION region;
        UI_POSITION position;
        UI_SCROLL_INFORMATION scroll;
        UI_EVENT *event;

        UI_DEVICE *device;
        UI_DISPLAY *display;
        UI_EVENT_MANAGER *eventManager;
        UI_WINDOW_OBJECT *windowObject;
        UIW_WINDOW *window;
        UI_WINDOW_MANAGER *windowManager;

        void *data;
    };

    UI_EVENT(void);
    UI_EVENT(EVENT_TYPE type, ZIL_RAW_CODE rawCode = 0);
    UI_EVENT(EVENT_TYPE type, ZIL_RAW_CODE rawCode, const UI_KEY &key);
    UI_EVENT(EVENT_TYPE type, ZIL_RAW_CODE rawCode,
        const UI_REGION &region);
    UI_EVENT(EVENT_TYPE type, ZIL_RAW_CODE rawCode,
        const UI_POSITION &position);
    UI_EVENT(EVENT_TYPE type, ZIL_RAW_CODE rawCode,
        const UI_SCROLL_INFORMATION &scroll);
#if defined(ZIL_MSWINDOWS)
```

```
    UI_EVENT(EVENT_TYPE type, HWND hWnd, UINT wMsg, WPARAM wParam,
        LPARAM lParam);
#elif defined(ZIL_OS2)
    UI_EVENT(EVENT_TYPE type, HWND hWnd, ULONG msg, MPARAM mp1, MPARAM mp2);
#elif defined(ZIL_MOTIF)
    UI_EVENT(EVENT_TYPE _type, XEvent &xevent);
#elif defined(ZIL_MACINTOSH)
    UI_EVENT(EVENT_TYPE type, EventRecord &mevent);
#elif defined(ZIL_NEXTSTEP)
    UI_EVENT(EVENT_TYPE type, NXEvent &nevent);
#endif
    EVENT_TYPE InputType(void) const;
};
```

General Members

This section describes those members that are used for general purposes.

- *type* is the type of event. Events are numbered as follows:

  -32,767 to -1,000—Reserved by Zinc Application Framework for future use.

  -999 to -1—Reserved by Zinc Application Framework for system messages. System messages are declared in **UI_EVT.HPP**. A full description of these messages is given in "Appendix B—System Events" of *Programmer's Reference Volume 2*.

  0 to 99—Reserved for raw device identifications. The following constants (declared in **UI_EVT.HPP**) are pre-defined:

  E_CURSOR(50)—Identification for the UID_CURSOR class.

  E_DEVICE(99)—Identification used to define a generic device.

  E_KEY(10)—Identification for the UID_KEYBOARD class.

  E_MACINTOSH(4)—Identification for Macintosh events.

  E_MOTIF(3)—Identification for Motif events.

  E_MOUSE(30)—Identification for the UID_MOUSE class.

  E_MSWINDOWS(1)—Identification for MS Windows events.

  E_NEXTSTEP(11)—Identification for NEXTSTEP events.

E_OS2(2)—Identification for OS/2 events.

The following additional raw device identifications are reserved by Zinc Application Framework for future use: 12-19, 31-39, 51-59, 70-79 and 90-98. The remaining values 5-9, 20-29, 40-49, 60-69 and 80-89 can be used by the programmer.

100 to 9,999—Reserved by Zinc Application Framework for logical events. Logical messages are declared in **UI_EVT.HPP**. A full description of these messages is given in "Appendix C—Logical Events" of *Programmer's Reference Volume 2*.

10,000 to 32,767—Available to the programmer for private use. These values are not used by Zinc Application Framework.

- *rawCode* is the raw code value associated with the event. The following devices (declared in **UI_EVT.HPP**) use the *rawCode* event field:

  UID_KEYBOARD—The *rawCode* for the keyboard device is the raw scan code associated with the key. For example, pressing <F1> in DOS generates a raw scan code of 0x3B00. In this case, the UI_EVENT structure would contain the following values:

  ```
  event.type = E_KEY;
  event.rawCode = 0x3B00;
  event.key.value = 0;                    // low 8 bits of rawCode
  event.key.shiftState = 0;
  ```

  NOTE: Curses does not place scan code values in *rawCode*. Instead, *rawCode* will contain the key's ASCII value.

  UID_MOUSE—The *rawCode* for the mouse device is the keyboard shift state (low 8 bits) and the mouse button state (high 8 bits). For example, pressing the left mouse button while holding the <Left-shift> key generates a raw code of 0x0102 (0x0002 for the <Left-shift> key and 0x0100 for the left-mouse button). In this case, the UI_EVENT structure would contain the following values:

  ```
  event.type = E_MOUSE;
  event.rawCode = 0x0102;
  event.position.column = <current mouse column position>;
  event.position.line = <current mouse row position>;
  ```

- *modifiers* is a bit field that indicates which modifier keys (i.e., shift keys, meta keys, etc.) were pressed at the time the event occurred.

- *message* is the message received from the graphical operating system if the application is running in such an environment.

- *key*, *region*, *position*, *scroll* and *data* are types of specific information associated with the event.

- *event*, *device*, *display*, *eventManager*, *windowObject*, *window* and *windowManager* are used for routing events.

UI_EVENT::UI_EVENT

Syntax

UI_EVENT(void);
or
UI_EVENT(EVENT_TYPE *type*, ZIL_RAW_CODE *rawCode* = 0);
or
UI_EVENT(EVENT_TYPE *type*, ZIL_RAW_CODE *rawCode*, const UI_KEY *&key*);
or
UI_EVENT(EVENT_TYPE *type*, ZIL_RAW_CODE *rawCode*,
const UI_REGION *&region*);
or
UI_EVENT(EVENT_TYPE *type*, ZIL_RAW_CODE *rawCode*,
const UI_POSITION *&position*);
or
UI_EVENT(EVENT_TYPE *type*, ZIL_RAW_CODE *rawCode*,
const UI_SCROLL_INFORMATION *&scroll*);
or
UI_EVENT(EVENT_TYPE *type*, HWND *hWnd*, UINT *wMsg*, WPARAM *wParam*,
LPARAM *lParam*);
or
UI_EVENT(EVENT_TYPE *type*, HWND *hWnd*, ULONG *msg*, MPARAM *mp1*,
MPARAM *mp2*);
or
UI_EVENT(EVENT_TYPE *_type*, XEvent *&xevent*);
or
UI_EVENT(EVENT_TYPE *type*, EventRecord *&mevent*);

or

UI_EVENT(EVENT_TYPE *type*, NXEvent *&nevent*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first overloaded constructor takes no arguments. It creates a basic event structure with no special initialization.

The second overloaded constructor initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $rawCode_{in}$ contains a valid ZIL_RAW_CODE.

The third overloaded constructor initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $rawCode_{in}$ contains a valid ZIL_RAW_CODE.
- key_{in} contains the address of a UI_KEY structure.

The fourth overloaded constructor initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $rawCode_{in}$ contains a valid ZIL_RAW_CODE.
- $region_{in}$ contains the address of a UI_REGION structure.

The fifth overloaded constructor initializes an event structure with the following

arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $rawCode_{in}$ contains a valid ZIL_RAW_CODE.
- $position_{in}$ contains the address of a UI_POSITION structure.

The sixth overloaded constructor initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $rawCode_{in}$ contains a valid ZIL_RAW_CODE.
- $scroll_{in}$ contains the address of a UI_SCROLL_INFORMATION structure.

The seventh overloaded constructor is used only for Windows and Windows NT programs. It initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $hWnd_{in}$ contains a handle to a window.
- $wMsg_{in}$ contains an input message.
- $wParam_{in}$ is a UINT value containing specific message information.
- $lParam_{in}$ is an LPARAM value containing specific message information.

The eighth overloaded constructor is used only for OS/2 programs. It initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $hWnd_{in}$ contains a handle to a window.
- msg_{in} contains an input message.
- $mp1_{in}$ is an MPARAM value containing specific message information.
- $mp2_{in}$ is an MPARAM value containing specific message information.

The ninth overloaded constructor is used only for Motif programs. It initializes an event structure with the following arguments:

- $\_type_{in}$ contains a valid EVENT_TYPE.
- $xevent_{in}$ is an XEvent value containing specific message information.

The tenth overloaded constructor is used only for Macintosh programs. It initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $mevent_{in}$ is a Macintosh EventRecord value containing specific message information.

The eleventh overloaded constructor is used only for NEXTSTEP programs. It initializes an event structure with the following arguments:

- $type_{in}$ contains a valid EVENT_TYPE.
- $nevent_{in}$ is a NEXTSTEP NXEvent value containing specific message information.

Example 1

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    .
    .
    .

    EVENT_TYPE ccode;

    do
    {
        // Get an event from the event manager.
        UI_EVENT event;
        eventManager->Get(event, Q_NORMAL);

        // Pass the event to the window manager.
        windowManager->Event(event);
    } while (ccode != L_EXIT);
    .
    .
```

```
    .
}

static void Exit(UI_WINDOW_OBJECT *item, UI_EVENT &event, EVENT_TYPE ccode)
{
    // Send an L_EXIT message through the system.
    event.type = L_EXIT;
    UI_EVENT_MANAGER *eventManager = ((UIW_POP_UP_ITEM *)item)->eventManager;
    eventManager->Put(event, Q_BEGIN);
}
```

Example 2

```
void UI_WINDOW_MANAGER::Add(UI_WINDOW_OBJECT *object)
{
    .
    .
    .

    // Flag the old object as non-current.
    if (firstObject && object != firstObject)
        firstObject->Event(UI_EVENT(S_NON_CURRENT));
    .
    .
    .

    // Flag the new object as current.
    if (object != firstObject && UI_LIST::Index(object) != -1)
    {
        UI_LIST::Subtract(object);
        UI_LIST::Add(firstObject, object);
    }
    else if (object != firstObject)
    {
        UI_LIST::Add(firstObject, object);
        object->Event(UI_EVENT(S_INITIALIZE));
        object->Event(UI_EVENT(S_CREATE));
    }
    display->RegionDefine(object->screenID, object->true);
    .
    .
    .

}
```

UI_EVENT::InputType

Syntax

#include <ui_evt.hpp>

EVENT_TYPE InputType(void) const;

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

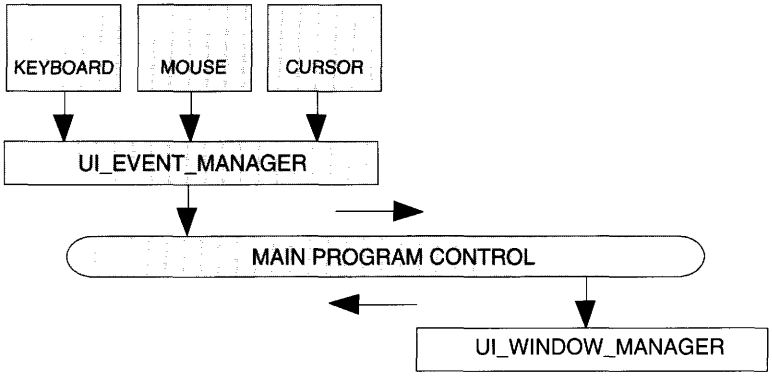
Remarks

This function returns the type of device that generated the event if the event was generated by a mouse or keyboard in a graphical operating system.

- *returnValue*$_{out}$ indicates the type of device that generated the event. *returnValue* will be either E_MOUSE if the event was a mouse event, or E_KEY if the event was a keyboard event.

CHAPTER 12 – UI_EVENT_MANAGER

The UI_EVENT_MANAGER class manages input devices and the event queue that temporarily stores messages waiting to be processed. The graphic illustration below shows the conceptual operation of the Event Manager within the library:



The controlling portion of the UI_EVENT_MANAGER class contains a list of input devices. Whenever an event is requested, the Event Manager polls each device, allowing it to place any events it may have on the event queue. This portion of the UI_EVENT_-MANAGER class is used only in those operating systems that do not provide an event driven messaging system (e.g., DOS and Curses).

The storage portion of the UI_EVENT_MANAGER class is implemented as an array of UI_EVENT structures. The size of this array is specified by the programmer when the Event Manager class is constructed. Input devices place events on the event queue so that they may be processed by the system. In addition to input devices, the operating system (only those operating systems that provide an event driven messaging system) and the programmer may also place events on the queue.

The UI_EVENT_MANAGER class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_EVENT_MANAGER : public UI_LIST
{
public:
    UI_EVENT_MANAGER(UI_DISPLAY *display, int noOfElements = 100);
    virtual ~UI_EVENT_MANAGER(void);
    EVENT_TYPE DevicePosition(ZIL_DEVICE_TYPE deviceType, int column,
        int line);
```

```
    EVENT_TYPE DeviceState(ZIL_DEVICE_TYPE deviceType,
        ZIL_DEVICE_STATE deviceState);
    EVENT_TYPE DeviceImage(ZIL_DEVICE_TYPE deviceType,
        DEVICE_IMAGE deviceImage);
    virtual EVENT_TYPE Event(const UI_EVENT &event,
        ZIL_DEVICE_TYPE deviceType = E_DEVICE);
    virtual int Get(UI_EVENT &event, Q_FLAGS flags = Q_NORMAL);
    virtual void Put(const UI_EVENT &event, Q_FLAGS flags = Q_END);
    Q_FLAGS QFlags(void);

    // List members.
    void Add(UI_DEVICE *device);
    UI_DEVICE *Current(void);
    UI_DEVICE *First(void);
    UI_DEVICE *Last(void);
    void Subtract(UI_DEVICE *device);
    UI_EVENT_MANAGER &operator+(UI_DEVICE *device);
    UI_EVENT_MANAGER &operator-(UI_DEVICE *device);

    // Version 2.0 and 1.0 compatibility.
    UI_EVENT_MANAGER(int noOfElements, UI_DISPLAY *display);

protected:
    int level;
    Q_FLAGS qFlags;
    UI_DISPLAY *display;
    UI_QUEUE_BLOCK queueBlock;
#if defined(ZIL_OS2)
    HMQ hmq;
#endif
};
```

General Members

This section describes those members that are used for general purposes.

- *level* indicates if a recursive call to the **Get( )** function is being made. If *level* is 1, then only a first-level call has been made to **Get( )**. *level* is incremented each time **Get( )** is called, and decremented each time it exits. Thus, if *level* is greater than 1, the function is at a recursive level.

- *qFlags* contains the flag settings for the current first-level call to **Get( )**.

- *display* is a pointer to the current display class.

- *queueBlock* is a pointer to the event queue, which contains all of the unprocessed messages sent by the devices, the operating system, or the programmer.

- *hmq* is a pointer to the OS/2 message queue.

UI_EVENT_MANAGER::UI_EVENT_MANAGER

Syntax

#include <ui_evt.hpp>

UI_EVENT_MANAGER(UI_DISPLAY **display*, int *noOfElements* = 100);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_EVENT_MANAGER class object. It must be called after the display class constructor has been called.

- *display*$_{in}$ is a pointer to the screen display. This pointer is used by input devices when they display their information to the screen display (e.g., the blinking cursor of the UID_CURSOR class object).

- *noOfElements*$_{in}$ tells the maximum number of elements to reserve in the event queue. The Event Manager automatically allocates space for *noOfElements*.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display, 100);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    .
    .
    .

    // Restore the system.  We must explicitly call the destructor for the
    // window manager and event manager to preserve the creation order.
```

```
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_EVENT_MANAGER::~UI_EVENT_MANAGER

Syntax

#include <ui_evt.hpp>

virtual ~UI_EVENT_MANAGER(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_EVENT_-MANAGER object and destroys the class information of any input device that remains attached to the Event Manager.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    .
    .
    .

    // Restore the system.  We must explicitly call the destructor for the
    // window manager and event manager to preserve the creation order.
    delete windowManager;
```

```
    delete eventManager;
    delete display;
    return (0);
}
```

UI_EVENT_MANAGER::Add

Syntax

#include <ui_evt.hpp>

virtual void Add(UI_DEVICE **device*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function adds a device to the Event Manager. When devices are added to the Event Manager, they are ordered so that devices with a higher priority (i.e., lower device type value) will be at the beginning of the Event Manager's list.

- $device_{in}$ is the device to be added to the Event Manager.

UI_EVENT_MANAGER::Current

Syntax

#include <ui_evt.hpp>

UI_DEVICE *Current(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the current device in the Event Manager's list.

- *returnValue*$_{out}$ is the current device in the Event Manager's list.

UI_EVENT_MANAGER::DeviceImage

Syntax

```
#include <ui_evt.hpp>

EVENT_TYPE DeviceImage(ZIL_DEVICE_TYPE deviceType,
    DEVICE_IMAGE deviceImage);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the image displayed by the input device specified by *deviceType*.

- *returnValue*$_{out}$ is the new state of the device (i.e., its image as specified in *deviceImage*).

- *deviceType*$_{in}$ is the device identification where the image message is to be sent. The following device types (declared in **UI_EVT.HPP**) may be specified:

E_CURSOR—Sends the state information to the UID_CURSOR class object (if it is in the device list).

E_DEVICE—Sends the state information to an input device whose device type is E_DEVICE (if it is in the device list).

E_MOUSE—Sends the state information to the UID_MOUSE class object (if it is in the device list.)

- *deviceImage*$_{in}$ is the new image of the device. For mouse, pen, and cursor devices, the allowable image changes (declared in **UI_EVT.HPP**) are:

  E_CURSOR—The UID_CURSOR class recognizes the following image information:

  DC_INSERT—Changes the cursor to an insert cursor. In DOS graphics mode, if *deviceImage* is DC_INSERT, the cursor device displays a thick vertical bar cursor on the screen. In DOS text mode, the DC_INSERT cursor is a wide box. This image applies to DOS only.

  DC_OVERSTRIKE—Changes the cursor to an overstrike cursor. In DOS graphics mode, if *deviceImage* is DC_OVERSTRIKE, the cursor device displays a thin vertical bar cursor on the screen. In DOS text mode, the DC_OVERSTRIKE cursor is a short, wide underline. This image applies to DOS only. (e.g., a thin vertical bar).

  E_MOUSE—The UID_MOUSE class recognizes the following image information:

  DM_DIAGONAL_ULLR—Displays the image shown when sizing the top-left or bottom-right corner of a window.

  DM_DIAGONAL_LLUR—Displays the image shown when sizing the top-right or bottom-left corner of a window.

  DM_EDIT—Displays the image shown when positioned over an editable field.

  DM_HORIZONTAL—Displays the image shown when sizing a window horizontally.

DM_MOVE—Displays the image shown when indicating that the object is to be moved.

DM_POSITION—Displays the image shown when indicating that something is to be positioned by the device.

DM_VERTICAL—Displays the image shown when sizing a window vertically.

DM_VIEW—Displays the default image, typically an arrow.

DM_WAIT—Displays the image shown to indicate to the user that some processing is taking place and that he should wait.

NOTE: Because Zinc allows the graphical operating systems to handle their images, not all of these images may be supported in all environments.

Example

```
#include <ui_evt.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    // Display an hour glass until the program is ready to receive user input.
    eventManager->DeviceImage(E_MOUSE, DM_WAIT);
    .
    .
    .

}
```

UI_EVENT_MANAGER::DevicePosition

Syntax

#include <ui_evt.hpp>

void DevicePosition(ZIL_DEVICE_TYPE *deviceType*, int *column*, int *line*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the position for the device (e.g., mouse, pen, or cursor). Some graphical operating systems may not allow this type of action for all devices.

- *deviceType*$_{in}$ is the type of device (e.g., E_CURSOR, or E_MOUSE) for which the message is intended.

- *column*$_{in}$ and *line*$_{in}$ is the position to where the device will be moved. The value of *column* and *line* depends on the type of display mode in which the application is running. For example, if the cursor is to be positioned at the center of the screen while the application is running in text mode (i.e., an 80 column by 25 line screen) the position values should be:

```
column = 40;
line = 13;
eventManager->DevicePosition(E_CURSOR, column, line);
```

If on the other hand, the application is running in a 640 column by 480 line graphics mode, the position values should be:

```
column = 320;
line = 240;
eventManager->DevicePosition(E_CURSOR, column, line);
```

Example

```
#include <ui_evt.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // Reposition the cursor at the top-left side of the screen.
    eventManager->DevicePosition(E_CURSOR, 0, 0);
    .
```

```
    .
    .
}
```

UI_EVENT_MANAGER::DeviceState

Syntax

```
#include <ui_evt.hpp>

EVENT_TYPE DeviceState(ZIL_DEVICE_TYPE deviceType,
    ZIL_DEVICE_STATE deviceState);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the state for the input device specified by *deviceType*.

- $returnValue_{out}$ is the new state of the device.
- $deviceType_{in}$ is the device identification where the state message is to be sent. The following device types (declared in **UI_EVT.HPP**) may be specified:

  E_CURSOR—Sends the state information to the UID_CURSOR class object (if it is in the device list).

  E_DEVICE—Sends the state information to an input device whose device type is E_DEVICE (if it is in the device list).

  E_MOUSE—Sends the state information to the UID_MOUSE class object (if it is in the device list.)

  E_KEY—Sends the state information to the UID_KEYBOARD class object (if it is in the device list).

- *deviceState*$_{in}$ is the new state of the device. Allowable state changes (declared in **UI_EVT.HPP**) are:

  D_HIDE—Hides the specified device's image. If *deviceType* is E_DEVICE, all devices in the Event Manager's device list are sent the D_HIDE message.

  D_ON—Turns the specified device on. If *deviceType* is E_DEVICE, all devices in the Event Manager's device list are sent the D_ON message.

  D_OFF—Turns the specified device off. If *deviceType* is E_DEVICE, all devices in the Event Manager's device list are sent the D_OFF message.

  D_STATE—Gets the state information associated with the specified device. If *deviceType* is E_DEVICE, only the state of the last device in the Event Manager's device list is returned.

  Other device states—These must be recognized by the device whose type is *deviceType*. For example, the UID_MOUSE class also recognizes the following state information:

    DM_DIAGONAL_ULLR—Displays the image shown when sizing the top-left or bottom-right corner of a window.

    DM_DIAGONAL_LLUR—Displays the image shown when sizing the top-right or bottom-left corner of a window.

    DM_EDIT—Displays the image shown when positioned over an editable field.

    DM_HORIZONTAL—Displays the image shown when sizing a window horizontally.

    DM_MOVE—Displays the image shown when indicating that the object is to be moved.

    DM_POSITION—Displays the image shown when indicating that something is to be positioned by the device.

    DM_VERTICAL—Displays the image shown when sizing a window vertically.

    DM_VIEW—Displays the default image, typically an arrow.

DM_WAIT—Displays the image shown to indicate to the user that some processing is taking place and that he should wait.

Example

```
#include <ui_evt.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    // Display an hour glass until the program is ready to receive user input.
    eventManager->DeviceState(E_MOUSE, DM_WAIT);
    .
    .
    .

}
```

UI_EVENT_MANAGER::Event

Syntax

#include <ui_evt.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*,
    ZIL_DEVICE_TYPE *deviceType* = E_DEVICE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function allows the programmer to communicate with devices through the Event Manager. This permits the programmer to change the interaction of input devices without having a pointer to the device.

- *event*$_{in}$ is the message to be passed to an input device.

- *deviceType*$_{in}$ is the type of device to which the message will be passed. ZIL_DEVICE_TYPE values used by the library include: E_CURSOR, E_KEY, and E_MOUSE.

Example

```
#include <ui_evt.hpp>

ExampleFunction()
{
    // Attach the keyboard to the event manager.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // Turn all the devices off.
    UI_EVENT event;
    event.type = D_OFF;
    eventManager->Event(event, E_DEVICE);
    .
    .
    .

}
```

UI_EVENT_MANAGER::First

Syntax

#include <ui_evt.hpp>

UI_DEVICE *First(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the first device in the Event Manager's list. When devices are added to the Event Manager, they are ordered so that devices with a higher priority (i.e., lower device type value) will be at the beginning of the Event Manager's list. Thus, this function will return a pointer to the highest priority device.

- *returnValue*$_{out}$ is the first device in the Event Manager's list.

UI_EVENT_MANAGER::Get

Syntax

```
#include <ui_evt.hpp>

virtual int Get(UI_EVENT &event, Q_FLAGS flags = Q_NORMAL);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function gets an event from the Event Manager's event queue, if one is available. The event queue is used to temporarily store events that are waiting to be processed. These events can be from input devices, from the operating system (if the operating system provides an event driven messaging system), or from the programmer.

- *returnValue*$_{out}$ is set to 0 if an event was available and copied to the *event* argument. Otherwise, a negative value is returned, indicating that an event was not available.

- *event*$_{out}$ is a reference pointer to the event. This argument is a copy of the event information.

- *flags*$_{in}$ indicates what actions should take place when attempting to get an event from the event queue. The following flags (declared in **UI.EVT_HPP**) specify the available actions:

Q_BEGIN—Retrieves the event from the beginning of the input queue. Setting this flag forces the Event Manager to return the oldest event in the event queue.

Q_BLOCK—Remains in the **UI_EVENT_MANAGER::Get( )** function polling the devices until there is an event on the queue.

Q_DESTROY—Destroys the event information from the Event Manager after it is copied to *event*. **NOTE:** The Q_NO_DESTROY flag takes precedence over this flag.

Q_END—Retrieves the event from the end of the input queue. Setting this flag forces the Event Manager to return the most recent event in the event queue.

Q_NO_BLOCK—Polls the devices and then immediately returns from the **UI_EVENT_MANAGER::Get( )** function, even if there is not an event in the event queue.

Q_NO_DESTROY—Does not destroy the event information from the input queue. If this flag is set, the next call to **UI_EVENT_MANAGER::Get( )** will return the same event.

Q_NO_POLL—Does not poll the devices before checking the event queue. This is an advanced flag that should only be used by UI_DEVICE class objects when they communicate with the Event Manager. It prevents UI_DEVICE class objects from being recursively called by the **UI_EVENT_MANAGER::Get( )** function.

Q_NORMAL—This flag is equivalent to setting the Q_BLOCK, Q_BEGIN, Q_DESTROY and Q_POLL flags. This flag is the default if no other flag is set.

Q_POLL—Ensures that all devices in the Event Manager's device list are called before information is retrieved from the event queue. This enables the devices to place any events they may have stored on the queue.

Example

```
#include <ui_win.hpp>

main()
{
    .
    .
    .

    EVENT_TYPE ccode;
    do
```

```
    {
        // Get an event from the event manager.
        UI_EVENT event;
        eventManager->Get(event, Q_NORMAL);

        // Pass the event to the window manager.
        ccode = windowManager->Event(event);
    } while (ccode != L_EXIT);
    .
    .
    .
}
```

UI_EVENT_MANAGER::Last

Syntax

#include <ui_evt.hpp>

UI_DEVICE *Last(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the last device in the Event Manager's list. When devices are added to the Event Manager, they are ordered so that devices with a higher priority (i.e., lower device type value) will be at the beginning of the Event Manager's list. Thus, this function will return a pointer to the lowest priority device.

- *returnValue*$_{out}$ is the last device in the Event Manager's list.

UI_EVENT_MANAGER::Put

Syntax

#include <ui_evt.hpp>

virtual void Put(const UI_EVENT *&event*, Q_FLAGS *flags* = Q_END);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function puts an event into the event queue.

- $event_{in}$ is a reference pointer to the event. This argument has the event information that is put in the input queue.

- $flags_{in}$ indicates the order in which to insert the event into the event queue. The following flags (declared in **UI_EVT.HPP**) are recognized by the **UI_EVENT_-MANAGER::Put( )** function:

  Q_BEGIN—Puts the event information at the beginning of the input queue (i.e., before the oldest event in the input queue.)

  Q_END—Puts the event information at the end of the input queue (i.e., after the most recent event in the input queue.) This flag is the default if no other flag is set.

Example

```
#include <ui_win.hpp>

static void Exit(UI_WINDOW_OBJECT *item, UI_EVENT &event, EVENT_TYPE ccode)
{
    // Send an L_EXIT message through the system.
    event.type = L_EXIT;
```

```
    UI_EVENT_MANAGER *eventManager = item->eventManager;
    eventManager->Put(event, Q_BEGIN);
}
```

UI_EVENT_MANAGER::QFlags

Syntax

#include <ui_evt.hpp>

virtual Q_FLAGS QFlags(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the value of the *qFlags* member variable.

- *returnValue*$_{out}$ is the current flag setting for the event queue flags. If a call to **Get( )** is in progress, *returnValue* will indicate the flag setting passed in the call to **Get( )**. If no call to **Get( )** is in process, this value will be 0.

UI_EVENT_MANAGER::Subtract

Syntax

#include <ui_evt.hpp>

void Subtract(UI_DEVICE **device*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function subtracts a device from the Event Manager.

- $device_{in}$ is the device to be subtracted from the Event Manager.

UI_EVENT_MANAGER::operator +

Syntax

```
#include <ui_evt.hpp>

UI_EVENT_MANAGER &operator + (UI_DEVICE *device);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload adds a device to the Event Manager. When devices are added to the Event Manager, they are ordered so that devices with a higher priority (i.e., lower device type value) will be at the beginning of the Event Manager's list.

- $returnValue_{out}$ is a pointer to the Event Manager. This pointer is returned so that the operator may be used in a statement containing other operations.

- $device_{in}$ is the device to be added to the Event Manager.

UI_EVENT_MANAGER::operator -

Syntax

#include <ui_evt.hpp>

UI_EVENT_MANAGER &operator - (UI_DEVICE *_device_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload subtracts a device from the Event Manager.

- *returnValue*$_{out}$ is a pointer to the Event Manager. This pointer is returned so that the operator may be used in a statement containing other operations.

- *device*$_{in}$ is the device to be subtracted from the Event Manager.

CHAPTER 13 – UI_EVENT_MAP

The UI_EVENT_MAP structure is used to map raw input device events to logical events. For example, Zinc Application Framework declares default event mapping for the UID_-KEYBOARD and UID_MOUSE class objects. Some of their mapped values (in DOS) are:

<F1> — Mapped to L_HELP; a message that causes the system to generate context-sensitive help information about the current window object.

<TAB> — Mapped to L_NEXT; a message that moves focus to the next object on the window.

<Left-mouse-button click> — Mapped to L_BEGIN_SELECT if on a selection object or L_BEGIN_MARK if on an editable object. These messages select a window field or start a marking operation, respectively.

The UI_EVENT_MAP class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_EVENT_MAP
{
    ZIL_OBJECTID objectID;
    ZIL_LOGICAL_EVENT logicalValue;
    EVENT_TYPE eventType;
    ZIL_RAW_CODE rawCode;
    ZIL_RAW_CODE modifiers;

    static LOGICAL_EVENT MapEvent(UI_EVENT_MAP *mapTable,
        const UI_EVENT &event, ZIL_OBJECTID id1 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id2 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id3 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id4 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id5 = ID_WINDOW_OBJECT);
};
```

General Members

This section describes those members that are used for general purposes.

- *objectID* is the object identification for which the match applies. (A full list of object identifications is given in **UI_EVT.HPP**.) Each window identification has an "ID_" prefix. Some example window object identifications are:

ID_WINDOW_OBJECT—This identification is a default identification associated with all class objects derived from the UI_WINDOW_OBJECT base class.

ID_BORDER—This identification is associated with the UIW_BORDER class object.

ID_STRING—This identification is associated with the UIW_STRING object or with any class object derived from the UIW_STRING base class (e.g., UIW_DATE, UIW_TIME).

- *logicalValue* is the logical event to map. (A full list of logical values is given in **UI_EVT.HPP**.) Each logical value has an "L_" prefix. Some example logical values are:

  L_EXIT—Exits the application program.

  L_BEGIN_MARK—Begins a mark region.

- *eventType* is the raw device identification. The following event types (declared in **UI_EVT.HPP**) are pre-defined by Zinc Application Framework:

  E_CURSOR—Identification for the UID_CURSOR object.

  E_KEY—Identification for the UID_KEYBOARD object. This device generates keyboard input information.

  E_MOUSE—Identification for the UID_MOUSE object. This device generates mouse input information.

- *rawCode* is the raw scan code or button state (depending on the type of device) of the event.

- *modifiers* is a bit field that indicates which modifier keys (i.e., shift keys, meta keys, etc.) were pressed at the time the event occurred.

UI_EVENT_MAP::MapEvent

Syntax

#include <ui_evt.hpp>

static LOGICAL_EVENT MapEvent(UI_EVENT_MAP **mapTable*,
const UI_EVENT *&event*,
ZIL_OBJECTID *id1* = ID_WINDOW_OBJECT,
ZIL_OBJECTID *id2* = ID_WINDOW_OBJECT,
ZIL_OBJECTID *id3* = ID_WINDOW_OBJECT,
ZIL_OBJECTID *id4* = ID_WINDOW_OBJECT,
ZIL_OBJECTID *id5* = ID_WINDOW_OBJECT);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function provides the logical mapping (if any) of a raw event.

- $returnValue_{out}$ is the logical event that matches the event and identification parameters. If no match occurs, this value is *event.type* (i.e., the event type passed into the **MapEvent( )** function).

- $mapTable_{in}$ is a pointer to the event map table to be used by the event mapping function.

- $event_{in}$ is the raw event to be mapped. The *event.type* and *event.rawCode* values are used by the event mapping function.

- $id1_{in}$, $id2_{in}$, $id3_{in}$, $id4_{in}$ and $id5_{in}$ are hierarchal identification values used when interpreting the raw event. For example, the UIW_TEXT class object uses the following identification values when it looks for a logical mapping:

  id1—ID_TEXT
  id2—ID_WINDOW

id3—ID_WINDOW_OBJECT
id4—unused
id5—unused

Example

```
#include <ui_evt.hpp>

class ZIL_EXPORT_CLASS UI_WINDOW_OBJECT : public UI_ELEMENT
{
protected:
    EVENT_TYPE LogicalEvent(const UI_EVENT &event, ZIL_OBJECTID currentID)
        { return (UI_EVENT_MAP::MapEvent(eventMapTable, event, currentID,
            windowID[0], windowID[1], windowID[2], windowID[3], windowID[4])); }
    .
    .
    .

}

EVENT_TYPE UIW_TITLE::Event(const UI_EVENT &event)
{
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_TITLE);
    switch (ccode)
    {
    .
    .
    .

    }
    return (ccode);
}
```

CHAPTER 14 – UI_GEOMETRY_MANAGER

The UI_GEOMETRY_MANAGER class object is the controlling class for geometry management. Geometry management is used to restrict an object to minimum and maximum sizes or to tie an edge of an object to other objects or its parent so that it remains at a specified distance from the object. The objects can be stretched or shrunk or can simply be repositioned. Different types of constraints can be applied to each object, allowing flexible run-time positioning and sizing.

A geometry manager should be added to the window that contains the objects being managed. If a child window has objects that should be managed, it should have its own geometry manager. Otherwise, one geometry manager is sufficient to manage all objects on a window. Constraints, such as UI_ATTACHMENT, UI_DIMENSION_CONSTRAINT and UI_RELATIVE_CONSTRAINT, are added to the geometry manager.

The UI_GEOMETRY_MANAGER class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class UI_GEOMETRY_MANAGER : public UI_WINDOW_OBJECT, public UI_LIST
{
public:
    static ZIL_ICHAR _className[];

    UI_GEOMETRY_MANAGER(void);
    virtual ~UI_GEOMETRY_MANAGER(void);
    virtual ZIL_ICHAR *ClassName(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event);
    virtual void *Information(ZIL_ZIL_INFO_REQUEST request, void *data,
        ZIL_ZIL_OBJECTID objectID = ID_DEFAULT);

#if defined(ZIL_LOAD)
    virtual ZIL_NEW_FUNCTION NewFunction(void);
    static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    UI_GEOMETRY_MANAGER(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    virtual void Load(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
        ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif

    // List members.
    UI_CONSTRAINT *Add(UI_CONSTRAINT *object);
    UI_CONSTRAINT *Current(void);
    UI_CONSTRAINT *First(void);
```

```
    UI_CONSTRAINT *Last(void);
    UI_CONSTRAINT *Subtract(UI_CONSTRAINT *object);
    UI_GEOMETRY_MANAGER &operator+(UI_CONSTRAINT *object);
    UI_GEOMETRY_MANAGER &operator-(UI_CONSTRAINT *object);
};
```

General Members

This section describes those members that are used for general purposes.

- *_className* contains a string identifying the class. The string is always the same name as the class, is always in English, and never changes. For example, for the UI_GEOMETRY_MANAGER class, *_className* is "UI_GEOMETRY_MANAGER."

UI_GEOMETRY_MANAGER::UI_GEOMETRY_MANAGER

Syntax

#include <ui_win.hpp>

UI_GEOMETRY_MANAGER(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_GEOMETRY_MANAGER class object.

UI_GEOMETRY_MANAGER::~UI_GEOMETRY_MANAGER

Syntax

#include <ui_win.hpp>

virtual ~UI_GEOMETRY_MANAGER(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_GEOMETRY_MANAGER object. All constraints attached to the geometry manager will also be destroyed.

UI_GEOMETRY_MANAGER::Add UI_GEOMETRY_MANAGER::operator +

Syntax

#include <ui_win.hpp>

UI_CONSTRAINT *Add(UI_CONSTRAINT **object*);
or
UI_GEOMETRY_MANAGER &operator + (UI_CONSTRAINT **object*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions are used to add a constraint to the geometry manager. The order in which objects are added to a window is important because it affects the order in which the constraints are processed. When the window to which the geometry manager is attached is sized the geometry manager goes through its list of constraints, from first to last, calling each constraint's **Modify( )** function. If more than one constraint can affect an object, then the constraints must be added to the geometry manager so that the constraint that needs to be processed first is added first. For example, if object 1 is tied to the left edge of object 2, using a UI_ATTACHMENT constraint, and object 2 is tied to its parent, using a UI_RELATIVE_CONSTRAINT. object 2's constraint should be added to the geometry manager first. This is because its size or position will likely change if the window is sized, and object 1's position needs to be updated based on object 2's new position.

The first function adds a constraint to the geometry manager.

- *returnValue*$_{out}$ is a pointer to *object*.
- *object*$_{in}$ is a pointer to the constraint to be added to the geometry manager.

The second operator overload adds a constraint to the geometry manager. This operator overload is equivalent to calling the **UI_GEOMETRY_MANAGER::Add( )** function except that it allows the chaining of constraint additions to the geometry manager.

- *returnValue*$_{out}$ is a pointer to the UI_GEOMETRY_MANAGER. This pointer is returned so that the operator may be used in a statement containing other operations.
- *object*$_{in}$ is a pointer to the constraint that is to be added to the geometry manager.

UI_GEOMETRY_MANAGER::ClassName

Syntax

```
#include <ui_win.hpp>

virtual ZIL_ICHAR *ClassName(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns the object's class name.

- *returnValue*$_{out}$ is a pointer to *_className*.

UI_GEOMETRY_MANAGER::Current

Syntax

```
#include <ui_win.hpp>

UI_CONSTRAINT *Current(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the current constraint, if one exists, in the geometry manager.

- *returnValue*$_{out}$ is a pointer to the current constraint. If there is no current constraint, *returnValue* is NULL.

UI_GEOMETRY_MANAGER::Event

Syntax

#include <ui_win.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function processes run-time messages sent to the geometry manager. It is declared virtual so that any derived geometry manager class can override its default operation.

- $returnValue_{out}$ indicates how *event* was processed. If the event is processed successfully, the function returns the logical type of event that was interpreted from *event*. If the event could not be processed, S_UNKNOWN is returned.

- $event_{in}$ contains a run-time message for the geometry manager. The type of operation performed depends on the interpretation of the event. The following logical events are processed by **Event( )**:

  S_CHANGED, **S_CREATE** and **S_MOVE**—These messages cause the window and all its sub-objects to update their size and position. If the geometry manager gets one of these messages from the window, it calls all its constraints' **Modify( )** functions.

  All other messages return an S_UNKNOWN.

UI_GEOMETRY_MANAGER::First

Syntax

#include <ui_win.hpp>

UI_CONSTRAINT *First(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the first constraint, if one exists, in the geometry manager.

- *returnValue*$_{out}$ is a pointer to the first constraint. If there is no first constraint, *returnValue* is NULL.

UI_GEOMETRY_MANAGER::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST *request*, void **data*,
ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the geometry manager:

  I_INITIALIZE_CLASS—Causes the object to initialize any basic information that does not require a knowledge of its parent or sibling objects. This request is sent from the constructor of the object.

  All other requests are sent to **UI_WINDOW_OBJECT::Information( )** for processing.

- *data*$_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.

- *objectID*$_{in}$ is a ZIL_OBJECTID that specifies which type of object the request is intended for. Because the **Information( )** function is virtual, it is possible for an object to be able to handle a request at more than one level of its inheritance hierarchy. *objectID* removes the ambiguity by specifying which level of an object's hierarchy should process the request. If no value is provided for *objectID*, the object will attempt to interpret the request with the *objectID* of the actual object type.

UI_GEOMETRY_MANAGER::Last

Syntax

```
#include <ui_win.hpp>

UI_CONSTRAINT *Last(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the last constraint, if one exists, in the geometry manager.

- *returnValue*$_{out}$ is a pointer to the last constraint. If there is no last constraint, *returnValue* is NULL.

UI_GEOMETRY_MANAGER::Subtract

Syntax

```
#include <ui_win.hpp>

UI_CONSTRAINT *Subtract(UI_CONSTRAINT *object);
    or
UI_GEOMETRY_MANAGER &operator - (UI_CONSTRAINT *object);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions are used to subtract a constraint from the geometry manager. These functions do not delete the constraints, they merely remove them from the list. The programmer is responsible for destroying any objects explicitly subtracted from the geometry manager.

The first function subtracts a constraint from the geometry manager.

- *returnValue*$_{out}$ is a pointer to *object*.

- *object*$_{in}$ is a pointer to the constraint to be subtracted from the geometry manager.

The second operator overload subtracts a constraint from the geometry manager. This operator overload is equivalent to calling the **UI_GEOMETRY_MANAGER::-Subtract( )** function except that it allows the chaining of constraint subtractions from the geometry manager.

- *returnValue*$_{out}$ is a pointer to the UI_GEOMETRY_MANAGER. This pointer is returned so that the operator may be used in a statement containing other operations.

- *object*$_{in}$ is a pointer to the constraint that is to be subtracted from the geometry manager.

Storage Members

This section describes those class members that are used for storage purposes.

UI_GEOMETRY_MANAGER::UI_GEOMETRY_MANAGER

Syntax

```
#include <ui_win.hpp>

UI_GEOMETRY_MANAGER(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file,
    ZIL_STORAGE_OBJECT_READ_ONLY *object,
    UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
    UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_GEOMETRY_MANAGER by loading the object from a data file. Typically, the programmer does not need to use this constructor. If a geometry manager is stored in a data file it is usually stored as part of a UIW_-WINDOW and will be loaded when the window is loaded.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WIN-DOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_GEOMETRY_MANAGER::Load

Syntax

#include <ui_win.hpp>

virtual void Load(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*, ZIL_STORAGE_OBJECT_READ_ONLY **object*, UI_ITEM **objectTable*, UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a UI_GEOMETRY_MANAGER from a persistent object data file. It is called by the persistent constructor and is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_GEOMETRY_MANAGER::New

Syntax

```
#include <ui_win.hpp>

static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
    UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
    UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a persistent object from a data file. This function is a static class member so that its address can be placed in a table used by the library to load persistent objects from a data file.

NOTE: The application must first create a display if objects are to be loaded from a data file.

- $name_{in}$ is the name of the object to be loaded.
- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_GEOMETRY_MANAGER::NewFunction

Syntax

```
#include <ui_win.hpp>

virtual ZIL_NEW_FUNCTION NewFunction(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns a pointer to the object's **New( )** function.

- *returnValue*$_{out}$ is a pointer to the object's **New( )** function.

UI_GEOMETRY_MANAGER::Store

Syntax

#include <ui_win.hpp>

virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
UI_ITEM *userTable);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to write an object to a data file.

- $name_{in}$ is the name of the object to be stored.

- $file_{in}$ is a pointer to the ZIL_STORAGE where the persistent object will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the persistent object information will be stored. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

- $objectTable_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WIN-DOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- $userTable_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-

OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

CHAPTER 15 – UI_GRAPHICS_DISPLAY

The UI_GRAPHICS_DISPLAY class implements a graphics display that uses the GFX graphics library package to draw to the screen. The UI_GRAPHICS_DISPLAY class is the only DOS graphics display that supports Unicode mode. Thus, if a Unicode application is being created for DOS graphics mode this display class must be used instead of any other display class. Since the UI_GRAPHICS_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_GRAPHICS_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_GRAPHICS_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class UI_GRAPHICS_DISPLAY : public UI_DISPLAY, public UI_REGION_LIST
{
public:
    struct GRAPHICSFONT
    {
        int font;
        int maxWidth, maxHeight;
    };
    typedef unsigned char GRAPHICSPATTERN[10];

    static UI_PATH *searchPath;
    static GRAPHICSFONT fontTable[ZIL_MAXFONTS];
    static GRAPHICSPATTERN patternTable[ZIL_MAXPATTERNS];

    UI_GRAPHICS_DISPLAY(int mode = 4);
    virtual ~UI_GRAPHICS_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
```

```
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
    int _fillPattern;
    int _backgroundColor;
    int _foregroundColor;
    int _fillAttributes;
    int _outlineAttributes;
    signed char _virtualCount;
    UI_REGION _virtualRegion;
    char _stopDevice;

    void SetFont(ZIL_LOGICAL_FONT logicalFont);
    void SetPattern(const UI_PALETTE *palette, int _xor);
};
```

General Members

This section describes those members that are used for general purposes.

- *GRAPHICSFONT* is a structure that contains the following font information:

  font contains the value of the font. FNT_SMALL_FONT (font is 0), FNT_-DIALOG_FONT (font is 1) and FNT_SYSTEM_FONT (font is 2) are predefined by Zinc.

  maxHeight is the height of the tallest character.

maxWidth is the width of the widest character.

- *GRAPHICSPATTERN* is an array of 10 bytes that make up the 8x8 bitmap pattern. The first two bytes indicate the number of rows and columns defined in the pattern. The remaining 8 bytes define the pattern. Each byte (8 bits) corresponds to 8 pixels in the pattern. The patterns defined by Zinc are: PTN_SOLID_FILL, PTN_INTERLEAVE_FILL and PTN_BACKGROUND_FILL.

- *searchPath* contains the path to be searched for the Unicode font file. This file contains character definitions for thousands of Unicode characters. The file, called **UNICODE.FNT**, must be found at run-time or else the application will not be able to display the proper characters.

- *fontTable* is an array of *GRAPHICSFONT*. The default array contains space for 10 *ZINCFONT* entries. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A font used to display an icon's text string.

  FNT_DIALOG_FONT—A font used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.).

  FNT_SYSTEM_FONT—A sans-serif style font used to display a window's title.

  The remaining entries in *fontTable* are initially set to ROM_8X8, which is a GFX fixed-width, 8x8, bitmapped font.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *patternTable* is an array of *GRAPHICSPATTERN*. The default array contains space for 15 *GRAPHICSPATTERN* entries. The following entries are pre-defined by Zinc:

  PTN_SOLID_FILL—Solid fill.

  PTN_INTERLEAVE_FILL—Interleaving line fill.

  PTN_BACKGROUND_FILL—Background fill style.

- *maxColors* is the maximum number of colors supported by the graphics mode that was initialized. For example, an EGA display might support sixteen colors. This member will be filled in according to information obtained from the GFX graphics

library after it has initialized. The GFX graphics library supports SVGA modes, including 256 color mode. Zinc will support whatever mode is initialized by the GFX graphics library.

- *_fillPattern* is an index into the *patternTable* specifying the current fill pattern.
- *_backgroundColor* is the current background drawing color.
- *_foregroundColor* is the current foreground drawing color.
- *_fillAttributes* is the type of filling that takes place (e.g., is the shape filled?, is a line drawn around the filled area?, etc.). This field is only used by the UI_GRAPHICS_-DISPLAY when calling the GFX graphics functions.
- *_outlineAttributes* is the current line style. This field is only used by the UI_-GRAPHICS_DISPLAY when calling the GFX graphics functions.
- *_virtualCount* is a count of the number of virtual screen operations that have taken place. For example, when the **VirtualGet( )** function is called, *_virtualCount* is decremented. Additionally, when the **VirtualPut( )** function is called, *_virtualCount* is incremented.
- *_virtualRegion* is the region affected by either **VirtualGet( )** or **VirtualPut( )**.
- *_stopDevice* is a variable used to disable updates of device images on the display. If *_stopDevice* is TRUE, no drawing will be done to the screen. Otherwise, drawing will be made directly to the screen display.

UI_GRAPHICS_DISPLAY::UI_GRAPHICS_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_GRAPHICS_DISPLAY(int *mode* = 4);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_GRAPHICS_DISPLAY object. When a new UI_-GRAPHICS_DISPLAY class is constructed, Zinc sets the screen display to the background color and pattern specified by the inherited variable *backgroundPalette*.

- $mode_{in}$ determines the display mode initialized (e.g., CGA, EGA, VGA, SVGA, etc.). There are several ways to initialize the UI_GRAPHICS_DISPLAY class. The first uses auto-selection. The following modes can be passed in to auto-select the display mode based on the graphics hardware capability:

0x01	medium resolution (320x200)
0x02	high resolution, monochrome (640x200)
0x03	EGA enhanced resolution (640x350)
0x04	VGA resolution (640x480)

Alternately, the resolution can be forced. To do this, *mode* must be **FORCE_BIOS_-MODE** + mode, where mode can be one of the following:

0x04	320x200	4 colors
0x05	320x200	2 colors
0x06	640x200	2 colors
0x08	640x400	2 colors
0x09	720x348	2 colors
0x0D	320x200	16 colors
0x0E	640x200	16 colors
0x0F	640x350	2 colors
0x10	640x350	16 colors
0x11	640x480	2 colors
0x12	640x480	16 colors

For example, if 640x480 16-color resolution is desired, *mode* should be set to **FORCE_BIOS_MODE** + 0x12. **FORCE_BIOS_MODE** is a constant defined in **GFX.H**.

To initialize the UI_GRAPHICS_DISPLAY to a SVGA mode, *mode* should be set to one of the following:

0x100	640x400	256 colors
0x101	640x480	256 colors
0x102	800x600	16 colors
0x103	800x600	256 colors
0x104	1024x768	16 colors
0x105	1024x768	256 colors
0x106	1280x1024	16 colors
0x107	1280x1024	256 colors

Example

```
#include <ui_win.hpp>
main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    .
    .
    .

    return (0);
}
```

UI_GRAPHICS_DISPLAY::~UI_GRAPHICS_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_GRAPHICS_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_GRAPHICS_-

DISPLAY class. Care should be taken to only destroy a UI_GRAPHICS_DISPLAY class that is not attached to another associated object.

UI_GRAPHICS_DISPLAY::SetFont

Syntax

#include <ui_dsp.hpp>

void SetFont(ZIL_LOGICAL_FONT *logicalFont*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the font information used by the GFX graphics library. The information contained in the *logicalFont* entry of the *fontTable* array is used to set the font.

- $logicalFont_{in}$ is the font to be used. *logicalFont* is an entry into the *fontTable* array.

UI_GRAPHICS_DISPLAY::SetPattern

Syntax

#include <ui_dsp.hpp>

void SetPattern(const UI_PALETTE **palette*, int *_xor*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the pattern information used by the GFX graphics library. The information contained in *palette* is used to set the pattern.

- $palette_{in}$ contains the pattern style, foreground color, and background color to be used when setting the pattern.

- $\_xor_{in}$ indicates if the pattern should be drawn with the xor attribute on. If *_xor* is TRUE, the pattern will be an xor pattern. Otherwise, the pattern will not be xor.

CHAPTER 16 – UI_HELP_STUB

The UI_HELP_STUB class is the base class for the help system. The help system is used to display help for the end-user. The UI_HELP_STUB class defines the functionality that must exist in the help system. It is an abstract class, so only classes derived from UI_-HELP_STUB, such as UI_HELP_SYSTEM, can be created.

The UI_HELP_STUB class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_HELP_STUB : public ZIL_INTERNATIONAL
{
public:
    virtual ~UI_HELP_STUB(void);
    virtual void DisplayHelp(UI_WINDOW_MANAGER *windowManager,
        UI_HELP_CONTEXT helpContext = NO_HELP_CONTEXT) = 0;
};
```

General Members

This section describes those members that are used for general purposes.

UI_HELP_STUB::~UI_HELP_STUB

Syntax

#include <ui_win.hpp>

virtual ~UI_HELP_STUB(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_HELP_STUB

object.

UI_HELP_STUB::DisplayHelp

Syntax

```
#include <ui_win.h>

virtual void DisplayHelp(UI_WINDOW_MANAGER *windowManager,
    UI_HELP_CONTEXT helpContext = NO_HELP_CONTEXT);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This pure virtual function displays the help window. See "Chapter 17—UI_HELP_-SYSTEM" for details on the help system's implementation of this function.

- *windowManager*$_{in}$ is a pointer to the Window Manager.
- *helpContext*$_{in}$ is the help context to present. If this value is NO_HELP_CONTEXT, the help window system will use the default help context provided in the UI_HELP_-SYSTEM constructor.

CHAPTER 17 – UI_HELP_SYSTEM

The UI_HELP_SYSTEM class is used to provide help information to the end-user at run-time. The programmer can create both context-sensitive help information—so that the end-user can get help relating to the current task—and general help to aid the end-user with general aspects of the application.

The UI_HELP_SYSTEM class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_HELP_SYSTEM : public UI_HELP_STUB
{
public:
    static ZIL_ICHAR _className[];
    static int defaultInitialized;

    UI_HELP_SYSTEM(ZIL_ICHAR *fileName,
        UI_WINDOW_MANAGER *windowManager = ZIL_NULLP(UI_WINDOW_MANAGER),
        UI_HELP_CONTEXT helpContext = NO_HELP_CONTEXT);
    virtual ~UI_HELP_SYSTEM(void);
    virtual void DisplayHelp(UI_WINDOW_MANAGER *windowManager,
        UI_HELP_CONTEXT helpContext = NO_HELP_CONTEXT);

    void SetLanguage(const ZIL_ICHAR *languageName);

protected:
    ZIL_STORAGE_READ_ONLY *storage;
    UIW_WINDOW *helpWindow;
    UIW_TITLE *titleField;
    UIW_TEXT *messageField;
    UI_HELP_CONTEXT defaultHelpContext;
    const ZIL_LANGUAGE *myLanguage;
};
```

General Members

This section describes those members that are used for general purposes.

- *_className* contains a string identifying the class. The string is always the same name as the class, is always in English, and never changes. For example, for the UI_HELP_SYSTEM class, *_className* is "UI_HELP_SYSTEM."

- *defaultInitialized* indicates if the default language strings for this object have been set up. The default strings are located in the file **LANG_DEF.CPP**. If *defaultInitialized* is TRUE, the strings have been set up. Otherwise they have not been. *defaultInitialized* is set to TRUE when the strings are set up in the object's constructor.

- *storage* is a pointer to the ZIL_STORAGE_READ_ONLY that contains the help data. The **.DAT** file must be created by the programmer using the Visual Designer.

- *helpWindow* is a pointer to the UIW_WINDOW used to display help messages. The UI_HELP_SYSTEM creates this window automatically.

- *titleField* is a pointer to the UIW_TITLE object on the help window. The UI_-HELP_SYSTEM creates this title automatically.

- *messageField* is a pointer to the UIW_TEXT field used to display the help text. The UI_HELP_SYSTEM creates this field automatically.

- *defaultHelpContext* contains the default help context to be used if no other help context is specified. If the programmer wishes to use a particular help context as the default help context, he must specify the context to use in the constructor for the UI_-HELP_SYSTEM.

- *myLanguage* is the ZIL_LANGUAGE object that contains the string translations for this object.

Generating help files

The help context information is read from a help **.DAT** file when needed. This file is created in the Visual Designer either directly or from a text file. For example, the text file **HELP.TXT** below was first created using a text editor and then converted into a help **.DAT** file.

```
--- HELP_GENERAL
General Help
This application demonstrates how to use the help system

--- HELP_SPECIFIC
Specific Help
The UI_HELP_SYSTEM can be used to present both context-sensitive help and
general help.

The help information can be created in a text file, which is then processed
using the Designer to produce a help file.  Alternatively, the help
information can be created using the Help Context Editor in the Visual
Designer.
```

There are two help contexts in the example above. A help context consists of the context identifier, the context title, and the context help text. The help context identifier is set off by three dashes on the left side. The line below the help context name is the title that is displayed in the help window at run-time. All lines between the title and the next help context or file end are used as the help information presented for that context. The help

window will automatically do word-wrapping, so the programmer does not need to worry about line length. This means that when the help file is generated the carriage return at the end of each line in the text file is ignored. If a new line is required, place either a blank line or a backslash in the text file.

The Designer generates two files for use with help: a **.DAT** file and a **.HPP** file. The **.HPP** file should be included in each module of the program that calls the help system directly, since it contains declarations for the constants used to reference the help context information. The generated header file appears as follows:

```
#define HELP_GENERAL          0x0001  // General Help
#define HELP_SPECIFIC         0x0002  // Specific Help
```

The help context information in the text file can be modified and regenerated without recompiling the program if the help context names do not change. This is very useful if international versions of the application require different help files.

UI_HELP_SYSTEM::UI_HELP_SYSTEM

Syntax

#include <ui_win.h>
#include "*filename*.hpp"

UI_HELP_SYSTEM(ZIL_ICHAR **fileName*,
    UI_WINDOW_MANAGER **windowManager* =
    ZIL_NULLP(UI_WINDOW_MANAGER),
    UI_HELP_CONTEXT *helpContext* = NO_HELP_CONTEXT);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new UI_HELP_SYSTEM class object.

- *fileName*$_{in}$ is a pointer to a string containing the name of the help **.DAT** file. This file is generated in the Visual Designer .

- *windowManager*$_{in}$ is a pointer to the Window Manager. It is used by the help system to display the help window.

- *helpContext*$_{in}$ is the help context to present when no specific help context is available. The programmer may specify the help context identifier for the help he wants used as the default.

Example

```
#include <ui_win.hpp>
#define USE_HELP_CONTEXTS
#include "demo.hpp"

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    UI_WINDOW_OBJECT::errorSystem = new UI_ERROR_SYSTEM;
    UI_WINDOW_OBJECT::helpSystem = new UI_HELP_SYSTEM("demo.dat",
         windowManager, HELP_GENERAL);
    .
    .
    .

    // Restore the system.
    delete UI_WINDOW_OBJECT::helpSystem;
    delete UI_WINDOW_OBJECT::errorSystem;
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_HELP_SYSTEM::~UI_HELP_SYSTEM

Syntax

#include <ui_win.h>

virtual ~UI_HELP_SYSTEM(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_HELP_-SYSTEM object.

UI_HELP_SYSTEM::DisplayHelp

Syntax

```
#include <ui_win.h>
#include "filename.hpp"

virtual void DisplayHelp(UI_WINDOW_MANAGER *windowManager,
    UI_HELP_CONTEXT helpContext = NO_HELP_CONTEXT);
```

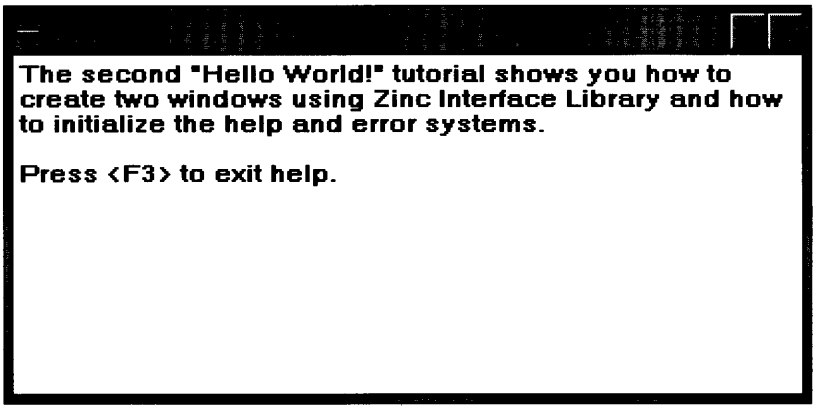
Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function is used to display help information. The picture below shows a graphic representation of the UI_HELP_SYSTEM presentation window:



- *windowManager*$_{in}$ is a pointer to the Window Manager. The help system will attach the help window to the Window Manager.

- *helpContext*$_{in}$ is the help context to present. If this value is NO_HELP_CONTEXT, the help window system will use the default help context provided in the UI_HELP_-SYSTEM constructor.

Example

```
#include <ui_win.hpp>
#define USE_HELP_CONTEXTS
#include "demo.hpp"

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MS_MOUSE
        + new UID_CURSOR;

    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    UI_WINDOW_OBJECT::errorSystem = new UI_ERROR_SYSTEM;
    UI_WINDOW_OBJECT::helpSystem = new UI_HELP_SYSTEM("demo.dat",
         windowManager, HELP_GENERAL);
    .
    .
    .

    // Call the help system to display general help.
    windowManager->helpSystem->DisplayHelp(windowManager, HELP_SPECIFIC);
    .
    .
    .
}
```

UIW_HELP_SYSTEM::SetLanguage

Syntax

#include <ui_win.hpp>

void SetLanguage(const ZIL_ICHAR *_languageName_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the language to be used by the object. The string translations for the object will be loaded and the object's *myLanguage* member will be updated to point to the new ZIL_LANGUAGE object. By default, the object uses the language identified in the **LANG_DEF.CPP** file, which compiles into the library. (If a different default language is desired, simply copy a **LANG_<ISO>.CPP** file from the ZINC\SOURCE\-INTL directory to the \ZINC\SOURCE directory, and rename it to **LANG_DEF.CPP** before compiling the library.) The language translations are loaded from the **I18N.DAT** file, so it must be shipped with your application.

- $languageName_{in}$ is the two-letter ISO language code identifying which language the object should use.

CHAPTER 18 – UI_ITEM

The UI_ITEM structure is used to store different pieces of related information that, together, can be used for any of several purposes. One common use is to create several UI_ITEM structures in an array which is then passed to the constructor of a library object. The library object constructor uses the information in each UI_ITEM structure of the array to create an object which is added to the library object being constructed. For example, when a UI_ITEM array is passed to a UIW_COMBO_BOX constructor, UIW_STRING objects are created and attached to the combo box, thus saving the programmer from having to create the strings. Zinc also uses UI_ITEM arrays as lookup tables for creating persistent objects and to maintain library strings that have been translated to different languages.

The UI_ITEM class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_ITEM
{
    EVENT_TYPE value;
    void *data;
    ZIL_ICHAR *text;
    UIF_FLAGS flags;
};
```

General Members

This section describes those members that are used for general purposes.

- *value* is a number associated with the item. Its use depends on the context in which the UI_ITEM structure is used. *value* can be used to identify a particular item, or it can be an event to be put on the event queue if the item created from the UI_ITEM structure is selected. This is common if the UI_ITEM array is used to create UIW_POP_UP_ITEMs attached to a UIW_PULL_DOWN_ITEM. For example, if the following items are specified:

```
UI_ITEM _menuFlag[] =
{
    { ONE,      NULL,   " Item &one ",  MNIF_NO_FLAGS },
    { TWO,      NULL,   " Item &two ",  MNIF_NON_SELECTABLE },
    { L_EXIT,   NULL,   " E&xit",       MNIF_SEND_MESSAGE },
    { 0,        NULL,   NULL,           NULL }
};
```

  and the "Exit" option is selected, an L_EXIT event is put on the event queue.

- *data* may contain any information to associate with the item. The most common use for *data* by the library is to point to a user function associated with the object. When the object is selected, the function pointed to by *data* will be called. For example, the **_menuFlag** array defined above could be modified to contain a user function for each menu item:

```
UI_ITEM _menuFlag[] =
{
    { BTF_NO_TOGGLE,    CheckFlag,  " No toggle ",      WOF_NO_FLAGS },
    { BTF_DOWN_CLICK,   CheckFlag,  " Down click ",     WOF_NO_FLAGS },
    { BTF_CHECK_MARK,   CheckFlag,  " Check mark ",     WOF_NO_FLAGS },
    { BTF_AUTO_SIZE,    CheckFlag,  " Auto size ",      WOF_NO_FLAGS },
    { 0,                NULL,       NULL,               NULL }
};

EVENT_TYPE CheckFlag(UI_WINDOW_OBJECT *data, const UI_EVENT &event,
    EVENT_TYPE ccode)
{

    // Typecast a pointer to the pop-up-item.
    UIW_POP_UP_ITEM *item = (UIW_POP_UP_ITEM *)data;
    switch (item->value)
    {
    case BTF_NO_TOGGLE:
        .
        .
        .

        break;

    case BTF_DOWN_CLICK:
        .
        .
        .

        break;
    }
    return ccode;
}
```

- *text* is text associated with the item. When creating objects using the UI_ITEM array, *text* is typically the text that is displayed on the screen. When used as a lookup table to obtain translated library strings, *text* will contain the text to be displayed.

- *flags* is flags associated with the item. These flags are used when constructing the class object. If the item constructed is a UIW_POP_UP_ITEM, *flags* is interpreted to be MNIF_FLAGS. If the item constructed is a UIW_STRING, then *flags* is interpreted to be STF_FLAGS. The type of object constructed from the UI_ITEM structure depends on what object the UI_ITEM array was passed to.

NOTE: An array of UI_ITEM structures should always end with an end-of-array entry indicated by a UI_ITEM object that has 0 or NULL as the *value*, *data*, *text* and *flags*. This field must be provided since no array size argument is provided:

```
UI_ITEM _buttonFlag[] =
{
    .
    .
    .
    { 0,    NULL,   NULL,   NULL }  // End of array.
};
```

Portability

This structure is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Example

```
#include <ui_win.hpp>

ExampleFunction(UI_WINDOW_MANAGER *windowManager)
{
    UI_ITEM listItems[] =
    {
        { 11,       NULL,       "Item 1.1",     STF_NO_FLAGS },
        { 12,       NULL,       "Item 1.2",     STF_NO_FLAGS },
        { 21,       NULL,       "Item 2.1",     STF_NO_FLAGS },
        { 22,       NULL,       "Item 2.2",     STF_NO_FLAGS },
        { 0,        NULL,       NULL,           NULL }
    };

    // Create the window.
    UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
    *window
        + new UIW_BORDER
        + new UIW_TITLE(" Sample List ")
        + new UIW_PROMPT(2, 1, "List:")
        + new UIW_VT_LIST(10, 1, 20, 6, NULL, 0, listItems);
    *windowManager + window;
    .
    .
    .

}
```

CHAPTER 19 – UI_KEY

The UI_KEY structure is used to store the keyboard state generated by a key event. This structure maintains the keyboard's shift state and the key that was pressed.

The UI_KEY structure is declared in **UI_EVT.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_KEY
{
    ZIL_RAW_CODE shiftState;
    ZIL_RAW_CODE value;
};
```

General Members

This section describes those members that are used for general purposes.

- *shiftState* is a flag field that indicates the shift state of the keyboard. The shift state may contain one or more of the following flags (declared in **UI_EVT.HPP**):

  S_ALT—Indicates that the <Alt> key was pressed.

  S_CAPS_LOCK—Indicates that the <Caps-Lock> key was on.

  S_CTRL—Indicates that the <Ctrl> key was pressed.

  S_INSERT—Indicates that the <Ins> key was on.

  S_LEFT_SHIFT—Indicates that the <Left-Shift> key was pressed.

  S_NUM_LOCK—Indicates that the <Num-Lock> key was on.

  S_RIGHT_SHIFT—Indicates that the <Right-Shift> key was pressed.

  S_SCROLL_LOCK—Indicates that the <Scroll-Lock> key was on.

  Not every shift state listed above is available on every keyboard on every environment. On some environments the keypress that generates the state is slightly different, or, as may be the case with environments that allow key mapping (e.g., Unix environments), the keypress may be completely different, depending on the

user's configuration. This list is intended to be a comprehensive list of possible states.

- *value* is the key's value. It is not the scan code.

Portability

This structure is available on the following environments:

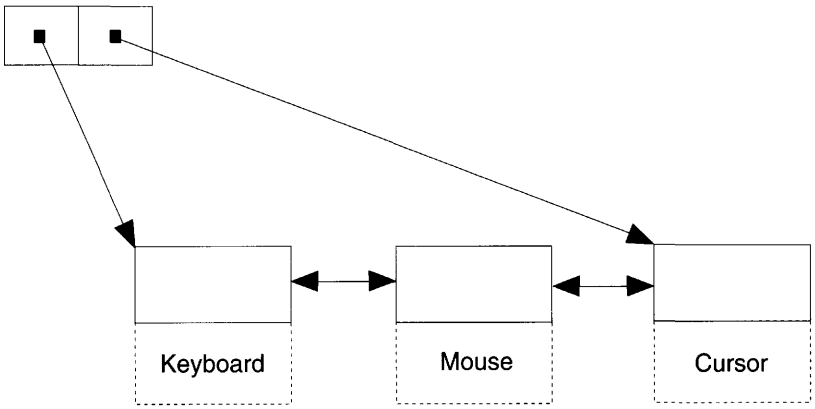
■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Example

```
#include <ui_evt.hpp>

void UID_KEYBOARD::Poll()
{
    // See if a keystroke is already waiting.
    .
    .
    .

    // Get the key from the keyboard bios using INT 16H, 10H(or 00H if not
    // enhanced).
    UI_EVENT event;
    event.type = E_KEY;
    inregs.h.ah = _enhancedBios;
    ZIL_INT86(0x16, &inregs, &outregs);
    event.rawCode = outregs.x.ax;
    event.key.value = outregs.h.al;

    // Get the shift state using INT 16H, 12H(or 02H if not enhanced).
    inregs.h.ah = 0x02 + _enhancedBios;
    ZIL_INT86(0x16, &inregs, &outregs);
    event.key.shiftState = outregs.h.al;

    // Place event on the queue.
    if (state != D_OFF && eventManager)
        eventManager->Put(event, Q_END);
}
```

CHAPTER 20 – UI_LIST

The UI_LIST class is a container class used to manage doubly-linked list elements derived from the UI_ELEMENT base class. It serves as the base class to all Zinc Application Framework management classes (e.g., UI_EVENT_MANAGER, UI_REGION_LIST) and many control objects (e.g., UIW_WINDOW, UIW_VT_LIST). All elements in a list must be derived from the UI_ELEMENT class since all UI_LIST member functions act upon UI_ELEMENT class objects. The figure below illustrates how elements are linked together in a list:



The UI_LIST class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_LIST
{
public:
    ZIL_COMPARE_FUNCTION compareFunction;

    UI_LIST(ZIL_COMPARE_FUNCTION compareFunction =
        ZIL_NULLF(ZIL_COMPARE_FUNCTION));
    virtual ~UI_LIST(void);
    UI_ELEMENT *Add(UI_ELEMENT *newElement);
    UI_ELEMENT *Add(UI_ELEMENT *element, UI_ELEMENT *newElement);
    int Count(void);
    UI_ELEMENT *Current(void);
    virtual void Destroy(void);
    UI_ELEMENT *First(void);
    UI_ELEMENT *Get(int index);
    UI_ELEMENT *Get(int (*findFunction)(void *element1, void *matchData),
        void *matchData);
    int Index(UI_ELEMENT const *element);
    UI_ELEMENT *Last(void);
    void SetCurrent(UI_ELEMENT *element);
    virtual void Sort(void);
    UI_ELEMENT *Subtract(UI_ELEMENT *element);
    UI_LIST &operator+(UI_ELEMENT *element);
    UI_LIST &operator-(UI_ELEMENT *element);
```

```
protected:
    UI_ELEMENT *first, *last, *current;
};
```

General Members

This section describes those members that are used for general purposes.

- *compareFunction* is a programmer defined function that will be called by the library when sorting the list of objects. *compareFunction* is called as each individual object is added and if the list is sorted explicitly by calling the **Sort( )** function. The objects can be sorted based on any key unique to the object. Pointers to the objects being compared are passed to the *compareFunction*, so any information required to do the sorting needs to be associated with the object. Because the objects can be of any type, even a derived type, the object pointers will need to be typecast in the *compareFunction*.

  The definition of the *compareFunction* is as follows:

  int FunctionName(void **element1*, void **element2*);

  returnValue$_{out}$ indicates the relative ordering of the two elements. *returnValue* should be negative if *element1* should be placed in front of *element2*, 0 if the two elements are sorted the same or positive if *element1* should come after *element2*.

  element1$_{in}$ is a pointer to the first element to be compared. This void pointer must be typecast according to the type of object being sorted.

  element2$_{in}$ is a pointer to the second element to be compared. This void pointer must be typecast according to the type of object being sorted.

- *first* and *last* point to the first and last elements in the list, respectively.

- *current* points to the current element in the list.

UI_LIST::UI_LIST

Syntax

#include <ui_gen.hpp>

UI_LIST(ZIL_COMPARE_FUNCTION *compareFunction* =
ZIL_NULLF(ZIL_COMPARE_FUNCTION));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new UI_LIST object.

- *compareFunction*$_{in}$ is a function that is used to determine the order of list elements. See the description of the *UI_LIST::compareFunction* member variable above for more information about the compare function.

Example

```
#include <ui_gen.hpp>

int ButtonValueCompare(void *button1, void *button2)
{
    return(((UIW_BUTTON *)button1)->value - ((UIW_BUTTON *)button2)->value);
}

ExampleFunction()
{
    // Each declaration below calls the UI_LIST constructor.
    UI_LIST list1;
    UI_LIST *list2 = new UI_LIST;
    UI_LIST list3(ButtonValueCompare);
    UI_LIST *list4 = new UI_LIST(ButtonValueCompare);
    .
    .
    .
    // Call the destructor for lists 2 and 4.  The list1 and list3 destructors
    // are automatically called when the scope of this function ends.
    delete list2;
    delete list4;
}
```

UI_LIST::~UI_LIST

Syntax

#include <ui_gen.hpp>

virtual ~UI_LIST(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_LIST object. It also destroys each element in the list.

Example

```
#include <ui_gen.hpp>

int ButtonValueCompare(void *button1, void *button2)
{
    return(((UIW_BUTTON *)button1)->value - ((UIW_BUTTON *)button2)->value);
}

ExampleFunction()
{
    // Each declaration below calls the UI_LIST constructor.
    UI_LIST list1;
    UI_LIST *list2 = new UI_LIST;
    UI_LIST list3(ButtonValueCompare);
    UI_LIST *list4 = new UI_LIST(ButtonValueCompare);
    .
    .
    .

    // Call the destructor for lists 2 and 4.  The list1 and list3 destructors
    // are automatically called when the scope of this function ends.
    delete list2;
    delete list4;
}
```

UI_LIST::Add
UI_LIST::operator +

Syntax

#include <ui_gen.hpp>

UI_ELEMENT *Add(UI_ELEMENT **newElement*);
or
UI_ELEMENT *Add(UI_ELEMENT **element*, UI_ELEMENT **newElement*);
or
UI_LIST &operator + (UI_ELEMENT **element*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions are used to add a new element to the UI_LIST object.

The first overloaded function adds a new element to the UI_LIST object into a position specified by the list's *compareFunction*. If no compare function is specified when the list is constructed, *newElement* is added to the end of the list.

- $returnValue_{out}$ is a pointer to *newElement* if the addition was successful. Otherwise, *returnValue* is NULL.

- $newElement_{in}$ is a pointer to the element to be added to the list. This argument must be a class object derived from the UI_ELEMENT base class.

The second overloaded function overrides the list's *compareFunction* by inserting *newElement* directly before *element*. The **UI_LIST::Sort( )** function may be called to sort the list when this function is used.

- $returnValue_{out}$ is a pointer to *newElement* if the addition was successful. Otherwise, *returnValue* is NULL.

- *element*$_{in}$ is a pointer to an element before which the new element is to be placed. If this variable is NULL, the function adds *newElement* to the end of the list.

- *newElement*$_{in}$ is a pointer to the element to be added to the list. This argument must be a class object derived from the UI_ELEMENT base class.

The third operator overload adds an element to the UI_LIST object. This operator overload is equivalent to calling the **UI_LIST::Add( )** function except that it allows the chaining of list element additions to the UI_LIST object.

- *returnValue*$_{out}$ is a reference pointer to the UI_LIST object. Returning the pointer to the UI_LIST object allows chaining of the **UI_LIST::operator+** overload operator.

- *element*$_{in}$ is a pointer to the new element that is to be added to the list.

NOTE: The **Add( )** function and the **+ operator** are also implemented in several classes derived from UI_LIST. Their argument types and return value types may be different than those shown here. See the appropriate chapter for more information on the derived implementation of these functions.

Example

```
#include <ui_win.hpp>

ExampleFunction(UI_WINDOW_MANAGER *windowManager)
{
    // Create a new window and attach it to the window manager.
    UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
    *window
        + new UIW_BORDER
        + new UIW_MAXIMIZE_BUTTON
        + new UIW_MINIMIZE_BUTTON
        + new UIW_SYSTEM_BUTTON
        + new UIW_TITLE("Window 1");
    *windowManager + window;
}
```

UI_LIST::Count

Syntax

#include <ui_gen.hpp>

int Count(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a count of the number of elements in the list.

- *returnValue*$_{out}$ is the number of elements in the list.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    UI_LIST list1;
    list1.Add(ZIL_NULLF(ZIL_COMPARE_FUNCTION), new SAMPLE_UI_ELEMENT);
    list1.Add(ZIL_NULLF(ZIL_COMPARE_FUNCTION), new SAMPLE_UI_ELEMENT);
    .
    .
    .

    // Count the number of elements in the list.
    int count = list1.Count();
    .
    .
    .

}
```

UI_LIST::Current

Syntax

#include <ui_gen.hpp>

UI_ELEMENT *Current(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the current element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the current element in the list. If there is no current element, *returnValue* is NULL.

NOTE: The **Current( )** function is also implemented in several classes derived from UI_LIST, such as UIW_COMBO_BOX and UIW_WINDOW. Their argument types and return value types may be different than those shown here. See the appropriate chapter for more information on the derived implementation of these functions.

UI_LIST::Destroy

Syntax

```
#include <ui_gen.hpp>

virtual void Destroy(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function destroys each element in the UI_LIST object, then clears the *first*, *last* and *current* members. The list's *compareFunction* remains unchanged.

Example 1

```
#include <ui_gen.hpp>

ExampleFunction1(UI_ELEMENT *element1)
{
    UI_LIST list1;
    list1.Add(element1);
    .
    .
    .

    // Destroy all the elements of the list.
    list1.Destroy();
    .
    .
    .

}
```

Example 2

```
ExampleFunction2(UI_ELEMENT *element1, UI_ELEMENT *element2)
{
    UI_LIST *list2 = new LIST;
    *list2 + element1 + element2;
    .
    .
    .

    // Destructively remove all items from the list.  The
    // element destructor is called for each item in the list.
    // Notice we have to also call delete on the list, since it was
    // dynamically constructed.
    list2->Destroy();
    delete list2;
    .
    .
    .

}
```

UI_LIST::First

Syntax

#include <ui_gen.hpp>

UI_ELEMENT *First(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the first element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the first element in the list. If there is no first element, *returnValue* is NULL.

NOTE: The **First( )** function is also implemented in several classes derived from UI_LIST, such as UIW_COMBO_BOX and UIW_WINDOW. Their argument types and return value types may be different than those shown here. See the appropriate chapter for more information on the derived implementation of these functions.

UI_LIST::Get

Syntax

```
#include <ui_gen.hpp>

UI_ELEMENT *Get(int index);
    or
UI_ELEMENT *Get(int (*findFunction)(void *element, void *matchData),
    void *matchData);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions are used to get a specific list element.

The first overloaded function returns the list element specified by *index*. The first element in the list has an index value of 0. If the index value is invalid, NULL is returned.

- *returnValue*$_{out}$ is a pointer to the matching element of the list. This value is NULL if no element matched the index value.

- *index*$_{in}$ is the index of the list element to find. List element indexes are zero based (i.e., the first element in a list has an index value of 0).

The second overloaded function searches the UI_LIST object for a pattern matched by *findFunction*.

- *returnValue*$_{out}$ is a pointer to the matching list element. This value is NULL if no element matches *matchData*.

- *findFunction*$_{in}$ is a pointer to a programmer-supplied function that compares a specified element with the typecast *matchData*. If an exact match is made this function must return a 0. Any non-zero value indicates that no match was made.

- *matchData*$_{in}$ is a pointer to the data to be matched. This can point to any data the programmer desires to match. The **Get( )** function will call *findFunction* with this argument as the *matchData* parameter.

Example 1

```
#include <ui_gen.hpp>

ExampleFunction1()
{
    UI_LIST list;
    list + new ITEM("Item1") + new ITEM("Item2");
    .
    .
    .

    // Get the 2nd element in the list.
    UI_ELEMENT *element = list.Get(1);
    // Get the element that matches the "Item2" pattern.
    ITEM *item = (ITEM *)list.Get(ITEM::Find, "Item2");
    .
    .
    .

}
```

Example 2

```
FindElement(void *element1, void *element2)
{
    return ((element1 == element2) ? 0 : -1);
}

ExampleFunction2()
{
    UI_LIST list2;
    ITEM *item;
    *list2
        + new ITEM("Item3")
        + (item = new ITEM("Item1"))
        + new ITEM("Item2");
    .
    .
    .

    // Get the first element in the list.
    ITEM *item = (ITEM *)list.Get(0);

    // See if item is still in the list.
    if (list.Get(FindElement, item))
        cout << "Item1 was found in the list.";
    else
        cout << "Item1 was NOT found in the list.";
}
```

UI_LIST::Index

Syntax

#include <ui_gen.hpp>

int Index(UI_ELEMENT const **element*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the index value of the specified element. If no element matches the specified element, -1 is returned.

- *returnValue*$_{out}$ gives the index of the element in the UI_LIST object. List element indexes are zero based (i.e., the first element in a list has an index value of 0). If *element* is not found in the UI_LIST object, -1 is returned.

- *element*$_{in}$ is a pointer to the list element to find. *element* must be derived from UI_ELEMENT.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    UI_LIST list;
    ITEM *item3 = new ITEM("Item3");
    ITEM *item1 = new ITEM("Item1");
    ITEM *item2 = new ITEM("Item2");
    list + item3 + item1 + item2;
    .
    .
    .

    list.Sort();
    // Get the index number of an element in a sorted list.
    cout << "Item1 is item #" << list.Index(item1) + 1 << "in the list.";
}
```

UI_LIST::Last

Syntax

#include <ui_gen.hpp>

UI_ELEMENT *Last(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the last element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the last element in the list. If there is no last element, *returnValue* is NULL.

NOTE: The **Last( )** function is also implemented in several classes derived from UI_LIST, such as UIW_COMBO_BOX and UIW_WINDOW. Their argument types and return value types may be different than those shown here. See the appropriate chapter for more information on the derived implementation of these functions.

UI_LIST::SetCurrent

Syntax

#include <ui_gen.hpp>

void SetCurrent(UI_ELEMENT **element*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is used to set the current item in the list.

- *element*$_{in}$ is a pointer to the element in the list that will become current. *element* must be a member of the list (i.e., it must have been previously added to the list.)

Example

```
EVENT_TYPE COMPORT_SETUP::ResetDefaults(UI_WINDOW_OBJECT *object,
    UI_EVENT &event, EVENT_TYPE ccode)
{
    if (ccode != L_SELECT)
        return ccode;

    for (UI_WINDOW_OBJECT *window = object; window->parent;
        window = window->parent)
            ;

    COMPORT_SETUP *parentWindow = (COMPORT_SETUP *)window;
    .
```

```
    .
    .

    // Reset the combo box's default current items.
    parentWindow->portField->list.SetCurrent(parentWindow->defaultPort);
    .
    .
    .

    return ccode;
}
```

UI_LIST::Sort

Syntax

#include <ui_gen.hpp>

void Sort(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function sorts the UI_LIST object using the *compareFunction* that was assigned in the constructor. If the list has no compare function, no sort occurs.

Example

```
#include <ui_gen.hpp>
ExampleFunction()
{
    UI_LIST list(ITEM::Compare);
    ITEM *item3 = new ITEM("Item3");
    ITEM *item1 = new ITEM("Item1");
    ITEM *item2 = new ITEM("Item2");
    list + item3 + item1 + item2;
    .
    .
    .
    // Sort a list of items.
    list.Sort();
}
```

UI_LIST::Subtract
UI_LIST::operator –

Syntax

```
#include <ui_gen.hpp>

UI_ELEMENT *Subtract(UI_ELEMENT *element);
    or
UI_LIST &operator – (UI_ELEMENT *element);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These functions remove an element from the UI_LIST object.

The first function removes an element from the UI_LIST object but does not call the destructor associated with the element. The programmer is responsible for deletion of each object explicitly subtracted from a list.

- *returnValue*$_{out}$ is a pointer to the next element in the list. This value is NULL if there are no more elements after the subtracted element.

- *element*$_{in}$ is a pointer to the element to be subtracted from the list.

The second operator overload removes an element from the UI_LIST object but does not call the destructor associated with the element. This operator overload is equivalent to calling the **Subtract( )** function, except that it allows the chaining of list element removals from the UI_LIST object.

- *returnValue*$_{out}$ is a reference pointer to the UI_LIST object. Returning the pointer to the list allows chaining of the **UI_LIST::operator–** overload operator.

- *element*$_{in}$ is a pointer to the element that is to be removed from the list. *element* must be derived from UI_ELEMENT.

NOTE: The **Subtract( )** function and the **- operator** are also implemented in several classes derived from UI_LIST. Their argument types and return value types may be different than those shown here. See the appropriate chapter for more information on the derived implementation of these functions.

Example 1

```
#include <ui_gen.hpp>

ExampleFunction1(UI_ELEMENT *element1)
{
    // Construct a list, then add elements to it.
    UI_LIST list1;
    list1.Add(element1);
    .
    .
    .

    // Delete a particular element from a list.
    list1.Subtract(element1);
    delete element1;
    .
    .
    .

}
```

Example 2

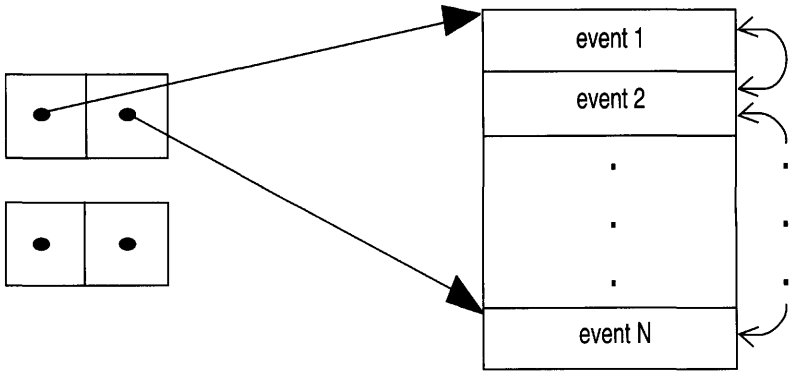
```
ExampleFunction2(UI_ELEMENT *element1, UI_ELEMENT *element2)
{
    // Construct a list, then add elements to it using the
    // + operator overload.
    UI_LIST *list1 = new UI_LIST;
    *list1 + element1 + element2;
    .
    .
    .

    // Move elements from list1 to list2.
    UI_LIST *list2 = new UI_LIST;

    while (list1->First())
    {
        UI_ELEMENT *element = list1->First();
        *list1 - element;
        *list2 + element;
    }
    .
    .
    .

}
```

CHAPTER 21 – UI_LIST_BLOCK

The UI_LIST_BLOCK class is used when a doubly-linked list is required but speed is also a concern. The UI_LIST_BLOCK is created as an array of list elements. When adding elements to and subtracting elements from the list, memory is not allocated, but instead pointers to existing elements are manipulated.

Since Zinc Application Framework uses lists and list elements exclusively, a UI_LIST_-BLOCK array is structured to behave like a list so that it can access Zinc Application Framework objects and functions.

The UI_LIST_BLOCK class uses two pointers, one for the entire list and another for the list of elements that are not in use, called the free list. When a list block is initialized, an array of items is created, with the free list comprising the entire list, since it is initially empty. Each of the elements in the array is derived from the UI_ELEMENT base class; therefore, each has a *previous* and a *next* pointer. The figure below illustrates this arrangement:



For example, the Event Manager uses an array of event elements to store event information. This array is essentially a block of UI_EVENT structures. In the case of UI_EVENT, however, which is not derived from UI_ELEMENT, a UI_QUEUE_-ELEMENT class is constructed that is derived from UI_ELEMENT:

```
class ZIL_EXPORT_CLASS UI_QUEUE_ELEMENT : public UI_ELEMENT
{
public:
    UI_QUEUE_ELEMENT(void);
    ~UI_QUEUE_ELEMENT(void);
    UI_EVENT event;
```

```
    UI_QUEUE_ELEMENT *Next(void);
    UI_QUEUE_ELEMENT *Previous(void);
};
```

This class is actually only an event with a *previous* and a *next* pointer, which allows an array to be set up that behaves like a list.

Every time a new element is added to a list, instead of having to allocate memory for it—an expensive operation—the space is taken from the array. Originally the entire list is in the free list, but if the array/list needs a new element, an element will be shifted out of the free list. When elements are removed from the list, instead of memory being deallocated—also an expensive operation—the element will be placed back in the free list.

Constructing arrays that act as lists allows for greater speed and efficiency within Zinc Application Framework. For example, the Event Manager is continually feeding information into the system. If space had to be allocated for each of these events, the application would be extremely inefficient. Instead, a large block of memory is allocated when the program is initializing, and no more allocations are made for that list block. The downside, of course, is that some memory that may not be used is permanently allocated for the list.

The UI_LIST_BLOCK class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_LIST_BLOCK : public UI_LIST
{
public:
    virtual ~UI_LIST_BLOCK(void);
    UI_ELEMENT *Add(void);
    UI_ELEMENT *Add(UI_ELEMENT *element);
    int Full(void);
    UI_ELEMENT *Subtract(UI_ELEMENT *element);

protected:
    int noOfElements;
    void *elementArray;
    UI_LIST freeList;

    UI_LIST_BLOCK(int noOfElements,
        ZIL_COMPARE_FUNCTION compareFunction =
            ZIL_NULLF(ZIL_COMPARE_FUNCTION));
};
```

General Members

This section describes those members that are used for general purposes.

- *noOfElements* indicates how many elements should be allocated for the list.

- *elementArray* is a pointer to the allocated block. This array must be allocated by the programmer through a derived class of UI_LIST_BLOCK.

- *freeList* contains pointers to the elements not currently in use.

UI_LIST_BLOCK::UI_LIST_BLOCK

Syntax

#include <ui_gen.hpp>

UI_LIST_BLOCK(int *noOfElements*, ZIL_COMPARE_FUNCTION *compareFunction* = ZIL_NULLF(ZIL_COMPARE_FUNCTION));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_LIST_BLOCK object. The constructor is protected because only derived classes should use the UI_LIST_BLOCK functionality.

- $noOfElements_{in}$ is the number of elements in the list.

- $compareFunction_{in}$ is a function used by the list to determine the order of each element in the list. *compareFunction* is called each time a new element is added and when the list is sorted explicitly by calling its **Sort( )** member function. *compareFunction* can be provided by the programmer to allow sorting based on a key unique to the elements being placed in the list.

  The definition of the *compareFunction* is as follows:

  int FunctionName(void **element1*, void **element2*);

returnValue$_{out}$ indicates the relative ordering of the two elements. *returnValue* should be negative if *element1* should be placed in front of *element2*, 0 if the two elements are sorted the same, or positive if *element1* should come after *element2*.

element1$_{in}$ is a pointer to the first element to be compared. This void pointer must be typecast according to the type of derived object being sorted.

element2$_{in}$ is a pointer to the second element to be compared. This void pointer must be typecast according to the type of derived object being sorted.

Example

```
#include <ui_evt.hpp>

UI_QUEUE_BLOCK::UI_QUEUE_BLOCK(int _noOfElements) :
    UI_LIST_BLOCK(_noOfElements)
{
    // Initialize the queue block.
    UI_QUEUE_ELEMENT *queueBlock = new UI_QUEUE_ELEMENT[_noOfElements];
    elementArray = queueBlock;
    for (int i = 0; i < _noOfElements; i++)
        freeList.Add(NULL, &queueBlock[i]);
}
```

UI_LIST_BLOCK::~UI_LIST_BLOCK

Syntax

#include <ui_gen.hpp>

virtual ~UI_LIST_BLOCK(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_LIST_-BLOCK object. It also destroys each element in the list.

Example

```
#include <ui_evt.hpp>

UI_QUEUE_BLOCK::~UI_QUEUE_BLOCK()
{
    // Free the queue block.
    UI_QUEUE_ELEMENT *queueBlock = (UI_QUEUE_ELEMENT *)elementArray;
    delete [noOfElements]queueBlock;
}
```

UI_LIST_BLOCK::Add

Syntax

#include <ui_gen.hpp>

UI_ELEMENT *Add(void);
or
UI_ELEMENT *Add(UI_ELEMENT **element*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions are used to add a new element to the UI_LIST_BLOCK object.

The first overloaded function adds a new, empty element to the used list. The element's position is specified by the list's *compareFunction*. If no compare function is specified when the list is constructed, the element is added to the end of the list. The new element is transferred from the free list.

The second overloaded function overrides the list's *compareFunction* by inserting the new element directly before *element*.

- *returnValue*$_{out}$ is a pointer to the new element if the addition was successful. Otherwise, *returnValue* is NULL.

- *element*$_{in}$ is a pointer to an element before which the new element is to be placed. If this argument is NULL, the function adds the new element to the end of the list.

Example

```
#include "ui_evt.hpp"

void UI_EVENT_MANAGER::Put(const UI_EVENT &event, Q_FLAGS flags)
{
    // Place the event back in the event queue.
    UI_QUEUE_ELEMENT *element =
        (UI_QUEUE_ELEMENT *)queueBlock.Add(FlagSet(flags, Q_END) ? NULL :
        queueBlock.First());
    if (element)
        element->event = event;
}
```

UI_LIST_BLOCK::Full

Syntax

#include <ui_gen.hpp>

int Full(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function indicates if the UI_LIST_BLOCK is full.

- *returnValue*$_{out}$ indicates if the UI_LIST_BLOCK is full. If the list block is full *returnValue* is TRUE. Otherwise it is FALSE.

UI_LIST_BLOCK::Subtract

Syntax

#include <ui_gen.hpp>

UI_ELEMENT *Subtract(UI_ELEMENT **element*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function removes an element from the used list and puts it back into the free list. This function does not call the destructor associated with the element.

- *returnValue*$_{out}$ is a pointer to the next element in the list. This value is NULL if there are no more elements after the removed element.

- *element*$_{in}$ is a pointer to the element to be removed from the list.

Example

```
#include "ui_evt.hpp"

int UI_EVENT_MANAGER::Get(UI_EVENT &event, Q_FLAGS flags)
{
    UI_DEVICE *device;
    UI_QUEUE_ELEMENT *element;
    int error = -1;

    // Stay in loop while no event conditions are met.
    do
    {
        // Call all the polled devices.
        if (!FlagSet(flags, Q_NO_POLL))
        {
            .
            .
            .

            for (device = First(); device; device = device->Next())
                device->Poll();
        }
```

```
        // Get the event.
        element = FlagSet(flags, Q_END) ? queueBlock.Last() :
            queueBlock.First();
        if (element)
        {
            event = element->event;
            if (!FlagSet(flags, Q_NO_DESTROY))
                queueBlock.Subtract((UI_ELEMENT *)element);
            error = 0;
        }
        else if (FlagSet(flags, Q_NO_BLOCK))
            return (-2);
    } while (error);

    // Return the error status.
    return (error);
}
```

CHAPTER 22 – UI_MACINTOSH_DISPLAY

The UI_MACINTOSH_DISPLAY class implements a graphics display that uses the Apple Macintosh graphics package to draw to the screen. Since the UI_MACINTOSH_-DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_MACINTOSH_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_MACINTOSH_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_MACINTOSH_DISPLAY : public UI_DISPLAY
{
public:
    // Forward declaration of classes used by UI_MACINTOSH_DISPLAY.
    friend class ZIL_EXPORT_CLASS UI_WINDOW_OBJECT;

    struct MACFONT
    {
        short   font;
        Style   face;
        short   mode;
        short   size;
        FontRec **fRec;
    };

    static MACFONT fontTable[ZIL_MAXFONTS];
    static ZIL_UINT8 patternTable[ZIL_MAXPATTERNS][8];
    static RGBColor *rgbColorMap;
    static CTabHandle pixMapColorTable;

    static Boolean usedMenuID[lastMenuID + 1];
    static MenuHandle appleMenu;
    static UI_WINDOW_OBJECT *appleAbout;
    static UI_WINDOW_OBJECT *menuBar;

    UI_MACINTOSH_DISPLAY(void);
    virtual ~UI_MACINTOSH_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
```

```
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual RGBColor MapRGBColor(ZIL_COLOR fromColor);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
};
```

General Members

This section describes those members that are used for general purposes.

- *MACFONT* is a structure that contains the following font information:

  font is the font family that defines the typeface.

  face is the style (e.g., bold, underline, etc.) used to display the text.

  mode is the mode used to display the text. For example, the text might be XOR'ed, or displayed in inverse colors.

  size is the point size of the font.

fRec is a pointer to the Macintosh font resource that contains all the information about the font.

- *fontTable* is an array of **MACFONT**. The default array contains space for 10 **MACFONT** entries. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A small font similar in size to a font that might be used to display an icon's text string.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_STRING, UIW_TEXT, etc.)

  FNT_SYSTEM_FONT—The Macintosh system font.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *patternTable* is an array containing space for 15 pattern entries. The following entries are pre-defined by Zinc:

  PTN_SOLID_FILL—A solid fill pattern.

  PTN_INTERLEAVE_FILL—An interleaving line fill pattern. Zinc does not currently use this pattern on the Macintosh.

  PTN_BACKGROUND_FILL—The background fill pattern. Zinc does not currently use this pattern on the Macintosh.

  PTN_SYSTEM_COLOR—The system color used for highlighting text or list entries. The user can set this color in the Color Control Panel.

- *rgbColorMap* is an array of RGBColor values that define the colors available in Zinc.

- *pixMapColorTable* is the Macintosh color table used when drawing PixMaps.

- *usedMenuID* is an array that keeps track of which menuID's have been used. The Macintosh limits an application to 256 pop-up menus. Each array entry corresponds to a menuID. If the array entry is TRUE, that menuID has been used. Otherwise, the menuID is available.

- *appleMenu* is a pointer to the Apple menu on the menu bar.

- *appleAbout* is a pointer to the About pop-up item in the Apple menu.
- *menuBar* is a pointer to the menu bar.
- *maxColors* is the maximum number of colors supported by the graphics mode in use by the system. This member will be filled in according to information obtained from the Macintosh. Zinc will support whatever mode is in use by the system.

UI_MACINTOSH_DISPLAY::UI_MACINTOSH_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_MACINTOSH_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
■ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_MACINTOSH_DISPLAY class object.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_MACINTOSH_DISPLAY;

    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
```

```
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_MACINTOSH_DISPLAY::~UI_MACINTOSH_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_MACINTOSH_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
■ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_MACINTOSH_DISPLAY class. Care should be taken to only destroy a UI_MACINTOSH_DISPLAY class that is not attached to another associated object.

UI_MACINTOSH_DISPLAY::MapRGBColor

Syntax

#include <ui_dsp.hpp>

static RGBColor MapRGBColor(ZIL_COLOR *fromColor*);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
■ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function maps a logical color to an RGB color.

- *returnValue*$_{out}$ is the RGB color that was mapped to.
- *fromColor*$_{in}$ is the logical color for which the RGB color is desired.

CHAPTER 23 – UI_MSC_DISPLAY

The UI_MSC_DISPLAY class implements a graphics display that uses the Microsoft MSC graphics library package to draw to the screen. Since the UI_MSC_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_MSC_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_MSC_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_MSC_DISPLAY : public UI_DISPLAY,
    public UI_REGION_LIST
{
public:
    struct ZIL_EXPORT_CLASS MSCFONT
    {
        char *typeFace;
        char *options;
    };
    typedef unsigned char MSCPATTERN[8];

    static UI_PATH *searchPath;
    static MSCFONT fontTable[ZIL_MAXFONTS];
    static MSCPATTERN patternTable[ZIL_MAXPATTERNS];

    UI_MSC_DISPLAY(int mode = 0);
    virtual ~UI_MSC_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
```

```
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
    signed char _virtualCount;
    UI_REGION _virtualRegion;
    char _stopDevice;
    int _fillPattern;
    int _backgroundColor;
    int _foregroundColor;

    void SetFont(ZIL_LOGICAL_FONT logicalFont);
    void SetPattern(const UI_PALETTE *palette, int _xor);
};
```

General Members

This section describes those members that are used for general purposes.

- *MSCFONT* is a structure that contains the following font information:

  typeFace contains the string name of the font. Zinc uses Microsoft's Helvetica font, so for the three fonts defined by Zinc, *typeFace* is "Helv."

  options contains the font characteristics. For more information see **_setfont( )** in the *Microsoft Visual C++ Reference*.

- *MSCPATTERN* is an array of 8 bytes that make up the 8x8 bitmap pattern. Each byte (8 bits) corresponds to 8 pixels in the pattern. The patterns defined by Zinc are:

PTN_SOLID_FILL, PTN_INTERLEAVE_FILL and PTN_BACKGROUND_FILL. For more information see **setfillpattern( )** in the *Microsoft Visual C++ Reference.*

- *searchPath* contains the path to be searched for the font file. The MSC graphics library needs to access font files at run-time so that it can draw characters in graphics mode. Because Zinc uses Microsoft's Helvetica font, the UI_MSC_DISPLAY class needs to find the **HELVB.FON** file at run-time. If the display class cannot find this file, graphics mode will not initialize.

- *fontTable* is an array of *MSCFONT.* The default array contains space for 10 *MSCFONT* entries. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A font that is used to display an icon's text string.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.)

  FNT_SYSTEM_FONT—A sans-serif style font that is used to display a window's title.

  NOTE: To use these fonts, or if other "stroked" fonts are added to this table, the proper Microsoft font files must be in the current working directory or in the environment's path at run-time.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *patternTable* is an array of *MSCPATTERN.* The default array contains space for 15 *MSCPATTERN* entries. The following entries are pre-defined by Zinc:

  PTN_SOLID_FILL—Solid fill.

  PTN_INTERLEAVE_FILL—Interleaving line fill.

  PTN_BACKGROUND_FILL—Background fill style.

- *maxColors* is the maximum number of colors supported by the graphics mode that was initialized. For example, an EGA display might support sixteen colors. This member will be filled in according to information obtained from the MSC graphics library after it has initialized. The MSC graphics library supports SVGA modes,

including 256 color mode. Zinc will support whatever mode is initialized by the MSC graphics library.

- *_virtualCount* is a count of the number of virtual screen operations that have taken place. For example, when the **VirtualGet( )** function is called, *_virtualCount* is decremented. Additionally, when the **VirtualPut( )** function is called, *_virtualCount* is incremented.

- *_virtualRegion* is the region affected by either **VirtualGet( )** or **VirtualPut( )**.

- *_stopDevice* is a variable used to prevent recursive updates of device images on the display. If *_stopDevice* is TRUE, no drawing will be done to the screen. Otherwise, drawing will be made directly to the screen display.

- *_fillPattern* is an index into the *patternTable* specifying the current fill pattern.

- *_backgroundColor* is the current background drawing color.

- *_foregroundColor* is the current foreground drawing color.

UI_MSC_DISPLAY::UI_MSC_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_MSC_DISPLAY(int *mode* = 0);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_MSC_DISPLAY object. When a new UI_MSC_-DISPLAY class is constructed, the screen display is set to the background color and pattern specified by the inherited variable *backgroundPalette*.

- *mode*$_{in}$ specifies the graphics mode that should be initialized. If *mode* is 0, which is the default, the UI_MSC_DISPLAY class will initialize the highest resolution graphics mode possible using the MSC **_MAXRESMODE** constant. For more information on the possible values for *mode*, see **_setvideomode( )** in the *Microsoft Visual C++ Reference*.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_MSC_DISPLAY::~UI_MSC_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_MSC_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_MSC_-DISPLAY class. Care should be taken to only destroy a UI_MSC_DISPLAY class that is not attached to another associated object.

UI_MSC_DISPLAY::SetFont

Syntax

#include <ui_dsp.hpp>

void SetFont(ZIL_LOGICAL_FONT *logicalFont*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the font information used by the MSC graphics library. The information contained in the *logicalFont* entry of the *fontTable* array is used to set the font.

- $logicalFont_{in}$ is the font to be used. *logicalFont* is an entry into the *fontTable* array.

UI_MSC_DISPLAY::SetPattern

Syntax

#include <ui_dsp.hpp>

void SetPattern(const UI_PALETTE **palette*, int *_xor*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the pattern information used by the MSC graphics library. The information contained in *palette* is used to set the pattern.

- $palette_{in}$ contains the pattern style, foreground color, and background color to be used when setting the pattern.

- $\_xor_{in}$ indicates if the pattern should be drawn with the xor attribute on. If *_xor* is TRUE, the pattern will be an xor pattern. Otherwise, the pattern will not be xor.

CHAPTER 24 – UI_MSWINDOWS_DISPLAY

The UI_MSWINDOWS_DISPLAY class implements a graphics display that uses the Microsoft Windows graphics package to draw to the screen. Since the UI_MSWINDOWS_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_MSWINDOWS_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_MSWINDOWS_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_MSWINDOWS_DISPLAY : public UI_DISPLAY
{
public:
    static HDC hDC;
    static HFONT fontTable[ZIL_MAXFONTS];
    static WORD patternTable[ZIL_MAXPATTERNS][8];

    UI_MSWINDOWS_DISPLAY(HANDLE hInstance, HANDLE hPrevInstance,
        int nCmdShow);
    virtual ~UI_MSWINDOWS_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
```

```
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
};
```

General Members

This section describes those members that are used for general purposes.

- *hDC* is a handle to the current display context. *hDC* is created and destroyed in the **VirtualGet( )** and **VirtualPut( )** functions, respectively.

- *fontTable* is an array of font handles for Microsoft Windows. The fonts used by Zinc are obtained from the system. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A small font similar in size to a font that might be used to display an icon's text string. MS-Windows is responsible for displaying the text on an icon, so this font is not typically used by Zinc.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.)

  FNT_SYSTEM_FONT—A slightly larger font similar in size to a font that might be used to display a window's title. MS-Windows is responsible for displaying the title of a window, so this font is not typically used by Zinc.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *patternTable* is an array containing space for 15 pattern entries. The following entries are pre-defined by Zinc:

  PTN_SOLID_FILL—A solid fill pattern.

  PTN_INTERLEAVE_FILL—An interleaving line fill pattern.

  PTN_BACKGROUND_FILL—The background fill pattern.

- *maxColors* is the maximum number of colors supported by the graphics mode in use by MS-Windows. For example, a VGA display might support sixteen colors. This member will be filled in according to information obtained from Windows. Zinc will support whatever mode is in use by Windows.

UI_MSWINDOWS_DISPLAY::UI_MSWINDOWS_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_MSWINDOWS_DISPLAY(HANDLE *hInstance*, HANDLE *hPrevInstance*,
int *nCmdShow*);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	■ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_MSWINDOWS_DISPLAY class object.

- $hInstance_{in}$ is the particular instance under which the application is running. For example, if an application is run twice, there are two instances of that application. This value is passed in automatically by **WinMain( )**.

- *hPrevInstance*$_{in}$ is the previous instance of the application. If a program is run for the first time, *hPrevInstance* is 0. This value is passed in automatically by **WinMain( )**.

- *nCmdShow*$_{in}$ is a string containing the command line parameters. This value is passed in automatically by **WinMain( )**.

Example

```
#include <ui_win.hpp>

int PASCAL WinMain(HANDLE hInstance, HANDLE hPrevInstance, LPSTR lpszCmdLine,
    int nCmdShow)
{
    // Initialize the display.
    UI_DISPLAY *display = new UI_MSWINDOWS_DISPLAY(hInstance, hPrevInstance,
        nCmdShow);

    // Initialize the event manager.
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD + new UID_MOUSE + new UID_CURSOR;



    // Initialize the window manager.
    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Clean up.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_MSWINDOWS_DISPLAY::~UI_MSWINDOWS_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_MSWINDOWS_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	■ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_MS-WINDOWS_DISPLAY class. Care should be taken to only destroy a UI_MS-WINDOWS_DISPLAY class that is not attached to another associated object.

CHAPTER 25 – UI_NEXTSTEP_DISPLAY

The UI_NEXTSTEP_DISPLAY class implements a drawing package for the NEXTSTEP environment. The UI_NEXTSTEP_DISPLAY uses Display PostScript to actually do the drawing. Since the UI_NEXTSTEP_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_NEXTSTEP_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_NEXTSTEP_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_NEXTSTEP_DISPLAY : public UI_DISPLAY
{
public:
    // Forward declaration of classes used by UI_NEXTSTEP_DISPLAY.
    friend class ZIL_EXPORT_CLASS UI_WINDOW_OBJECT;

    struct NEXTFONT
    {
        id font;
    };

    static NEXTFONT fontTable[ZIL_MAXFONTS];
    static UI_WINDOW_OBJECT *menuBar;
    UI_NEXTSTEP_DISPLAY();
    virtual ~UI_NEXTSTEP_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor =  FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void MapNSColor(const UI_PALETTE *palette, int foreground,
        NXColor *nextColor);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
```

```
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
};
```

General Members

This section describes those members that are used for general purposes.

- *NEXTFONT* is a structure that contains the following font information:

  font is a pointer to the font.

- *fontTable* is an array of fonts each of which contains the definition of a NEXTSTEP system font. The fonts used by Zinc are obtained from the system. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A small font similar in size to a font that might be used to display an icon's text string. NEXTSTEP is responsible for displaying the text on an icon, so this font is not typically used by Zinc.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.)

FNT_SYSTEM_FONT—A slightly larger font similar in size to a font that might be used to display a window's title. NEXTSTEP is responsible for displaying the title of a window, so this font is not typically used by Zinc.

See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *menuBar* is a pointer to the application's pull-down menu, it one exists.
- *maxColors* is the maximum number of colors supported by the graphics mode in use by the operating environment. This member will be filled in according to information obtained from the environment. Zinc will support whatever mode is in use by the environment.

NOTE: All member functions use the standard Zinc screen pixel coordinates with (0,0) being the top-left corner of the display even though Display PostScript places the origin at the lower-left corner of the display. This is done to remain consistent across platforms.

UI_NEXTSTEP_DISPLAY::UI_NEXTSTEP_DISPLAY

Syntax

```
#include <ui_dsp.hpp>

UI_NEXTSTEP_DISPLAY(void);
```

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_NEXTSTEP_DISPLAY class object.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize the display.
    UI_DISPLAY *display = new UI_NEXTSTEP_DISPLAY;

    // Initialize the event manager.
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    // Initialize the window manager.
    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Clean up.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_NEXTSTEP_DISPLAY::~UI_NEXTSTEP_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_NEXTSTEP_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_NEXTSTEP_DISPLAY class. Care should be taken to only destroy a UI_NEXTSTEP_DISPLAY class that is not attached to another associated object.

UI_NEXTSTEP_DISPLAY::MapNSColor

Syntax

```
#include <ui_dsp.hpp>

virtual void MapNSColor(const UI_PALETTE *palette, int foreground,
    NXColor *nextColor);
```

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	■ NEXTSTEP

Remarks

This function is used to obtain a NEXTSTEP color from a UI_PALETTE entry.

- $palette_{in}$ is the palette from which the NEXTSTEP color is to be obtained.
- $foreground_{in}$ specifies if the palette's foreground color is to be obtained. If *foreground* is TRUE, the palette's foreground color is mapped. Otherwise, the palette's background color is mapped.
- $nextColor_{out}$ is the NEXTSTEP color mapped to from the palette entry.

CHAPTER 26 – UI_OS2_DISPLAY

The UI_OS2_DISPLAY class implements a Presentation Manager display that uses the OS/2 Presentation Manager API and the Graphics Programming Interface (GPI) to draw to the screen. Since the UI_OS2_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_OS2_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_OS2_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_OS2_DISPLAY : public UI_DISPLAY
{
public:
    static HPS hps;
    static FONTMETRICS fontTable[ZIL_MAXFONTS];

    UI_OS2_DISPLAY(void);
    virtual ~UI_OS2_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
```

```
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;

    void SetFont(ZIL_LOGICAL_FONT logicalFont);
};
```

General Members

This section describes those members that are used for general purposes.

- *hps* is a handle to the current OS/2 presentation space. *hps* is created and destroyed in the **VirtualGet( )** and **VirtualPut( )** functions, respectively.

- *fontTable* is an array of OS/2 FONTMETRICS each of which contains the definition of an OS/2 system font. The fonts used by Zinc are obtained from the system. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A small font similar in size to a font that might be used to display an icon's text string. OS/2 is responsible for displaying the text on an icon, so this font is not typically used by Zinc.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.)

  FNT_SYSTEM_FONT—A slightly larger font similar in size to a font that might be used to display a window's title. OS/2 is responsible for displaying the title of a window, so this font is not typically used by Zinc.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *maxColors* is the maximum number of colors supported by the graphics mode in use by the Presentation Manager. For example, a VGA display might support sixteen colors. This member will be filled in according to information obtained from the GPI. Zinc will support whatever mode is in use by the Presentation Manager.

NOTE: All member functions use the standard Zinc screen pixel coordinates with (0,0) being the top-left corner of the display even though OS/2 places the origin at the lower-left corner of the display. This is done to remain consistent across platforms.

UI_OS2_DISPLAY::UI_OS2_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_OS2_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	■ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_OS2_DISPLAY class object.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize the display.
    UI_DISPLAY *display = new UI_OS2_DISPLAY;

    // Initialize the event manager.
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    // Initialize the window manager.
```

```
    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Clean up.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_OS2_DISPLAY::~UI_OS2_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_OS2_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	■ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_OS2_-DISPLAY class. Care should be taken to only destroy a UI_OS2_DISPLAY class that is not attached to another associated object.

UI_OS2_DISPLAY::SetFont

Syntax

#include <ui_dsp.hpp>

void SetFont(ZIL_LOGICAL_FONT *logicalFont*);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	■ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the font information used by the GPI graphics library. The information contained in the *logicalFont* entry of the *fontTable* array is used to set the font.

- *logicalFont*$_{in}$ is the font to be used. *logicalFont* is an entry into the *fontTable* array.

CHAPTER 27 – UI_PALETTE

The UI_PALETTE structure is used by Zinc Application Framework to provide color information for different display types. A palette contains entries for monochrome text mode, color text mode, color graphics mode, black-and-white graphics mode and monochrome graphics mode. Because one palette contains information for each display type, a high level object does not need to know the display type when assigning a color. The appropriate palette field will be used by the low-level display function.

The UI_PALETTE structure is declared in **UI_DSP.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_PALETTE
{
    // --- Text mode ---
    ZIL_ICHAR fillCharacter;            // Fill character.
    ZIL_COLOR colorAttribute;           // Color attribute.
    ZIL_COLOR monoAttribute;            // Mono attribute.

    // --- Graphics mode ---
    LOGICAL_PATTERN fillPattern;        // Fill pattern.
    ZIL_COLOR colorForeground;          // EGA/VGA colors.
    ZIL_COLOR colorBackground;
    ZIL_COLOR bwForeground;             // Black & White colors (2 color).
    ZIL_COLOR bwBackground;
    ZIL_COLOR grayScaleForeground;      // Monochrome colors (3+ color).
    ZIL_COLOR grayScaleBackground;
};
```

General Members

This section describes those members that are used for general purposes.

- *fillCharacter* is the text mode fill character. It is the character that will be used to fill in blank areas if the drawing function calls for the area to be filled. This field is used by text mode displays only.

- *colorAttribute* contains the foreground and background color definitions for the palette. The **attrib( )** macro is used to combine the color values for this field. This field is used by text mode displays only.

- *monoAttribute* contains the foreground and background monochrome definitions for the palette. The **attrib( )** macro is used to combine the color values for this field. This field is used by text mode displays only.

- *fillPattern* is the graphics fill pattern. It is the pattern that will be used to fill in areas if the drawing function calls for the area to be filled. This field is used by graphics mode displays only. The following patterns (declared in **UI_DSP.HPP**) can be used:

  PTN_SOLID_FILL—The pattern is a solid, single-color pattern.

  PTN_INTERLEAVE_FILL—The pattern will interleave two colors.

  PTN_BACKGROUND_FILL—The pattern is a special pattern used for the background of the display.

  PTN_SYSTEM_COLOR—The colors specified in the palette are system color identifiers for the graphical operating system. If this pattern is specified Zinc will query the operating system to obtain the color defined for the color identifier.

  PTN_RGB_COLOR—The colors specified in the palette are RGB color values. The RGB constants are defined in **UI_DSP.HPP**.

- *colorForeground* and *colorBackground* are the color foreground and background values to use in color graphics mode.

- *bwForeground* and *bwBackground* are the black-and-white foreground and background values to use in black-and-white graphics mode, including Hercules displays.

- *grayScaleForeground* and *grayScaleBackground* are gray scale foreground and background values to use in monochrome graphics mode.

Example

```
#include <ui_dsp.hpp>

static UI_PALETTE backgroundPalette = {
    '\260', attrib(BLUE, BLACK), attrib(MONO_DIM, MONO_BLACK),
    PTN_INTERLEAVE_FILL, BLUE, BLUE, BW_WHITE, BW_WHITE, GS_GRAY, GS_GRAY };

main( )
{
    display->backgroundPalette = &backgroundPalette;
    .
    .
    .
}
```

CHAPTER 28 – UI_PALETTE_MAP

The UI_PALETTE_MAP structure is used by Zinc Application Framework class objects for color map information. The structure associates an object identifier and a logical palette identifier with a palette. By constructing a table of UI_PALETTE_MAP objects it is possible to determine which palette to use for a specific object in a specific scenario. For example, a button that is non-selectable may draw differently than a button that is current. Each combination of button and specific scenario should be represented in the table of palette maps.

The UI_PALETTE_MAP structure is declared in **UI_WIN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_PALETTE_MAP
{
    ZIL_OBJECTID objectID;
    ZIL_LOGICAL_PALETTE logicalPalette;
    UI_PALETTE palette;

    static UI_PALETTE *MapPalette(UI_PALETTE_MAP *mapTable,
        ZIL_LOGICAL_PALETTE logicalPalette,
        ZIL_OBJECTID id1 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id2 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id3 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id4 = ID_WINDOW_OBJECT,
        ZIL_OBJECTID id5 = ID_WINDOW_OBJECT);
};
```

General Members

This section describes those members that are used for general purposes.

- *objectID* is a value that identifies the type of object for which the palette map entry applies. For example, all palette maps that pertain to the UIW_BUTTON class have an *objectID* if ID_BUTTON. A full list of object identifications is given in **UI_WIN.HPP**. Some example object identifications are:

  ID_WINDOW_OBJECT—Associated with all class objects derived from the UI_WINDOW_OBJECT base class.

  ID_BORDER—Associated with the UIW_BORDER class object.

  ID_STRING—Associated with the UIW_STRING object or with any class object derived from the UIW_STRING base class (e.g., UIW_DATE, UIW_-TIME).

- *logicalPalette* is a value that identifies the scenario for the object. For example, a button may be non-selectable, may be current or may not have any special look. The following logical palette identifications (defined in **UI_WIN.HPP**) are recognized:

  PM_ACTIVE—Indicates that the object is active.

  PM_CURRENT—Indicates that the object is current.

  PM_HOT_KEY—Indicates that the object has a hotkey character.

  PM_INACTIVE—Indicates that the object is not active.

  PM_NON_SELECTABLE—Indicates that the object is non-selectable.

  PM_SELECTED—Indicates that the object is selected.

  PM_ANY—Indicates that the object has no special look.

  PM_SPECIAL—Indicates that the palette is a special palette.

  The following algorithm is used to determine which palette map identification is used:

  1—If the object is not selectable (i.e., the object's *woFlags* variable has the WOF_NON_SELECTABLE flag set), the **PM_NON_SELECTABLE** palette map is used.

  2—If the object is in an inactive state (i.e., its parent window is not the current window) the **PM_INACTIVE** color map is used.

  3—If the object has been selected (i.e., the object's *woStatus* variable has the WOS_SELECTED status set), the **PM_SELECTED** color map is used.

  4—If the object is not current but its parent window is the current window, the **PM_ACTIVE** color map is used.

  5—If the object is current and its parent window is the current window, the **PM_CURRENT** color map is used.

  6—If no match is found in the previous cases, **PM_ANY** is used.

- *palette* is the palette associated with the object type and scenario.

UI_PALETTE_MAP::MapPalette

Syntax

```
#include <ui_map.hpp>

static UI_PALETTE *MapPalette(UI_PALETTE_MAP *mapTable,
    ZIL_LOGICAL_PALETTE logicalPalette,
    ZIL_OBJECTID id1 = ID_WINDOW_OBJECT,
    ZIL_OBJECTID id2 = ID_WINDOW_OBJECT,
    ZIL_OBJECTID id3 = ID_WINDOW_OBJECT,
    ZIL_OBJECTID id4 = ID_WINDOW_OBJECT,
    ZIL_OBJECTID id5 = ID_WINDOW_OBJECT);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function searches a palette map table for a match on the object type and the scenario for the object. It returns the palette mapped to, if a match is found.

NOTE: Not all environments use the palette map tables to draw the objects. In those graphical operating systems that already handle drawing the objects, Zinc typically lets the operating system do the drawing. However, if an object is an ownerdraw object (i.e., it has the WOS_OWNERDRAW status set, so it draws from the **DrawItem( )** function), however, it will usually bypass the operating system and use the palette map table to draw.

- *returnValue*$_{out}$ is the palette that was mapped from the object identifier and the scenario.

- *mapTable*$_{in}$ is a pointer to the palette map table to be searched. Zinc uses several by default:

  _normalPaletteMapTable contains the normal mappings for all objects.

_errorPaletteMapTable contains the mappings for the error window.

_helpPaletteMapTable contains the mappings for the help window.

UI_DISPLAY::xorPalette contains the mapping for XOR drawing.

UI_DISPLAY::backgroundPalette contains the mappings for the background of the screen.

- *logicalPalette*$_{in}$ is a value that identifies the scenario for the object.

- *id1*$_{in}$, *id2*$_{in}$, *id3*$_{in}$, *id4*$_{in}$ and *id5*$_{in}$ are object identifiers. The five values are used to identify the object's inheritance hierarchy. Typically, the object's *windowID* array supplies these values. If **MapPalette** cannot find a match on *id1* it will attempt to find a match on *id2*, and so on until it either has a match or can't find a match. It is generally a good idea to provide a catch-all palette map for ID_WINDOW_-OBJECT and PM_ANY that would be used if no other palette maps match.

Example

```
#include <ui_win.hpp>
EVENT_TYPE UIW_BORDER::DrawItem(const UI_EVENT &event, EVENT_TYPE ccode)
{
    .
    .
    .

    // Draw the border.
    int size = display->cellHeight;
    UI_REGION region = parent->true;
    UI_PALETTE *outline = LogicalPalette(ccode, ID_OUTLINE);
    display->Rectangle(screenID, region, outline, 1, FALSE, FALSE, &clip);
    display->Rectangle(screenID, true, outline, 1, FALSE, FALSE, &clip);
    --region;
    if (ccode == S_DISPLAY_ACTIVE && FlagSet(parent->woAdvancedFlags,
        WOAF_DIALOG_OBJECT))
         lastPalette = UI_PALETTE_MAP::MapPalette(paletteMapTable, PM_SELECTED,
            ID_BORDER);
    .
    .
    .

    return (ccode);
}
```

CHAPTER 29 – UI_PATH

The UI_PATH class is used to maintain a list of path elements. A path element, which is a UI_PATH_ELEMENT class object, contains a path to a specific directory. An object can use a UI_PATH object to keep a list of directories that may contain data the object depends on. For example, a graphics display class may need run-time access to some graphics font definition files. The class could use a UI_PATH object to search for the font files initially or, once they've been located, to keep track of their directory.

The UI_PATH class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_PATH : public UI_LIST, public ZIL_INTERNATIONAL
{
public:
    UI_PATH(ZIL_ICHAR *programPath = ZIL_NULLP(ZIL_ICHAR),
        int rememberCWD = TRUE);
    ~UI_PATH(void);
    const ZIL_ICHAR *FirstPathName(void);
    const ZIL_ICHAR *NextPathName(void);

    // List members
    UI_PATH_ELEMENT *Current(void);
    UI_PATH_ELEMENT *First(void);
    UI_PATH_ELEMENT *Last(void);

public:
    static ZIL_ICHAR *_pathString;
    static ZIL_ICHAR *_zincPathString;
};
```

General Members

This section describes those members that are used for general purposes.

- *_pathString* is a string used to get the path from the appropriate operating system environment variable. By default, *_pathString* is "PATH" thus allowing the PATH environment variable to be obtained.

- *_zincPathString* is a string used to get the Zinc data file path from the appropriate operating system environment variable. By default, *_zincPathString* is "ZINC_-PATH" thus allowing the Zinc data file path to be obtained from the ZINC_PATH environment variable. The use of the ZINC_PATH environment variable is optional.

UI_PATH::UI_PATH

Syntax

#include <ui_gen.hpp>

UI_PATH(ZIL_ICHAR **programPath* = ZIL_NULLP(ZIL_ICHAR),
    int *rememberCWD* = TRUE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new UI_PATH class object.

- $programPath_{in}$ is a string containing the program's origination directory.
- $rememberCWD_{in}$ indicates if a path element containing the current working directory should be placed in the list of path elements. If *rememberCWD* is TRUE, the current working directory is placed in the list. Otherwise it is not.

Example

```
#include <ui_gen.hpp>

main(int argc, char *argv[])
{
    // Initialize the path.
    UI_PATH *path = new UI_PATH(argv[0], TRUE);
    UI_DISPLAY *display = new UI_MSC_DISPLAY(0, 0, path);
    .
    .
    .

    delete display;
    delete path;
}
```

UI_PATH::~UI_PATH

Syntax

#include <ui_gen.hpp>

~UI_PATH(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the class information associated with the UI_PATH object. Al path elements attached to the object will also be destroyed.

Example

```
#include <ui_gen.hpp>

main(int argc, char *argv[])
{
    // Initialize the path.
    UI_PATH *path = new UI_PATH(argv[0], TRUE);
    .
    .
    .

    delete path;
}
```

UI_PATH::Current

Syntax

#include <ui_gen.hpp>

UI_PATH_ELEMENT *Current(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the current path element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the current path element in the list. If there is no current element, *returnValue* is NULL.

UI_PATH::First

Syntax

```
#include <ui_gen.hpp>

UI_PATH_ELEMENT *First(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the first path element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the first path element in the list. If there is no first element, *returnValue* is NULL.

UI_PATH::FirstPathName

Syntax

#include <ui_gen.hpp>

const ZIL_ICHAR *FirstPathName(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the path or directory of the first path element.

- *returnValue*$_{out}$ is a pointer to a string containing the path or directory of the first path element. If there is no first element, it returns NULL.

Example

```
#include <stdlib.h>
#include <stdio.h>
#include <ui_gen.hpp>

int ExampleFunction(const ZIL_ICHAR *file, unsigned int mode)
{
    UI_PATH *path = new UI_PATH;
    .
    .
    .

    ZIL_ICHAR *pathName;
    pathName = path->FirstPathName();
    if (pathName == NULL)
        return (-1);

    else
    {
        while ((pathName = path->NextPathName()) != 0)

            if ((handle = open(pathName, mode)) >= 0)
                return (handle);
    }
    return (-1);
}
```

UI_PATH::Last

Syntax

#include <ui_gen.hpp>

UI_PATH_ELEMENT *Last(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the last path element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the last path element in the list. If there is no last element, *returnValue* is NULL.

UI_PATH::NextPathName

Syntax

#include <ui_gen.hpp>

const ZIL_ICHAR *NextPathName(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the path or directory of the path element after the current path element.

- *returnValue*$_{out}$ is a pointer to a string containing the path or directory of the next path element. If there is no next element, it returns NULL.

Example

```
#include <stdlib.h>
#include <stdio.h>
#include <ui_gen.hpp>

int ExampleFunction(const ZIL_ICHAR *file, unsigned int mode)
{
    int handle;
    UI_PATH *path = new UI_PATH;
    .
    .
    .

    SetFileName(file);
    ZIL_ICHAR *pathName;
    pathName = path->FirstPathName()
    while ((pathName = path->NextPathName()) != 0)
        if ((handle = open(pathName, mode)) >= 0)
            return (handle);
    return (-1);
}
```

CHAPTER 30 – UI_PATH_ELEMENT

The UI_PATH_ELEMENT class is used to store a directory path. Some classes in Zinc need to keep track of the location of files on disk. By placing a path element in a linked list maintained by the UI_PATH class, an object can maintain a path to any number of directory locations.

The UI_PATH_ELEMENT class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_PATH_ELEMENT : public UI_ELEMENT,
    public ZIL_INTERNATIONAL
{
public:
    ZIL_ICHAR *pathName;

    UI_PATH_ELEMENT(ZIL_ICHAR *pathName, int length = -1);
    ~UI_PATH_ELEMENT(void);

    // List members.
    UI_PATH_ELEMENT *Next(void);
    UI_PATH_ELEMENT *Previous(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *pathName* is a string containing the directory to be searched. *pathName* may contain drive specifiers.

UI_PATH_ELEMENT::UI_PATH_ELEMENT

Syntax

#include <ui_gen.hpp>

UI_PATH_ELEMENT(ZIL_ICHAR **pathName*, int *length* = -1);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_PATH_ELEMENT object. The UI_PATH_ELEMENT is used to store a path name and is used in conjunction with the UI_PATH class.

- *pathName*$_{in}$ contains the path or directory name.
- *length*$_{in}$ is the length of *pathName*. If no value is entered for *length*, the length of *pathName* is used.

Example

```
#include <ui_gen.hpp>

UI_PATH::UI_PATH(ZIL_ICHAR *programPath, int rememberCWD)
{
    // Get the path names.
    for (int i = 0; i < 3; i++)
    {
        // Determine which path to look for.
        ZIL_ICHAR path[256];
        if (i == 0 && rememberCWD)
            getcwd(path, 256);
        else if (i == 1 && programPath)
            strcpy(path, programPath);
        else if (i == 2 && getenv("PATH"))
            strcpy(path, getenv("PATH"));
        else
            strcpy(path, "");

        // Parse the directory tree.
        for (int j = 0; path[j]; )
        {
            for (int k = j; path[k] && path[k] != ';'; )
                k++;
            Add(NULL, new UI_PATH_ELEMENT(&path[j], k - j));
            j = path[k] ? k + 1 : k;
        }
    }
}
```

UI_PATH_ELEMENT::~UI_PATH_ELEMENT

Syntax

#include <ui_gen.hpp>

~UI_PATH_ELEMENT(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the class information associated with the UI_PATH_ELEMENT object.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    .
    .
    .

    path - pathElement;
    delete pathElement;
}
```

UI_PATH_ELEMENT::Next

Syntax

#include <ui_gen.hpp>

UI_PATH_ELEMENT *Next(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the next path element, if one exists, in the list of path elements.

UI_PATH_ELEMENT::Previous

Syntax

```
#include <ui_gen.hpp>

UI_PATH_ELEMENT *Previous(void);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the previous path element, if one exists, in the list of path elements.

CHAPTER 31 – UI_POSITION

The UI_POSITION structure is used to store and manipulate screen positional information (e.g., mouse screen positions).

The UI_POSITION structure is declared in **UI_DSP.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_POSITION
{
    int column, line;

#if defined(ZIL_MSWINDOWS)
    void Assign(const POINT &point);
#elif defined(ZIL_OS2)
    void Assign(const POINTL &point);
#elif defined(ZIL_MACINTOSH)
    void Assign(const Point &point);
#elif defined(ZIL_NEXTSTEP)
    void Assign(const NXPoint &point);
#endif
    int operator==(const UI_POSITION &position) const;
    int operator!=(const UI_POSITION &position) const;
    int operator<(const UI_POSITION &position) const;
    int operator>(const UI_POSITION &position) const;
    int operator>=(const UI_POSITION &position) const;
    int operator<=(const UI_POSITION &position) const;
    UI_POSITION &operator++(void);
    UI_POSITION &operator--(void);
    UI_POSITION &operator+=(int offset);
    UI_POSITION &operator-=(int offset);
};
```

General Members

This section describes those members that are used for general purposes.

- *column* is the horizontal position value. This value may be in cells, minicells or pixels depending on the context of the UI_REGION being used.

- *line* is the vertical position value. This value may be in cells, minicells or pixels depending on the context of the UI_REGION being used.

Example

```
#include <ui_evt.hpp>

EVENT_TYPE UID_CURSOR::Event(const UI_EVENT &event)
{
    .
```

```
    .
    .

    switch (event.rawCode)
    {
    .
    .
    .

    case D_SHOW:
        if (state != D_OFF)
        {
            UI_REGION region;
            region.left = position.column;
            region.top = position.line;
            region.right = region.left + display->cellWidth - 1;
            region.bottom = region.top + display->cellHeight - 1;
            if (region.Overlap(event.region))
                tState = (event.rawCode == D_HIDE) ? D_HIDE : D_ON;
        }
        break;
    .
    .
    .

    }
}
```

UI_POSITION::Assign

Syntax

#include <ui_dsp.hpp>

void Assign(const POINT *&point*);
or
void Assign(const POINTL *&point*);
or
void Assign(const Point *&point*);
or
void Assign(const NXPoint *&point*);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	☐ OSF/Motif	☐ Curses	■ NEXTSTEP

Remarks

This function copies the position information from the operating system-specific structure into the UI_POSITION structure.

- $point_{in}$ is the operating system-specific position structure whose value is to be copied into the UI_POSITION structure.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    position.Assign(tPosition);
    .
    .
    .

}
```

UI_POSITION::operator ==

Syntax

#include <ui_dsp.hpp>

int operator == (const UI_POSITION *&position*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines if the position maintained by the UI_POSITION structure is the same as *position*.

- $returnValue_{out}$ is TRUE if the UI_POSITION is the same as *position*. Otherwise, *returnValue* is FALSE.

- *position*$_{in}$ is the position to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (position == tPosition)
    {
        .
        .
        .

    }
}
```

UI_POSITION::operator !=

Syntax

#include <ui_dsp.hpp>

int operator != (const UI_POSITION &*position*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines if the UI_POSITION structure is not equal to the UI_-POSITION structure specified by *position*.

- *returnValue*$_{out}$ is TRUE if the UI_POSITION structure is not the same as *position*. Otherwise, *returnValue* is FALSE.

- *position*$_{in}$ is the position to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (position != tPosition)
    {
        .
        .
        .

    }
}
```

UI_POSITION::operator <

Syntax

#include <ui_dsp.hpp>

int operator < (const UI_POSITION &*position*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the UI_POSITION structure is less than the UI_POSITION structure specified by *position*. The UI_POSITION structure is less than *position* if the column value of the UI_POSITION structure is less than the column value of *position* or if the line value of the UI_POSITION structure is less than the line value of *position*.

- $returnValue_{out}$ is TRUE if the UI_POSITION structure is less than *position*. Otherwise, *returnValue* is FALSE.

- $position_{in}$ is the position to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (position < tPosition)
    {
        .
        .
        .

    }
}
```

UI_POSITION::operator >

Syntax

#include <ui_dsp.hpp>

int operator > (const UI_POSITION &*position*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the UI_POSITION structure is greater than the UI_POSITION structure specified by *position*. The UI_POSITION structure is greater than *position* if the column value of the UI_POSITION structure is greater than the column value of *position* or if the line value of the UI_POSITION structure is greater than the line value of *position*.

- $returnValue_{out}$ is TRUE if the UI_POSITION structure is greater than *position*. Otherwise, *returnValue* is FALSE.

- $position_{in}$ is the position to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (position > tPosition)
    {
        .
        .
        .

    }
}
```

UI_POSITION::operator >=

Syntax

#include <ui_dsp.hpp>

int operator >= (const UI_POSITION &*position*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the UI_POSITION structure is greater than or equal to the UI_POSITION structure specified by *position*. The UI_POSITION structure is greater than or equal to *position* if the column value of the UI_POSITION structure is greater than or equal to the column value of *position* or if the line value of the UI_POSITION structure is greater than or equal to the line value of *position*.

- $returnValue_{out}$ is TRUE if the UI_POSITION structure is greater than or equal to *position*. Otherwise, *returnValue* is FALSE.

- $position_{in}$ is the position to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (position >= tPosition)
    {
        .
        .
        .

    }
}
```

UI_POSITION::operator <=

Syntax

#include <ui_dsp.hpp>

int operator <= (const UI_POSITION *&position*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the UI_POSITION structure is less than or equal to the UI_POSITION structure specified by *position*. The UI_POSITION structure is less than or equal to *position* if the column value of the UI_POSITION structure is less than or equal to the column value of *position* or if the line value of the UI_POSITION structure is less than or equal to the line value of *position*.

- $returnValue_{out}$ is TRUE if the UI_POSITION structure is less than or equal to *position*. Otherwise, *returnValue* is FALSE.

- $position_{in}$ is the position to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (position <= tPosition)
    {
        .
        .
        .

    }
}
```

UI_POSITION::operator ++

Syntax

#include <ui_dsp.hpp>

UI_POSITION &operator ++ (void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload increments the *line* and *column* values of the UI_POSITION structure by one.

- *returnValue*$_{out}$ is a pointer to the UI_POSITION structure after the value has been incremented. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    .
    .
```

```
    .
    position++;
}
```

UI_POSITION::operator --

Syntax

#include <ui_dsp.hpp>

UI_POSITION &operator -- (void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload decrements the *line* and *column* values of the UI_POSITION structure by one.

- *returnValue*$_{out}$ is a pointer to the UI_POSITION structure after the position has been decremented. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_dsp.hpp>
ExampleFunction ( )
{
    .
    .
    .
    position--;
}
```

UI_POSITION::operator +=

Syntax

#include <ui_dsp.hpp>

UI_POSITION &operator += (int *offset*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload increments the *line* and *column* values of the UI_POSITION structure by *offset*.

- $returnValue_{out}$ is a pointer to the UI_POSITION structure. This pointer is returned so that the operator may be used in a statement containing other operations.

- $offset_{in}$ is the value to be added to the position values.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    .
    .
    .

    position += 5;
}
```

UI_POSITION::operator -=

Syntax

#include <ui_dsp.hpp>

UI_POSITION &operator -= (int *offset*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload decrements the *line* and *column* values of the UI_POSITION structure by *offset*.

- $returnValue_{out}$ is a pointer to the UI_POSITION structure. This pointer is returned so that the operator may be used in a statement containing other operations.
- $offset_{in}$ is the value to be subtracted from the position values.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    .
    .
    .
    position -= 5;
}
```

CHAPTER 32 – UI_PRINTER

The UI_PRINTER class object is used to send output to a printer. In those environments that support printers directly (e.g., MS-Windows, OS/2, Macintosh, and NEXTSTEP) this class uses the operating system's API. So any printer supported by that environment is supported by Zinc Application Framework. In DOS, Epson®-compatible dot-matrix printers, Hewlett Packard PCL printers, and PostScript® printers are supported. In Motif PostSript printers are supported.

The printer class can be used either to draw custom images using display primitives or to simply dump a portion of the screen to the printer.

The display primitives are documented in "Chapter 7—UI_DISPLAY" of this manual. Only those functions unique to the UI_PRINTER class are documented here.

The UI_PRINTER class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_PRINTER : public UI_DISPLAY
{
public:
    ZIL_PRINTER_MODE printerMode;
    UI_DISPLAY *display;

    struct ZIL_EXPORT_CLASS POSTSCRIPTFONT
    {
        char *typeFace;
        short pointSize;
    };
    static POSTSCRIPTFONT psFontTable[ZIL_MAXFONTS];

#if defined(ZIL_MSDOS)
    int lPort;
#elif defined(ZIL_MSWINDOWS)
    HDC hdc;
    static HFONT fontTable[ZIL_MAXFONTS];
#elif defined(ZIL_OS2)
    HDC hdc;
    static FONTMETRICS fontTable[ZIL_MAXFONTS];
#elif defined(ZIL_MACINTOSH)
    GrafPtr displayPort;
    TPPrPort printerPort;
    THPrint printJob;
    struct PRINTERFONT
    {
        short   font;
        Style   face;
        short   mode;
        short   size;
        FontRec **fRec;
    };
    static PRINTERFONT fontTable[ZIL_MAXFONTS];
#elif defined(ZIL_NEXTSTEP)
    struct NEXTFONT
    {
        id font;
```

```
    };
    static NEXTFONT fontTable[ZIL_MAXFONTS];
#endif

    UI_PRINTER(UI_DISPLAY *_display = ZIL_NULLP(UI_DISPLAY));
    virtual ~UI_PRINTER(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    void Rectangle(ZIL_SCREENID screenID, const UI_REGION &region,
        const UI_PALETTE *palette, int width = 1, int fill = FALSE,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    int VirtualGet(ZIL_SCREENID screenID, const UI_REGION &region);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

    // New routines for Printer.
    virtual int  BeginPrintJob(ZIL_PRINTER_MODE pMode = PRM_DEFAULT,
        char *_fileName = ZIL_NULLP(char));
    virtual void EndPrintJob(void);
    virtual void BeginPage(void);
    virtual void EndPage(void);
    virtual void ScreenDump(ZIL_SCREENID screenID, UI_REGION &region,
        ZIL_PRINTER_MODE = PRM_DEFAULT, char *_fileName = ZIL_NULLP(char));
};
```

General Members

This section describes those members that are used for general purposes.

- *printerMode* indicates what printer mode the device is in. *printerMode* can have one of the following values:

  PRM_DEFAULT—Causes the device to attempt to connect directly to the default printer.

  PRM_DOTMATRIX9—Causes the device to print to a 9-pin Epson-compatible dot matrix printer. This mode is specific to DOS.

  PRM_DOTMATRIX24—Causes the device to print to a 24-pin Epson-compatible dot matrix printer. This mode is specific to DOS.

  PRM_LASER—Causes the device to print to a Hewlett Packard PCL printer. This mode is specific to DOS.

  PRM_POSTSCRIPT—Causes the device to print to a PostScript file.

- *display* is a pointer to the display. A valid pointer for the display used by the application must be supplied if screen dumps are to be used.

- *POSTSCRIPTFONT* identifies PostScript fonts.

  typeFace is the name of the font.

  pointSize is the point size of the font.

- *psFontTable* is a table of PostScript fonts used by the printer. Initially, this table has ten common PostScript fonts in it.

- *lPort* is the line port being printed to. This member is available in DOS only.

- *hdc* is the device context handle for the printer. This member is available in Windows and OS/2 only.

- *fontTable* corresponds to the font table used by the display class.

- *displayPort* is the current display port. It is saved so that it can be properly restored when printing is completed. This member is available in Macintosh only.

- *printerPort* is the printer port being printed to. This member is available in Macintosh only.

- *printJob* is information about the print job that was set up by the end-user.
- *PRINTERFONT* is a structure that identifies Macintosh fonts. It corresponds to the display class font structure.
- *NEXTFONT* is a structure that identifies NEXTSTEP fonts. It corresponds to the display class font structure.

UI_PRINTER::UI_PRINTER

Syntax

static #include <ui_dsp.hpp>

UI_PRINTER(UI_DISPLAY *_display_ = ZIL_NULLP(UI_DISPLAY));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_PRINTER class object.

- $display_{in}$ is a pointer to the display. A valid display pointer must be provided if screen dumps are required.

UI_PRINTER::~UI_PRINTER

Syntax

static #include <ui_dsp.hpp>

~UI_PRINTER(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This destructor destroys the UI_PRINTER class information.

UI_PRINTER::BeginPage

Syntax

```
#include <ui_dsp.hpp>

virtual void BeginPage(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function initializes the device to begin accepting commands for a new page in the print job. Any calls to the printer primitives made after a call to this function will be buffered until a call to **EndPage( )** is made. When **EndPage( )** is called, the page will be printed. **BeginPage( )** must be called before any printer primitives commands are generated.

UI_PRINTER::BeginPrintJob

Syntax

```
#include <ui_dsp.hpp>

virtual int BeginPrintJob(ZIL_PRINTER_MODE pMode = PRM_DEFAULT,
    char *_fileName = ZIL_NULLP(char));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function begins the printing process by initializing any required information and setting up the printer. Printing can be sent to a file on disk if desired. This function must be called at the beginning of the entire print job.

- *returnValue*$_{out}$ indicates the success of the function call. *returnValue* is FALSE if the function was unsuccessful. Otherwise, it is TRUE.

- *pMode*$_{in}$ indicates the printer mode desired. See the description of *printerMode*, above, for the possible modes.

- *_fileName*$_{in}$ is the name of the file to print to if PostScript output should go to a file. If no filename is provided, output will go directly to the printer.

  In Motif, if *pMode* is PRM_DEFAULT, thus causing the device to output to the printer directly, then *_fileName* is used to specify commands for the print job. If *_fileName* is NULL, the print job will be piped to "lpr" by default. If other options are desired, such as specifying the name of the printer and how many copies should be printed, this string should be set accordingly. For example, if the printer name is PostScriptPrinter and 3 copies are desired, *_fileName* should be "lpr -PPostScript-Printer -#3."

UI_PRINTER::EndPage

Syntax

#include <ui_dsp.hpp>

virtual void EndPage(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function prints the current page. After calling **BeginPage( )**, all printer primitive functions will be buffered. When an image is completed, **EndPage( )** should be called to send the page to the printer. **EndPage( )** clears the page, so subsequent calls to printer primitives will appear on a new page.

UI_PRINTER::EndPrintJob

Syntax

#include <ui_dsp.hpp>

virtual void EndPrintJob(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function ends the printing process by sending any necessary escape sequences to the printer. This function must be called at the end of the entire print job.

UI_PRINTER::ScreenDump

Syntax

```
#include <ui_dsp.hpp>

virtual void ScreenDump(ZIL_SCREENID screenID, UI_REGION &region,
    ZIL_PRINTER_MODE pMode = PRM_DEFAULT,
    char *_fileName = ZIL_NULLP(char));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function dumps a portion of the screen to the printer. This function calls **BeginPrintJob( )**, **BeginPage( )**, **EndPage( )**, and **EndPrintJob( )**.

- $screenID_{in}$ is the screenID of the window being printed.
- $region_{in}$ is the region of the screen that is to be printed. *region* is relative to the upper-left corner of the window identified by *screenID* and is in screen coordinates. Thus, if the display is a text mode display, *region* is in cell coordinates. Otherwise, it is in pixel coordinates.
- $pMode_{in}$ indicates the printer mode desired. See the description of *printerMode*, above, for the possible modes.
- $\_fileName_{in}$ is the name of the file to print to if PostScript output should go to a file. If no filename is provided, output will go directly to the printer.

In Motif, if *pMode* is PRM_DEFAULT, thus causing the device to output to the printer directly, then *_fileName* is used to specify commands for the print job. If *_fileName* is NULL, the print job will be piped to "lpr" by default. If other options are desired, such as specifying the name of the printer and how many copies should be printed, this string should be set accordingly. For example, if the printer name is PostScriptPrinter and 3 copies are desired, *_fileName* should be "lpr -PPostScript-Printer -#3."

CHAPTER 33 – UI_QUEUE_BLOCK

The UI_QUEUE_BLOCK is an advanced class that is only used by the Event Manager. In general, programmers should not be concerned with it. The UI_QUEUE_BLOCK class is an array of UI_QUEUE_ELEMENT objects that acts like a doubly-linked list. Because it is an array that is created at the beginning of the program, manipulating the list is much faster than if memory is allocated and deallocated each time an element is added or subtracted in the list. See "Chapter 21—UI_LIST_BLOCK" for more details about the operation of a list block.

The UI_QUEUE_BLOCK class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_QUEUE_BLOCK : public UI_LIST_BLOCK
{
public:
    UI_QUEUE_BLOCK(int noOfElements);
    ~UI_QUEUE_BLOCK(void);

    UI_QUEUE_ELEMENT *Current(void);
    UI_QUEUE_ELEMENT *First(void);
    UI_QUEUE_ELEMENT *Last(void);
};
```

General Members

This section describes those members that are used for general purposes.

UI_QUEUE_BLOCK::UI_QUEUE_BLOCK

Syntax

#include <ui_evt.hpp>

UI_QUEUE_BLOCK(int *noOfElements*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor allocates an array of UI_QUEUE_ELEMENT classes and initializes them to behave like a list. This is done so that the programmer can have access to all of the list functions without having to create new array functions.

- *noOfElements*$_{in}$ designates the number of elements to be assigned space in memory.

Example

```
#include <ui_evt.hpp>

UI_QUEUE_BLOCK::UI_QUEUE_BLOCK(int _noOfElements) :
    UI_LIST_BLOCK(_noOfElements)
{
    // Initialize the queue block.
    UI_QUEUE_ELEMENT *queueBlock = new UI_QUEUE_ELEMENT[_noOfElements];
    elementArray = queueBlock;
    for (int i = 0; i < _noOfElements; i++)
        freeList.Add(NULL, &queueBlock[i]);
}

UI_EVENT_MANAGER::UI_EVENT_MANAGER(UI_DISPLAY *_display, int _noOfElements) :
    UI_LIST(UI_DEVICE::CompareDevices), queueBlock(_noOfElements), level(1)
{
    display = _display;
    UI_DEVICE::display = display;
    UI_DEVICE::eventManager = this;
}
```

UI_QUEUE_BLOCK::~UI_QUEUE_BLOCK

Syntax

#include <ui_evt.hpp>

~UI_QUEUE_BLOCK(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This destructor destroys the class information associated with the UI_QUEUE_BLOCK class. It also destroys each element in the queue block.

Example

```
#include <ui_evt.hpp>

UI_QUEUE_BLOCK::~UI_QUEUE_BLOCK(void)
{
    // Free the queue block.
    UI_QUEUE_ELEMENT *queueBlock = (UI_QUEUE_ELEMENT *)elementArray;
    delete [noOfElements]queueBlock;
}
```

UI_QUEUE_BLOCK::Current

Syntax

#include <ui_gen.hpp>

UI_QUEUE_ELEMENT *Current(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the current element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the current element in the list. If there is no current element, *returnValue* is NULL.

UI_QUEUE_BLOCK::First

Syntax

#include <ui_gen.hpp>

UI_QUEUE_ELEMENT *First(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the first element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the first element in the list. If there is no first element, *returnValue* is NULL.

UI_QUEUE_BLOCK::Last

Syntax

#include <ui_gen.hpp>

UI_QUEUE_ELEMENT *Last(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the last element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the last element in the list. If there is no last element, *returnValue* is NULL.

CHAPTER 34 – UI_QUEUE_ELEMENT

The UI_QUEUE_ELEMENT class is an advanced class that is only used by the UI_-QUEUE_BLOCK class within the Event Manager. It contains the UI_EVENT structure, which contains an event to be processed by the system. In general, programmers should not be concerned with it.

The UI_QUEUE_ELEMENT class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_QUEUE_ELEMENT : public UI_ELEMENT
{
public:
    UI_QUEUE_ELEMENT(void);
    ~UI_QUEUE_ELEMENT(void);
    UI_EVENT event;

    UI_QUEUE_ELEMENT *Next(void);
    UI_QUEUE_ELEMENT *Previous(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *event* is the UI_EVENT information associated with the queue element.

UI_QUEUE_ELEMENT::UI_QUEUE_ELEMENT

Syntax

#include <ui_evt.hpp>

UI_QUEUE_ELEMENT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a UI_QUEUE_ELEMENT object.

Example

```
#include <ui_evt.hpp>

UI_QUEUE_BLOCK::UI_QUEUE_BLOCK(int _noOfElements) :
    UI_LIST_BLOCK(_noOfElements)
{
    // Initialize the queue block.
    UI_QUEUE_ELEMENT *queueBlock = new UI_QUEUE_ELEMENT[_noOfElements];
    elementArray = queueBlock;
    for (int i = 0; i < _noOfElements; i++)
        freeList.Add(NULL, &queueBlock[i]);
}
```

UI_QUEUE_ELEMENT::~UI_QUEUE_ELEMENT

Syntax

#include <ui_evt.hpp>

virtual ~UI_QUEUE_ELEMENT(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_QUEUE_-ELEMENT object. Care should be taken to only destroy a UI_QUEUE_ELEMENT class that is not attached to another associated object.

UI_QUEUE_ELEMENT::Next

Syntax

#include <ui_evt.hpp>

UI_QUEUE_ELEMENT *Next(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the next UI_QUEUE_ELEMENT in the list.

- *returnValue*$_{out}$ is a pointer to the next UI_QUEUE_ELEMENT in the list, if one exists. If one does not exist, *returnValue* will be NULL.

UI_QUEUE_ELEMENT::Previous

Syntax

#include <ui_evt.hpp>

UI_QUEUE_ELEMENT *Previous(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the previous UI_QUEUE_ELEMENT in the list.

- *returnValue*$_{out}$ is a pointer to the previous UI_QUEUE_ELEMENT in the list, if one exists. If one does not exist, *returnValue* will be NULL.

CHAPTER 35 – UI_REGION

The UI_REGION structure is used to store and manipulate region information. A region is a rectangular area defined by its four corners. The UI_REGION structure is typically used to define an object's screen location.

The UI_REGION structure is declared in **UI_DSP.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_REGION
{
public:
    int left, top, right, bottom;

#if defined(ZIL_MSWINDOWS)
    void Assign(const RECT &rect);
#elif defined(ZIL_OS2)
    void Assign(const RECTL &rect);
#elif defined(ZIL_MACINTOSH)
    void Assign(const Rect &rect);
#elif defined(ZIL_NEXTSTEP)
    void Assign(const NXRect &rect);
#endif
    int Encompassed(const UI_REGION &region) const;
    int Height(void) const;
    int Overlap(const UI_REGION &region) const;
    int Overlap(const UI_POSITION &position) const;
    int Touching(const UI_POSITION &position) const;
    int Overlap(const UI_REGION &region, UI_REGION &result) const;
    int Width(void) const;

    int operator==(const UI_REGION &region) const;
    int operator!=(const UI_REGION &region) const;
    UI_REGION &operator++(void);
    UI_REGION &operator--(void);
    UI_REGION &operator+=(int offset);
    UI_REGION &operator-=(int offset);
};
```

General Members

This section describes those members that are used for general purposes.

- *left* and *top* define the top-left corner of the region. These values may be in cells, minicells or pixels depending on the context of the UI_REGION being used.

- *right* and *bottom* define the bottom-right corner of the region. These values may be in cells, minicells or pixels depending on the context of the UI_REGION being used.

UI_REGION::Assign

Syntax

#include <ui_dsp.hpp>

void Assign(const RECT &*rect*);
or
void Assign(const RECTL &*rect*);
or
void Assign(const Rect &*rect*);
or
void Assign(const NXRect &*rect*);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	☐ OSF/Motif	☐ Curses	■ NEXTSTEP

Remarks

This function copies the region information from the operating system-specific structure into the UI_REGION structure.

- $rect_{in}$ is the operating system-specific region structure whose value is to be copied into the UI_REGION structure.

Example

```
#include <ui_dsp.hpp>

ExampleFunction()
{
    region.Assign(tRegion);
    .
    .
    .

}
```

UI_REGION::Encompassed

Syntax

#include <ui_dsp.hpp>

int Encompassed(const UI_REGION *&region*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function determines if the UI_REGION object is completely encompassed by the UI_REGION structure specified by *region*.

- $returnValue_{out}$ is TRUE if the UI_REGION object is encompassed by *region*. Otherwise, *returnValue* is FALSE.

- $region_{in}$ is the region to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (region1.Encompassed(region2))
    {
        .
        .
        .

    }
}
```

UI_REGION::Height

Syntax

#include <ui_dsp.hpp>

int Height(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the height of the region.

- *returnValue*$_{out}$ is the height of the region.

UI_REGION::Overlap

Syntax

#include <ui_dsp.hpp>

int Overlap(const UI_REGION *&region*);
or
int Overlap(const UI_POSITION *&position*);
or
int Overlap(const UI_REGION *&region*, UI_REGION *&result*);

Portability

These functions are available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions determine if the UI_REGION object overlaps another region or position.

The first overloaded function determines if the UI_REGION object is overlapped by another UI_REGION structure specified by *region*.

- *returnValue*$_{out}$ is TRUE if the UI_REGION object is overlapped by *region*. Otherwise, *returnValue* is FALSE.

- *region*$_{in}$ is the region to be compared.

The second overloaded function determines if the UI_REGION object is overlapped by a UI_POSITION structure specified by *position*.

- *returnValue*$_{out}$ is TRUE if the UI_REGION object is overlapped by *position*. Otherwise, *returnValue* is FALSE.

- *position*$_{in}$ is the position to be compared.

The third overloaded function tests to see if the UI_REGION object is overlapped by the UI_REGION structure specified by *region*. The overlapping portion of the regions is copied into *result*.

- *returnValue*$_{out}$ is TRUE if the UI_REGION object is overlapped by *region*. Otherwise, *returnValue* is FALSE.

- *region*$_{in}$ is the region to be compared.

- *result*$_{out}$ is the region overlapped by both the UI_REGION object and *region*.

Example 1

```
#include <ui_dsp.hpp>

EVENT_TYPE UID_CURSOR::Event(const UI_EVENT &event)
{
    .
    .
    .

    switch (event.type)
    {
    .
    .
    .
```

```
    case D_SHOW:
        if (state != D_OFF)
        {
            UI_REGION region;
            region.left = position.column;
            region.top = position.line;
            region.right = region.left + display->cellWidth - 1;
            region.bottom = region.top + display->cellHeight - 1;
            if (region.Overlap(event.region))
                tState = (event.rawCode == D_HIDE) ? D_HIDE : D_ON;
        }
        break;

    }
}
```

Example 2

```
#include <ui_win.hpp>

EVENT_TYPE UIW_VT_LIST::Event(const UI_EVENT &event)
{
    .
    .
    .

    if (object && (ccode == L_SELECT || true.Overlap(event.position)))
        object->Event(UI_EVENT(L_SELECT));
    break;
    .
    .
    .

    // Return the control code.
    return (ccode);
}
```

UI_REGION::Touching

Syntax

#include <ui_dsp.hpp>

int Touching(const UI_POSITION *&position*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function determines whether the point specified by *position* is touching the edge of the UI_REGION object. *position* is considered to be touching the region if the point defined by *position* is exactly on an edge defined by the UI_REGION structure.

- $returnValue_{out}$ is TRUE if *position* is touching the edge of the UI_REGION object. Otherwise, *returnValue* is FALSE.

- $position_{in}$ is the position to be compared.

UI_REGION::Width

Syntax

#include <ui_dsp.hpp>

int Width(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the width of the region.

- $returnValue_{out}$ is the width of the region.

UI_REGION::operator ==

Syntax

#include <ui_dsp.hpp>

int operator == (const UI_REGION *&region*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines if the UI_REGION object has the same region as the UI_REGION specified by *region*.

- *returnValue*$_{out}$ is TRUE if the UI_REGION is the same as *region*. Otherwise, *returnValue* is FALSE.

- *region*$_{in}$ is the region to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (region1 == region2)
    {
        .
        .
        .

    }
}
```

UI_REGION::operator !=

Syntax

#include <ui_dsp.hpp>

int operator != (const UI_REGION &*region*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines if the UI_REGION object does not have the same region as the UI_REGION object specified by *region*.

- *returnValue*$_{out}$ is TRUE if UI_REGION is not the same as *region*. Otherwise, *returnValue* is FALSE.

- *region*$_{in}$ is the region to be compared.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    if (region1 != region2)
    {
        .
        .
        .

    }
}
```

UI_REGION::operator ++

Syntax

#include <ui_dsp.hpp>

UI_REGION &operator ++ (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload increases the size of the region on each side by one. It does this by decrementing the *left* and *top* values of the region by one and incrementing the *right* and *bottom* values of the region by one.

- *returnValue*$_{out}$ is a pointer to the UI_REGION object after its size has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_dsp.hpp>
ExampleFunction ( )
{
    .
    .
    .
    ++region;
}
```

UI_REGION::operator --

Syntax

#include <ui_dsp.hpp>

UI_REGION &operator -- (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload decreases the size of the region on each side by one. It does this by incrementing the *left* and *top* values of the region by one and decrementing the *right* and *bottom* values of the region by one.

- *returnValue*$_{out}$ is the address of the UI_REGION object after its size has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    .
    .
    .
    --region;
}
```

UI_REGION::operator +=

Syntax

#include <ui_dsp.hpp>

UI_REGION &operator += (int *offset*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload increases the size of the region on each side by *offset*. It does this by subtracting *offset* from the *left* and *top* values of the region and adding *offset* to the *right* and *bottom* values of the region.

- *returnValue*$_{out}$ is a pointer to the UI_REGION object after its size has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    .
    .
    .
    region += 5;
}
```

UI_REGION::operator -=

Syntax

#include <ui_dsp.hpp>

UI_REGION &operator -= (int offset);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload decreases the size of the region on each side by *offset*. It does this by adding *offset* to the *left* and *top* values of the region and subtracting *offset* from the *right* and *bottom* values of the region.

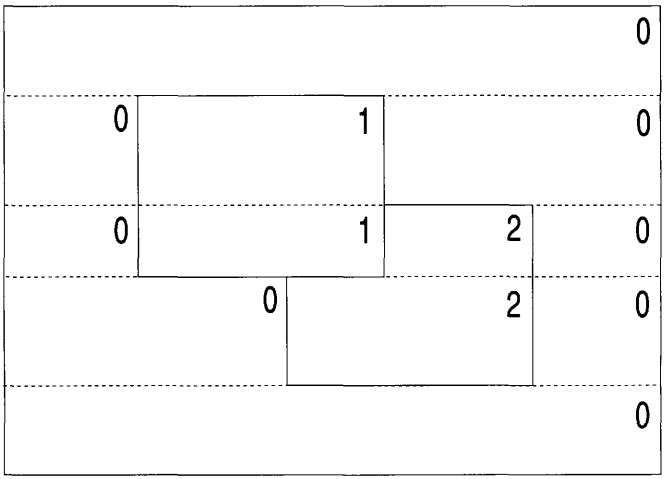
- *returnValue*$_{out}$ is a pointer to the UI_REGION object after its size has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_dsp.hpp>

ExampleFunction ( )
{
    .
    .
    .

    region -= 5;
}
```

CHAPTER 36 – UI_REGION_ELEMENT

The UI_REGION_ELEMENT class works with the UI_REGION_LIST class to maintain a list of rectangular screen regions. The screen regions are used to calculate a window's available region and to perform clipping more efficiently when updating the display. When an object with the WOF_NON_FIELD_REGION flag set is added to a window, the window's available region is updated to prevent allocating that space in the future. The window's available region is maintained by a UI_REGION_LIST. Also, whenever a window is placed on the screen or an existing window's position or size is changed, the affected areas of the display must be updated. The screen's regions are maintained in a UI_REGION_LIST that allows Zinc to efficiently update the display. The picture below shows how a screen may be split up (where 0 is the screen background and 1 and 2 are overlapping windows):



In general, the programmer does not need to use this class.

The UI_REGION_ELEMENT class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_REGION_ELEMENT : public UI_ELEMENT
{
public:
    ZIL_SCREENID screenID;
    UI_REGION region;

    UI_REGION_ELEMENT(ZIL_SCREENID screenID, const UI_REGION &_region);
    UI_REGION_ELEMENT(ZIL_SCREENID screenID, int left, int top, int right,
        int bottom);
    ~UI_REGION_ELEMENT(void);
```

```
    // Element members.
    UI_REGION_ELEMENT *Next(void);
    UI_REGION_ELEMENT *Previous(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *screenID* identifies which object "owns" the region. *screenID* is an identifier associated with a window object. See the *screenID* section of "Chapter 43—UI_-WINDOW_OBJECT" of this manual and "Appendix A—Support Definitions" of *Programmer's Reference Volume 2* for more information.

- *region* is the rectangular region that is reserved.

UI_REGION_ELEMENT::UI_REGION_ELEMENT

Syntax

#include <ui_dsp.hpp>

UI_REGION_ELEMENT(ZIL_SCREENID *_screenID*, const UI_REGION &*_region*);
or
UI_REGION_ELEMENT(ZIL_SCREENID *_screenID*, int *_left*, int *_top*, int *_right*, int *_bottom*);

Portability

These functions are available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors create a new UI_REGION_ELEMENT object.

- $\_screenID_{in}$ is the identification to associate with the region.

- *_region*$_{in}$ is the region to define.
- *_left*$_{in}$, *_top*$_{in}$, *_right*$_{in}$ and *_bottom*$_{in}$ is the region to define.

Example

```
#include <ui_dsp.hpp>

void UI_DISPLAY::RegionDefine(ZIL_SCREENID screenID, int left, int top,
    int right, int bottom)
{
    UI_REGION region;
    region.left = left;
    region.top = top;
    region.right = right;
    region.bottom = bottom;
    // See if it is a full screen definition.
    if (region.left <= 0 && region.top <= 0 &&
        region.right >= columns - 1 && region.bottom >= lines - 1)

    {
        UI_REGION_LIST::Destroy();
        Add(0, new UI_REGION_ELEMENT(screenID, 0, 0, columns - 1, lines - 1));
        return;
    }
    .
    .
    .

}
```

UI_REGION_ELEMENT::~UI_REGION_ELEMENT

Syntax

#include <ui_dsp.hpp>

~UI_REGION_ELEMENT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This destructor destroys the class information associated with the UI_REGION_-ELEMENT object.

Example

```
#include <ui_dsp.hpp>

void UI_REGION_LIST::Split(int screenID, const UI_REGION &region)
{
    UI_REGION tRegion, sRegion;
    UI_REGION_ELEMENT *dRegion, *t_dRegion;
    // Split any overlapping regions.
    for (dRegion = First(); dRegion; dRegion = t_dRegion)
    {
        .
        .
        .

        // Region 3 is the object's region.
        UI_LIST::Subtract(dRegion);
        delete dRegion;
    }
}
```

UI_REGION_ELEMENT::Next

Syntax

#include <ui_dsp.hpp>

UI_REGION_ELEMENT *Next(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the next UI_REGION_ELEMENT in the list.

- *returnValue*$_{out}$ is a pointer to the next UI_REGION_ELEMENT in the list, if one exists. If one does not exist, *returnValue* will be NULL.

UI_REGION_ELEMENT::Previous

Syntax

```
#include <ui_dsp.hpp>

UI_REGION_ELEMENT *Previous(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

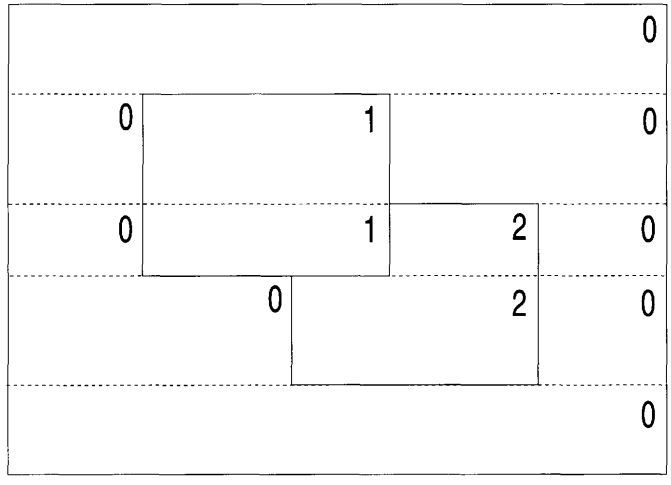
Remarks

This function returns a pointer to the previous UI_REGION_ELEMENT in the list.

- *returnValue*$_{out}$ is a pointer to the previous UI_REGION_ELEMENT in the list, if one exists. If one does not exist, *returnValue* will be NULL.

CHAPTER 37 – UI_REGION_LIST

The UI_REGION_LIST class works with the UI_REGION_ELEMENT class to maintain a list of rectangular screen regions. The screen regions are used to calculate a window's available region and to perform clipping more efficiently when updating the display. When an object with the WOF_NON_FIELD_REGION flag set is added to a window, the window's available region is updated to prevent allocating that space in the future. The window's available region is maintained by a UI_REGION_LIST. Also, whenever a window is placed on the screen or an existing window's position or size is changed, the affected areas of the display must be updated. The screen's regions are maintained in a UI_REGION_LIST that allows Zinc to efficiently update the display. The picture below shows how a screen may be split up (where 0 is the screen background and 1 and 2 are overlapping windows):



The UI_REGION_LIST class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_REGION_LIST : public UI_LIST
{
public:
    UI_REGION_LIST(void);
    ~UI_REGION_LIST(void);
    void Split(ZIL_SCREENID screenID, const UI_REGION &region,
        int allocateBelow = FALSE);


    // List members.
    UI_REGION_ELEMENT *Current(void);
    UI_REGION_ELEMENT *First(void);
```

```
    UI_REGION_ELEMENT *Last(void);
};
```

General Members

This section describes those members that are used for general purposes.

UI_REGION_LIST::Current

Syntax

#include <ui_dsp.hpp>

UI_REGION_ELEMENT *Current(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the current element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the current element in the list. If there is no current element, *returnValue* is NULL.

UI_REGION_LIST::First

Syntax

#include <ui_dsp.hpp>

UI_REGION_ELEMENT *First(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the first element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the first element in the list. If there is no first element, *returnValue* is NULL.

UI_REGION_LIST::Last

Syntax

```
#include <ui_dsp.hpp>

UI_REGION_ELEMENT *Last(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the last element, if one exists, in the list.

- *returnValue*$_{out}$ is a pointer to the last element in the list. If there is no last element, *returnValue* is NULL.

UI_REGION_LIST::Split

Syntax

#include <ui_dsp.hpp>

void Split(ZIL_SCREENID *screenID*, const UI_REGION &*region*,
int *allocateBelow* = FALSE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function splits the regions in the region list and adds the new region to the list.

- $screenID_{in}$ is the identification to associate with the new region.
- $region_{in}$ is the new region to define.
- $allocateBelow_{in}$ specifies whether a new region should be created if there are no regions in the list.

Example

```
#include <ui_dsp.hpp>

void UI_DISPLAY::RegionDefine(ZIL_SCREENID screenID, int left, int top, int
right,
    int bottom)
{
    UI_REGION region;
    region.left = left;
    region.top = top;
    region.right = right;
    region.bottom = bottom;
    .
    .
    .

    // Clip regions partially off the screen to fit on the screen.
    if (region.left < 0)
        region.left = 0;
    if (region.right >= columns)
```

```
        region.right = columns - 1;
    if (region.top < 0)
        region.top = 0;

    if (region.bottom >= lines)
        region.bottom = lines - 1;
    // Split any overlapping regions.
    Split(screenID, region);

    // Define the new display region.
    Add(0, new UI_REGION_ELEMENT(screenID, &region));
}
```

CHAPTER 38 – UI_RELATIVE_CONSTRAINT

The UI_RELATIVE_CONSTRAINT class object is used for geometry management. Specifically, this class allows a managed object to be tied to an edge of its parent at a distance relative to the size of the parent. For example, a button can be positioned so that its left edge is always twenty-five percent of the way across its parent, even if the parent is sized. The UI_RELATIVE_CONSTRAINT is added to the parent object's geometry manager. See "Chapter 14—UI_GEOMETRY_MANAGER" for more details on using the geometry manager.

The UI_RELATIVE_CONSTRAINT class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class UI_RELATIVE_CONSTRAINT : public UI_CONSTRAINT
{
public:
    UI_RELATIVE_CONSTRAINT(UI_WINDOW_OBJECT *_object,
        RLCF_FLAGS _rlcFlags = RLCF_NO_FLAGS,
        int _numerator = 50, int _denominator = 100, int _offset = 0);
    virtual ~UI_RELATIVE_CONSTRAINT(void);

    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);
    virtual void Modify(void);

#if defined(ZIL_LOAD)
    virtual ZIL_NEW_FUNCTION NewFunction(void);
    static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    UI_RELATIVE_CONSTRAINT(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    virtual void Load(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name, ZIL_STORAGE *file,
        ZIL_STORAGE_OBJECT *object, UI_ITEM *objectTable,
        UI_ITEM *userTable);
#endif

protected:
    int numerator;
    int denominator;
    RLCF_FLAGS rlcFlags;
    int offset;
};
```

General Members

This section describes those members that are used for general purposes.

- *numerator* is used in conjunction with *denominator* to determine the relative positioning of the managed object. *numerator* is divided by *denominator* to obtain a percentage. The managed object will be positioned according to this percentage of the parent window's size.

- *denominator* is used in conjunction with *numerator* to determine the relative positioning of the managed object. *numerator* is divided by *denominator* to obtain a percentage. The managed object will be positioned according to this percentage of the parent window's size.

- *rlcFlags* are flags that define the operation of the UI_RELATIVE_CONSTRAINT class. A full description of the relative constraint flags is given in the UI_RELATIVE_CONSTRAINT constructor.

- *offset* is how far, in addition to the percentage determined using *numerator* and *denominator*, the managed object should be positioned from the object to which it is tied. *offset* number of cells are added to the position determined by the percentage. This value is specified in cell dimensions.

UI_RELATIVE_CONSTRAINT::UI_RELATIVE_CONSTRAINT

Syntax

#include <ui_win.hpp>

UI_RELATIVE_CONSTRAINT(UI_WINDOW_OBJECT *_*object*,
RLCF_FLAGS _*rlcFlags* = RLCF_NO_FLAGS, int _*numerator* = 50,
int _*denominator* = 100, int _*offset* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_RELATIVE_CONSTRAINT object.

- *_object*$_{in}$ is the object to be managed.

- *_rlcFlags*$_{in}$ are flags that define the operation of the UI_RELATIVE_CONSTRAINT class. The following flags (declared in **UI_WIN.HPP**) control the general operation of a UI_RELATIVE_CONSTRAINT class object:

  RLCF_BOTTOM—Maintains the bottom edge of the managed object at the specified relative distance from the object to which it is tied.

  RLCF_LEFT—Maintains the left edge of the managed object at the specified relative distance from the object to which it is tied.

  RLCF_HORIZONTAL_CENTER—Causes the object to be centered horizontally within its parent.

  RLCF_OPPOSITE—Causes the managed object to be tied to the opposite edge of the object to which it is tied. For example, if the RLCF_TOP flag is set, the top edge of the managed object will be tied to the bottom edge of the object to which it is tied.

  RLCF_NO_FLAGS—Does not associate any special flags with the UI_RELATIVE_CONSTRAINT class. This flag should not be used in conjunction with any other RLCF flags.

  RLCF_RIGHT—Maintains the right edge of the managed object at the specified relative distance from the object to which it is tied.

  RLCF_STRETCH—Causes the managed object to be stretched, if necessary, to maintain its constraints. For example, if the left and right edges of the object are tied to the parent window and the window is sized, the managed object must stretch or shrink to maintain its distance from the edges.

  RLCF_TOP—Maintains the top edge of the managed object at the specified relative distance from the object to which it is tied.

  RLCF_VERTICAL_CENTER—Causes the object to be centered vertically within its parent.

- *_numerator*$_{in}$ is divided by *denominator* to obtain the relative positioning constraint.

- *_denominator*$_{in}$ is divided into *numerator* to obtain the relative positioning constraint.
- *_offset*$_{in}$ is an additional fixed distance at which the managed object will be maintained.

UI_RELATIVE_CONSTRAINT::~UI_RELATIVE_CONSTRAINT

Syntax

#include <ui_win.hpp>

virtual ~UI_RELATIVE_CONSTRAINT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_RELATIVE_CONSTRAINT object.

UI_RELATIVE_CONSTRAINT::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST *request*, void **data*,
ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the relative constraint object:

  I_CLEAR_FLAGS—Clears the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type RLCF_FLAGS that contains the flags to be cleared. This request only clears those flags that are passed in; it does not simply clear the entire field.

  I_GET_FLAGS—Requests the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type RLCF_FLAGS. If *data* is NULL, a pointer to *rlcFlags* will be returned.

  I_GET_DENOMINATOR—Returns the *denominator* value. If this message is sent, *data* must be a pointer to a variable of type **int** where the constraint's *denominator* will be copied.

  I_GET_NUMERATOR—Returns the *numerator* value. If this message is sent, *data* must be a pointer to a variable of type **int** where the constraint's *numerator* will be copied.

  I_SET_FLAGS—Sets the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type RLCF_FLAGS that contains the flags to be set. This request only sets those flags that are passed in; it does not clear any flags that are already set.

I_SET_DENOMINATOR—Sets the *denominator* value. If this message is sent, *data* must be a pointer to a variable of type **int** that contains the constraint's new *denominator*.

I_SET_NUMERATOR—Sets the *numerator* size allowed by the constraint. If this message is sent, *data* must be a pointer to a variable of type **int** that contains the constraint's new *numerator*.

All other requests are passed to **UI_CONSTRAINT::Information( )** for processing.

- $data_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.

- $objectID_{in}$ is not used.

UI_RELATIVE_CONSTRAINT::Modify

Syntax

```
#include <ui_win.hpp>

virtual void Modify(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function updates the managed object's position and, if necessary, size according to the constraints specified. The geometry manager calls each constraint's **Modify( )** function whenever the parent object's position or size is changed.

Storage Members

This section describes those class members that are used for storage purposes.

UI_RELATIVE_CONSTRAINT::UI_RELATIVE_CONSTRAINT

Syntax

#include <ui_win.hpp>

UI_RELATIVE_CONSTRAINT(const ZIL_ICHAR **name*,
ZIL_STORAGE_READ_ONLY **file*,
ZIL_STORAGE_OBJECT_READ_ONLY **object*,
UI_ITEM **objectTable* = ZIL_NULLP(UI_ITEM),
UI_ITEM **userTable* = ZIL_NULLP(UI_ITEM));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_RELATIVE_CONSTRAINT by loading the object from a data file. Typically, the programmer does not need to use this constructor. If a constraint is stored in a data file it is usually stored as part of a geometry manager and will be loaded when the geometry manager is loaded.

- $name_{in}$ is the name of the object to be loaded.
- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the

programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_RELATIVE_CONSTRAINT::Load

Syntax

#include <ui_win.hpp>

virtual void Load(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*, ZIL_STORAGE_OBJECT_READ_ONLY **object*, UI_ITEM **objectTable*, UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a UI_RELATIVE_CONSTRAINT from a persistent object data file. It is called by the persistent constructor and is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_RELATIVE_CONSTRAINT::New

Syntax

```
#include <ui_win.hpp>

static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
    UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
    UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a persistent object from a data file. This function is a static class member so that its address can be placed in a table used by the library to load persistent objects from a data file.

NOTE: The application must first create a display if objects are to be loaded from a data file.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_RELATIVE_CONSTRAINT::NewFunction

Syntax

#include <ui_win.hpp>

virtual ZIL_NEW_FUNCTION NewFunction(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns a pointer to the object's **New( )** function.

- *returnValue*$_{out}$ is a pointer to the object's **New( )** function.

UI_RELATIVE_CONSTRAINT::Store

Syntax

#include <ui_win.hpp>

virtual void Store(const ZIL_ICHAR **name*, ZIL_STORAGE **file*,
ZIL_STORAGE_OBJECT **object*, UI_ITEM **objectTable*,
UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to write an object to a data file.

- *name*$_{in}$ is the name of the object to be stored.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE where the persistent object will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the persistent object information will be stored. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in "Chapter 43—UI_WIN-DOW_OBJECT" in this manual. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions, and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in "Chapter 43—UI_WINDOW_-OBJECT" in this manual. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

CHAPTER 39 – UI_SCROLL_INFORMATION

The UI_SCROLL_INFORMATION structure is used to maintain scroll information. It is used to send scrolling events to objects as well as to maintain current scroll settings.

The UI_SCROLL_INFORMATION structure is declared in **UI_EVT.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS UI_SCROLL_INFORMATION
{
    ZIL_INT16 current;
    ZIL_INT16 minimum;
    ZIL_INT16 maximum;
    ZIL_INT16 showing;
    ZIL_INT16 delta;
};
```

General Members

This section describes those members that are used for general purposes.

- *current* indicates the current scroll position within the range designated by *minimum* and *maximum*. If the values are settings for a UIW_SCROLL_BAR, *current* affects the relative position of the thumb button between the two end buttons of the scroll bar.

- *minimum* is the minimum value of the scroll range. The actual value used is insignificant. *minimum* is used in relation to *maximum* and *current*, so their relative values must make sense. The object using UI_SCROLL_INFORMATION is responsible for setting the values and interpreting their meaning.

- *maximum* is the maximum value of the scroll range. The actual value used is insignificant. *maximum* is used in relation to *minimum* and *current*, so their relative values must make sense. The object using UI_SCROLL_INFORMATION is responsible for setting the values and interpreting their meaning.

- *showing* indicates how much of the scroll range is "visible." *showing* controls how far *current* is moved when a full page scroll is performed. For example, if a text object has 100 lines of text, and 10 lines are visible, the scroll bar that controls it might have a range of 1 to 90 and a *showing* value of 10 (if 10 lines are visible then only 90 lines need to be scrolled for the entire field to be viewed). If the end-user selects a full page scroll on the scroll bar the text object will scroll by 10 lines. The

scroll bar's thumb button will also be adjusted, as will its *current* value, by 1/9th of the range (i.e., it moves by 10, the value of *showing*, within the range of 90 values).

- *delta* indicates how far to adjust the *current* value when the smallest scroll movement is made. For example, on the text object in the example above, *delta* will be 1, indicating that selecting an end button on the scroll bar will scroll the text 1 line.

Portability

This structure is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Example

```
#include <ui_win.hpp>

EVENT_TYPE SCROLL_OBJECT::Event(const UI_EVENT &event)
{
    UI_WINDOW_OBJECT *object;
    .
    .
    .

    // Switch on the event type.
    switch (ccode)
    {
    case S_HSCROLL:
    case S_VSCROLL:
        {
        object = Current();
        int hDelta = 0, vDelta = 0;
        .
        .
        .

        if (ccode == S_HSCROLL && hScroll)
        {
            hScroll->Event(event);
            hDelta = -event.scroll.delta * (object->true.right -
                object->true.left + 1);
        }
        else if (ccode == S_VSCROLL && vScroll)
        {
            vScroll->Event(event);
            vDelta = -event.scroll.delta * (object->true.bottom -
                object->true.top + 1);
        }
        .
        .
        .

        break;
    }
```

```
    // Return the control code.
    return (ccode);
}
```

CHAPTER 40 – UI_TEXT_DISPLAY

The UI_TEXT_DISPLAY class implements a text display that writes directly to screen memory. The UI_TEXT_DISPLAY is used for both DOS text mode applications and for Curses applications. Since the UI_TEXT_DISPLAY class is derived from the display class UI_DISPLAY, only details specific to the UI_TEXT_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_TEXT_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_TEXT_DISPLAY : public UI_DISPLAY,
    public UI_REGION_LIST
{
public:
    TDM_MODE mode;

    UI_TEXT_DISPLAY(TDM_MODE _mode = TDM_AUTO);
    virtual ~UI_TEXT_DISPLAY(void);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette,
        int isForeground = 1);
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    ZIL_SCREEN_CELL *_screen;
    int _virtualCount;
    UI_REGION _virtualRegion;
    char _stopDevice;
```

```
    // I18N member variables and functions.
public:
    static ZIL_ICHAR _tCornerUL[];
    static ZIL_ICHAR _tCornerUR[];
    static ZIL_ICHAR _tCornerLL[];
    static ZIL_ICHAR _tCornerLR[];
    static ZIL_ICHAR _tHorizontal[];
    static ZIL_ICHAR _tVertical[];
};
```

General Members

This section describes those members that are used for general purposes.

- *mode* is the text mode that is initialized.
- *_screen* is a pointer to the BIOS screen buffer.
- *_moveBuffer* is a pointer to screen memory. This extra memory facilitates faster screen moves.
- *_virtualCount* is a count of the number of virtual screen operations that have taken place. For example, when the **VirtualGet( )** function is called, *_virtualCount* is decremented. Additionally, when the **VirtualPut( )** function is called, *_virtualCount* is incremented.
- *_virtualRegion* is the region affected by either **VirtualGet( )** or **VirtualPut( )**.
- *_stopDevice* is a variable used to prevent recursive updates of device images on the display. If *_stopDevice* is TRUE, no drawing will be done to the screen. Otherwise, drawing will be made directly to the screen display.

UI_TEXT_DISPLAY::UI_TEXT_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_TEXT_DISPLAY(TDM_MODE *_mode* = TDM_AUTO);

Portability

This function is available on the following environments:

■ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	■ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_TEXT_DISPLAY object. When a new UI_TEXT_-DISPLAY class is constructed, the system clears the screen to the background color and pattern specified by the inherited palette variable *backgroundPalette*. See "Chapter 27—UI_PALETTE" of this manual for more information about palettes. Also, the blink attribute is disabled to allow the use of high-intensity colors.

- *_mode*$_{in}$ specifies the type of text display to create. The available display modes (defined in **UI_DSP.HPP**) are:

  TDM_AUTO—Creates a text display using the current text mode.

  TDM_25x40 and **TDM_BW_25x40**—Create a text display with 25 lines and 40 columns.

  TDM_25x80, **TDM_BW_25x80** and **TDM_MONO_25x80**—Create a text display with 25 lines and 80 columns.

  TDM_43x80—Creates a text display with 43 lines and 80 columns on an EGA display or 50 lines and 80 columns on a VGA display.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    if (!display->installed)
    {
        delete display;
        display = new UI_TEXT_DISPLAY;
    }

    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
```

```
    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_TEXT_DISPLAY::~UI_TEXT_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_TEXT_DISPLAY(void);

Portability

This function is available on the following environments:

■ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	■ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_TEXT_-DISPLAY class. Care should be taken to only destroy a UI_TEXT_DISPLAY class that is not attached to another associated object.

Internationalization Members

This section describes those members used for internationalization purposes.

- *_tCornerUL* is an array that contains the characters used to represent the upper left corner of a window in text mode. By default these characters are '┌' and '╔'.

- *_tCornerUR* is an array that contains the characters used to represent the upper right corner of a window in text mode. By default these characters are '┐' and '╗'.

- *_tCornerLL* is an array that contains the characters used to represent the lower left corner of a window in text mode. By default these characters are '└' and '╚'.

- *_tCornerLR* is an array that contains the characters used to represent the lower right corner of a window in text mode. By default these characters are '┘' and '╝'.

- *_tHorizontal* is an array that contains the characters used to represent the horizontal (i.e., top and bottom) edges of a window in text mode. By default these characters are '─' and '═'.

- *_tVertical* is an array that contains the characters used to represent the vertical (i.e., left and right) edges of a window in text mode. By default these characters are '│' and '║'.

CHAPTER 41 – UI_WCC_DISPLAY

The UI_WCC_DISPLAY class object is a graphics display class that uses the graphics library packaged with the Watcom compiler. Since the UI_WCC_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_WCC_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

The UI_WCC_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_WCC_DISPLAY : public UI_DISPLAY,
    public UI_REGION_LIST
{
public:
    struct ZIL_EXPORT_CLASS WCCFONT
    {
        char *typeFace;
        char *options;
    };
    typedef unsigned char WCCPATTERN[8];

    static UI_PATH *searchPath;
    static WCCFONT fontTable[ZIL_MAXFONTS];
    static WCCPATTERN patternTable[ZIL_MAXPATTERNS];

    UI_WCC_DISPLAY(int mode = 0);
    virtual ~UI_WCC_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
```

```
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);

protected:
    int maxColors;
    signed char _virtualCount;
    UI_REGION _virtualRegion;
    char _stopDevice;
    int _fillPattern;
    int _backgroundColor;
    int _foregroundColor;

    void SetFont(ZIL_LOGICAL_FONT logicalFont);
    void SetPattern(const UI_PALETTE *palette, int _xor);
};
```

General Members

This section describes those members that are used for general purposes.

- *WCCFONT* is a structure that contains the following font information:

  typeFace contains the string name of the font. Zinc uses Watcom's Helvetica font, so for the three fonts defined by Zinc, *typeFace* is "Helv."

  options contains the font characteristics. For more information see **_setfont( )** in the *Watcom C Graphics Library Reference*.

- *WCCPATTERN* is an array of 8 bytes that make up the 8x8 bitmap pattern. Each byte (8 bits) corresponds to 8 pixels in the pattern. The patterns defined by Zinc are: PTN_SOLID_FILL, PTN_INTERLEAVE_FILL and PTN_BACKGROUND_FILL.

For more information see **setfillpattern( )** in the *Watcom C Graphics Library Reference*.

- *searchPath* contains the path to be searched for the font file. The WCC graphics library needs to access font files at run-time so that it can draw characters in graphics mode. Because Zinc uses Watcom's Helvetica font, the UI_WCC_DISPLAY class needs to find the **HELVB.FON** file at run-time. If the display class cannot find this file, graphics mode will not initialize.

- *fontTable* is an array of *WCCFONT*. The default array contains space for 10 *WCCFONT* entries. The following entries are pre-defined by Zinc:

  FNT_SMALL_FONT—A font that is used to display an icon's text string.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.)

  FNT_SYSTEM_FONT—A sans-serif style font that is used to display a window's title.

  NOTE: To use these fonts, or if other "stroked" fonts are added to this table, the proper Watcom font files must be in the current working directory or in the environment's path at run-time.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

- *patternTable* is an array of *WCCPATTERN*. The default array contains space for 15 *WCCPATTERN* entries. The following entries are pre-defined by Zinc:

  PTN_SOLID_FILL—Solid fill.

  PTN_INTERLEAVE_FILL—Interleaving line fill.

  PTN_BACKGROUND_FILL—Background fill style.

- *maxColors* is the maximum number of colors supported by the graphics mode that was initialized. For example, an EGA display might support sixteen colors. This member will be filled in according to information obtained from the WCC graphics library after it has initialized. The WCC graphics library supports SVGA modes,

including 256 color mode. Zinc will support whatever mode is initialized by the WCC graphics library.

- *_virtualCount* is a count of the number of virtual screen operations that have taken place. For example, when the **VirtualGet( )** function is called, *_virtualCount* is decremented. Additionally, when the **VirtualPut( )** function is called, *_virtualCount* is incremented.

- *_virtualRegion* is the region affected by either **VirtualGet( )** or **VirtualPut( )**.

- *_stopDevice* is a variable used to prevent recursive updates of device images on the display. If *_stopDevice* is TRUE, no drawing will be done to the screen. Otherwise, drawing will be made directly to the screen display.

- *_fillPattern* is an index into the *patternTable* specifying the current fill pattern.

- *_backgroundColor* is the current background drawing color.

- *_foregroundColor* is the current foreground drawing color.

UI_WCC_DISPLAY::UI_WCC_DISPLAY

Syntax

#include <ui_dsp.hpp>

UI_WCC_DISPLAY(int *mode* = 0);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_WCC_DISPLAY object. When a new UI_WCC_-DISPLAY class is constructed, the screen display is set to the background color and pattern specified by the inherited variable *backgroundPalette*.

- *mode*$_{in}$ specifies the graphics mode that should be initialized. If *mode* is 0, which is the default, the UI_WCC_DISPLAY class will initialize the highest resolution graphics mode possible using the WCC **_MAXRESMODE** constant. For more information on the possible values for *mode*, see **_setvideomode( )** in the *Watcom C Graphics Library Reference*.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize Zinc Application Framework.
    UI_DISPLAY *display = new UI_WCC_DISPLAY;
    .
    .
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_WCC_DISPLAY::~UI_WCC_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_WCC_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_WCC_-DISPLAY class. Care should be taken to only destroy a UI_WCC_DISPLAY class that is not attached to another associated object.

UI_WCC_DISPLAY::SetFont

Syntax

#include <ui_dsp.hpp>

void SetFont(ZIL_LOGICAL_FONT *logicalFont*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function is used to set the font information used by the WCC graphics library. The information contained in the *logicalFont* entry of the *fontTable* array is used to set the font.

- $logicalFont_{in}$ is the font to be used. *logicalFont* is an entry into the *fontTable* array.

UI_WCC_DISPLAY::SetPattern

Syntax

#include <ui_dsp.hpp>

void SetPattern(const UI_PALETTE **palette*, int *_xor*);

Portability

This function is available on the following environments:

☐ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

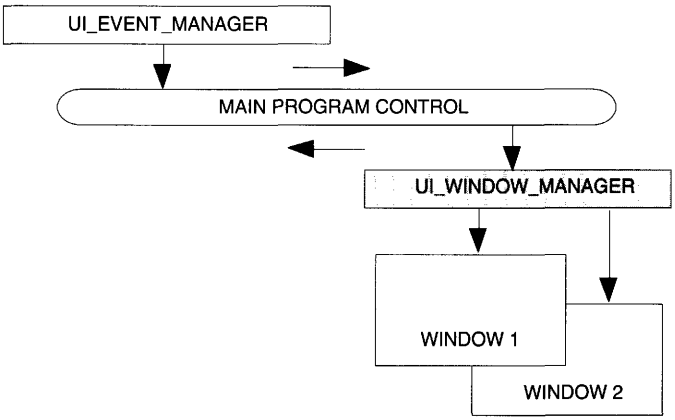
This function is used to set the pattern information used by the WCC graphics library. The information contained in *palette* is used to set the pattern.

- $palette_{in}$ contains the pattern style, foreground color, and background color to be used when setting the pattern.

- $\_xor_{in}$ indicates if the pattern should be drawn with the xor attribute on. If *_xor* is TRUE, the pattern will be an xor pattern. Otherwise, the pattern will not be xor.

CHAPTER 42 – UI_WINDOW_MANAGER

The UI_WINDOW_MANAGER class is used to maintain the list of windows displayed by the application and to dispatch events. The Window Manager also handles some events that are generic to the entire application. For example, the user may select an option that causes the application to close. The Window Manager can detect this event and begin the process to close the application. The graphic illustration below shows the conceptual operation of the Window Manager within the library:



The UI_WINDOW_MANAGER class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_WINDOW_MANAGER : public UIW_WINDOW
{
public:
    ZIL_EXIT_FUNCTION exitFunction;
    UI_WINDOW_OBJECT *dragObject;

    UI_WINDOW_MANAGER(UI_DISPLAY *display, UI_EVENT_MANAGER *eventManager,
        ZIL_EXIT_FUNCTION exitFunction = ZIL_NULLF(ZIL_EXIT_FUNCTION));
    virtual ~UI_WINDOW_MANAGER(void);
    void Center(UI_WINDOW_OBJECT *object);
    virtual EVENT_TYPE Event(const UI_EVENT &event);
    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);

    // List members.
    UI_WINDOW_OBJECT *Add(UI_WINDOW_OBJECT *object);
    UI_WINDOW_OBJECT *Subtract(UI_WINDOW_OBJECT *object);
    UI_WINDOW_MANAGER &operator+(UI_WINDOW_OBJECT *object);
    UI_WINDOW_MANAGER &operator-(UI_WINDOW_OBJECT *object);
};
```

General Members

This section describes those members that are used for general purposes.

- *exitFunction* is a programmer defined function that is called whenever the Window Manager receives the L_EXIT_FUNCTION message. For example, the programmer may want to confirm whether the end-user really wants to exit the program. The programmer can use the *exitFunction* to add a window to the Window Manager confirming the end-user's desire to exit. If *exitFunction* is NULL, the L_EXIT_-FUNCTION message is changed to an L_EXIT message by the Window Manager. The definition of the *exitFunction* is as follows:

  EVENT_TYPE FunctionName(UI_DISPLAY **display*,
  UI_EVENT_MANAGER *&eventManager*,
  UI_WINDOW_MANAGER **windowManager*);

  $returnValue_{out}$ indicates what the program should do. *returnValue* is returned to the main event loop, so if the program should terminate immediately, the function should return an L_EXIT, which will cause the main event loop to exit and the program to end. If some other action is desired, the function may place one or more events on the queue. In this case, *returnValue* should be S_CONTINUE or something similar.

  $display_{in}$ is a pointer to the display.

  $eventManager_{in}$ is a pointer to the Event Manager.

  $windowManager_{in}$ is a pointer to the Window Manager.

  It is also possible to have the *exitFunction* called when a particular window is closed. To accomplish this, the Window Manager's *screenID* must be set equal to the window's *screenID*. The following piece of code demonstrates this:

```
*windowManager
    + window;

windowManager->screenID = window->screenID;
```

- *dragObject* is a pointer to the object that is being dragged if a drag and drop operation is in progress.

UI_WINDOW_MANAGER::UI_WINDOW_MANAGER

Syntax

#include <ui_win.hpp>

UI_WINDOW_MANAGER(UI_DISPLAY **display*,
UI_EVENT_MANAGER **eventManager*,
ZIL_EXIT_FUNCTION *exitFunction* = ZIL_NULLF(ZIL_EXIT_FUNCTION));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_WINDOW_MANAGER object. It should be called after the display and Event Manager classes have been called.

- $display_{in}$ is a pointer to the display. This pointer is used by window objects when they draw.

- $eventManager_{in}$ is a pointer to the Event Manager. This pointer is used by window objects to place events on the queue or to send messages to devices.

- $exitFunction_{in}$ is a programmer defined function that is called whenever the Window Manager receives the L_EXIT_FUNCTION message. See the description of the *exitFunction* member above for more details.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize the system.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY();
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    .
    .
```

```
    .

    // Restore the system.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_WINDOW_MANAGER::~UI_WINDOW_MANAGER

Syntax

#include <ui_win.hpp>

virtual ~UI_WINDOW_MANAGER(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_WINDOW_-MANAGER object. Destroying the Window Manager will also delete all windows still attached to the Window Manager unless they have the WOAF_NO_DESTROY flag set. If this flag is set on a window, the programmer is responsible for deleting the window.

Example

```
#include <ui_win.hpp>

main()
{
    // Initialize the system.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    UI_WINDOW_MANAGER *windowManager = new UI_WINDOW_MANAGER(display,
        eventManager);
    .
    .
    .

    // Restore the system.
    delete windowManager;
```

```
    delete eventManager;
    delete display;
    return (0);
}
```

UI_WINDOW_MANAGER::Add
UI_WINDOW_MANAGER::operator +

Syntax

#include <ui_win.hpp>

UI_WINDOW_OBJECT *Add(UI_WINDOW_OBJECT **object*);
or
UI_WINDOW_MANAGER &operator + (UI_WINDOW_OBJECT **object*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions are used to add a new window to the UI_WINDOW_-MANAGER object.

The first overloaded function adds a window to the UI_WINDOW_MANAGER object. The window will be the current window. This function can be used to add a new window to the Window Manager or to make an already displayed window current.

- $returnValue_{out}$ is a pointer to *object* if the addition was successful. Otherwise, *returnValue* is NULL.

- $object_{in}$ is a pointer to the window to be added to the Window Manager.

The second operator overload adds a window to the UI_WINDOW_MANAGER object. This operator overload is equivalent to calling the **UI_WINDOW_MANAGER::Add( )** function except that it allows the chaining of window additions to the UI_WINDOW_-MANAGER object.

- *returnValue*$_{out}$ is a pointer to the UI_WINDOW_MANAGER object. This pointer is returned so that the operator may be used in a statement containing other operations.

- *object*$_{in}$ is a pointer to the new window that is to be added to the Window Manager.

Example

```
#include <ui_win.hpp>

ExampleFunction(UI_WINDOW_MANAGER *windowManager)
{
    // Create a new window and attach it to the window manager.
    UIW_WINDOW *window = new UIW_WINDOW(0, 0, 40, 10);
    *window
        + new UIW_BORDER
        + new UIW_MAXIMIZE_BUTTON
        + new UIW_MINIMIZE_BUTTON
        + new UIW_SYSTEM_BUTTON
        + new UIW_TITLE("Window 1");
    *windowManager + window;
}
```

UI_WINDOW_MANAGER::Center

Syntax

#include <ui_win.hpp>

void Center(UI_WINDOW_OBJECT **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function centers an object on the screen. Only objects that are attached directly to the Window Manager should be centered using this function (i.e., a button attached to a window cannot be centered using this function).

- *object*$_{in}$ is a pointer to the object that is to be centered on the screen. *object* must be attached directly to the Window Manager.

UI_WINDOW_MANAGER::Event

Syntax

#include <ui_win.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function processes events sent to the Window Manager and dispatches events destined for other objects. In the main event loop, events that are waiting to be processed are removed from the Event Manager's event queue and sent to this function. If the event is meant for the Window Manager, it is processed by this function. If the event is intended for another object the **Event( )** function dispatches it. How the **Event( )** function dispatches events depends on the event and the environment. If the event is a Zinc event— meaning it was not generated by the operating system—the event is routed to the appropriate window. The event will be processed in a top-down fashion, with the top-level objects (e.g., a window attached to the Window Manager) getting the event before the sub-objects (e.g., a button attached to a window) will. If the environment is a graphical operating system that already has an event-driven messaging system, such as Windows or Motif, and the event came from the operating system, the event will be passed to the operating system so that it may dispatch it as it normally would. Thus, it is possible to place events on the queue that are specific to your application but still interact with the operating system's API if desired.

- *returnValue*$_{out}$ indicates how *event* was processed. If the event is processed successfully, the function returns the logical type of event that was interpreted from *event*. The event may have been processed by the **UI_WINDOW_MANAGER::-Event( )** function directly or it may have been dispatched by the Window Manager and handled by another object's **Event( )** function. See "Appendix B—System Events" of *Programmer's Reference Volume 2* for a complete listing of system events and "Appendix C—Logical Events" of *Programmer's Reference Volume 2* for a complete listing of logical events. The following event types (declared in

UI_EVT.HPP) may need to be handled specially when returned from this function to the main event loop:

L_EXIT—The Window Manager received an event that either mapped to the L_EXIT event, or an action was performed that caused the Window Manager to generate the L_EXIT event. If this event is returned, program execution should be discontinued.

S_NO_OBJECT—There are no objects in the Window Manager's list. This message is returned whenever the message is object-specific but no object is attached to the Window Manager. Typically, the application should end if this message is received.

S_UNKNOWN—The event could not be processed. This may be the result of an invalid operation or because the event was not recognized by any objects.

- $event_{in}$ contains a run-time message. The type of operation performed depends on the interpretation of the event. The following logical events are processed by **Event( )**:

  L_BEGIN_COPY_DRAG—Indicates that the end-user is beginning a drag operation to copy an object.

  L_BEGIN_MOVE_DRAG—Indicates that the end-user is beginning a drag operation to move an object.

  L_BEGIN_SELECT—Indicates that the end-user pressed the mouse button down. This begins the selection process of an object. This event is interpreted from an event generated by the mouse device.

  L_CONTINUE_COPY_DRAG—Indicates that the end-user is continuing a drag operation to copy an object.

  L_CONTINUE_MOVE_DRAG—Indicates that the end-user is continuing a drag operation to move an object.

  L_END_COPY_DRAG—Indicates that the end-user has completed a drag operation to copy an object.

  L_END_MOVE_DRAG—Indicates that the end-user has completed a drag operation to move an object.

L_EXIT—Indicates that the end-user performed some action that should result in the termination of the program. The Window Manager does not actually process this event, but instead returns it to the main event loop which should process it. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_EXIT_FUNCTION—Causes the Window Manager to call the programmer-defined exit function, if one exists. The most common use for the exit function is to confirm that the user wants to exit the program. If no exit function was provided by the programmer this message will result in an L_EXIT being processed. See the description of the *exitFunction* member above for more details.

L_HELP—If the message is interpreted by the Window Manager, it requests general help associated with the application. If this message is interpreted by a particular window object, it requests the context-sensitive help associated with the object.

L_MAXIMIZE—Maximizes the current window. Typically, this event is the result of the end-user selecting a key combination to maximize the current window. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_MINIMIZE—Minimizes the current window. Typically, this event is the result of the end-user selecting a key combination to minimize the current window. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_MOVE—Allows the end-user to move the window from keyboard control. Typically, this event is the result of the end-user selecting a key combination to move the current window. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_NEXT_WINDOW—Causes the next window to be made current. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_RESTORE—Restores the current window from its minimized or maximized state. Typically, this event is the result of the end-user selecting a key combination to restore the current window. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_SIZE—Allows the end-user to size the window from keyboard control. Typically, this event is the result of the end-user selecting a key combination to size the current window. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

L_VIEW—A general event that indicates the mouse was moved while no buttons were pressed. An object can use this message to change the appearance of the mouse pointer. This event is interpreted from an event generated by the mouse device.

S_ADD_OBJECT—Is used to add an object to the Window Manager. A pointer to the object to be added must be in *event.data*. This message is interpreted only by those objects that contain a list (e.g., windows, horizontal and vertical lists, combo boxes, etc.).

S_CASCADE—Causes the Window Manager to size and arrange the windows in a cascaded fashion.

S_CLOSE—Causes the Window Manager to close the current window, if possible. The current window will not be closed if the window has the WOAF_-LOCKED flag set. In addition to closing the window, the Window Manager will also delete the window, freeing the memory. It will not delete the window, however, if the window has the WOAF_NO_DESTROY flag set. In this case the programmer is responsible for deleting the window. If there are any temporary windows attached to the Window Manager (i.e., windows that have the WOAF_TEMPORARY flag set) they will also be closed and deleted in addition to the first non-temporary window. This event may be placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions. This event is not sent to the window. The window will receive an S_DEINITIALIZE message when it is being closed.

S_CLOSE_TEMPORARY—Closes the current window if it is temporary. For example, a UIW_POP_UP_MENU is a temporary window. A temporary window is a window that has the WOAF_TEMPORARY flag set. If the current window is not a temporary window, no action will occur. This event may be

placed directly on the event queue by the programmer or it may be interpreted from an event that resulted from the end-user's actions.

S_REDISPLAY—Causes a refresh of the display. All windows attached to the Window Manager will be redrawn. In some operating systems (e.g., DOS, Curses) the background may be redrawn as well.

S_RESET_DISPLAY—Changes the display to a different resolution. *event.data* should point to the new display class to be used. If *event.data* is NULL, a text mode display will be created. This event is specific to DOS and must be placed on the event queue by the programmer. The library will never generate this event.

S_SUBTRACT_OBJECT—Is used to subtract an object from the Window Manager. A pointer to the object to be subtracted must be in *event.data*. This message is interpreted only by those objects that contain a list (e.g., windows, horizontal and vertical lists, combo boxes, etc.).

NOTE: Because most graphical operating systems already process their own events related to this object, or because some of the events listed above may not make sense for some of these operating systems, the messages listed above may not be handled in every environment. Wherever possible, Zinc allows the operating system to process its own messages so that memory use and speed will be as efficient as possible.

Example

```
#include <ui_win.hpp>

main()
{
    .
    .
    .

    // Get events until the L_EXIT event occurs.
    EVENT_TYPE ccode;
    do
    {
        UI_EVENT event;
        eventManager->Get(event, Q_NORMAL);
        ccode = windowManager->Event(event);
    } while (ccode != L_EXIT && ccode != S_NO_OBJECT);
    .
    .
    .

}
```

UI_WINDOW_MANAGER::Information

Syntax

```
#include <ui_win.hpp>

virtual void *Information(ZIL_INFO_REQUEST request, void *data,
    ZIL_OBJECTID objectID = ID_DEFAULT);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the Window Manager:

  I_COPY_TEXT—Copies the text associated with the object. If this request is sent, *data* should be a pointer to a buffer of **ZIL_ICHAR**. The text is used to identify the task in the Program Manager's task list. This request is specific to MS Windows.

  I_GET_NUMBERID_OBJECT—Returns a pointer to an object whose *numberID* matches the value in *data*, if one exists. This object does a depth-first search of the objects attached to it looking for a match of the *numberID*. If no object has a *numberID* that matches *data*, NULL is returned. If this message is sent, *data* must be a pointer to a programmer defined NUMBERID.

I_GET_STRINGID_OBJECT—Returns a pointer to an object whose *stringID* matches the character string in *data*, if one exists. This object does a depth-first search of the objects attached to it looking for a match of the *stringID*. If no object has a *stringID* that matches *data*, NULL is returned. If this message is sent, *data* must be a pointer to a programmer defined string.

I_GET_TEXT—Returns a pointer to the text associated with the object. If this request is sent, *data* should be a doubly-indirected pointer to **ZIL_ICHAR**. This request does not copy the text into a new buffer. The text is used to identify the task in the Program Manager's task list. This request is specific to MS Windows.

I_SET_TEXT—Sets the text associated with the object. This request will also redisplay the object with the new text. *data* should be a pointer to the new text. The text is used to identify the task in the Program Manager's task list. This request is specific to MS Windows.

- $data_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.

- $objectID_{in}$ is a ZIL_OBJECTID that specifies which type of object the request is intended for. Because the **Information( )** function is virtual, it is possible for an object to be able to handle a request at more than one level of its inheritance hierarchy. *objectID* removes the ambiguity by specifying which level of an object's hierarchy should process the request. If no value is provided for *objectID*, the object will attempt to interpret the request with the *objectID* of the most derived class.

Example

```
#include <ui_win.hpp>

UI_WINDOW_OBJECT *GetObject(char *name, UI_WINDOW_MANAGER *windowManager)
{
    // Find the window object given a name and return a pointer to it.
    return (windowManager->Information(I_GET_STRINGID_OBJECT, name,
        ID_WINDOW_MANAGER));
}
```

UI_WINDOW_MANAGER::Subtract
UI_WINDOW_MANAGER::operator –

Syntax

#include <ui_win.hpp>

UI_WINDOW_OBJECT *Subtract(UI_WINDOW_OBJECT **object*);
or
UI_WINDOW_MANAGER &operator – (UI_WINDOW_OBJECT **object*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These functions remove a window from the UI_WINDOW_MANAGER object. They only remove the window from the Window Manager list—they do not delete the object.

The first function subtracts a window from the UI_WINDOW_MANAGER object. The window will not be deleted. The programmer is responsible for deletion of each object explicitly subtracted from a list.

- *returnValue*$_{out}$ is a pointer to the next window in the list. This value is NULL if there are no more windows after the subtracted window.

- *element*$_{in}$ is a pointer to the window to be subtracted from the list.

The second operator overload removes a window from the UI_WINDOW_MANAGER object. The window will not be deleted. The programmer is responsible for deletion of each object explicitly subtracted from a list. This operator overload is equivalent to calling the **Subtract( )** function, except that it allows the chaining of list element removals from the UI_WINDOW_MANAGER object.

- *returnValue*$_{out}$ is a pointer to the UI_WINDOW_MANAGER object. This pointer is returned so that the operator may be used in a statement containing other operations.

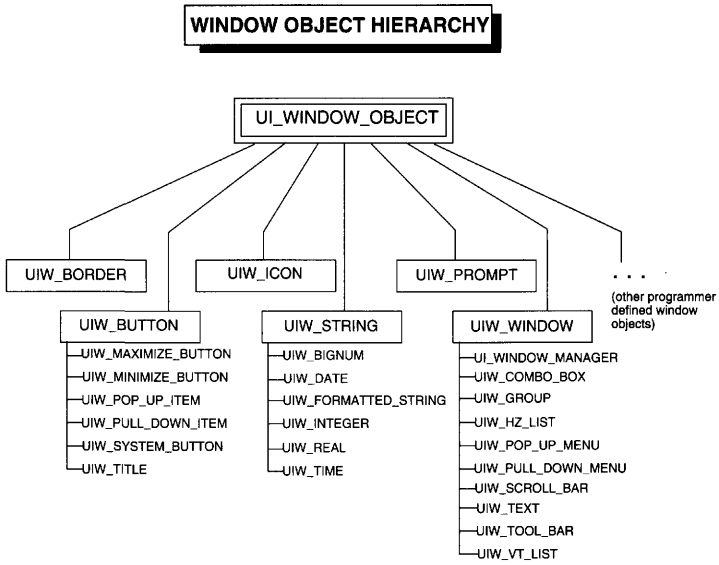
- *object*$_{in}$ is a pointer to the window that is to be removed from the list.

Example

```
#include <ui_win.hpp>

ExampleFunction(UI_WINDOW_MANAGER *windowManager, UIW_WINDOW *window)
{
    *windowManager - window;
}
```

CHAPTER 43 – UI_WINDOW_OBJECT

The UI_WINDOW_OBJECT class is the base class to all window objects. It provides the basic functionality required for objects to be displayed. It should not be used as a constructed class. Rather, derived classes, such as UIW_BORDER, UIW_BUTTON or UIW_WINDOW must be used. The figure below shows the window object hierarchy:



Windows and window objects are attached to the Window Manager or a window at run-time by the programmer. Once a window or window object is attached, it receives event information from the Window Manager.

The UI_WINDOW_OBJECT class is declared in **UI_WIN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_WINDOW_OBJECT : public UI_ELEMENT,
    public ZIL_INTERNATIONAL
{
public:
    // Forward declaration of classes used by UI_WINDOW_OBJECT.
    friend class ZIL_EXPORT_CLASS UI_WINDOW_MANAGER;
    friend class ZIL_EXPORT_CLASS UI_ERROR_STUB;
    friend class ZIL_EXPORT_CLASS UI_ERROR_SYSTEM;
    friend class ZIL_EXPORT_CLASS UI_HELP_STUB;
    friend class ZIL_EXPORT_CLASS UI_HELP_SYSTEM;

    static int repeatRate;
    static int doubleClickRate;
    static WOS_STATUS defaultStatus;
```

```
    static UI_DISPLAY *display;
    static UI_EVENT_MANAGER *eventManager;
    static UI_WINDOW_MANAGER *windowManager;
    static UI_ERROR_STUB *errorSystem;
    static UI_HELP_STUB *helpSystem;
    static ZIL_STORAGE_READ_ONLY *defaultStorage;
    static UI_ITEM *objectTable;
    static UI_ITEM *userTable;
    static ZIL_ICHAR _className[];

    UI_EVENT_MAP *eventMapTable;
    UI_EVENT_MAP *hotKeyMapTable;
    UI_PALETTE_MAP *paletteMapTable;

#if defined(ZIL_MACINTOSH)
    union
    {
        ZIL_SCREENID    screenID;
        ControlHandle   controlScreenID;
        ListHandle      listScreenID;
        MenuHandle      menuScreenID;
        TEHandle        textScreenID;
        WindowPtr       windowScreenID;
    };
#else
    ZIL_SCREENID screenID;
#endif
    WOF_FLAGS woFlags;
    WOAF_FLAGS woAdvancedFlags;
#if defined (ZIL_EDIT)
    WOAF_FLAGS designerAdvancedFlags;
#endif
    WOS_STATUS woStatus;
    UI_REGION true;
    UI_REGION relative;
    UI_WINDOW_OBJECT *parent;
    UI_HELP_CONTEXT helpContext;

    UIF_FLAGS userFlags;
    UIS_STATUS userStatus;
    void *userObject;
    EVENT_TYPE (*userFunction)(UI_WINDOW_OBJECT *object, UI_EVENT &event,
        EVENT_TYPE ccode);
    EVENT_TYPE UserFunction(const UI_EVENT &event, EVENT_TYPE ccode);

    virtual ~UI_WINDOW_OBJECT(void);
    virtual ZIL_ICHAR *ClassName(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event);
    ZIL_LOGICAL_FONT Font(ZIL_LOGICAL_FONT font = FNT_NONE);
    UI_WINDOW_OBJECT *Get(const ZIL_ICHAR *name);
    UI_WINDOW_OBJECT *Get(ZIL_NUMBERID _numberID);
    unsigned HotKey(unsigned hotKey = 0);
    unsigned HotKey(ZIL_ICHAR *text);
    virtual void *Information(ZIL_INFO_REQUEST request, void *data,
        ZIL_OBJECTID objectID = ID_DEFAULT);
    int Inherited(ZIL_OBJECTID matchID);
    EVENT_TYPE LogicalEvent(const UI_EVENT &event,
        ZIL_OBJECTID currentID = 0, int nativeType = TRUE);
    UI_PALETTE *LogicalPalette(LOGICAL_EVENT logicalEvent,
        ZIL_OBJECTID currentID = 0);
    NUMBERID NumberID(NUMBERID numberID = 0);
    EVENT_TYPE RedisplayType(void);
    void RegionConvert(UI_REGION &region, int absolute);
    UI_WINDOW_OBJECT *Root(int mdiChild = FALSE);
    ZIL_OBJECTID SearchID(void);
    ZIL_ICHAR *StringID(const ZIL_ICHAR *stringID = ZIL_NULLP(ZIL_ICHAR));
#if defined(ZIL_MOTIF)
    static XmString CreateMotifString(ZIL_ICHAR *,
```

```
        ZIL_ICHAR ** = ZIL_NULLP(ZIL_ICHAR *), int = TRUE);
    static void StripHotKeyMark(ZIL_ICHAR *text);
    virtual ZIL_SCREENID TopWidget(void);
    Widget shell;
#endif
    virtual int Validate(int processError = TRUE);

#if defined(ZIL_LOAD)
    virtual ZIL_NEW_FUNCTION NewFunction(void);
    static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    UI_WINDOW_OBJECT(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
    virtual void Load(const ZIL_ICHAR *name, ZIL_STORAGE_READ_ONLY *file,
        ZIL_STORAGE_OBJECT_READ_ONLY *object,
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name,
        ZIL_STORAGE *file = ZIL_NULLP(ZIL_STORAGE),
        ZIL_STORAGE_OBJECT *object = ZIL_NULLP(ZIL_STORAGE_OBJECT),
        UI_ITEM *objectTable = ZIL_NULLP(UI_ITEM),
        UI_ITEM *userTable = ZIL_NULLP(UI_ITEM));
#endif

    // List members.
    UI_WINDOW_OBJECT *Next(void);
    UI_WINDOW_OBJECT *Previous(void);

protected:
    ZIL_OBJECTID searchID;
    ZIL_NUMBERID numberID;
    ZIL_ICHAR stringID[32];
    ZIL_OBJECTID windowID[5];

    unsigned hotKey;
    ZIL_LOGICAL_FONT font;
    UI_PALETTE *lastPalette;
    ZIL_ICHAR *userObjectName;      // Used for storage purposes only.
    ZIL_ICHAR *userFunctionName;        // Used for storage purposes only.
    UI_REGION clip;
#if defined(ZIL_MSDOS) || defined(ZIL_CURSES)
    static ZIL_ICHAR *pasteBuffer; // There is only one global paste buffer.
    static int pasteLength;
#elif defined(ZIL_WINNT)
    DWORD dwStyle;
    WNDPROC defaultCallback;
    void RegisterObject(char *className, char *winClassName,
        WNDPROC *defProcInstance, ZIL_ICHAR *title = ZIL_NULLP(ZIL_ICHAR),
        HMENU menu = 0);
#elif defined(ZIL_MSWINDOWS)
    DWORD dwStyle;
    FARPROC defaultCallback;

    void RegisterObject(char *className, char *winClassName, int *offset,
        FARPROC *procInstance, FARPROC *defProcInstance,
        ZIL_ICHAR *title = ZIL_NULLP(ZIL_ICHAR), HMENU menu = 0);
#elif defined(ZIL_OS2)
    ZIL_UINT32 flStyle;
    ZIL_UINT32 flFlag;
    PFNWP defaultCallback;
```

```
    ZIL_SCREENID RegisterObject(char *className, int *registeredClass,
        PFNWP *baseCallback, ZIL_ICHAR *title,
        void *controlData = ZIL_NULLP(void));
#elif defined(ZIL_MOTIF)
    static Arg args[50];
    static int nargs;
    void RegisterObject(WidgetClass widgetClass,
        ZIL_MOTIF_CONVENIENCE_FUNCTION convenienceFunction,
        EVENT_TYPE ccode, int useArgs = FALSE, int manage = TRUE,
        ZIL_SCREENID parent = 0);
#endif

    UI_WINDOW_OBJECT(int left, int top, int width, int height,
        WOF_FLAGS woFlags, WOAF_FLAGS woAdvancedFlags);
    EVENT_TYPE DrawBorder(ZIL_SCREENID screenID, UI_REGION &region,
        int fillRegion, EVENT_TYPE ccode);
    virtual EVENT_TYPE DrawItem(const UI_EVENT &event, EVENT_TYPE ccode);
    EVENT_TYPE DrawShadow(ZIL_SCREENID screenID, UI_REGION &region,
        int depth, int fillRegion, EVENT_TYPE ccode);
    EVENT_TYPE DrawText(ZIL_SCREENID screenID, UI_REGION &region,
        const ZIL_ICHAR *text, UI_PALETTE *palette, int fillRegion,
        EVENT_TYPE ccode);
    void Modify(const UI_EVENT &event);
    int NeedsUpdate(const UI_EVENT &event, EVENT_TYPE ccode);
    void RegisterObject(char *name);
    virtual void RegionMax(UI_WINDOW_OBJECT *object);
};
```

General Members

This section describes those members that are used for general purposes.

- *repeatRate* is the time, in hundredths of seconds, that must elapse before an event is repeated. For example, when the down arrow on a UIW_SCROLL_BAR is depressed and held, scrolling events will occur at the rate specified by *repeatRate*.

- *doubleClickRate* is the time, in hundredths of seconds, that is used to determine if two consecutive mouse clicks are to be interpreted as a double click. If two mouse clicks occur within the time specified by *doubleClickRate*, then a double-clicked event is processed.

- *defaultStatus* is the status assigned to a window object when it is first constructed. If this value is changed to a valid status, all window objects will be created with this status (e.g., setting WOS_GRAPHICS would cause all window objects to be created with pixel boundaries and sizes).

- *display* is a pointer to the display class.

- *eventManager* is a pointer to the Event Manager.

- *windowManager* is a pointer to the Window Manager.

- *errorSystem* is a pointer to the error system. *errorSystem* should be initialized by the programmer at the beginning of the program if an error system is used.

- *helpSystem* is a pointer to the help system. *helpSystem* should be initialized by the programmer at the beginning of the program if a help system is used.

- *defaultStorage* is a pointer to the default storage system that is used for resource storage and/or retrieval. *defaultStorage* is used when loading icon and bitmap button images. It can also be used to load resources (i.e., UIW_WINDOW). *defaultStorage* should be initialized by the programmer at the beginning of the program if it will be needed.

- *objectTable* is a table used to create objects from a persistent object file. The table contains entries for each type of object in the file. An entry consists of an object identifier and a pointer to the object's static **New( )** function. When an object is being loaded from the file, its *searchID* is loaded which is then used to obtain the address of the appropriate **New( )** function from *objectTable*. The **New( )** function loads all the associated data for that object from the file. Each object that can be persistent must have a static **New( )** member function. This is necessary because C++ does not allow the passing of non-static member functions and a constructor cannot be made static. The Designer creates an object table in the **.CPP** file it generates. When this file is compiled and linked into the application, it will be used to set the *objectTable* member. Alternately, a table can be created by hand and used to initialize *objectTable*.

```
static UI_ITEM _objectTable[] =
{
    { ID_BIGNUM, VOIDF(UIW_BIGNUM::New), UIW_BIGNUM::_className, 0 },
    { ID_BORDER, VOIDF(UIW_BORDER::New), UIW_BORDER::_className, 0 },
    { ID_BUTTON, VOIDF(UIW_BUTTON::New), UIW_BUTTON::_className, 0 },
    { ID_DATE, VOIDF(UIW_DATE::New), UIW_DATE::_className, 0 },
    { ID_GROUP, VOIDF(UIW_GROUP::New), UIW_GROUP::_className, 0 },
    { ID_HZ_LIST, VOIDF(UIW_HZ_LIST::New), UIW_HZ_LIST::_className, 0 },
    { ID_ICON, VOIDF(UIW_ICON::New), UIW_ICON::_className, 0 },
    { ID_PROMPT, VOIDF(UIW_PROMPT::New), UIW_PROMPT::_className, 0 },
    { ID_STRING, VOIDF(UIW_STRING::New), UIW_STRING::_className, 0 },
    { ID_TEXT, VOIDF(UIW_TEXT::New), UIW_TEXT::_className, 0 },
    { ID_TIME, VOIDF(UIW_TIME::New), UIW_TIME::_className, 0 },
    { ID_TITLE, VOIDF(UIW_TITLE::New), UIW_TITLE::_className, 0 },
    { ID_VT_LIST, VOIDF(UIW_VT_LIST::New), UIW_VT_LIST::_className, 0 },
    { ID_WINDOW, VOIDF(UIW_WINDOW::New), UIW_WINDOW::_className, 0 },
    { ID_END, ZIL_NULLP(void), ZIL_NULLP(ZIL_ICHAR), 0 }
};
UI_ITEM *UI_WINDOW_OBJECT::objectTable = _objectTable;
```

NOTE: Initially, *objectTable* points to a default table (contained in **G_JUMP.CPP**). The default table has all of the entries commented out to prevent unnecessary modules from linking into the application. If this table is needed, simply uncomment the required lines or copy and rename the table and uncomment the required lines.

- *userTable* is a table used to associate user functions and compare functions with the persistent objects that use them. The table contains entries for each function that appears in the persistent object file. An entry consists of a string used to identify the function and the address of the function. When an object is being loaded from the file, its *userFunctionName* or *compareFunctionName* is loaded which is then used to obtain the address of the appropriate user function or compare function address from *userTable*. If an object has a user function or compare function, they must be static. This is necessary because C++ does not allow the passing of non-static member functions. The Designer creates a user table in the **.CPP** file it generates. When this file is compiled and linked into the application, it will be used to set the *userTable* member. Alternately, a table can be created by hand and used to initialize *userTable*.

```
static UI_ITEM _userTable[] =
{
    { 0, VOIDF(FilenameCallback), "FilenameCallback", 0 },
    { 0, VOIDF(FilterCallback), "FilterCallback", 0 },
    { 0, VOIDF(DirectoryCompare), "DirectoryCompare", 0 },
    { ID_END, ZIL_NULLP(void), ZIL_NULLP(ZIL_ICHAR), 0 }
};
UI_ITEM *UI_WINDOW_OBJECT::userTable = _userTable;
```

NOTE: Initially, *userTable* points to a default table (contained in **G_JUMP.CPP**). The default table is empty.

- *_className* contains a string identifying the class. The string is always the same name as the class, is always in English, and never changes. For example, for the UI_WINDOW_OBJECT class, *_className* is "UI_WINDOW_OBJECT."

- *eventMapTable* is a pointer to the event map table used by the object. The event map table is used to map raw events that were generated by an input device into logical events that the library objects can act upon. All objects use the same event map table by default, but individual objects can be assigned a special, user-defined table if behavior that is different than the default is required.

- *hotKeyMapTable* is a pointer to the hotkey map table used by the object. The hotkey map table is used to map the raw key event to the hotkey that was pressed. All objects use the same hotkey map table by default, but individual objects can be assigned a special, user-defined table if desired.

- *paletteMapTable* is a pointer to the palette map table used by the object. The palette map table is used to determine what color the object is supposed to be under particular circumstances. All objects use the same palette map table by default, but individual objects can be assigned a special, user-defined table if different colors are required.

- *screenID* is a unique identification given to a window object when it (or its parent) is attached to the Window Manager. This value is used in various places, but the most significant is when calling display functions. The *screenID* is used to identify the object and its display space. In most graphical operating systems, *screenID* is the window handle of the object. In DOS it is a value that identifies a screen region. In Motif it identifies the type of Motif widget the object is.

- *controlScreenID* is the Macintosh Handle to the object if it is a control object (e.g., button, scroll bar, etc.). Because the Macintosh toolbox has a specific handle type and specific functions for this type of object, a screenID specific to this type of object is required.

- *listScreenID* is the Macintosh Handle to the object if it is a list object (e.g., vertical list, etc.). Because the Macintosh toolbox has a specific handle type and specific functions for this type of object, a screenID specific to this type of object is required.

- *menuScreenID* is the Macintosh Handle to the object if it is a pop-up menu object. Because the Macintosh toolbox has a specific handle type and specific functions for this type of object, a screenID specific to this type of object is required.

- *textScreenID* is the Macintosh Handle to the object if it is an editable object (e.g., string, date, etc.). Because the Macintosh toolbox has a specific handle type and specific functions for this type of object, a screenID specific to this type of object is required.

- *windowScreenID* is the Macintosh pointer to the object if it is a window. Because the Macintosh toolbox has a specific pointer type and specific functions for this type of object, a screenID specific to this type of object is required.

- *woFlags* are flags (common to all window objects) that determine the general operation of the window object. The following flags (declared in **UI_WIN.HPP**) control the general presentation of, and interaction with, a window object:

  WOF_AUTO_CLEAR—Automatically marks the entire buffer if the end-user tabs to the field from another object. If the user then enters data (without first having pressed any movement or editing keys) the entire field will be replaced. This flag applies to editable objects only.

  WOF_BORDER—Draws a border around the object. The graphical border's appearance will depend on the operating system used, and, if in DOS, on the graphics style being used. In text mode, a border may or may not be drawn, depending on the text style being used. See "Appendix A—Support

Definitions" of *Programmer's Reference Volume 2* for information on changing DOS graphics mode styles and text mode styles.

WOF_INVALID—Sets the initial status of the field to be "invalid." Invalid entries fit in the absolute range determined by the object type but do not fulfill all the requirements specified by the program. By denoting the field as invalid, you force the user to enter an acceptable value. This flag applies to editable fields that have validation, such as dates and times.

WOF_JUSTIFY_CENTER—Center-justifies the text within the displayed object.

WOF_JUSTIFY_RIGHT—Right-justifies the text within the displayed object.

WOF_MINICELL—Causes the position and size values that were passed into the constructor to be interpreted as minicells. A minicell is a fraction the size of a normal cell. Greater precision in object placement is achieved by specifying an object's position in minicell coordinates. A minicell is 1/10th the size of a normal cell by default.

WOF_NO_ALLOCATE_DATA—Prevents the object from allocating a buffer to store the data. If this flag is set, the programmer is responsible for allocating the memory for the data. The programmer is also responsible for deallocating that memory when it is no longer needed.

WOF_NO_FLAGS—Does not associate any special window flags with the object. Setting this flag left-justifies the data, where applicable. This flag should not be used in conjunction with any other WOF flags.

WOF_NON_FIELD_REGION—Causes the object to ignore its position and size parameters and use the remaining available space in its parent object.

WOF_NON_SELECTABLE—Prevents the object from being selected. If this flag is set, the user will not be able to position on nor select the object. Typically, the object will be drawn in such a manner as to appear non-selectable (e.g., it may appear lighter than a selectable field).

WOF_SUPPORT_OBJECT—Causes the object to be placed in the parent object's support list. The support list is reserved for objects that are not displayed as part of the user region of the window. Care should be taken when setting this flag on objects that do not use it by default, as undesired effects may result.

WOF_UNANSWERED—Sets the initial status of the field to be "unanswered." An unanswered field is displayed as an empty field. This flag applies to editable objects only.

WOF_VIEW_ONLY—Prevents the object from being edited. However, the object may become current and the user may scroll through the data, mark it, and copy it. This flag applies to editable objects only.

- *woAdvancedFlags* are flags (common to all window objects) that determine the advanced operation of the window object. The following flags (declared in **UI_WIN.HPP**) control the advanced operation of a window object:

  WOAF_DIALOG_OBJECT—Creates the window as a dialog box. A dialog box is a temporary window used to display or receive information from the user. Using this flag will cause a special dialog style border to be displayed.

  NOTE: Some operating environments (e.g, Windows) will create a border, system button and title for a dialog window. Other environments (e.g., DOS) may not, and so a border, system button and title must be added to the dialog window by the programmer. Zinc will ignore any support objects in environments that automatically provide them, such as Windows.

  WOAF_DRAG_OBJECT—Allows the object or its contents to be used in a drag and drop operation.

  WOAF_LOCKED—Prevents the window object from being removed from the display. The WOAF_LOCKED flag must be cleared before the window object can be removed from the display.

  WOAF_MODAL—Prevents any other window from receiving events from the Window Manager. A modal window receives all events until it is removed from the display. This flag applies to objects attached directly to the Window Manager only.

  WOAF_MDI_OBJECT—Causes the window to be an MDI window. If this flag is set on a window that is added to the Window Manager, it becomes an MDI parent (i.e., it can contain MDI child objects). An MDI parent must have a pull-down menu. An MDI parent should contain only support objects (i.e., system button, border, title, etc.), the required pull-down menu, an optional tool bar and MDI children.

If this flag is set on a window that is added to another MDI window, it becomes an MDI child window. MDI child windows can be moved or sized but will remain entirely within the MDI parent window.

NOTE: MDI is not standard across environments. For example, in Windows, DOS, Curses and OS/2, child windows will be clipped by their parent window, but in Motif, NEXTSTEP and Macintosh, the child windows will not be clipped by their parent. In these environments, the child windows are still owned by the parent window, however, so closing the parent window will cause all child windows added to the parent to close also.

WOAF_NO_DESTROY—Prevents the window from being destroyed when it is closed. If this flag is set, the window object can be removed from the display, but the programmer is responsible for destroying it. This flag applies to windows, parent or child, only.

WOAF_NO_FLAGS—Does not associate any special advanced flags with the window object. This flag should not be used in conjunction with any other WOAF flags.

WOAF_NON_CURRENT—Prevents the object from becoming current. If this flag is set, users will not be able to select the object from the keyboard. The object may still be selected using the mouse or a hotkey, but it will not become current.

WOAF_NORMAL_HOT_KEYS—Allows the end-user to select an option by pressing its hotkey by itself, without the <Alt> key otherwise required for selecting with a hotkey.

WOAF_NO_MOVE—Prevents the end-user from changing the screen location of the window at run-time. This flag must be set if the window is to be a non-MDI child.

WOAF_NO_SIZE—Prevents the end-user from changing the size of the window at run-time. This flag must be set if the window is to be a non-MDI child.

WOAF_OUTSIDE_REGION—Indicates the window object occupies space outside of the *true* region of the parent window but is still within the parent window (e.g., the UIW_BORDER class).

WOAF_TEMPORARY—Causes the object to be displayed temporarily. If another window is made current or a non-temporary window is added to the

Window Manager, all temporary windows are removed automatically by the Window Manager. This flag applies to objects attached directly to the Window Manager only.

- *woStatus* is a status flag that indicates the current state of a window object. The state may be reflected in the appearance of the object, its behavior or may only be recognized internally. These flags are updated occasionally when the object's state changes. The following status flags (declared in **UI_WIN.HPP**) specify the window object's current status:

  WOS_CHANGED—Indicates that the window object's data has been modified by the end-user.

  WOS_CURRENT—Indicates that the window object is the current object in its parent's list. Only one window object in a list may have the WOS_CURRENT flag set at any given time.

  WOS_GRAPHICS—Indicates that the window object region is specified in graphics coordinates as opposed to cell coordinates. This flag is set when an object's region is converted from cell coordinates to graphics coordinates.

  WOS_INVALID—Indicates that the window object's data is in an "invalid" state. An object's data is invalid if it is not within the absolute range for the object or is not within a range specified by the programmer.

  WOS_MAXIMIZED—Indicates that the window object is in a maximized state.

  WOS_MINIMIZED—Indicates that the window object is in a minimized state.

  WOS_NO_STATUS—Indicates that the window object has no status.

  WOS_OWNERDRAW—Causes the window object's **DrawItem( )** function to be called when the object needs to be drawn.

  WOS_READ_ERROR—Indicates that there was an error reading a storage file.

  WOS_REDISPLAY—Indicates that the window object needs to be redisplayed.

  WOS_SELECTED—Indicates that the object is selected. The most common use for this flag is with buttons, where a button field can be in a selected or a non-selected state.

WOS_UNANSWERED—Indicates that the window object's data is in an "unanswered" state.

- *true* is the region that is used to position the object in the operating system. An object's *true* region is calculated from its *relative* region in the **RegionMax( )** function. In DOS, Curses and Macintosh, the *true* region is relative to the upper-left corner of the screen. In all other environments *true* is relative to the parent window's user region origin. The user region is the area of the window framed by, but not including, the support objects. In these environments, the *true* region is very similar to the *relative* region.

- *relative* is the region passed to the object in its constructor. It contains the desired position of the window object relative to the object's parent.

- *parent* is a pointer to the window object's parent. Its parent is the object it was attached to.

- *helpContext* is the help context identifier associated with the window object. The help context is passed to the help system when displaying help information. The help system displays the information identified by the help context. The help context value is generated by the Designer. The help context identifier name can be obtained from the header file produced by the Designer.

- *userFlags* is a flag field for the programmer's use. Zinc does not use this member. *userFlags* is maintained when the object is stored in a data file.

- *userStatus* is a status flag field for the programmer's use. Zinc does not use this member. As with other status flags, *userStatus* is not maintained when the object is stored in a data file.

- *userObject* is a pointer for the programmer's use. Since this is a void pointer, the object must be typecast by the programmer. This pointer is used by Zinc Application Framework for UIW_COMBO_BOX and UIW_PULL_DOWN_MENU objects and so should not be used by the programmer for these objects. For all other objects, the programmer is welcome to use this member as desired. If *userObject* has an entry in the *UI_WINDOW_OBJECT::userTable*, then the text name in the table is saved in the data file.

- *userFunction* is a programmer defined function that will be called by the library at certain points in the user's interaction with an object. The user function is generally called by the library when the object becomes current, is selected or becomes non-current. Because the user function is called at these times, the programmer can do

data validation or any other type of necessary operation. The definition of the *userFunction* is as follows:

EVENT_TYPE FunctionName(UI_WINDOW_OBJECT **object*,
UI_EVENT *&event*, EVENT_TYPE *ccode*);

returnValue$_{out}$ indicates if an error has occurred. *returnValue* should be 0 if the no error occurred. Otherwise, the programmer should call the error system with an appropriate error message and return -1.

object$_{in}$ is a pointer to the object for which the user function is being called. This argument must be typecast by the programmer if class-specific members need to be accessed.

event$_{in}$ is the run-time message passed to the object.

ccode$_{in}$ is the logical or system code that caused the user function to be called.

- *shell* is a pointer to the object's shell widget. It must be set before a call to **UI_WINDOW_OBJECT::RegisterObject( )** is made. This member is available for Motif only.

- *searchID* identifies the object's type. For example, if the object is a UIW_BUTTON, its *searchID* is ID_BUTTON. *searchID*, sometimes also referred to as the *objectID*, is stored with the object and is used to identify the object type when loading it from a **.DAT** file. A complete list of ZIL_OBJECTID values can be found in **UI_WIN.HPP**.

- *numberID* is a numerical value used to identify an object. Zinc places certain requirements on an object's *numberID* member. For example, a window's *numberID* must be greater than the *numberID* of all objects attached to the window. Thus, Zinc will modify a window's *numberID*. In general, this member should not be used by the programmer.

- *stringID* is a string name used to identify an object. The programmer is responsible for setting an object's *stringID*. *stringID* can be up to 32 characters, including the NULL terminator.

- *windowID* is an array that contains an object's inheritance hierarchy. This hierarchy is used at run-time by functions such as **MapEvent( )** and **MapPalette( )**, neither of which have any knowledge of class hierarchies, to map events or palettes appropriately for the object. For example, for a UIW_GROUP windowID[0] is

ID_GROUP, windowID[1] is ID_WINDOW, and the remaining entries are ID_WINDOW_OBJECT.

- *hotKey* is the character to use as the hotkey for the object. A value of 0 means that no hotkey is associated with the object.

- *font* is the ZIL_LOGICAL_FONT associated with the object. *font* is an index into the *fontTable* array that is a member of each display class. For more information regarding fonts, see the appropriate display chapter.

- *lastPalette* is a pointer to the last palette used to display the object. By maintaining a pointer, unnecessary mapping will be prevented.

- *userObjectName* is the string representation of the user object name. This variable is used for storage purposes only. The *userObjectName* is placed in the *objectTable* in an entry for the *userObject*.

- *userFunctionName* is the string representation of the user function name. This variable is used for storage purposes only. The *userFunctionName* is placed in the *userTable* in an entry for the *userFunction*.

- *clip* provides additional clip region information for an object. *clip* contains the area of the object clipped to the object's parent's user region. The user region is the region encompassed by, but not including, the support objects. Thus, if an object is partially outside its parents region (i.e., the window is clipping part of the object off) *clip* will prevent the object from drawing those parts of the object that are outside the parent.

- *pasteBuffer* is the global paste buffer. This member is available in DOS and Curses only.

- *pasteLength* is the length of the global paste buffer. This member is available in DOS and Curses only.

- *dwStyle* is the object's window style flags. This member is available in Windows only.

- *defaultCallback* is the base class default callback function (e.g., **DefWindowProc( )** in Windows). This member is available in Windows, Windows NT and OS/2 only.

- *flStyle* is the object's window style flags. This member is available in OS/2 only.

- *flFlag* is the object's class-specific window style flags. This member is available in OS/2 only.

- *args* is an array of Xt resources. This member is available for Motif only.

- *nargs* is a counter of how many entries have been made in the *args* array. This member is available for Motif only.

NOTE: All the member functions in this chapter are advanced. In general, only derived window objects should need access to these functions.

UI_WINDOW_OBJECT::UI_WINDOW_OBJECT

Syntax

#include <ui_win.hpp>

UI_WINDOW_OBJECT(int *left*, int *top*, int *width*, int *height*,
WOF_FLAGS *woFlags*, WOAF_FLAGS *woAdvancedFlags*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UI_WINDOW_OBJECT class object. A UI_WINDOW_-OBJECT by itself is of little use, so the constructor is protected so that only derived classes can call it.

- $left_{in}$ and top_{in} is the starting position of the object. Typically, these values are in cell coordinates. If the WOF_MINICELL flag is set, however, these values will be interpreted as minicell values.

- $width_{in}$ is the width of the object. Typically, this value is in cell coordinates. If the WOF_MINICELL flag is set, however, this value will be interpreted as a minicell value.

- *height*$_{in}$ is the height of the object. Typically, this value is in cell coordinates. If the WOF_MINICELL flag is set, however, this value will be interpreted as a minicell value.

- *woFlags* are flags (common to all window objects) that determine the general operation of the object. A full description of these flags is given at the beginning of this chapter.

- *woAdvancedFlags* are flags (common to all window objects) that determine the advanced operation of the object. A full description of these flags is given at the beginning of this chapter.

Example

```
#include <ui_win.hpp>

UIW_BUTTON::UIW_BUTTON(int left, int top, int width, char *_string,
    USHORT _btFlags, USHORT _woFlags,
    void (*_userFunction)(void *object, UI_EVENT &event), USHORT _value) :
    UI_WINDOW_OBJECT(left, top, width, 1, _woFlags | WOF_BORDER,
    WOAF_NO_FLAGS),
    btFlags(_btFlags), btStatus(BTS_NO_STATUS), userFunction(_userFunction),
    string(NULL), value(_value), getString(NULL), time(0)
{
    .
    .
    .

}
```

UI_WINDOW_OBJECT::~UI_WINDOW_OBJECT

Syntax

#include <ui_win.hpp>

virtual ~UI_WINDOW_OBJECT(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the information associated with the UI_WINDOW_-OBJECT class. This function is declared virtual so that the destructors associated with derived classes will be called before the base class destructor is called.

UI_WINDOW_OBJECT::ClassName

Syntax

#include <ui_win.hpp>

virtual ZIL_ICHAR *ClassName(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function returns the class name associated with the object.

- *returnValue*$_{out}$ is a pointer to the *_className* member.

UI_WINDOW_OBJECT::CreateMotifString

Syntax

#include <ui_win.hpp>

static XmString CreateMotifString(ZIL_ICHAR *_text_,
    ZIL_ICHAR **_displayText_ = ZIL_NULLP(ZIL_ICHAR *),
    int _strip_ = TRUE);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	■ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function creates a Motif string. Motif strings have several components that must be associated with each other.

- *returnValue*$_{out}$ is the Motif string that is created.
- *text*$_{in}$ is the string that is to be placed in the Motif string.
- *displayText*$_{out}$ is a doubly indirected pointer to a string buffer. This pointer will be set to point to a buffer containing the *text*. The text will be the same as what was passed in unless *strip* is TRUE, in which case the text will have any hotkey designator characters removed.
- *strip*$_{in}$ specifies if hotkey designator characters (i.e., the '&' character) should be stripped from the string.

UI_WINDOW_OBJECT::DrawBorder

Syntax

```
#include <ui_win.hpp>

EVENT_TYPE DrawBorder(ZIL_SCREENID screenID, UI_REGION &region,
    int fillRegion, EVENT_TYPE ccode);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function draws the border of a window object. The border drawn by this function is the thin border that results from the WOF_BORDER flag being set. This border is not the UIW_BORDER.

- *returnValue*$_{out}$ indicates if the border was drawn successfully. *returnValue* is TRUE if the border was drawn successfully. Otherwise, *returnValue* is FALSE.

- *screenID*$_{in}$ is the *screenID* of the object.

- *region*$_{in/out}$ is the region where the border should be drawn. This value is decremented by the size of the border. This argument should be a copy of the object's *true* region.

- *fillRegion*$_{in}$ specifies if the region within the border should be filled. If *fillRegion* is TRUE, the region will be filled. Otherwise, the region will not be filled.

- *ccode*$_{in}$ is the logical or system event that caused the border to be drawn.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_WINDOW::Event(const UI_EVENT &event)
{
    .
    .
    .
    // Switch on the event type.
    switch (ccode)
    {

    case S_CURRENT:
    case S_NON_CURRENT:
    case S_DISPLAY_ACTIVE:
    case S_DISPLAY_INACTIVE:
        {
        // Draw the border and fill the background.
        UI_WINDOW_OBJECT::Event(event);
        if (!FlagSet(woStatus, WOS_REDISPLAY))
            break;
        UI_REGION region = true;
        display->VirtualGet(screenID, region);
        if (FlagSet(woFlags, WOF_BORDER) && true.Overlap(event.region))
            DrawBorder(screenID, region, FALSE, ccode);
    .
    .
    .
    }
    // Return the control code.
    return (ccode);
}
```

UI_WINDOW_OBJECT::DrawItem

Syntax

#include <ui_win.hpp>

virtual EVENT_TYPE DrawItem(const UI_EVENT *&event*, EVENT_TYPE *ccode*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual advanced function is used to draw the object. If the WOS_OWNERDRAW status is set for the object, this function will be called when drawing the object. This allows the programmer to derive a new class from UI_WINDOW_OBJECT and handle the drawing of the object, if desired.

- $returnValue_{out}$ is a response based on the success of the function call. If the object is drawn the function returns a non-zero value. If the object is not drawn, 0 is returned.

- $event_{in}$ contains the run-time message that caused the object to be redrawn. *event.region* contains the region in need of updating. The following logical events may be sent to the **DrawItem( )** function:

  S_CURRENT, **S_NON_CURRENT**, **S_DISPLAY_ACTIVE** and **S_DISPLAY_INACTIVE**—Messages that cause the object to be redrawn.

  WM_DRAWITEM—A message that causes the object to be redrawn. This message is specific to Windows and OS/2.

  Expose—A message that causes the object to be redrawn. This message is specific to Motif.

- $ccode_{in}$ contains the logical interpretation of *event*.

UI_WINDOW_OBJECT::DrawShadow

Syntax

#include <ui_win.hpp>

EVENT_TYPE DrawShadow(ZIL_SCREENID *screenID*, UI_REGION *&region*, int *depth*, int *fillRegion*, EVENT_TYPE *ccode*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function draws the shadow that gives the object a three-dimensional appearance.

- *returnValue*$_{out}$ indicates if the shadow was drawn successfully. *returnValue* is TRUE if the shadow was drawn successfully. Otherwise, *returnValue* is FALSE.

- *screenID*$_{in}$ is the *screenID* of the object.

- *region*$_{in/out}$ is the region where the shadow should be drawn. This value is decremented by the size of the shadow. This argument should be a copy of the object's *true* region.

- *depth*$_{in}$ specifies the degree of shading to be drawn. Values greater than 0 (i.e., 1, 2) cause the object to appear to pop out of the screen, a value of 0 causes no shadow to be drawn, and values less than 0 (i.e., -1, -2) cause the object to appear depressed.

- *fillRegion*$_{in}$ specifies if the region within the shadow should be filled. If *fillRegion* is TRUE, the region will be filled. Otherwise, the region will not be filled.

- *ccode*$_{in}$ is the logical or system event that caused the shadow to be drawn.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_BORDER::DrawItem(const UI_EVENT &, EVENT_TYPE ccode)
{
    // Check for text mode.
    if (display->isText)
    {
        UI_REGION region = parent->true;
        DrawShadow(screenID, region, 2, FALSE, ccode);
        return (ccode);
    }
    .
    .
    .

}
```

UI_WINDOW_OBJECT::DrawText

Syntax

#include <ui_win.hpp>

EVENT_TYPE DrawText(ZIL_SCREENID *screenID*, UI_REGION *&region*,
const ZIL_ICHAR **text*, UI_PALETTE **palette*, int *fillRegion*,
EVENT_TYPE *ccode*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function draws text in the object.

- $returnValue_{out}$ indicates if the text was drawn successfully. *returnValue* is TRUE if the text was drawn successfully. Otherwise, *returnValue* is FALSE.

- $screenID_{in}$ is the *screenID* of the object.

- *region*$_{in/out}$ is the region where the text should be drawn. This argument should be a copy of the object's *true* region.

- *text*$_{in}$ is a pointer to the text to be displayed. If the text string contains a hotkey character, denoted by a preceding '&' character, then it will be underlined if the application is running in graphics mode or highlighted if the application is running in text mode.

- *palette*$_{in}$ is a pointer to the palette structure that defines the color to draw the text. The palette's foreground color is used to draw the text. The palette's background color is used to draw the background of the text (if *fillRegion* is TRUE).

- *fillRegion*$_{in}$ specifies if the region within the text should be filled. If *fillRegion* is TRUE, the region will be filled. Otherwise, the region will not be filled.

- *ccode*$_{in}$ is the logical or system event that caused the text to be drawn.

UI_WINDOW_OBJECT::Event

Syntax

#include <ui_win.hpp>

virtual EVENT_TYPE Event(const UI_EVENT &*event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function processes run-time messages sent to the object. It is declared virtual so that any derived class can override its default operation. This function processes general messages for all objects. If a derived object does not handle a particular message in its **Event( )** function, it should pass the event to its base class. Thus, events that are not handled by derived objects may eventually be passed to this function since all objects are derived from UI_WINDOW_OBJECT.

- *returnValue*$_{out}$ indicates how *event* was processed. If the event is processed successfully, the function returns the logical type of event that was interpreted from *event*. If the event could not be processed, S_UNKNOWN is returned.

- *event*$_{in}$ contains a run-time message for the object. The type of operation performed depends on the interpretation of the event. The following logical events are processed by **Event( )**:

  E_KEY—Indicates that a key has been pressed. This message is interpreted from a keyboard event.

  L_BEGIN_SELECT—Indicates that the end-user began the selection of the object by pressing the mouse button down while on the object.

  L_CONTINUE_SELECT—Indicates that the end-user previously clicked down on the object with the mouse and is now continuing to hold the mouse button down while on the object.

  L_DOWN—Moves the focus down one object. If there is no object below the current object, focus will "wrap" to an object at the top of the window and to the right of the current object. This message is interpreted from a keyboard event.

  L_END_SELECT—Indicates that the selection process, initiated with the L_-BEGIN_SELECT message, is complete. For example, the end-user has pressed and released the mouse button.

  L_HELP—Requests the context-sensitive help associated with the object.

  L_LEFT—Moves the focus left one object. If there is no object to the left of the current object, focus will "wrap" to an object on the right of the window and above the current object. This message is interpreted from a keyboard event.

  L_NEXT—This message is passed to the object's parent, if one exists, for processing.

  L_PREVIOUS—This message is passed to the object's parent, if one exists, for processing.

  L_RIGHT—Moves the focus right one object. If there is no object to the right of the current object, focus will "wrap" to an object on the left of the window and below the current object. This message is interpreted from a keyboard event.

L_SELECT—Indicates that the object has been selected. The selection may be the result of a mouse click or a keyboard action.

L_UP—Moves the focus up one object. If there is no object above the current object, focus will "wrap" to an object at the bottom of the window and to the left of the current object. This message is interpreted from a keyboard event.

L_VIEW—Indicates that the mouse is being moved over the object. This message allows the object to alter the mouse image.

S_ADD_OBJECT—This message is passed to the object's parent, if one exists, for processing.

S_CHANGED—Causes the object to recalculate its position and size. When a window is moved or sized, the objects on the window will need to recalculate their positions. This message informs an object that it has changed and that it should update itself.

S_CLOSE—If this message is received at the UI_WINDOW_OBJECT level, it will have come from the operating system. The message is placed on the event queue for processing.

S_CLOSE_TEMPORARY—If this message is received at the UI_WINDOW_-OBJECT level, it will have come from the operating system. The message is placed on the event queue for processing.

S_CREATE—Causes the object to create itself. The object will calculate its position and size and, if necessary, will register itself with the operating system. This message is sent by the Window Manager when a window is attached to it to cause the window and all the objects attached to the window to determine their positions.

S_CURRENT—Causes the object to draw itself to appear current. This message is sent by the Window Manager to a window when it becomes current. The window, in turn, passes this message to the object on the window that is current.

S_DEINITIALIZE—Informs the object that it is about to be removed from the application and that it should deinitialize any information. The Window Manager sends this message to a window when the window is subtracted from the Window Manager. The window, in turn, relays the message to all objects attached to it.

S_DISPLAY_ACTIVE—Causes the object to draw itself to appear active. An active object is one that is on the active (i.e., current) window. Most objects do not display differently whether they are active or inactive. An active object should not be confused with a current object. An object is active if it is on the active window. However, it may not be the current object on the window.

The region that needs to be redisplayed is passed in the UI_REGION portion of the UI_EVENT structure when this message is sent. The object only needs to redisplay when the region passed by the event overlaps the region of the object.

S_DISPLAY_INACTIVE—Causes the object to draw itself to appear inactive. An inactive object is one that is not on the active (i.e., current) window. Most objects do not display differently whether they are inactive or active.

The region that needs to be redisplayed is passed in the UI_REGION portion of the UI_EVENT structure when this message is sent. The object only needs to redisplay when the region passed with the event overlaps the region of the object.

S_DRAG_COPY_OBJECT—Indicates that the end-user is dragging the object for a copy operation.

S_DRAG_MOVE_OBJECT—Indicates that the end-user is dragging the object for a move operation.

S_DROP_COPY_OBJECT—Indicates that the end-user is dropping an object for a copy operation. The dragged object's text is copied to this object.

S_DROP_MOVE_OBJECT—Indicates that the end-user is dropping an object for a move operation. The dragged object's text is moved to this object.

S_INITIALIZE—Causes the object to initialize any necessary information that may require a knowledge of its parent or siblings. When a window is added to the Window Manager, the Window Manager sends this message to cause the window and all the objects attached to the window to initialize themselves.

S_MOVE—Causes the object to update its location. The distance to move is contained in the *position* field of UI_EVENT. For example, an *event.position.line* of -10 and an *event.position.column* of 15 moves the object 10 lines up and 15 columns to the right.

S_NON_CURRENT—Indicates that the object has just become non-current. This message is received when the user moves to another window or object.

S_REDISPLAY—Causes the object to redraw.

S_REGION_DEFINE—Causes the object to reserve a region of the screen in which it will display.

S_REGISTER_OBJECT—Causes the object to register itself with the operating system.

S_RESET_DISPLAY—Changes the display to a different resolution. *event.data* should point to the new display class to be used. If *event.data* is NULL, then a text mode display will be created. This event is specific to DOS and must be placed on the event queue by the programmer. The library will never generate this event.

S_SIZE—Causes the object to change its size. The object's new *relative* region is passed in *event.region*.

S_SUBTRACT_OBJECT—This message is passed to the object's parent, if one exists, for processing.

All other events cause the S_UNKNOWN message to be returned.

NOTE: Because most graphical operating systems already process their own events related to this object, the messages listed above may not be handled in every environment. Wherever possible, Zinc allows the operating system to process its own messages so that memory use and speed will be as efficient as possible. In these situations, the system event can be trapped in a derived **Event( )** function.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_BUTTON::Event(const UI_EVENT &event)
{
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_BUTTON);
    switch (ccode)
    {
    case S_CREATE:
    case S_SIZE:
        .
        .
        .

    default:
        ccode = UI_WINDOW_OBJECT::Event(event);
        break;
    }
```

```
    // Return the control code.
    return (ccode);
}
```

UI_WINDOW_OBJECT::Font

Syntax

#include <ui_win.hpp>

ZIL_LOGICAL_FONT Font(ZIL_LOGICAL_FONT *font* = FNT_NONE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function sets the logical font for an object or returns the logical font in use by the object. See the individual display class chapters for more information regarding fonts.

- $returnValue_{out}$ is the logical font in use by the object.
- $font_{in}$ is the logical font to be assigned to the object. If *font* is FNT_NONE, the default, then the font is not changed but the current font will be returned.

UI_WINDOW_OBJECT::Get

Syntax

#include <ui_win.hpp>

UI_WINDOW_OBJECT *Get(const ZIL_ICHAR **name*);
or
UI_WINDOW_OBJECT *Get(ZIL_NUMBERID *_numberID*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions are used to get a pointer to a specific object in the object's list. They do a depth-first search of the objects in the list, searching for a match on the identification data specified. If the object is not derived from UI_LIST, no action is performed.

The first overloaded function returns the object whose *stringID* matches *name*.

- *returnValue*$_{out}$ is a pointer to the object whose *stringID* matches *name*. If no object matches *name*, NULL is returned.
- *name*$_{in}$ is the *stringID* of the object to be located.

The second function returns the object whose *numberID* matches *_numberID*.

- *returnValue*$_{out}$ is a pointer to the object whose *numberID* matches *_numberID*. If no object matches *_numberID*, NULL is returned.
- *_numberID*$_{in}$ is the *numberID* of the object to be located.

UI_WINDOW_OBJECT::HotKey

Syntax

```
#include <ui_win.hpp>

unsigned HotKey(unsigned hotKey = 0);
    or
unsigned HotKey(ZIL_ICHAR *text);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions set the hotkey for the object. If an object added to a window contains sub-objects with hotkeys, then the object should have its hotkey set to HOT_-KEY_SUB_WINDOW so that its children can process hotkeys. For example, a UIW_-TOOL_BAR with buttons on it should have its hotkey set to HOT_KEY_SUB_-WINDOW.

The first overloaded function sets the hotkey for the object.

- *returnValue*$_{out}$ is the value of the hotkey after it has been changed.
- *hotKey*$_{in}$ is the new hotkey value. Any alphanumeric character can be used for a hotkey. If *hotKey* is 0, no change is made but the hotkey value is returned.

The second overloaded function sets the hotkey for the object by parsing the text that is passed in looking for the hotkey designator character (an '&' by default).

- *returnValue*$_{out}$ is the value of the hotkey after it has been changed.
- *text*$_{in}$ is a pointer to the text for the object. This text is searched for the hotkey designator character (an '&' by default). If the character is found, then the character immediately after it is set to be the object's hotkey.

Example

```
ExampleFunction(UI_WINDOW_OBJECT *object1, UI_WINDOW_OBJECT *object2)
{
    object1->HotKey('A');
    .
    .
    .

    unsigned value = object1->HotKey( );
    object2->HotKey(value);
}
```

UI_WINDOW_OBJECT::Information

Syntax

#include <ui_win.hpp>

virtual void *Information(INFORMATION_REQUEST *request*, void **data*,
ZIL_OBJECTID *objectID* = ID_DEFAULT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function allows Zinc Application Framework objects and programmer functions to get or modify specified information about an object.

- *returnValue*$_{out}$ is a pointer to the return data that was requested. The type of the return data depends on the request. If the request did not require the return of information, this value is NULL.

- *request*$_{in}$ is a request to get or set information associated with the object. The following requests (defined in **UI_WIN.HPP**) are recognized by the window object:

  I_CHANGED_FLAGS—Informs the object that the programmer has changed some flags associated with the object and that the object should update itself accordingly. This request should be sent after changing an object's flags, particularly if the new flag settings will change the visual appearance of the object.

  I_CLEAR_FLAGS—Clears the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type UIF_FLAGS that contains the flags to be cleared, and *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer wishes to clear the WOF_FLAGS of an object, *objectID* should be ID_WINDOW_-OBJECT. If, for example, the object is a button and the BTF_FLAGS are to be cleared, *objectID* should be ID_BUTTON. This allows the object to process the

request at the proper level. This request only clears those flags that are passed in; it does not simply clear the entire field.

I_CHANGED_STATUS—Informs the object that the programmer has changed some status flags associated with the object and that the object should update itself accordingly. This request should be sent after changing an object's status flags, particularly if the new status flag settings will change the visual appearance of the object. If this request is sent, *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer changes the WOS_STATUS of an object, *objectID* should be ID_-WINDOW_OBJECT. If, for example, the object is a button and the BTS_-STATUS is modified, *objectID* should be ID_BUTTON. This allows the object to process the request at the proper level.

I_CLEAR_STATUS—Clears the current status flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type UIS_STATUS that contains the status flags to be cleared, and *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer wishes to clear the WOS_STATUS of an object, *objectID* should be ID_-WINDOW_OBJECT. If, for example, the object is a button and the BTS_STATUS is to be cleared, *objectID* should be ID_BUTTON. This allows the object to process the request at the proper level. This request only clears those status flags that are passed in; it does not simply clear the entire field.

I_GET_FLAGS—Requests the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type UIF_FLAGS, and *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer wishes to obtain the WOF_FLAGS of an object, *objectID* should be ID_WINDOW_OBJECT. If, for example, the object is a button and the BTF_FLAGS are desired, *objectID* should be ID_BUTTON. This allows the object to process the request at the proper level.

I_GET_NUMBERID_OBJECT—Returns a pointer to an object whose *numberID* matches the value in *data*, if one exists. This object does a depth-first search of the objects attached to it, looking for a match of the *numberID*. If no object has a *numberID* that matches *data*, NULL is returned. If this message is sent, *data* must be a pointer to a NUMBERID. Programmers should use a window's *numberID* with caution as it may change at run-time. For more details, see the note accompanying the description of **UI_WINDOW_-OBJECT::NumberID( )** in this chapter.

I_GET_STATUS—Requests the current status flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type UIS_STATUS, and *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer wishes to obtain the WOS_STATUS of an object, *objectID* should be ID_WINDOW_OBJECT. If, for example, the object is a button and the BTS_STATUS is desired, *objectID* should be ID_BUTTON. This allows the object to process the request at the proper level.

I_GET_STRINGID_OBJECT—Returns a pointer to an object whose *stringID* matches the character string in *data*, if one exists. This object does a depth-first search of the objects attached to it looking for a match of the *stringID*. If no object has a *stringID* that matches *data*, NULL is returned. If this message is sent, *data* must be a pointer to a string.

I_INITIALIZE_CLASS—Causes the object to initialize any basic information that does not require a knowledge of its parent or sibling objects. This request is sent from the constructor of the object.

I_SET_FLAGS—Sets the current flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type UIF_FLAGS that contains the flags to be set, and *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer wishes to set the WOF_-FLAGS of an object, *objectID* should be ID_WINDOW_OBJECT. If, for example, the object is a button and the BTF_FLAGS are to be set, *objectID* should be ID_BUTTON. This allows the object to process the request at the proper level. This request only sets those flags that are passed in; it does not clear any flags that are already set.

I_SET_STATUS—Sets the current status flag settings for the object. If this request is sent, *data* should be a pointer to a variable of type UIS_STATUS that contains the status flags to be set, and *objectID* should indicate the type of object with which the flags are associated. For example, if the programmer wishes to set the WOS_STATUS of an object, *objectID* should be ID_WINDOW_-OBJECT. If, for example, the object is a button and the BTS_STATUS is to be set, *objectID* should be ID_BUTTON. This allows the object to process the request at the proper level. This request only sets those status flags that are passed in; it does not clear any flags that are already set.

- $data_{in/out}$ is used to provide information to the function or to receive the information requested, depending on the type of request. In general, this must be space allocated by the programmer.

- *objectID*$_{in}$ is a ZIL_OBJECTID that specifies which type of object the request is intended for. Because the **Information( )** function is virtual, it is possible for an object to be able to handle a request at more than one level of its inheritance hierarchy. *objectID* removes the ambiguity by specifying which level of an object's hierarchy should process the request. If no value is provided for *objectID*, the object will attempt to interpret the request with the *objectID* of the actual object type.

Example

```
#include <ui_win.hpp>
#include <string.h>

void *UIW_BUTTON::Information(ZIL_INFO_REQUEST request, void *data,
    ZIL_OBJECTID objectID)
{
    // Switch on the request.
    switch (request)
    {
    .
    .
    .

    case I_GET_FLAGS:
    case I_SET_FLAGS:
    case I_CLEAR_FLAGS:
        if (objectID && objectID != ID_BUTTON)
            data = UI_WINDOW_OBJECT::Information(request, data, objectID);
        else if (request == I_GET_FLAGS && !data)
            data = &btFlags;
        else if (request == I_GET_FLAGS)
            *(BTF_FLAGS *)data = btFlags;
        else if (request == I_SET_FLAGS)
            btFlags |= *(BTF_FLAGS *)data;
        else
            btFlags &= ~(*(BTF_FLAGS *)data);
        break;
    .
    .
    .

    }
    // Return the information.
    return (data);
}
```

UI_WINDOW_OBJECT::Inherited

Syntax

#include <ui_win.hpp>

int Inherited(ZIL_OBJECTID *matchID*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function indicates if the object is inherited from a particular class, specified by the objectID.

- *returnValue*$_{out}$ is TRUE if the window object is inherited from the class specified by *matchID*. Otherwise, *returnValue* is FALSE.

- *matchID*$_{in}$ is the objectID to match. If the object is derived from the class specified by *matchID*, *returnValue* will be TRUE. **Inherited( )** determines the object's inheritance hierarchy by inspecting the object's *windowID* array.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_ICON::Event(const UI_EVENT &event)
{
    .
    .
    .

    // Switch on the event type.
    EVENT_TYPE ccode = event.type;
    switch (ccode)
    {
    case S_CREATE:
        if (!_iconJumpInstance)
            _iconJumpInstance = (FARPROC)IconJumpProcedure;
        UI_WINDOW_OBJECT::Event(event);
        if (parent->Inherited(ID_LIST))
            parent->woStatus |= WOS_OWNERDRAW;


        .
        .
        .

    }

    // Return the control code.
    return (ccode);
}
```

UI_WINDOW_OBJECT::LogicalEvent

Syntax

#include <ui_win.hpp>

EVENT_TYPE LogicalEvent(const UI_EVENT *&event*, ZIL_OBJECTID *currentID* = 0,
int *nativeType* = TRUE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used by all window objects to interpret a raw event.

- *returnValue*$_{out}$ is the logical event that is interpreted from the raw event and object identification.

- *event*$_{in}$ is the raw event that is to be interpreted. Typically, this event was generated by a device, such as the keyboard.

- *currentID*$_{in}$ is the objectID of the object interpreting the event. This value is used to determine the mapping of a logical event.

- *nativeType*$_{in}$ specifies if the message is to be processed as a native operating system message. By default, most keyboard and mouse events are not translated in graphical operating systems. If *nativeType* is TRUE, this is how processing will occur and the logical event that is returned will indicate that the event is a native operating system event (e.g., a Windows event will return E_MSWINDOWS). If *nativeType* is FALSE and the event did not directly map to a logical event, however, keyboard events will return E_KEY and mouse events will return E_MOUSE, no matter what operating system the application is running on. The native event is still returned in the *message* field of the UI_EVENT structure.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_BORDER::Event(const UI_EVENT &event)
{
    // Switch on the event type.
    UI_REGION region;
    EVENT_TYPE ccode = LogicalEvent(event, ID_BORDER);
    switch (ccode)
    {
    .
    .
    .

    }

    // Return the control code.
    return (ccode);
}
```

UI_WINDOW_OBJECT::LogicalPalette

Syntax

#include <ui_win.hpp>

UI_PALETTE *LogicalPalette(LOGICAL_EVENT *logicalEvent*,
    ZIL_OBJECTID *currentID* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used by all window objects to determine which palette should be used to draw the object based on the logical event.

- $returnValue_{out}$ is a pointer to the palette that should be used to draw the object.

- $logicalEvent_{in}$ is the logical event that determines which palette entry to use. For example, if *logicalEvent* is S_CURRENT and the object is current, then the PM_-CURRENT palette will be used.

- *currentID*$_{in}$ is the objectID of the object interpreting the event. This value is used to determine the palette mapping given the logical event.

Example

```
#include <ui_win.hpp>

EVENT_TYPE EXAMPLE_CLASS::Event(const UI_EVENT &event)
{
    // Switch on the event type.
    UI_REGION region;
    EVENT_TYPE ccode = UI_WINDOW_OBJECT::LogicalEvent(event, ID_WINDOW_OBJECT);
    switch (ccode)
    {
    case S_DISPLAY_INACTIVE:
    case S_DISPLAY_ACTIVE:
        // Draw the borders around the object.
        UI_WINDOW_OBJECT::Event(event);
        UI_PALETTE *palette = LogicalPalette(ccode, ID_WINDOW_OBJECT);
        .
        .
        .

        break;
    .
    .
    .

    }

    // Return the control code.
    return (ccode);
}
```

UI_WINDOW_OBJECT::Modify

Syntax

#include <ui_win.hpp>

void Modify(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to change an object's size or position. When this function is called, an XOR outline of the object appears. The outline can be moved or sized with the arrow keys on the keyboard or by moving the mouse (if **Modify( )** was invoked as a response to a mouse click). When <Enter> is pressed or the mouse button is released, the object will take on its new size or position.

- *event*$_{in}$ contains the type of modification to be done. *event*'s members are set to the following values:

  event.type specifies if the function is to size (*event.type* is L_SIZE) or move (*event.type* is L_MOVE) the object.

  event.rawCode specifies which edges of the object can be modified (i.e., M_LEFT_CHANGE, M_TOP_CHANGE, M_RIGHT_CHANGE or M_BOTTOM_CHANGE.)

Example

```
#include <ui_win.hpp>

EVENT_TYPE UIW_WINDOW::Event(const UI_EVENT &event)
{
    UI_WINDOW_OBJECT *object;

    .
    .
    .

    // Switch on the event type.
    switch (ccode)
    {
    .
    .
    .
    case S_MOVE:
    case S_SIZE:
        Modify(event);
        break;
    }
}
```

UI_WINDOW_OBJECT::NeedsUpdate

Syntax

#include <ui_win.hpp>

int NeedsUpdate(const UI_EVENT *&event*, EVENT_TYPE *ccode*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function determines if the object needs to be redrawn. Currently, this function always returns TRUE.

- $returnValue_{out}$ is always TRUE.
- $event_{in}$ is not used.
- $ccode_{in}$ is not used.

UI_WINDOW_OBJECT::Next

Syntax

#include <ui_win.hpp>

UI_WINDOW_OBJECT *Next(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the next object attached to the object's parent, if one exists.

UI_WINDOW_OBJECT::NumberID

Syntax

#include <ui_win.hpp>

ZIL_NUMBERID NumberID(ZIL_NUMBERID *numberID* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets or retrieves an object's *numberID*.

NOTE: The variable *numberID* is used by the library. An object's *numberID* must be unique among all objects on a window and a window's *numberID* must be greater than any of its children's *numberID*'s. Thus, for a window, *numberID* may be modified by the library. For this reason, *numberID* should not be used to identify a window. It is recommended that programmers use *stringID*, rather than *numberID*, to identify objects.

- $returnValue_{out}$ is the object's *numberID*.

- *numberID*$_{in}$ is the new *numberID* for the object. If this value is 0, the object's *numberID* is not modified, but its current *numberID* is returned.

UI_WINDOW_OBJECT::Previous

Syntax

```
#include <ui_win.hpp>

UI_WINDOW_OBJECT *Previous(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the previous object attached to the object's parent, if one exists.

UI_WINDOW_OBJECT::RedisplayType

Syntax

```
#include <ui_win.hpp>

EVENT_TYPE RedisplayType(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function indicates what type of redisplay the object requires. The object may need to be drawn to appear current, active or inactive.

- *returnValue*$_{out}$ indicates how the object needs to be redrawn. *returnValue* can have one of the following values:

  S_CURRENT—Indicates that the object should be drawn to appear current.

  S_DISPLAY_ACTIVE—Indicates that the object should be drawn to appear active.

  S_DISPLAY_INACTIVE—Indicates that the object should be drawn to appear inactive.

UI_WINDOW_OBJECT::RegionConvert

Syntax

#include <ui_win.hpp>

void RegionConvert(UI_REGION *&region*, int *absolute*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts a region to pixel coordinates. When an object is constructed, it is usually given cell coordinates for its size and position. This function is used to convert the coordinates into pixel coordinates when in graphics mode.

- *region*$_{in/out}$ is the region that is to be converted.

- *absolute*$_{in}$ specifies if the function should add a *preSpace* and *postSpace* region to the converted region. If *absolute* is TRUE, the converted region will not have a *preSpace* and *postSpace* region added. Otherwise, *preSpace* and *postSpace* will be added to the converted region. *preSpace* and *postSpace* are members of the display class that define the space between the top or bottom of a cell and the top or bottom of the object itself.

Example

```
#include <ui_win.hpp>

EVENT_TYPE UI_WINDOW_OBJECT::Event(const UI_EVENT &event)
{
    static ZIL_TIME lastTime;
    UI_WINDOW_OBJECT *object;

    // Switch on the event type.
    EVENT_TYPE ccode = LogicalEvent(event);
    switch (ccode)
    {
    case S_INITIALIZE:
        .
        .
        .

        dwStyle |= parent ? WS_CHILD | WS_VISIBLE : WS_OVERLAPPED;
        RegionConvert(relative, (parent && !FlagSet(woFlags,
            WOF_NON_FIELD_REGION)) ? FALSE : TRUE);
        break;
    .
    .
    .

    }
    .
    .
    .

}
```

UI_WINDOW_OBJECT::RegionMax

Syntax

#include <ui_win.hpp>

virtual void RegionMax(UI_WINDOW_OBJECT **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function sets the object's *true* and *clip* regions. They are set to the object's *relative* region.

- $object_{in}$ is a pointer to the object that needs its *true* region assigned. Its *true* member will be modified with its actual position.

Example

```
#include <ui_win.hpp>

#if defined(ZIL_MSWINDOWS)
EVENT_TYPE UIW_PULL_DOWN_MENU::Event(const UI_EVENT &event)
{
    UI_WINDOW_OBJECT *object;

    // Switch on the event type.
    EVENT_TYPE ccode = event.type;
    switch (ccode)
    {
    .
    .
    .

    case S_SIZE:
        // Compute the positions of the window objects.
        if (FlagSet(pdStatus, PDS_MAIN_MENU))
        {
            true.top = true.bottom = 0;
            break;
        }
        else if (ccode == S_SIZE)
            parent->RegionMax(this);
        .
        .
        .

        break;
    .
    .
    .

    }
    return (ccode);
}
```

UI_WINDOW_OBJECT::RegisterObject

Syntax

```
#include <ui_win.hpp>

void RegisterObject(char *className, char *winClassName,
    WNDPROC *defProcInstance, ZIL_ICHAR *title = ZIL_NULLP(ZIL_ICHAR),
    HMENU menu = 0);
    or
void RegisterObject(char *className, char *winClassName, int *offset,
    FARPROC *procInstance, FARPROC *defProcInstance,
    ZIL_ICHAR *title = ZIL_NULLP(ZIL_ICHAR), HMENU menu = 0);
    or
ZIL_SCREENID RegisterObject(char *className, PSZ os2ClassName,
    int *classRegistered, ZIL_ICHAR *title, void *controlData = ZIL_NULLP(void));
    or
void RegisterObject(WidgetClass widgetClass,
    ZIL_MOTIF_CONVENIENCE_FUNCTION convenienceFunction,
    EVENT_TYPE ccode, int useArgs = FALSE, int manage = TRUE,
    ZIL_SCREENID parent = 0);
    or
void RegisterObject(char *name);
```

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	☐ Curses	■ NEXTSTEP

Remarks

These functions register the object with the operating system. An object will not receive any messages from the operating system if it has not been registered.

The first function is specific to Windows NT.

- *className*$_{in}$ is the name of the Zinc object being registered. These are Zinc names such as "UIW_VT_LIST," "UIW_BUTTON," "UIW_WINDOW," etc.

- *winClassName*$_{in}$ is the name of the Windows class from which the object being registered is derived. *winClassName* is the base class of the Windows NT object and does not necessarily follow Zinc's class hierarchy. For example, UIW_VT_LIST is derived from UIW_WINDOW, but in the Windows environment, the Zinc object is derived from LIST_BOX and must be registered that way.

- *defProcInstance*$_{out}$ is the address of the default callback function that Windows provides for each object.

- *title*$_{in}$ is a string containing the title of the window, if any.

- *menu*$_{in}$ is the pull-down menu associated with the window, if any.

The second function is specific to Windows.

- *className*$_{in}$ is the name of the Zinc object being registered. These are Zinc names such as "UIW_VT_LIST," "UIW_BUTTON," "UIW_WINDOW," etc.

- *winClassName*$_{in}$ is the name of the Windows class from which the object being registered is derived. *winClassName* is the base class of the Windows object and does not necessarily follow Zinc's class hierarchy. For example, UIW_VT_LIST is derived from UIW_WINDOW, but in the Windows environment, the Zinc object is derived from LIST_BOX and must be registered that way.

- *offset*$_{in/out}$ is the size (in bytes) of the user space that accompanies messages from the operating system. Initially, this value should be -1 which will cause the function to initialize the object.

- *procInstance*$_{in/out}$ is the address of the callback function that Windows will call when the object gets an event. This function is provided, for each object, by Zinc Application Framework.

- *defProcInstance*$_{in/out}$ is the address of the default callback function that Windows provides for each object.

- *title*$_{in}$ is a string containing the title of the window, if any.

- *menu*$_{in}$ is the pull-down menu associated with the window, if any.

The third function is specific to OS/2.

- *returnValue*$_{out}$ is the ZIL_SCREENID of the object created.

- *className*$_{in}$ is the name of the Zinc object being registered. These are Zinc names such as "UIW_VT_LIST," "UIW_BUTTON," "UIW_WINDOW," etc.

- *classRegistered*$_{in/out}$ when passed in, indicates if the function should attempt to register the class. If *classRegister* is TRUE, the function will try to register to the class with the OS/2 operating system. Otherwise, it will only create an instance of the object. *classRegister* is modified by the function to indicate if the class was registered.

- *baseCallback*$_{in/out}$ is the address of the default callback function that OS/2 provides for each object.

- *title*$_{in}$ is a string containing the title of the window, if any.

- *controlData*$_{in}$ is frame control data. The *flFlag* member is used for this value.

The fourth function is specific to Motif.

- *widgetClass*$_{in}$ is the type of Xt widget that is to be created. If this parameter is used, the *convenienceFunction* parameter should be NULL.

- *convenienceFunction*$_{in}$ is the convenienceFunction that is to be used to create the object. If this parameter is used, the *widgetClass* parameter should be NULL.

- *ccode*$_{in}$ distinguishes the circumstances under which **RegisterObject( )** is being called (i.e., **RegisterObject( )** could be called with an S_SIZE, an S_CREATE or some other ccode. This parameter allows the function to distinguish between the various events).

- *useArgs*$_{in}$ specifies whether the args array has been filled at all prior to the call to **RegisterObject( )**. If *useArgs* is TRUE, then the array has been partially filled already.

- *manage*$_{in}$ indicates if the widget created by the corresponding convenience function should be managed. Since most convenience functions don't manage their widget by default, setting *manage* to TRUE will cause the widget to be managed.

- *parent*$_{in}$ specifies the Xt parent of the object.

The fifth function causes the object to be registered by sending an S_REGISTER_-OBJECT message to the object.

- *name*$_{in}$ is the class name of the object to be registered.

Example

```
EVENT_TYPE UIW_VT_LIST::Event(const UI_EVENT &event)
{
    UI_WINDOW_OBJECT *object;

    // Switch on the event type.
    EVENT_TYPE ccode = LogicalEvent(event);
    switch (ccode)
    {
    .
    .
    .

    case S_CREATE:
        UI_WINDOW_OBJECT::Event(event);
        RegisterObject("UIW_VT_LIST", "LISTBOX", &_listOffset,
            &_listJumpInstance, &_listCallback, NULL);
        SendMessage(screenID, WM_SETREDRAW, FALSE, 0);
        for (object = First(); object; object = object->Next())
            object->Event(event);
        SendMessage(screenID, WM_SETREDRAW, TRUE, 0);
        break;
    .
    .
    .

    }

    // Return the control code.
    return (ccode);
}
```

UI_WINDOW_OBJECT::Root

Syntax

#include <ui_dsp.hpp>

UI_WINDOW_OBJECT *Root(int *mdiChild* = FALSE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns a pointer to the object's root window.

- *returnValue*$_{out}$ is a pointer to the object's root window. The root window is the window that is attached to the Window Manager, unless *mdiChild* is TRUE, in which case the root window is the MDI child window that is attached to the MDI parent window.

- *mdiChild*$_{in}$ specifies if the root window that is returned should be the top-most root or the MDI child window root. If *mdiChild* is TRUE, the MDI child root is returned. Otherwise, the root window, attached to the Window Manager, is returned.

UI_WINDOW_OBJECT::SearchID

Syntax

#include <ui_win.hpp>

ZIL_OBJECTID SearchID(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This member function returns the *searchID* of the object. The *searchID*, sometimes also referred to as the *objectID*, identifies the object's type. For example, a button has a *searchID* of ID_BUTTON. The possible values for *searchID* are defined in **UI_-WIN.HPP**.

- *returnValue*$_{out}$ is the object's *searchID*.

Example

```
#include <ui_win.hpp>

ExampleFunction1(UIW_WINDOW *window)
{
    .
    .
    .
```

```
    ZIL_OBJECTID searchID = window->SearchID();
    .
    .
    .
}
```

UI_WINDOW_OBJECT::StringID

Syntax

#include <ui_win.hpp>

ZIL_ICHAR *StringID(const ZIL_ICHAR **stringID* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This member function sets or obtains the *stringID* of the object.

- $returnValue_{out}$ is the object's *stringID*.
- $stringID_{in}$ is the new *stringID* for the object. If this value is NULL, the object's *stringID* is not modified, but its current *stringID* is returned.

Example

```
#include <ui_win.hpp>
UIW_WINDOW *ExampleFunction1(void)
{
    // Create the standard Hello World! window.
    UIW_WINDOW *window = UIW_WINDOW::Generic(2, 2, 40, 6, "Hello World Window");
    window->StringID("HELLO_WORLD_WINDOW");
    // Add the window objects to the window.
    *window
        + new UIW_TEXT(0, 0, 0, 0, "Hello, World!", 256,
            WNF_NO_FLAGS, WOF_NON_FIELD_REGION);
    // Return a pointer to the window.
    return (window);
}
```

UI_WINDOW_OBJECT::TopWidget

Syntax

#include <ui_win.hpp>

virtual ZIL_SCREENID TopWidget(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	■ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual function returns the *screenID* of the object's top-most Motif Widget if the object is made up of multiple Widgets. Some objects may be created as a combination of several Widgets with one Widget acting as the top-most, controlling Widget. This function obtains that Widget's *screenID*.

- $returnValue_{out}$ is the *screenID* of the top-most Widget.

UI_WINDOW_OBJECT::UserFunction

Syntax

#include <ui_win.hpp>

EVENT_TYPE UserFunction(const UI_EVENT &event, EVENT_TYPE ccode);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function calls the object's user function, if it exists, or else validates the window object. When a window object receives the L_SELECT, S_CURRENT or S_NON_CURRENT messages, it will call **UserFunction( )**. **UserFunction( )** calls the object's **userFunction( )** if it exists. Otherwise it calls the object's **Validate( )** function.

- *returnValue*$_{out}$ is the return value from the user function or validation function.
- *event*$_{in}$ is the event that caused **UserFunction( )** to be called. *event* is passed to the user function.
- *ccode*$_{in}$ is the logical event that was interpreted from the event. It is used to determine the type of action that is to take place.

UI_WINDOW_OBJECT::Validate

Syntax

#include <ui_win.hpp>

virtual int Validate(int *processError* = TRUE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is used to validate objects. When an object receives the L_SELECT or S_NON_CURRENT messages, it calls **Validate( )** to check if the value entered is valid. However, if a user function is associated with the object, **Validate( )** must be called explicitly from the user function if range checking is desired. The value is invalid if it is not within the absolute range of the object or if it is not within a range specified by the *range* member variable. The implementation of **Validate( )** at the UI_WINDOW_OBJECT level is merely as a stub. Not all objects can be validated (e.g., it doesn't make sense to validate a button's data). Those objects that can be validated have an overloaded

Validate( ) function. Those objects that cannot be validated, though, do not have an overloaded **Validate( )**. This function is called in those cases.

- *returnValue*$_{out}$ is always 0, indicating success.
- *processError*$_{in}$ is not used.

Storage Members

This section describes those class members that are used for storage purposes.

UI_WINDOW_OBJECT::UI_WINDOW_OBJECT

Syntax

#include <ui_win.hpp>

UI_WINDOW_OBJECT(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*,
ZIL_STORAGE_OBJECT_READ_ONLY **object*,
UI_ITEM **objectTable* = ZIL_NULLP(UI_ITEM),
UI_ITEM **userTable* = ZIL_NULLP(UI_ITEM));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor creates a new UI_WINDOW_OBJECT by loading the object from a data file. Typically, the programmer does not need to use this constructor. If an object is stored in a data file it is usually stored as part of a UIW_WINDOW and will be loaded when the window is loaded.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in this chapter. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in this chapter. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_WINDOW_OBJECT::Load

Syntax

#include <ui_win.hpp>

virtual void Load(const ZIL_ICHAR **name*, ZIL_STORAGE_READ_ONLY **file*, ZIL_STORAGE_OBJECT_READ_ONLY **object*, UI_ITEM **objectTable*, UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a UI_WINDOW_OBJECT from a persistent object data file. It is called by the persistent constructor and is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be loaded.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in this chapter. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in this chapter. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_WINDOW_OBJECT::New

Syntax

```
#include <ui_win.hpp>

static UI_WINDOW_OBJECT *New(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY),
```

UI_ITEM **objectTable* = ZIL_NULLP(UI_ITEM),
UI_ITEM **userTable* = ZIL_NULLP(UI_ITEM));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load a persistent object from a data file. This function is a static class member so that its address can be placed in a table used by the library to load persistent objects from a data file.

NOTE: The application must first create a display if objects are to be loaded from a data file.

- $name_{in}$ is the name of the object to be loaded.

- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the persistent object. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the persistent object information will be loaded. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

- $objectTable_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in this chapter. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- $userTable_{in}$ is a pointer to a table that contains the addresses of user objects, user functions and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in this chapter. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked

into the program, or, if no Designer-created table exists, it will use a default empty table.

UI_WINDOW_OBJECT::NewFunction

Syntax

#include <ui_win.hpp>

virtual ZIL_NEW_FUNCTION NewFunction(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function returns a pointer to the object's **New( )** function.

- *returnValue*$_{out}$ is a pointer to the object's **New( )** function.

UI_WINDOW_OBJECT::Store

Syntax

#include <ui_win.hpp>

virtual void Store(const ZIL_ICHAR **name*, ZIL_STORAGE **file*,
ZIL_STORAGE_OBJECT **object*, UI_ITEM **objectTable*,
UI_ITEM **userTable*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to write an object to a data file.

- *name*$_{in}$ is the name of the object to be stored.

- *file*$_{in}$ is a pointer to the ZIL_STORAGE where the persistent object will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the persistent object information will be stored. This must be allocated by the programmer. For more information on loading persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

- *objectTable*$_{in}$ is a pointer to a table that contains the addresses of the static **New( )** member functions for all persistent objects. For more details about *objectTable* see the description of *UI_WINDOW_OBJECT::objectTable* in this chapter. If *objectTable* is NULL, the library will use the object table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

- *userTable*$_{in}$ is a pointer to a table that contains the addresses of user objects, user functions and compare functions. For more details about *userTable* see the description of *UI_WINDOW_OBJECT::userTable* in this chapter. If *userTable* is NULL, the library will use the user table created by the Designer, if one was linked into the program, or, if no Designer-created table exists, it will use a default empty table.

CHAPTER 44 – UI_XT_DISPLAY

The UI_XT_DISPLAY class implements a graphics display that uses the X Toolkit Intrinsics and Xlib graphics functions to draw to the screen. This display class is used with Motif applications. Since the UI_XT_DISPLAY class is derived from UI_DISPLAY, only details specific to the UI_XT_DISPLAY class are given in this chapter. For descriptions and examples regarding virtual or inherited display members, see "Chapter 7—UI_DISPLAY."

Applications using the UI_XT_DISPLAY class are true X Window or OSF/Motif programs. The X resource database is used to specify such resources as default colors, widget fonts, etc. While the default application class name is "ZincApp", users can create their own class names and files that specify the application defaults. The X foreground and background resources currently override *UI_WINDOW_OBJECT::paletteMapTable* for objects. The *UI_WINDOW_OBJECT::paletteMapTable* is used only for graphics display primitives. The X resource file is also used to specify which fonts are used as the default Zinc fonts. If a different font is desired, simply make the appropriate changes in the X resource file.

The UI_XT_DISPLAY class is declared in **UI_DSP.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UI_XT_DISPLAY : public UI_DISPLAY
{
public:
    struct XFONT
    {
        XFontStruct *fontStruct;
        XmFontList fontList;
#if defined(ZIL_UNICODE)
        XFontSet fontSet;
#endif
    };

    static XFONT fontTable[ZIL_MAXFONTS];

    UI_XT_DISPLAY(int *argc = ZIL_NULLP(int),
        char **argv = ZIL_NULLP(char *), char *appClass = "ZincApp",
        XrmOptionDescList options = ZIL_NULLP(XrmOptionDescRec),
        Cardinal numOptions = 0,
        String *fallbackResources = ZIL_NULLP(String));
    virtual ~UI_XT_DISPLAY(void);
    virtual void Bitmap(ZIL_SCREENID screenID, int column, int line,
        int bitmapWidth, int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette = ZIL_NULLP(UI_PALETTE),
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_BITMAP_HANDLE *colorBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE),
        ZIL_BITMAP_HANDLE *monoBitmap = ZIL_NULLP(ZIL_BITMAP_HANDLE));
    virtual void BitmapArrayToHandle(ZIL_SCREENID screenID, int bitmapWidth,
        int bitmapHeight, const ZIL_UINT8 *bitmapArray,
        const UI_PALETTE *palette, ZIL_BITMAP_HANDLE *colorBitmap,
        ZIL_BITMAP_HANDLE *monoBitmap);
    virtual void BitmapHandleToArray(ZIL_SCREENID screenID,
```

```
        ZIL_BITMAP_HANDLE colorBitmap, ZIL_BITMAP_HANDLE monoBitmap,
        int *bitmapWidth, int *bitmapHeight, ZIL_UINT8 **bitmapArray);
    virtual void Ellipse(ZIL_SCREENID screenID, int column, int line,
        int startAngle, int endAngle, int xRadius, int yRadius,
        const UI_PALETTE *palette, int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void IconArrayToHandle(ZIL_SCREENID screenID, int iconWidth,
        int iconHeight, const ZIL_UINT8 *iconArray,
        const UI_PALETTE *palette, ZIL_ICON_HANDLE *icon);
    virtual void IconHandleToArray(ZIL_SCREENID screenID,
        ZIL_ICON_HANDLE icon, int *iconWidth, int *iconHeight,
        ZIL_UINT8 **iconArray);
    virtual void Line(ZIL_SCREENID screenID, int column1, int line1,
        int column2, int line2, const UI_PALETTE *palette, int width = 1,
        int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual ZIL_COLOR MapColor(const UI_PALETTE *palette, int isForeground);
    virtual void Polygon(ZIL_SCREENID screenID, int numPoints,
        const int *polygonPoints, const UI_PALETTE *palette,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void Rectangle(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom, const UI_PALETTE *palette, int width = 1,
        int fill = FALSE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RectangleXORDiff(const UI_REGION &oldRegion,
        const UI_REGION &newRegion, ZIL_SCREENID screenID = ID_SCREEN,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION));
    virtual void RegionDefine(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual void RegionMove(const UI_REGION &oldRegion, int newColumn,
        int newLine, ZIL_SCREENID oldScreenID = ID_SCREEN,
        ZIL_SCREENID newScreenID = ID_SCREEN);
    virtual void Text(ZIL_SCREENID screenID, int left, int top,
        const ZIL_ICHAR *text, const UI_PALETTE *palette, int length = -1,
        int fill = TRUE, int _xor = FALSE,
        const UI_REGION *clipRegion = ZIL_NULLP(UI_REGION),
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextHeight(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int TextWidth(const ZIL_ICHAR *string,
        ZIL_SCREENID screenID = ID_SCREEN,
        ZIL_LOGICAL_FONT font = FNT_DIALOG_FONT);
    virtual int VirtualGet(ZIL_SCREENID screenID, int left, int top,
        int right, int bottom);
    virtual int VirtualPut(ZIL_SCREENID screenID);
};
```

General Members

This section describes those members that are used for general purposes.

- *XFONT* is a structure that contains the following font information:

  fontStruct is a pointer to the X font structure, **XFontStruct**.

  fontList is a list of X Window fonts created from *fontStruct*.

fontSet is used in Unicode mode only. It is a set of all fonts required to display characters for a given locale.

- *fontTable* is an array of font handles for X Windows. The following entries are predefined by Zinc:

  FNT_SMALL_FONT—A small font similar in size to a font that might be used to display an icon's text string. The operating system's window manager is responsible for displaying the text on an icon, so this font is not typically used by Zinc.

  FNT_DIALOG_FONT—A font that is used when text is displayed on window objects (e.g., UIW_BUTTON, UIW_STRING, UIW_TEXT, etc.)

  FNT_SYSTEM_FONT—A slightly larger font similar in size to a font that might be used to display a window's title. The operating system's window manager is responsible for displaying the title of a window, so this font is not typically used by Zinc.

  See the description of the *UI_WINDOW_OBJECT::font* member variable in "Chapter 43—UI_WINDOW_OBJECT" for information on specifying which font an object uses.

NOTE: All member functions use the standard Zinc screen pixel coordinates with (0,0) being the top-left corner of the display. This is done to remain consistent across platforms.

UI_XT_DISPLAY::UI_XT_DISPLAY

Syntax

```
#include <ui_dsp.hpp>

UI_XT_DISPLAY(int *argc = NULL, char **argv = NULL,
    char *appClass = "ZincApp",
    XrmOptionDescList options = ZIL_NULLP(XrmOptionDescRec),
    Cardinal numOptions = 0, String *fallbackResources = ZIL_NULLP(String));
```

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	■ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This constructor creates a new UI_XT_DISPLAY class object. All parameters for this constructor are passed to **XtAppInitialize( )**. For more details on the use of these parameters, see the description of **XtAppInitialize( )** in the *X Toolkit Intrinsics Reference Manual.*

- $argc_{in}$ is a pointer to an integer containing the number of arguments passed to function **main( )**. *argc* points to a 1 if the program was invoked with no command-line arguments. If the program was invoked with one command-line argument, *argc* will point to a 2, etc. *argc* is used to determine the number of parameters contained in *argv*.

- $argv_{in}$ is a pointer to an array of character strings that contain the actual command-line parameters. For example, if the program TEST were invoked with a /C switch, *argv[0]* would point to "TEST" and *argv[1]* would point to "/C".

- $appClass_{in}$ is a pointer to a character string denoting the class name of the application being executed. This identifies the name of the resource file used to initialize resources.

- $options_{in}$ describes how to parse the command line.

- $numOptions_{in}$ specifies how many options were provided in *options*.

- $fallbackResources_{in}$ is a list of resource file entries that is used if the resource file specified by *appClass* cannot be found.

Example

```
#include <ui_win.hpp>

int main(int argc, char **argv)
{
    // Initialize the display.
    UI_DISPLAY *display = new UI_XT_DISPLAY(&argc, argv, "ZincApp");

    // Initialize the event manager.
```

```
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);

    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;

    // Initialize the window manager.
    UI_WINDOW_MANAGER *windowManager =
        new UI_WINDOW_MANAGER(display, eventManager);
    .
    .
    .

    // Clean up.
    delete windowManager;
    delete eventManager;
    delete display;
    return (0);
}
```

UI_XT_DISPLAY::~UI_XT_DISPLAY

Syntax

#include <ui_dsp.hpp>

~UI_XT_DISPLAY(void);

Portability

This function is available on the following environments:

☐ DOS Text	☐ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	■ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UI_XT_DISPLAY class. Care should be taken to only destroy a UI_XT_DISPLAY class that is not attached to another associated object.

CHAPTER 45 – UID_CURSOR

The UID_CURSOR class is used to display a blinking cursor on the screen. It is used by objects that can be edited in order to show the end-user's position within the field. In text mode, this class uses BIOS calls to enable or disable the blinking hardware cursor. In DOS graphics mode, this class paints a blinking cursor on the screen. In environments other than DOS and Curses, the operating system handles the management of the cursor (in some operating systems, the edit cursor is referred to as a "caret"). In those environments, the UID_CURSOR class provides little, if any, control over the cursor.

The UID_CURSOR class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UID_CURSOR : public UI_DEVICE,
    public ZIL_INTERNATIONAL
{
public:
    static int blinkRate;

    DEVICE_IMAGE image;
    UI_POSITION position;

    UID_CURSOR(ZIL_DEVICE_STATE state = D_OFF,
        DEVICE_IMAGE image = DC_INSERT);
    virtual ~UID_CURSOR(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event);

protected:
    UI_POSITION offset;

    virtual void Poll(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *blinkRate* identifies the rate at which the cursor will blink. This value is in hundredths of seconds. This member is used for DOS and Curses only.

- *image* identifies the type of cursor being displayed on the screen. Its value may either be DC_INSERT or DC_OVERSTRIKE. In DOS graphics mode, if *image* is DC_INSERT, the cursor device displays a thick vertical bar cursor on the screen. If it is DC_OVERSTRIKE, the cursor device displays a thin vertical bar cursor on the screen. In DOS text mode, the DC_INSERT cursor is a wide box and the DC_-OVERSTRIKE cursor is a short, wide underline. This member is used for DOS only.

- *position* contains the cursor's true screen position (based on the screen's 0,0 left-top based coordinates). The value of this structure depends on the type of display mode in which the application is running. For example, a cursor positioned in the middle of the screen may contain a *position.column* value of 40 and *position.line* value of 12, if the application is running in text mode. The same cursor position, however, may produce values of 320 and 240 if the application is running in graphics mode. This member is used for DOS and Curses only.

- *offset* is an offset, from *position*, where the cursor image will be displayed. This member is used for DOS and Curses only.

UID_CURSOR::UID_CURSOR

Syntax

#include <ui_evt.hpp>

UID_CURSOR(ZIL_DEVICE_STATE *state* = D_OFF,
    DEVICE_IMAGE *image* = DC_INSERT);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UID_CURSOR class object. It should be called after the display and Event Manager constructors have been called.

- $state_{in}$ is the initial state of the cursor device. The cursor device may be initialized to one of the following states (defined in **UI_EVT.HPP**):

  D_HIDE—Initializes the cursor to be on but not visible. If the cursor is blinking, its state is either D_ON or D_HIDE. Thus, the cursor will only be invisible until it blinks back on. The blink rate is controlled by the *blinkRate* member. The initial state mask is DC_INSERT.

D_OFF—Initializes the cursor to be off. In this state, the cursor is not shown on the screen. This is the default value if no argument is provided.

D_ON—Initializes the cursor to be on and visible. The initial state mask is DC_INSERT.

- *image*$_{in}$ identifies the initial type of cursor being displayed on the screen. Its value may be one of the following types (defined in **UI_EVT.HPP**):

  DC_INSERT—The cursor device displays a thick vertical bar cursor in graphics mode, or a wide block in text mode. This is the default value if no argument is provided.

  DC_OVERSTRIKE—The cursor device displays a thin vertical bar cursor in graphics mode, or a short, wide underline in text mode.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard, mouse and cursor devices.
    UI_TEXT_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // This automatically calls the keyboard, mouse and cursor destructors.
    delete eventManager;
    delete display;
    return (0);
}
```

UID_CURSOR::~UID_CURSOR

Syntax

#include <ui_evt.hpp>

virtual ~UID_CURSOR(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UID_CURSOR object. Care should be taken to only destroy a cursor device that is not attached to the Event Manager.

Example

```
#include <ui_evt.hpp>

ExampleFunction()
{
    // Attach the keyboard, mouse and cursor devices.
    UI_TEXT_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // This automatically calls the keyboard, mouse and cursor destructors.
    delete eventManager;
    delete display;
    return (0);
}
```

UID_CURSOR::Event

Syntax

#include <ui_evt.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function processes messages sent to the cursor device. It is declared virtual so that any derived cursor class can override its default operation.

- *returnValue*$_{out}$ is the current state of the cursor device. This value will be D_OFF, DC_INSERT or DC_OVERSTRIKE.

- *event*$_{in}$ contains a run-time message for the cursor object. The following messages (declared in **UI_EVT.HPP**) are processed by the **Event( )** function:

  D_HIDE—Blinks the cursor off. If the cursor is blinking, its state is D_ON when it is visible and D_HIDE when it is not visible. Thus, no cursor will be visible until it blinks back on. The blink rate is controlled by the *blinkRate* member.

  D_OFF—Turns off the cursor. If the cursor is off, no cursor is shown on the screen.

  D_ON—Turns on the cursor. If the cursor is on, a cursor is shown on the screen until it is time to blink off.

  D_STATE—Returns the current state of the cursor. If the cursor is on, the *image* will be returned.

  DC_INSERT—Turns the cursor on and enables the insert cursor.

  DC_OVERSTRIKE—Turns the cursor on and enables the overstrike cursor.

  S_DEINITIALIZE—De-initializes the cursor device.

  S_INITIALIZE—Initializes the cursor device.

  S_POSITION—Changes the screen position of the cursor. If this message is sent, *event.position.column* and *event.position.line* must contain the run-time

display position of the cursor on the screen. The values of *event.position.column* and *event.position.line* depend on the type of display mode in which the application is running. For example, if the cursor is to be positioned at the center of the screen while the application is running in text mode (e.g., an 80 column by 25 line screen) the position values should be:

```
event.position.column = 40;
event.position.line = 13;
```

If, on the other hand, the application is running in a 640 column by 480 line graphics mode, the position values should be:

```
event.position.column = 320;
event.position.line = 240;
```

If the cursor is in a D_OFF state, the position change will be reflected when the cursor is turned back on.

The state of the cursor device may also be changed using the **UI_EVENT_MANAGER::-Event( )** or **UI_EVENT_MANAGER::DeviceState( )** functions.

NOTE: Because most graphical operating systems already process their own events related to this object, the messages listed above may not be handled in every environment. Wherever possible, Zinc allows the operating system to process its own messages so that memory use and speed will be as efficient as possible.

Example

```
#include <ui_evt.hpp>

ExampleFunction()
{
    // Attach the keyboard to the event manager.
    UI_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    UID_CURSOR *cursor = new UID_CURSOR;
    *eventManager + cursor;
    .
    .
    .

    // Change the cursor to insert mode.
    UI_EVENT event;
    event.type = DC_INSERT;
    cursor->Event(event);
    .
    .
    .

    // Reposition the cursor the top-left side of the screen.
    event.type = S_POSITION;
    event.position.column = event.position.line = 0;
    cursor->Event(event);
```

```
    .
    .
    .
}
```

UID_CURSOR::Poll

Syntax

#include <ui_evt.hpp>

virtual void Poll(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is responsible for blinking the cursor on and off if the cursor is on and the application is running in DOS graphics mode. In text mode, this function has no effect. In addition, if the cursor is turned off, this function has no effect. This function is declared virtual so that any derived cursor class can override its default operation.

Example

An example of the **Poll( )** member function is presented in **UI_DEVICE::Poll( )**.

CHAPTER 46 – UID_KEYBOARD

The UID_KEYBOARD class is used to manage the keyboard device. This class handles events generated by the hardware keyboard device. Most compiler libraries have a set of functions to get input from the keyboard (e.g., **getch( )**, **getchar( )**). However, because Zinc Application Framework is an event-driven system, the keyboard is interfaced with other devices, such as a mouse, to provide smooth control of the user's input. In environments other than DOS and Curses, the operating system handles the management of the keyboard. In those environments, the UID_KEYBOARD class provides little, if any, control over the keyboard.

The UID_KEYBOARD class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UID_KEYBOARD : public UI_DEVICE,
    public ZIL_INTERNATIONAL
{
public:
    static EVENT_TYPE breakHandlerSet;

    UID_KEYBOARD(ZIL_DEVICE_STATE state = D_ON);
    virtual ~UID_KEYBOARD(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event);

protected:
    virtual void Poll(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *breakHandlerSet* defines what action is taken if the end-user attempts to break out of the program by hitting <Ctrl+Break> or <Ctrl+C>. If one of these key combinations is hit, the value of *breakHandlerSet* is placed on the event queue as an event. By default, *breakHandlerSet* is L_EXIT, which would cause the program to exit. If *breakHandlerSet* is set to L_EXIT_FUNCTION, the exit function associated with the Window Manager will be called, perhaps allowing the end-user to confirm that the application should be closed. The example below shows how this can be done:

```
UI_APPLICATION::Main()
{

    // Reset the break handler.
    UID_KEYBOARD::breakHandlerSet = L_EXIT_FUNCTION;
    .
    .
```

```
    .
}
```

Keyboard event information

The keyboard device provides the following event information (declared in **UI_EVT.HPP**) when a keyboard event is placed on the event queue:

```
struct ZIL_EXPORT_CLASS UI_KEY
{
    ZIL_RAW_CODE shiftState;
    ZIL_RAW_CODE value;
};

struct ZIL_EXPORT_CLASS UI_EVENT
{
    EVENT_TYPE type;            // The type of event (E_KEY).
    ZIL_RAW_CODE rawCode;          // The key's raw scan code.
    ZIL_RAW_CODE modifiers;
    .
    .
    .

    union
    {
        UI_KEY key;             // The key information.
        UI_REGION region;
        UI_POSITION position;
        UI_SCROLL_INFORMATION scroll;
        void *data;
    };

    // Member functions are described in the UI_EVENT reference chapter.
    .
    .
    .

};
```

- *type* is the event type. The UID_KEYBOARD device always generates an E_KEY event.

- *rawCode* is the key's raw scan code. **UI_MAP.HPP** contains **const** values for raw scan codes. Here are a few values for DOS:

```
const ZIL_RAW_CODE ENTER            =   0x1C0D;
const ZIL_RAW_CODE ESCAPE           =   0x011B;
const ZIL_RAW_CODE F1               =   0x3B00;
const ZIL_RAW_CODE GRAY_UP_ARROW    =   0x48E0;
```

- *modifiers* is a flag field that indicates the shift state of the keyboard.

- *key.shiftState* is the shift state of the keyboard. The shift state may contain one or more of the following flags (declared in **UI_EVT.HPP**):

  S_ALT—Indicates that the <Alt> key was pressed.

S_CAPS_LOCK—Indicates that the <Caps-Lock> key was on.

S_CTRL—Indicates that the <Ctrl> key was pressed.

S_INSERT—Indicates that the <Ins> key was on.

S_LEFT_SHIFT—Indicates that the <Left-Shift> key was pressed.

S_NUM_LOCK—Indicates that the <Num-Lock> key was on.

S_RIGHT_SHIFT—Indicates that the <Right-Shift> key was pressed.

S_SCROLL_LOCK—Indicates that the <Scroll-Lock> key was on.

- *key.value* is the key's value. It is not the scan code.

UID_KEYBOARD::UID_KEYBOARD

Syntax

#include <ui_evt.hpp>

UID_KEYBOARD(ZIL_DEVICE_STATE *state* = D_ON);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UID_KEYBOARD class object.

- $state_{in}$ is the initial state of the keyboard device. The keyboard device may be set to one of the following states (declared in **UI_EVT.HPP**):

D_OFF—Turns the keyboard device off. If the keyboard state is set to D_OFF, events are removed from the keyboard buffer but are not placed in the event queue (i.e., they are discarded).

D_ON—Turns the keyboard device on. If the keyboard is on, keyboard events will be placed on the event queue. This is the default value if no argument is provided.

The state of the UID_KEYBOARD device can be changed at run-time using the **UID_KEYBOARD::Event( )**, **UI_EVENT_MANAGER::Event( )** or **UI_EVENT_-MANAGER::DeviceState( )** function calls.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard, mouse and cursor devices.
    UI_TEXT_DISPLAY *display = new UI_TEXT_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // This automatically calls the keyboard, mouse and cursor destructors.
    delete eventManager;
    delete display;
    return (0);
}
```

UID_KEYBOARD::~UID_KEYBOARD

Syntax

#include <ui_evt.hpp>

virtual ~UID_KEYBOARD(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UID_KEYBOARD object. Care should be taken to only destroy a keyboard device that is not attached to the Event Manager.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard, mouse and cursor devices.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // This automatically calls the keyboard, mouse and cursor destructors.
    delete eventManager;
    delete display;
}
```

UID_KEYBOARD::Event

Syntax

#include <ui_evt.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function processes messages sent to the keyboard device. It is declared virtual so that any derived keyboard class can override its default operation.

- *returnValue*$_{out}$ is the current state of the keyboard device. This value will be D_OFF or D_ON.

- *event*$_{in}$ contains a run-time message for the keyboard object. The following events are processed by **Event( )**:

  D_OFF—Turns the keyboard device off. If the keyboard state is set to D_OFF, events are removed from the keyboard buffer but are not placed in the event queue (i.e., they are discarded).

  D_ON—Turns the keyboard device on. If the keyboard is on, keyboard events will be placed on the event queue. This is the default value if no argument is provided.

NOTE: Because most graphical operating systems already process their own events related to this object, the messages listed above may not be handled in every environment. Wherever possible, Zinc allows the operating system to process its own messages so that memory use and speed will be as efficient as possible.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard to the event manager.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    UID_KEYBOARD *keyboard = new UID_KEYBOARD;
    *eventManager + keyboard;
    .
    .
    .

    // Turn the keyboard off directly.
```

```
    UI_EVENT event;
    event.type = D_OFF;
    keyboard->Event(event);
    .
    .
    .
}
```

UID_KEYBOARD::Poll

Syntax

#include <ui_evt.hpp>

virtual void Poll(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function places any pending keyboard events on the event queue.

Example

An example of the **Poll( )** member function is given in **UI_DEVICE::Poll( )**.

CHAPTER 47 – UID_MOUSE

The UID_MOUSE class is used to manage the mouse device. This class handles events generated by the hardware mouse device and controls the presentation of the mouse image. In environments other than DOS and Curses, the operating system handles the management of the mouse. In those environments, the UID_MOUSE class provides little, if any, control over the mouse.

The UID_MOUSE class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS UID_MOUSE : public UI_DEVICE
{
public:
#if defined(ZIL_MSDOS) && !defined(ZIL_TEXT_ONLY)
    static int defaultInitialized;
    static ZIL_ICHAR _className[];
#endif
    DEVICE_IMAGE image;
    UI_POSITION position;

    UID_MOUSE(ZIL_DEVICE_STATE state = D_ON, DEVICE_IMAGE image = DM_WAIT);
    virtual ~UID_MOUSE(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event);

protected:
    UI_POSITION offset;

    virtual void Poll(void);
    // I18N member variables and functions.
#if defined(ZIL_MSDOS) && !defined(ZIL_TEXT_ONLY)
    const ZIL_DECORATION *myDecorations;
#endif
public:
#if defined(ZIL_MSDOS)
    void MouseMove(int deltaX, int deltaY);
#endif
};
```

General Members

This section describes those members that are used for general purposes.

- *defaultInitialized* indicates if the default decorations (i.e., images) for this object have been set up. The default decorations are located in the file **IMG_DEF.CPP**. If *defaultInitialized* is TRUE, the decorations have been set up. Otherwise, they have not been.

- *_className* contains a string identifying the class. The string is always the same name as the class, is always in English, and never changes. For example, for the UID_MOUSE class, *_className* is "UID_MOUSE."

- *image* identifies the type of mouse cursor being displayed on the screen. *image* may be one of the following:

  DM_DIAGONAL_ULLR—Displays the image shown when sizing the top-left or bottom-right corner of a window.

  DM_DIAGONAL_LLUR—Displays the image shown when sizing the top-right or bottom-left corner of a window.

  DM_DRAG_COPY—Displays the image shown when dragging an object to copy it.

  DM_DRAG_MOVE—Displays the image shown when dragging an object to move it.

  DM_EDIT—Displays the image shown when positioned over an editable field.

  DM_HORIZONTAL—Displays the image shown when sizing a window horizontally.

  DM_MOVE—Displays the image shown when indicating that the object is to be moved.

  DM_POSITION—Displays the image shown when indicating that something is to be positioned by the device.

  DM_VERTICAL—Displays the image shown when sizing a window vertically.

  DM_VIEW—Displays the default image, typically an arrow.

  DM_WAIT—Displays the image shown to indicate to the user that some processing is taking place and that he should wait.

  NOTE: Because Zinc allows the graphical operating systems to handle their images, not all of these images may be supported in all environments.

- *position* contains the mouse cursor's true screen position (based on the screen's 0,0 left-top based coordinates). The value of this structure depends on the type of display

mode in which the application is running. For example, a mouse cursor positioned in the middle of the screen may contain a *position.column* value of 40 and *position.line* value of 12, if the application is running in text mode. The same mouse cursor position, however, may produce values of 320 and 240 if the application is running in VGA graphics mode.

- *offset* is an offset, from *position*, where the mouse image will be displayed.

Mouse event information

The mouse device provides the following event information (declared in **UI_EVT.HPP**) when a mouse event is placed on the event queue:

```
struct UI_POSITION
{
    int column;                 // The mouse column position.
    int line;                   // The mouse line position.
};

struct ZIL_EXPORT_CLASS UI_EVENT
{
    EVENT_TYPE type;            // The type of event (E_MOUSE).
    ZIL_RAW_CODE rawCode;           // The keyboard and mouse scan code
    ZIL_RAW_CODE modifiers;         // Keyboard modifier key scan codes.

#if defined(ZIL_MSWINDOWS)
    MSG message;                // Windows message field.
#elif defined(ZIL_OS2)
    QMSG message;               // OS/2 message field.
#elif defined(ZIL_MOTIF)
    XEvent message;             // Motif message field.
#endif

    union
    {
        UI_KEY key;
        UI_REGION region;
        UI_POSITION position;   // The mouse position
        UI_SCROLL_INFORMATION scroll;
        .
        .
        .

        void *data;
    };

    // Member functions are described in the UI_EVENT reference chapter.
    .
    .
    .

};
```

- *type* is the event type. The mouse device always generates an E_MOUSE event in DOS and Curses.

- *rawCode* contains the keyboard's shift state and the mouse's button state. The possible state values are as follows:

  M_LEFT—The left mouse button is pressed. The Macintosh uses this value with single-button mice.

  M_LEFT_CHANGE—The left mouse button state has changed. If the M_-LEFT_CHANGE and M_LEFT flags are set, the left button has just been pressed. Otherwise, the left button has just been released. The Macintosh uses this value with single-button mice.

  M_MIDDLE—The middle mouse button is pressed. This flag will only be set when a three-button mouse is in use.

  M_MIDDLE_CHANGE—The middle mouse button state has changed. If the M_MIDDLE_CHANGE and M_MIDDLE flags are set, the middle button has just been pressed. Otherwise, the middle button has just been released. This flag will only be set when a three-button mouse is in use.

  M_RIGHT—The right mouse button is pressed.

  M_RIGHT_CHANGE—The right mouse button state has changed. If the M_-RIGHT_CHANGE and M_RIGHT flags are set, the right button has just been pressed. Otherwise, the right button has just been released.

  S_ALT—Indicates that the <Alt> key was pressed.

  S_CAPS_LOCK—Indicates that the <Caps-Lock> key was on.

  S_CTRL—Indicates that the <Ctrl> key was pressed.

  S_INSERT—Indicates that the <Ins> key was on.

  S_LEFT_SHIFT—Indicates that the <Left-Shift> key was pressed.

  S_NUM_LOCK—Indicates that the <Num-Lock> key was on.

  S_RIGHT_SHIFT—Indicates that the <Right-Shift> key was pressed.

  S_SCROLL_LOCK—Indicates that the <Scroll-Lock> key was on.

NOTE: The **M_TOP_CHANGE** and **M_BOTTOM_CHANGE** values are only used when a window object is to be sized. They are not set by the UID_MOUSE class.

- *modifiers* is a flag field that indicates the shift state of the keyboard.
- *position.column* is the mouse's horizontal position. In graphics mode, this value is given in pixel coordinates. In text mode, this value is given in character coordinates.
- *position.line* is the mouse's vertical position. In graphics mode, this value is given in pixel coordinates. In text mode, this value is given in character coordinates.

UID_MOUSE::UID_MOUSE

Syntax

```
#include <ui_evt.hpp>

UID_MOUSE(ZIL_DEVICE_STATE state = D_ON,
    DEVICE_IMAGE image = DM_WAIT);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UID_MOUSE class object.

- $state_{in}$ is the initial state of the mouse device. The mouse device may be set to one of the following states (declared in **UI_EVT.HPP**):

  D_HIDE—Initializes the mouse to be on but not visible.

  D_OFF—Turns the mouse device off. If the mouse is off, no mouse events will be placed on the event queue.

D_ON—Turns the mouse device on. If the mouse is on, mouse events will be placed on the event queue. This is the default value if no argument is provided.

The state of the UID_MOUSE device can be changed at run-time using the **UID_MOUSE::Event( )**, **UI_EVENT_MANAGER::Event( )** or **UI_EVENT_MANAGER::DeviceState( )** function calls.

- *image*$_{in}$ identifies the initial mouse image to be displayed. See the description of the *image* member above for more details.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard, mouse and cursor devices.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // This automatically calls the keyboard, mouse and cursor destructors.
    delete eventManager;
    delete display;
    return (0);
}
```

UID_MOUSE::~UID_MOUSE

Syntax

#include <ui_evt.hpp>

virtual ~UID_MOUSE(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UID_MOUSE object. Care should be taken to only destroy a mouse device that is not attached to the Event Manager.

Example

```
#include <ui_evt.hpp>

main()
{
    // Attach the keyboard, mouse and cursor devices.
    UI_DISPLAY *display = new UI_MSC_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
    *eventManager
        + new UID_KEYBOARD
        + new UID_MOUSE
        + new UID_CURSOR;
    .
    .
    .

    // This automatically calls the device destructors.
    delete eventManager;
    delete display;
    return (0);
}
```

UID_MOUSE::Event

Syntax

#include <ui_evt.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function processes messages sent to the mouse device. It is declared

virtual so that any derived mouse class can override its default operation.

- *returnValue*$_{out}$ is the current state of the mouse device. This value will be D_OFF, D_ON or D_HIDE.

- *event*$_{in}$ contains a run-time message for the mouse device. The following events are processed by **Event( )**:

  DM_DIAGONAL_ULLR—Displays the image shown when sizing the top-left or bottom-right corner of a window.

  DM_DIAGONAL_LLUR—Displays the image shown when sizing the top-right or bottom-left corner of a window.

  DM_DRAG_COPY—Displays the image shown when dragging an object to copy it.

  DM_DRAG_MOVE—Displays the image shown when dragging an object to move it.

  DM_EDIT—Displays the image shown when positioned over an editable field.

  DM_HORIZONTAL—Displays the image shown when sizing a window horizontally.

  DM_MOVE—Displays the image shown when indicating that the object is to be moved.

  DM_POSITION—Displays the image shown when indicating that something is to be positioned by the device.

  DM_VERTICAL—Displays the image shown when sizing a window vertically.

  DM_VIEW—Displays the default image, typically an arrow.

  DM_WAIT—Displays the image shown to indicate to the user that some processing is taking place and that he should wait.

  D_HIDE—Hides the mouse.

  D_OFF—Turns the mouse device off. If the mouse is off, no mouse events will be placed on the event queue.

D_ON—Turns the mouse device on. If the mouse is on, mouse events will be placed on the event queue. This is the default value if no argument is provided.

D_STATE—Returns the current state of the mouse. If the mouse is on, the *image* will be returned.

S_DEINITIALIZE—De-initializes the device.

S_INITIALIZE—Initializes the device.

S_POSITION—Changes the screen position of the mouse. If this message is sent, *event.position.column* and *event.position.line* must contain the run-time display position of the mouse on the screen. The values of *event.position.column* and *event.position.line* depend on the type of display mode in which the application is running. For example, if the mouse is to be positioned at the center of the screen while the application is running in text mode (e.g., an 80 column by 25 line screen) the position values should be:

```
event.position.column = 40;
event.position.line = 13;
```

If, on the other hand, the application is running in a 640 column by 480 line graphics mode, the position values should be:

```
event.position.column = 320;
event.position.line = 240;
```

If the mouse is in a D_OFF state, the position change will be reflected when the mouse is turned back on.

The state of the mouse device may also be changed using the **UI_EVENT_MANAGER::-Event( )** or **UI_EVENT_MANAGER::DeviceState( )** functions.

NOTE: Because most graphical operating systems already process their own events related to this object, the messages listed above may not be handled in every environment. Wherever possible, Zinc allows the operating system to process its own messages so that memory use and speed will be as efficient as possible.

Example

```
#include <ui_evt.hpp>

main()
{
    UI_DISPLAY *display = new UI_GRAPHICS_DISPLAY;
    UI_EVENT_MANAGER *eventManager = new UI_EVENT_MANAGER(display);
```

```
    UID_MOUSE *mouse = new UID_MOUSE;
    *eventManager + mouse;
    .
    .
    .

    // Turn on the mouse wait cursor.
    UI_EVENT event;
    event.type = DM_WAIT;
    mouse->Event(event);
    .
    .
    .

    // Turn on the mouse arrow cursor.
    UI_EVENT event;
    event.type = DM_VIEW;
    mouse->Event(event);
}
```

UID_MOUSE::MouseMove

Syntax

#include <ui_evt.hpp>

void MouseMove(int *deltaX*, int *deltaY*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This advanced function moves the mouse from its current position by the amount indicated in *deltaX* and *deltaY*. The mouse will not be allowed to move off the edge of the screen.

- $deltaX_{in}$ is the distance to move the mouse horizontally.
- $deltaY_{in}$ is the distance to move the mouse vertically.

UID_MOUSE::Poll

Syntax

#include <ui_evt.hpp>

virtual void Poll(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function places any pending mouse events on the event queue.

Example

An example of the **Poll( )** member function is given in **UI_DEVICE::Poll( )**.

Internationalization Members

This section describes those members that are used for internationalization purposes.

- *myDecorations* is the ZIL_DECORATION object that contains the images for this object.

CHAPTER 48 – UID_TIMER

The UID_TIMER class is used to notify an object when a specified length of time has elapsed. When the timer expires, it sends a message to the object and, if desired, can also place a message on the event queue. The timer should not be used for time-critical tasks that require notification at exact time intervals. The UID_TIMER class is not an interrupt driven class and must wait for current processes to give up the CPU before it can process a timer expiration. It is possible, depending on the system load, for several timer intervals to elapse before the timer is able to generate a timer message. Thus, the object requesting timer services should look at the current time when it receives a timer notification if it needs to know exactly how much time has elapsed since the last notification.

A timer can be set to expire at a single interval. If more than one timer interval is required, simply create another timer with the new interval.

A timer device is attached to the Event Manager. Objects requesting timer services, if any, are attached to the timer by sending the timer an S_ADD_OBJECT message. When the object no longer requires timer services, it should notify the timer by sending an S_SUBTRACT_OBJECT message. It is very important that an object be removed from the timer device if it is being deleted. Otherwise, the timer may attempt to send a timer message to the object after its memory has been freed, resulting in undefined, and likely fatal, behavior. An object can remove itself from the timer either in its destructor or when it receives an S_DEINITIALIZE message.

The UID_TIMER class is declared in **UI_EVT.HPP**. Its public and protected members are:

```
class UID_TIMER : public UI_DEVICE
{
#if defined(ZIL_MOTIF)
    friend void TimerCallback(XtPointer client_data, XtIntervalId *id);
#endif

public:
    TMR_FLAGS tmrFlags;

    UID_TIMER(ZIL_DEVICE_STATE state = D_ON, unsigned interval = 0,
        TMR_FLAGS tmrFlags = TMR_NO_FLAGS);
    virtual ~UID_TIMER(void);
    virtual EVENT_TYPE Event(const UI_EVENT &event);

    // NOTIFY_ELEMENT and NOTIFY_LIST should be treated as protected,
    // but this causes compiler errors on some systems.
    class NOTIFY_ELEMENT : public UI_ELEMENT
    {
    public:
        UI_WINDOW_OBJECT *notifyObject;
        NOTIFY_ELEMENT(UI_WINDOW_OBJECT *object);
        virtual ~NOTIFY_ELEMENT(void);
        NOTIFY_ELEMENT *Next(void);
```

```
        NOTIFY_ELEMENT *Previous(void);
    };

    class NOTIFY_LIST : public UI_LIST
    {
    public:
        NOTIFY_ELEMENT *First(void);
        NOTIFY_ELEMENT *Last(void);
    };

protected:
    unsigned msec;
    ZIL_UTIME interval;
    ZIL_UTIME lastTime;
    NOTIFY_LIST notifyList;

    virtual void Poll(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *tmrFlags* are flags that define the operation of the UID_TIMER class. A full description of the timer flags is given in the UID_TIMER constructor.

- *msec* is the length of time, in milliseconds, that must elapse before the timer generates a timer message.

- *interval* is the length of time, in milliseconds, that must elapse before the timer generates a timer message. This representation of the interval (i.e., as a ZIL_UTIME) is used to ensure that time comparisons that cross the midnight boundary are calculated correctly.

- *lastTime* is the last time at which the timer device expired and sent a timer message. This time is used as a reference to determine if the time specified by *interval* has expired.

- *notifyList* is the list of objects that have requested timer services from this timer device. This list is a NOTIFY_LIST of NOTIFY_ELEMENT objects. These classes will not be discussed, as they simply maintain a doubly-linked list of pointers.

UID_TIMER::UID_TIMER

Syntax

#include <ui_evt.hpp>

UID_TIMER(ZIL_DEVICE_STATE *state* = D_ON, unsigned *interval* = 0,
TMR_FLAGS *tmrFlags* = TMR_NO_FLAGS);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new UID_TIMER class object.

- $state_{in}$ is the initial state of the timer device. The timer device may be initialized to one of the following states (defined in **UI_EVT.HPP**):

  D_OFF—Initializes the timer to be off. In this state, the timer will not generate timer messages.

  D_ON—Initializes the timer to be on. In this state, the timer will generate timer messages when the timer expires.

- $interval_{in}$ is the length of time, in milliseconds, that must elapse before the timer generates a timer message. The resolution of the timer (i.e., how short the intervals can be) depends largely on the operating system and the system load. Because timer messages are generated from the **Poll( )** function, how often the **Poll( )** function is called can affect the resolution. For example, the OS/2 system timer can "fire" 18.2 times a second (the hardware clock tick rate). The OS/2 timer is only used to notify the application in case the application has become idle (in which case the **Poll( )** is not being called). So, we are "assured" (with the limitations mentioned previously) of the timer activating at least 18.2 times each second in OS/2. Setting the Q_NO_-BLOCK flag on calls to **UI_EVENT_MANAGER::Get( )** in the main event loop and setting an interval of 0 will result in timer messages being generated as quickly as possible.

The maximum *interval* allowed varies depending on the operating system. Windows has the shortest maximum interval at 65535 milliseconds. DOS can have intervals of up to 2^{32} milliseconds.

If *interval* is 0, the default, timer messages will be generated as quickly as possible. How often zero-interval timer messages are generated depends on the operating system, whether there are other processes running and how long the application takes to process a timer message.

- *tmrFlags*$_{in}$ are flags that define the operation of the UID_TIMER class. The following flags (declared in **UI_WIN.HPP**) control the general presentation of a UID_TIMER class object:

  TMR_NO_FLAGS—Does not associate any special flags with the UID_TIMER class object.

  TMR_QUEUE_EVENTS—Causes the timer to place a timer event on the event queue when the timer expires. Generally, this flag should only be set if no objects are requesting timer services directly, but it can be used if objects are requesting services.

UID_TIMER::~UID_TIMER

Syntax

#include <ui_evt.hpp>

virtual ~UID_TIMER(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the UID_TIMER object.

UID_TIMER::Event

Syntax

#include <ui_evt.hpp>

virtual EVENT_TYPE Event(const UI_EVENT *&event*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function processes messages sent to the timer device. It is declared virtual so that any derived timer class can override its default operation.

- $returnValue_{out}$ is the current state of the timer device. This value will be D_OFF or D_ON.

- $event_{in}$ contains a run-time message for the timer object. The following messages (declared in **UI_EVT.HPP**) are processed by the **Event( )** function:

  D_OFF—Turns off the timer. If the timer is off, it will not generate timer messages.

  D_ON—Turns on the timer. If the timer is on, it will generate timer messages when the timer expires.

  S_DEINITIALIZE—De-initializes the timer device. If necessary, the timer will turn off any timer processing that was previously set up with the operating system.

  S_INITIALIZE—Initializes the timer device. If necessary, the timer device will set up timer processing with the operating system.

S_ADD_OBJECT—Adds an object to the timer's *notifyList*. If this message is sent, *event.windowObject* must be a pointer to the object requesting timer services.

S_SUBTRACT_OBJECT—Removes an object from the timer's *notifyList*. If this message is sent, *event.windowObject* must be a pointer to the object requesting that it no longer receive timer services.

UID_TIMER::Poll

Syntax

```
#include <ui_evt.hpp>

virtual void Poll(void);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function checks to see if the timer has expired. If so, it sends an E_TIMER message to all objects that have requested timer services from this timer. It also places an E_TIMER event on the event queue if the TMR_QUEUE_EVENTS flag is set for the timer. In both cases *event.device* will point to the timer device generating the message.

Example

An example of the **Poll( )** member function is presented in **UI_DEVICE::Poll( )**.

CHAPTER 49 – ZIL_BIGNUM

The ZIL_BIGNUM class is a lower-level class used to store and manipulate numerical values. It is not a window object. See "Chapter 1—UIW_BIGNUM" of *Programmer's Reference Volume 2* for information about the bignum window object. The values handled by ZIL_BIGNUM include both integer and real bignums with a default maximum of 30 digits to the left and 8 digits to the right of the decimal point.

The ZIL_BIGNUM class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
#define NUMBER_WHOLE 30
#define NUMBER_DECIMAL 8
#if ZIL_WORD_SIZE > 16
#   define ZIL_DIGITS 8
#else
#   define ZIL_DIGITS 4
#endif

typedef ZIL_INT32 ZIL_IBIGNUM;
typedef double ZIL_RBIGNUM;
#if ZIL_DIGITS == 4
    typedef ZIL_UINT16 ZIL_NUMBER;
#elif ZIL_DIGITS == 8
    typedef ZIL_UINT32 ZIL_NUMBER;
#endif

class ZIL_EXPORT_CLASS ZIL_BIGNUM : public ZIL_INTERNATIONAL
{
    friend class ZIL_EXPORT_CLASS UIW_BIGNUM;

    friend ZIL_BIGNUM &abs(const ZIL_BIGNUM &number);
    friend ZIL_BIGNUM &ceil(const ZIL_BIGNUM &number);
    friend ZIL_BIGNUM &floor(const ZIL_BIGNUM &number);
    friend ZIL_BIGNUM &round(const ZIL_BIGNUM &number, int places = 0);
    friend ZIL_BIGNUM &truncate(const ZIL_BIGNUM &number, int places = 0);

public:
    ZIL_BIGNUM(void);
    ZIL_BIGNUM(ZIL_IBIGNUM value);
    ZIL_BIGNUM(ZIL_RBIGNUM value);
    ZIL_BIGNUM(const ZIL_ICHAR *string,
        const ZIL_ICHAR *decimalString = ZIL_NULLP(ZIL_ICHAR),
        const ZIL_ICHAR *signString = ZIL_NULLP(ZIL_ICHAR));
    ZIL_BIGNUM(const ZIL_BIGNUM &number);
    virtual ~ZIL_BIGNUM(void);
    void Export(ZIL_IBIGNUM *value);
    void Export(ZIL_RBIGNUM *value);
    void Export(ZIL_ICHAR *string, NMF_FLAGS nmFlags,
        const ZIL_ICHAR *decimalString = ZIL_NULLP(ZIL_ICHAR),
        const ZIL_ICHAR *signStr = ZIL_NULLP(ZIL_ICHAR));
    NMI_RESULT Import(ZIL_IBIGNUM value);
    NMI_RESULT Import(ZIL_RBIGNUM value);
    NMI_RESULT Import(const ZIL_BIGNUM &number);
    NMI_RESULT Import(const ZIL_ICHAR *string,
        const ZIL_ICHAR *decimalString = ZIL_NULLP(ZIL_ICHAR),
        const ZIL_ICHAR *signString = ZIL_NULLP(ZIL_ICHAR));

    ZIL_BIGNUM &operator=(const ZIL_BIGNUM &number);
    ZIL_BIGNUM &operator+(const ZIL_BIGNUM &number);
```

```
    ZIL_BIGNUM &operator-(const ZIL_BIGNUM &number);
    ZIL_BIGNUM &operator*(const ZIL_BIGNUM &number);
    ZIL_BIGNUM &operator++(void);
    ZIL_BIGNUM &operator--(void);
    ZIL_BIGNUM &operator+=(const ZIL_BIGNUM &number);
    ZIL_BIGNUM &operator-=(const ZIL_BIGNUM &number);
    int operator==(const ZIL_BIGNUM &number);
    int operator!=(const ZIL_BIGNUM &number);
    int operator>(const ZIL_BIGNUM &number);
    int operator>=(const ZIL_BIGNUM &number);
    int operator<(const ZIL_BIGNUM &number);
    int operator<=(const ZIL_BIGNUM &number);
    void SetLocale(const ZIL_ICHAR *localeName)

protected:
    const ZIL_LOCALE *myLocale;

};
```

General Members

This section describes those members that are used for general purposes.

- *NUMBER_WHOLE* is the number of digits allowed to the left of the decimal place. The default is to allow 30 digits to the left of the decimal place. To use numbers with more than 30 digits to the left of the decimal place, simply change the value of *NUMBER_WHOLE* to the desired amount and recompile the bignum module. No other changes are necessary.

- *NUMBER_DECIMAL* is the number of digits allowed to the right of the decimal place. The default is to allow 8 digits to the right of the decimal place. To use numbers with greater precision than 8 decimal places, simply change the value of *NUMBER_DECIMAL* to the desired amount and recompile the bignum module. No other changes are necessary.

- *ZIL_DIGITS* is used for number conversion and manipulation. The default value is 4, which allows the ZIL_BIGNUM class to work with integer values of 32 bits or less. If this value is changed to 8, the ZIL_BIGNUM class will work with integer values of 32 bits or more. The size of the integer used depends on the environment being compiled for.

NOTE: The ZIL_BIGNUM class uses special number types to do numerical operations. With the ZIL_BIGNUM class, use the following number types:

- *ZIL_IBIGNUM* is an integral data type associated with ZIL_BIGNUM. This type should be used when integer operations are done. It is defined to be of type

ZIL_INT32, which will be a signed int of at least 32 bits, depending on the word size of the environment being compiled for.

- *ZIL_RBIGNUM* is the real number data type associated with ZIL_BIGNUM. This type should be used when real operations are done. It is defined to be of type **double**. Using this type will require that the floating point library be used which will increase, often significantly, the size of the executable. Unless an individual application requires that floating point numbers be used, it is recommended that the string equivalent of a decimal number be used instead of the floating point numbers (i.e., "1.1" vs. 1.1).

- *ZIL_NUMBER* is a type used internally by the ZIL_BIGNUM class. Programmers need not use this type.

- *myLocale* is the ZIL_LOCALE object that contains the formatting information for this object.

ZIL_BIGNUM::ZIL_BIGNUM

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM(void);
or
ZIL_BIGNUM(ZIL_IBIGNUM *value*);
or
ZIL_BIGNUM(ZIL_RBIGNUM *value*);
or
ZIL_BIGNUM(const ZIL_ICHAR **string*,
const ZIL_ICHAR **decimalString* = ZIL_NULLP(ZIL_ICHAR),
const ZIL_ICHAR **signString* = ZIL_NULLP(ZIL_ICHAR));
or
ZIL_BIGNUM(const ZIL_BIGNUM &*number*);

Portability

These functions are available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors create a new ZIL_BIGNUM class object.

The first overloaded constructor creates a ZIL_BIGNUM object and initializes its value to zero.

The second overloaded constructor creates a ZIL_BIGNUM object and initializes its value with *value*.

- $value_{in}$ is a *ZIL_IBIGNUM* (integer) value to which the ZIL_BIGNUM object will be initialized.

The third overloaded constructor creates a ZIL_BIGNUM object and initializes its value with *value*.

- $value_{in}$ is a *ZIL_RBIGNUM* (real) value to which the ZIL_BIGNUM object will be initialized.

The fourth overloaded constructor creates a ZIL_BIGNUM object and initializes its value with *string*.

- $string_{in}$ is a character string that contains the value, either integral or real, to which the ZIL_BIGNUM object will be initialized.

- $decimalString_{in}$ is a pointer to the decimal character to be used in formatting the decimal number.

- $signString_{in}$ is a pointer to the sign character to be used in formatting the bignum.

The fifth overloaded constructor creates a ZIL_BIGNUM object and initializes its value with *number*.

- $number_{in}$ is another ZIL_BIGNUM object whose value will be copied into the ZIL_-BIGNUM object being constructed.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_IBIGNUM i = 4;
    ZIL_RBIGNUM r = 7.1;
```

```
    ZIL_BIGNUM number1;
    ZIL_BIGNUM *number2 = new ZIL_BIGNUM(i);
    ZIL_BIGNUM *number3 = new ZIL_BIGNUM(r);
    ZIL_BIGNUM *number4 = new ZIL_BIGNUM("100");
    ZIL_BIGNUM *number5 = new ZIL_BIGNUM(&number1);
    .
    .
    .

    delete number5;
    delete number4;
    delete number3;
    delete number2;
}
```

ZIL_BIGNUM::~ZIL_BIGNUM

Syntax

#include <ui_gen.hpp>

virtual ~ZIL_BIGNUM(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the ZIL_BIGNUM object. Care should be taken to only destroy a ZIL_BIGNUM class that is not attached to another associated object.

Example

```
#include <ui_gen.hpp>
ExampleFunction()
{
    ZIL_BIGNUM *number = new ZIL_BIGNUM("100");
    .
    .
    .
    delete number;
}
```

ZIL_BIGNUM::abs

Syntax

friend ZIL_BIGNUM &abs(const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to a ZIL_BIGNUM object containing the absolute value of the ZIL_BIGNUM value passed in.

- $returnValue_{out}$ is a ZIL_BIGNUM object containing the absolute value of *number*.
- $number_{in}$ is a ZIL_BIGNUM object for which the absolute value is desired.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM *firstValue;
    ZIL_BIGNUM secondValue("-100");
    ZIL_BIGNUM thirdValue("-100");
    .
    .
    .

    firstValue = abs(secondValue + thirdValue);
}
```

ZIL_BIGNUM::ceil

Syntax

friend ZIL_BIGNUM &ceil(const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to a ZIL_BIGNUM object containing the ceiling value of the ZIL_BIGNUM value. The ceiling of a bignum is considered to be the smallest integer that is greater than or equal to *number*.

- *returnValue*$_{out}$ is a ZIL_BIGNUM object containing the ceiling value of *number*.
- *number*$_{in}$ is a ZIL_BIGNUM object for which the ceiling value is desired.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM *firstValue;
    ZIL_BIGNUM secondValue("100.6");
    .
    .
    .
    firstValue = ceil(secondValue);
}
```

ZIL_BIGNUM::Export

Syntax

#include <ui_gen.hpp>

void Export(ZIL_IBIGNUM **value*);
or
void Export(ZIL_RBIGNUM **value*);
or
void Export(ZIL_ICHAR **string*, NMF_FLAGS *nmFlags*,
const ZIL_ICHAR **decimalString* = ZIL_NULLP(ZIL_ICHAR),
const ZIL_ICHAR **signStr* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions return the numerical information through a function-specific numeric value.

The first two overloaded functions copy the bignum information into the *value* argument.

- $value_{out}$ is a numeric value. The following types are supported for *value*:

  ZIL_IBIGNUM—A type which will be a signed int of at least 32 bits, depending on the environment being compiled for. For an environment that uses 32-bit words or smaller, the value can be between -2,147,483,648 and 2,147,483,647 (32 bits, signed), inclusive. For environments that use 64-bit words, the value can be between -9,223,372,036,854,775,809 and 9,223,372,036,854,775,808 (64 bits, signed), inclusive.

  ZIL_RBIGNUM—A double precision floating point number.

The third overloaded function copies the number into the *string* argument. When this function is used, space must be previously allocated for *string* by the programmer.

- $string_{out}$ is a pointer to a string that represents the bignum's value.

- $nmFlags_{in}$ gives formatting information about the return bignum's value. The following flags (declared in **UI_GEN.HPP**) are used to format the bignum string:

  NMF_COMMAS—Formats the bignum with commas (or the appropriate locale-specific thousands separator symbols).

  NMF_CREDIT—Formats the bignum with the locale-specific credit symbols whenever the bignum is negative.

  NMF_CURRENCY—Formats the bignum string with the locale-specific currency symbol.

NMF_DECIMAL(*decimal*)—Formats the bignum string with *decimal* number of decimal places to the right of the decimal point. Decimal places from 0 to 8 are supported by default. If more decimal places are desired, modify the value of the *NUMBER_DECIMAL* macro as described above.

NMF_DIGITS(*digits*)—Formats the bignum string with *digits* number of digits to the left of the decimal point. Digits from 0 to 30 are supported. If more digits are desired, modify the value of the *NUMBER_WHOLE* macro as described above.

NMF_NO_FLAGS—Does not associate any special flags with the ZIL_BIGNUM class object. This flag should not be used in conjunction with any other NMF flags.

NMF_PERCENT—Formats the bignum with the percent symbol.

- *decimalString*$_{in}$ is a pointer to the decimal character to be used in formatting the decimal number.
- *signStr*$_{in}$ is a pointer to the sign character to be used in formatting the bignum.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    .
    .
    .

    char string2[40];
    number.Export(string2, NMF_NO_FLAGS);
}
```

ZIL_BIGNUM::floor

Syntax

friend ZIL_BIGNUM &floor(const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to a ZIL_BIGNUM object containing the floor value of the ZIL_BIGNUM value passed in. The floor of a bignum is considered to be the largest integer value that is not greater than *number*.

- *returnValue*$_{out}$ is a ZIL_BIGNUM object containing the floor value of *number*.
- *number*$_{in}$ is a ZIL_BIGNUM object for which the floor value is desired.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM *firstValue;
    ZIL_BIGNUM secondValue("100.6");
    .
    .
    .

    firstValue = floor(secondValue);
}
```

ZIL_BIGNUM::GetLocale

Syntax

const ZIL_LOCALE *GetLocale(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to *myLocale*, the ZIL_LOCALE that provides formatting information.

- *returnValue*$_{out}$ is a pointer to *myLocale*.

ZIL_BIGNUM::Import

Syntax

#include <ui_gen.hpp>

NMI_RESULT Import(ZIL_IBIGNUM *value*);
or
NMI_RESULT Import(ZIL_RBIGNUM *value*);
or
NMI_RESULT Import(const ZIL_BIGNUM &*number*);
or
NMI_RESULT Import(const ZIL_ICHAR **string*,
const ZIL_ICHAR **decimalString* = ZIL_NULLP(ZIL_ICHAR),
const ZIL_ICHAR **signString* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions set the numerical information with a function-specific numeric value.

The first two overloaded functions copy the bignum information from the *value* argument.

- *returnValue*$_{out}$ is NMI_OK if the conversion was successful. Otherwise, *returnValue* is NMI_OUT_OF_RANGE and the bignum object will not be modified.

- *value*$_{in}$ is a numeric value. The following values are supported:

  ZIL_IBIGNUM—A type which will be a signed int of at least 32 bits, depending on the environment being compiled for. For an environment that uses 32-bit words or smaller, the value can be between -2,147,483,648 and 2,147,483,647 (32 bits, signed), inclusive. For environments that use 64-bit words, the value can be between -9,223,372,036,854,775,809 and 9,223,372,036,854,775,808 (64 bits, signed), inclusive.

  ZIL_RBIGNUM—A double precision floating point bignum.

The third overloaded function copies the bignum information from the *number* argument.

- *returnValue*$_{out}$ is NMI_OK if the conversion was successful. Otherwise, *returnValue* is NMI_OUT_OF_RANGE and the bignum object will not be modified.

- *number*$_{in}$ is a ZIL_BIGNUM reference variable. The value in *number* is copied into the bignum object.

The last overloaded function sets the ZIL_BIGNUM information according to the string argument.

- *returnValue*$_{out}$ is NMI_OK if the conversion was successful. Otherwise, *returnValue* is NMI_OUT_OF_RANGE and the bignum object will not be modified.

- *string*$_{in}$ is a pointer to a string that represents a bignum in character form.

- *decimalString*$_{in}$ is a pointer to the decimal character to be used in formatting the decimal number.

- *signString*$_{in}$ is a pointer to the sign character to be used in formatting the bignum.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    .
    .
    .
    ZIL_ICHAR *string = "100";
    ZIL_BIGNUM number;
    number.Import(string);
}
```

ZIL_BIGNUM::round

Syntax

friend ZIL_BIGNUM &round(const ZIL_BIGNUM &*number*, int *places* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to a ZIL_BIGNUM object containing the rounded value of the ZIL_BIGNUM value passed in.

- $returnValue_{out}$ is a ZIL_BIGNUM object containing the value of *number* rounded to the *places* decimal place.
- $number_{in}$ is the ZIL_BIGNUM value to be rounded.
- $places_{in}$ determines how many decimal places to round *number*. For example, if *places* were 1, the value 100.163 would be rounded to 100.2. If *places* were -1, the value 123.789 would be rounded to 120. The default value, 0, causes *number* to be rounded to a whole number.

Example

```
void UIW_INTL_CURRENCY::SetCountryCode(int _countryTableEntry)
{
    // Do Currency translation.
    ZIL_BIGNUM *amount = DataGet();
    ZIL_RBIGNUM value;
    amount->Export(&value);

    value *= _currency[countryTableEntry][_countryTableEntry];
    amount->Import(value);
    *amount = round(*amount, 2);

    countryTableEntry = _countryTableEntry;
    DataSet(amount);
}
```

ZIL_BIGNUM::SetLocale

Syntax

void SetLocale(const ZIL_ICHAR *_localeName_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the locale to be used by the object. The locale information for the object will be loaded and the object's *myLocale* member will be updated to point to the new ZIL_LOCALE object. By default, the object uses the locale identified in the **LOC_DEF.CPP** file, which compiles into the library. (If a different default locale is desired, simply copy a **LOC_<ISO>.CPP** file from the ZINC\SOURCE\INTL directory to the \ZINC\SOURCE directory, and rename it to **LOC_DEF.CPP** before compiling the library.) The locale information is loaded from the **I18N.DAT** file, so it must be shipped with your application.

- $localeName_{in}$ is the two-letter ISO country code identifying which locale information the object should use.

ZIL_BIGNUM::truncate

Syntax

friend ZIL_BIGNUM &truncate(const ZIL_BIGNUM &*number*, int *places* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to a ZIL_BIGNUM object containing the truncated value of the ZIL_BIGNUM value passed in.

- *returnValue*$_{out}$ is a ZIL_BIGNUM object containing the value of *number* after being truncated to *places* decimal places.
- *number*$_{in}$ is the ZIL_BIGNUM value to be truncated.
- *places*$_{in}$ specifies to which digit to truncate *number*. For example, if *places* were 1, the value 100.163 would be truncated to 100.1. If *places* were -1, the value 123.789 would be truncated to 120. The default value, 0, causes *number* to be truncated to the decimal point.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM *firstValue;
    ZIL_BIGNUM secondValue("100.6");
    .
    .
    .

    firstValue = truncate(secondValue);
}
```

ZIL_BIGNUM::operator =

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator = (const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload assigns the value of another ZIL_BIGNUM object specified by *number* to the ZIL_BIGNUM object.

- *returnValue*$_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

- *number*$_{in}$ is a ZIL_BIGNUM object containing the source value to be assigned.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM sourceValue("100");
    ZIL_BIGNUM targetValue;

    targetValue = sourceValue;
}
```

ZIL_BIGNUM::operator +

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator + (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload adds the value of another ZIL_BIGNUM object specified by *number* to the ZIL_BIGNUM object.

- *returnValue*$_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

- *number*$_{in}$ is a bignum object containing the value to be added to the ZIL_BIGNUM object.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM firstValue;
    ZIL_BIGNUM secondValue("200");

    firstValue.Import("100");
    secondValue = secondValue + firstValue;
}
```

ZIL_BIGNUM::operator -

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator - (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload subtracts the value of another ZIL_BIGNUM object specified by *number* from the ZIL_BIGNUM object.

- *returnValue*$_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

- *number*$_{in}$ is another ZIL_BIGNUM object containing the value to be subtracted from the ZIL_BIGNUM object.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM firstValue;
    ZIL_BIGNUM secondValue("200");

    firstValue.Import("100");
    secondValue = secondValue - firstValue;
}
```

ZIL_BIGNUM::operator *

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator * (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The operator overload multiplies the value of another ZIL_BIGNUM object specified by *number* by the ZIL_BIGNUM object.

- *returnValue*$_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

- *number*$_{in}$ is another ZIL_BIGNUM object containing the value to be multiplied by the ZIL_BIGNUM object.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM firstValue;
    ZIL_BIGNUM secondValue("200");

    firstValue.Import("100");
    secondValue = secondValue * firstValue;
}
```

ZIL_BIGNUM::operator ++

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator ++ (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload increments the ZIL_BIGNUM object's value by one.

- *returnValue*$_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_gen.hpp>

ExampleFunction(ZIL_BIGNUM &number)
{
    .
    .
    .
```

```
    number++;
}
```

ZIL_BIGNUM::operator --

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator -- (void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload decrements the ZIL_BIGNUM object's value by one.

- *returnValue*$_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_gen.hpp>

ExampleFunction(ZIL_BIGNUM &number)
{
    .
    .
    .

    number--;
}
```

ZIL_BIGNUM::operator +=

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator += (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload adds the value of another ZIL_BIGNUM object, specified by *number*, to the ZIL_BIGNUM object and copies the result back into the ZIL_BIGNUM object.

- $returnValue_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

- $number_{in}$ is another ZIL_BIGNUM object containing the value to be added to the ZIL_BIGNUM object.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM firstValue;
    ZIL_BIGNUM secondValue;

    firstValue.Import("100");
    secondValue.Import("200");
    secondValue += firstValue;
}
```

ZIL_BIGNUM::operator -=

Syntax

#include <ui_gen.hpp>

ZIL_BIGNUM &operator -= (const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload subtracts the value of another ZIL_BIGNUM object, specified by *number*, from the ZIL_BIGNUM object and copies the result back into the ZIL_BIGNUM object.

- $returnValue_{out}$ is a pointer to the ZIL_BIGNUM object after its value has been modified. This pointer is returned so that the operator may be used in a statement containing other operations.

- $number_{in}$ is another ZIL_BIGNUM object containing the value to be subtracted from the ZIL_BIGNUM object.

Example

```
#include <ui_gen.hpp>

ExampleFunction( )
{
    ZIL_BIGNUM firstValue;
    ZIL_BIGNUM secondValue;

    firstValue.Import("100");
    secondValue.Import("200");
    secondValue -= firstValue;
}
```

ZIL_BIGNUM::operator ==

Syntax

#include <ui_gen.hpp>

int operator == (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines if the value of the ZIL_BIGNUM object is equal to the value of the ZIL_BIGNUM object specified by *number*.

- $returnValue_{out}$ is TRUE if the ZIL_BIGNUM object is equal to *number*. Otherwise, *returnValue* is FALSE.

- $number_{in}$ is the other ZIL_BIGNUM object to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_BIGNUM governmentRevenue("10389230299.49");
    ZIL_BIGNUM governmentSpending("378321783443199.81");

    if (governmentRevenue == governmentSpending)
        printf("Budget is balanced?\n");
    else if (governmentRevenue < governmentSpending)
        printf("Big deal, this is normal.\n");
    else
        printf("Must be a computer error!\n");
}
```

ZIL_BIGNUM::operator !=

Syntax

#include <ui_gen.hpp>

int operator != (const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines if the value of the ZIL_BIGNUM object is not equal to the value of the ZIL_BIGNUM object specified by *number*.

- *returnValue*$_{out}$ is TRUE if the ZIL_BIGNUM object is not equal to *number*. Otherwise, *returnValue* is FALSE.
- *number*$_{in}$ is the other ZIL_BIGNUM object to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_BIGNUM totalDays("400");
    ZIL_BIGNUM daysPerYear("365");

    if (totalDays != daysPerYear)
    {
        if (totalDays < daysPerYear)
            printf("Less than one year has passed.\n");
        else
            printf("More than one year has passed.\n");
    }
}
```

ZIL_BIGNUM::operator >

Syntax

#include <ui_gen.hpp>

int operator > (const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the value of the ZIL_BIGNUM object is greater than the value of the ZIL_BIGNUM object specified by *number*.

- $returnValue_{out}$ is TRUE if the ZIL_BIGNUM object is greater than *number*. Otherwise, *returnValue* is FALSE.

- $number_{in}$ is the other ZIL_BIGNUM object to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_BIGNUM governmentRevenue("10389230299.49");
    ZIL_BIGNUM governmentSpending("378321783443199.81");

    if (governmentRevenue == governmentSpending)
        printf("Budget is balanced?\n");
    else if (governmentRevenue > governmentSpending)
        printf("Must be a computer error!\n");
    else
        printf("Big deal, this is normal.\n");
}
```

ZIL_BIGNUM::operator >=

Syntax

#include <ui_gen.hpp>

int operator >= (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the value of the ZIL_BIGNUM object is greater than or equal to the value of the ZIL_BIGNUM object specified by *number*.

- *returnValue*$_{out}$ is TRUE if the ZIL_BIGNUM object is greater than or equal to *number*. Otherwise, *returnValue* is FALSE.

- *number*$_{in}$ is the other ZIL_BIGNUM object to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_BIGNUM totalDays("400");
    ZIL_BIGNUM daysPerYear("365");

    if (totalDays >= daysPerYear)
        printf("One year has passed.\n");
    else
        printf("Less than one year has passed.\n");
}
```

ZIL_BIGNUM::operator <

Syntax

#include <ui_gen.hpp>

int operator < (const ZIL_BIGNUM *&number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the value of the ZIL_BIGNUM object is less than the value of the ZIL_BIGNUM object specified by *number*.

- *returnValue*$_{out}$ is TRUE if the ZIL_BIGNUM object is less than *number*. Otherwise, *returnValue* is FALSE.

- *number*$_{in}$ is the other ZIL_BIGNUM object to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_BIGNUM governmentRevenue("10389230299.49");
    ZIL_BIGNUM governmentSpending("378321783443199.81");

    if (governmentRevenue == governmentSpending)
        printf("Budget is balanced?\n");
    else if (governmentRevenue < governmentSpending)
        printf("What's new?!\n");
    else
        printf("Must be a computer error!\n");
}
```

ZIL_BIGNUM::operator <=

Syntax

#include <ui_gen.hpp>

int operator <= (const ZIL_BIGNUM &*number*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the value of the ZIL_BIGNUM object is less than or equal to the value of the ZIL_BIGNUM object specified by *number*.

- $returnValue_{out}$ is TRUE if the ZIL_BIGNUM object is less than or equal to *number*. Otherwise, *returnValue* is FALSE.

- $number_{in}$ is the other ZIL_BIGNUM object to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_BIGNUM totalDays("400");
    ZIL_BIGNUM daysPerYear("365");

    if (totalDays <= daysPerYear)
        printf("Less than one year has passed.\n");
    else
        printf("One year has passed.\n");
}
```

CHAPTER 50 – ZIL_BITMAP_ELEMENT

The ZIL_BITMAP_ELEMENT structure is used by the ZIL_DECORATION class to provide the bitmap decorations for objects. An object's decorations are those bitmaps or characters that are used to draw an image on the object. The decorations typically include a graphical image, or bitmap, for use in graphics mode and a textual image, or character string, for use in text mode. Most environments don't require these decorations since the operating system typically provides them. Zinc does all the drawing in DOS and Curses, however, so these environments use decorations extensively. An example of where a decoration would be used is the maximize button. In graphics mode, it typically has a small up-arrow bitmap. In text mode, though, it usually displays a left bracket, an up-arrow character, and a right-bracket; all text characters, of course. This class maintains the bitmap images. See "Chapter 71—ZIL_TEXT_ELEMENT" for information on the text strings used for decorations.

The ZIL_BITMAP_ELEMENT class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS ZIL_BITMAP_ELEMENT
{
    ZIL_UINT8 *bitmap;
    ZIL_NUMBERID numberID;
    ZIL_ICHAR stringID[ZIL_STRINGID_LEN];
};
```

General Members

This section describes those members that are used for general purposes.

- *bitmap* is the bitmap array maintained by the ZIL_BITMAP_ELEMENT.
- *numberID* is a numeric value used to identify the ZIL_BITMAP_ELEMENT.
- *stringID* is a string value used to identify the ZIL_BITMAP_ELEMENT.

CHAPTER 51 – ZIL_DATE

The ZIL_DATE class is a lower-level class used to store and manipulate date values. It is not a window object. See "Chapter 5—UIW_DATE" of *Programmer's Reference Volume 2* for information about the date window object.

NOTE: The **DayOfWeek**, **DaysInMonth** and **DaysInYear** functions may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

The ZIL_DATE class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_DATE : public ZIL_UTIME
{
public:
    ZIL_DATE(void);
    ZIL_DATE(const ZIL_DATE &date);
    ZIL_DATE(int year, int month, int day);
    ZIL_DATE(const ZIL_ICHAR *string, DTF_FLAGS dtFlags = DTF_NO_FLAGS);
    ZIL_DATE(int packedDate);
    int DayOfWeek(void);
    int DaysInMonth(void);
    int DaysInYear(void);
    void Export(int *year, int *month, int *day,
        int *dayOfWeek = ZIL_NULLP(int));
    void Export(ZIL_ICHAR *string, DTF_FLAGS dtFlags);
    void Export(int *packedDate);
    DTI_RESULT Import(void);
    DTI_RESULT Import(const ZIL_DATE &date);
    DTI_RESULT Import(int year, int month, int day);
    DTI_RESULT Import(const ZIL_ICHAR *string,
        DTF_FLAGS dtFlags = DTF_NO_FLAGS);
    DTI_RESULT Import(int packedDate);

    ZIL_INT32 operator=(ZIL_INT32 days);
    ZIL_INT32 operator=(const ZIL_DATE &date);
    ZIL_INT32 operator+(ZIL_INT32 days);
    ZIL_INT32 operator+(const ZIL_DATE &date);
    ZIL_INT32 operator-(ZIL_INT32 days);
    ZIL_INT32 operator-(const ZIL_DATE &date);
    ZIL_INT32 operator++(void);
    ZIL_INT32 operator--(void);
    void operator+=(ZIL_INT32 days);
    void operator-=(ZIL_INT32 days);
    int operator==(const ZIL_DATE &date);
    int operator!=(const ZIL_DATE &date);
    int operator>(const ZIL_DATE &date);
    int operator>=(const ZIL_DATE &date);
    int operator<(const ZIL_DATE &date);
    int operator<=(const ZIL_DATE &date);

    void SetBasis(int _basisYear);
    int GetBasis();
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_DATE::ZIL_DATE

Syntax

#include <ui_gen.hpp>

ZIL_DATE(void);
or
ZIL_DATE(const ZIL_DATE &*date*);
or
ZIL_DATE(int *year*, int *month*, int *day*);
or
ZIL_DATE(const ZIL_ICHAR **string*, DTF_FLAGS *dtFlags* = DTF_NO_FLAGS);
or
ZIL_DATE(int *packedDate*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded constructors create a new ZIL_DATE object.

The first overloaded constructor takes no arguments. It sets the date information according to the system's date.

The second overloaded constructor is a copy constructor that takes a previously constructed ZIL_DATE object to specify the default date.

- $date_{in}$ is a reference pointer to a previously constructed ZIL_DATE object.

The third overloaded constructor uses integer arguments to specify the default date.

- *year*$_{in}$ is the year. This argument must be either 0, if no year value is to be used with the date, or a value in a range from 100 to 32,767.

- *month*$_{in}$ is the month. This argument must be either 0, if no month value is to be used with the date, or a value in a range from 1 (January) to 12 (December).

- *day*$_{in}$ is the day. This argument must be either 0, if no day value is to be used with the date, or a value in a range from 1 to 31 that should be valid for the specified month and year.

The fourth overloaded constructor uses a string argument to specify the default date. The following algorithm is used to determine the proper order and meaning of date values:

1—Any number greater than 31 is assumed to be the year.

2—If the number is less than 100, the basis year is added to the value. See **ZIL_-DATE::SetBasis( )** below for information about the basis year. Year values below 100 are not allowed in the ZIL_DATE class.

3—Any number between 13 and 31 is assumed to be the day. In ambiguous situations where both the day and month values are less than 13, the country code date format (e.g., DTF_US_FORMAT, DTF_ASIAN_FORMAT) is used to decide the order of date values.

- *string*$_{in}$ is a string that contains the date information.

- *dtFlags*$_{in}$ specifies how to interpret the date string. The following flags (declared in **UI_GEN.HPP**) override the country dependent information (supplied by the operating system):

  DTF_EUROPEAN_FORMAT—Forces the date to be interpreted in the European format (i.e., *day/month/year*), regardless of the default country information.

  DTF_ASIAN_FORMAT—Forces the date to be interpreted in the Asian format (i.e., *year/month/day*), regardless of the default country information.

  DTF_MILITARY_FORMAT—Forces the date to be formatted in the United States Air Force format, regardless of the default country information. The air force format is ordered by *day month year* where *month* is either a 3-letter abbreviated word and *year* is a two-digit year value (if the DTF_SHORT_YEAR

or DTF_SHORT_MONTH flags are set) or *month* is spelled-out and *year* is a four-digit value. The air force style is used as the default. However, in order to accommodate the formats used in other branches of the military, other date formatting options (e.g., zero fill, upper case, etc.) may be used in conjunction with the standard military format.

DTF_NO_FLAGS—Does not associate any special flags with the ZIL_DATE object. In this case, the string will be interpreted using the default country information. This is the default argument if no other argument is provided. This flag should not be used in conjunction with any other DTF flags.

DTF_SYSTEM—Sets the date value according to the system date if the string is blank or NULL. For example, if the DTF_SYSTEM flag were set and a NULL string value was specified, the date would be set to the system date.

DTF_US_FORMAT—Forces the date to be interpreted in the U.S. format (i.e., *month/day/year*), regardless of the default country information.

The fifth overloaded constructor uses a packed integer argument to specify the default date.

- *packedDate*$_{in}$ is a packed representation of the date (whose format is the same as the MS-DOS file dates). This argument is packed according to the following bit pattern:

  bits 0-4 specify the day,
  bits 5-8 specify the month, and
  bits 9-15 specify the year minus 1980 (e.g., a value of 5 means 1985).

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE date1;
    ZIL_DATE date2(1990, 1, 1);
    ZIL_DATE *date3 = new ZIL_DATE("Jan. 1, 1990");
    ZIL_DATE *date4 = new ZIL_DATE(date1);
    .
    .
    .

    delete date4;
    delete date3;
    // The destructors for date1 and date2 are automatically called
    // when the scope of this function ends.
}
```

ZIL_DATE::DayOfWeek

Syntax

#include <ui_gen.hpp>

int DayOfWeek(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the numerical value of the day of the week (Sunday = 1, Monday = 2, . . . Saturday = 7) for the ZIL_DATE object.

NOTE: DayOfWeek( ) may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE date;

    date.dayTable =
    {
        "Sunday", "Monday", "Tuesday", "Wednesday", "Thursday",
        "Friday", "Saturday"
    };

    // Print the current day of week.
    printf("Today is %s.\n", date.dayTable[date.DayOfWeek() - 1]);
}
```

ZIL_DATE::DaysInMonth

Syntax

#include <ui_gen.hpp>

int DaysInMonth(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the number of days in the month specified by the ZIL_DATE object. For example, if the date were December 15, 1993, **DaysInMonth** would return 31.

NOTE: DaysInMonth( ) may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    // Print the number of days in the current month.
    ZIL_DATE date;
    printf("This month has %d days.\n", date.DaysInMonth());
}
```

ZIL_DATE::DaysInYear

Syntax

#include <ui_gen.hpp>

int DaysInYear(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the number of days in the year specified by the ZIL_DATE object. For example, if the date were January 15, 1992, **DaysInYear( )** would return 366 (i.e., 1 extra day for leap year).

NOTE: DaysInYear( ) may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    // Print the number of days in the year.
    ZIL_DATE date;
    printf("This year has %d days.\n", date.DaysInYear());
}
```

ZIL_DATE::Export

Syntax

#include <ui_gen.hpp>

void Export(int **year*, int **month*, int **day*, int **dayOfWeek* = ZIL_NULLP(int));
or
void Export(ZIL_ICHAR **string*, DTF_FLAGS *dtFlags*);
or
void Export(int **packedDate*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions obtain the value of the ZIL_DATE object.

The first overloaded function returns date information through four integer arguments.

- $year_{out}$ is a pointer to the variable that is to contain the year. If this argument is NULL, no year information is returned. If there is no year associated with the date, this argument will be 0. Otherwise, this argument will be a value within the range 100 to 32,767.

- $month_{out}$ is a pointer to the variable that is to contain the month. If this argument is NULL, no month information is returned. If there is no month associated with the date, this argument will be 0. Otherwise, this argument will be a value within the range 1 (January) to 12 (December).

- day_{out} is a pointer to the variable that is to contain the day. If this argument is NULL, no day information is returned. If there is no day associated with the date, this argument will be 0. Otherwise, this argument will be a value within the range 1 to 31.

- $dayOfWeek_{out}$ is a pointer to the variable that is to contain the day-of-week. If this argument is NULL, no day-of-week information is returned. If the year, month and day values are all present in the date, this argument will be a value within the range 1 (Sunday) to 7 (Saturday). Otherwise, this argument will be 0.

The second overloaded function returns the date information through the *string* argument.

- $string_{out}$ is a pointer to a string that gets the formatted date. This string must be long enough to contain the date.

- $dtFlags_{in}$ specifies how the return date should be formatted. The following flags (declared in **UI_GEN.HPP**) override the country dependent information (supplied by the operating system):

DTF_ALPHA_MONTH—Causes the month name to be spelled-out, as opposed to being represented numerically.

```
March 28, 1990
December 4, 1980
January 3, 2003
```

DTF_DASH—Separates the date fields with a dash, regardless of the default country date separator.

```
3-28-1990
12-04-1980
1-3-2003
```

DTF_DAY_OF_WEEK—Causes a spelled-out day-of-week to be shown in the date.

```
Monday May 4, 1992
Friday Dec. 5, 1980
Sunday Jan. 4, 2003
```

DTF_EUROPEAN_FORMAT—Forces the date to be formatted in the European format (i.e., *day/month/year*), regardless of the default country information.

```
28/3/1990
4 December, 1980
3 Jan., 2003
```

DTF_ASIAN_FORMAT—Forces the date to be formatted in the Asian format (i.e., *year/-month/day*), regardless of the default country information.

```
1990/3/28
1980 December 4
2003 Jan. 3
```

DTF_MILITARY_FORMAT—Forces the date to be formatted in the United States Air Force format, regardless of the default country information. The air force format is ordered by *day month year* where *month* is either a 3-letter abbreviated word and *year* is a two-digit year value (if the DTF_SHORT_YEAR or DTF_-SHORT_MONTH flags are set) or *month* is spelled-out and *year* is a four-digit value. The air force style is used as the default. However, in order to accommodate the formats used in other branches of the military, other date formatting options (e.g., zero fill, upper case, etc.) may be used in conjunction with the standard military format.

```
(air force style-
default)
4 Jul 91
4 July 1991
```

DTF_NO_FLAGS—Does not associate any special flags with the **Export( )** function. In this case, the date will be formatted using the default country information. This flag should not be used in conjunction with any other DTF flags.

```
(European format)
4 December 1989
23 June 2000

(Asian format)
1989 December 4
2000 June 23
```

DTF_SHORT_DAY—Adds an abbreviated day-of-week to the date.	`Wed. March 28, 1990`
	`Thurs. Dec. 4, 1980`
	`Sat. January 3, 2003`

DTF_SHORT_MONTH—Adds an abbreviated month name to the date.	`Mar. 28, 1990`
	`Dec. 4, 1980`
	`Jan. 3, 2003`

DTF_SHORT_YEAR—Forces the year to be formatted as a two-digit value.	`3/28/90`
	`December 4, 80`
	`Jan. 3, 89`

DTF_SLASH—Separates the date fields with a slash, regardless of the default country date separator.	`3/28/90`
	`12/04/1900`
	`1/3/2003`

DTF_SYSTEM—Uses the system date.	`3/28/90`
	`12/04/1980`
	`1/3/2003`

DTF_UPPER_CASE—Converts the alphabetic date characters to upper-case.	`MARCH 28, 1990`
	`DEC. 4, 1980`
	`SATURDAY JAN 3, 2003`

DTF_US_FORMAT—Forces the date to be formatted in the U.S. format (i.e., *month/day/year*), regardless of the default country information.	`March 28, 1990`
	`12/4/1980`
	`Jan 3, 2003`

DTF_ZERO_FILL—Forces the year, month and day values to be zero filled when their values are less than 10.	`March 08, 1990`
	`12/04/1980`
	`01/03/2003`

The third overloaded function returns date information through a packed integer.

- *packedDate*$_{out}$ is a packed representation of the date (whose format is the same as the MS-DOS file dates). This argument is packed according to the following bit pattern:

  bits 0-4 specify the day,
  bits 5-8 specify the month, and
  bits 9-15 specify the year minus 1980 (e.g., a value of 5 means 1985).

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE date; // Initialize a system date.
```

```
    // Print out the date in various forms.
    int year, month, day;
    date.Export(&year, &month, &day);
    printf("Integer date value: year-%d, month-%d, day-%d\n",
        year, month, day);
    char stringDate[128];
    date.Export(stringDate, DTF_NO_FLAGS);
    printf("String date value: %s", stringDate);

    // The destructor for date is automatically called when the
    // scope of this function ends.
}
```

ZIL_DATE::GetBasis

Syntax

#include <ui_gen.hpp>

int GetBasis( );

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the year being used as a basis for date manipulation by the ZIL_DATE object.

- *returnValue*$_{out}$ is the year used as the basis. The basis year identifies the century to be used to resolve two-digit year abbreviations. For example, if the basis year is 1800, then a year of 63 is resolved to be 1863. The basis year by default is obtained from the operating system.

ZIL_DATE::Import

Syntax

```
#include <ui_gen.hpp>

DTI_RESULT Import(void);
    or
DTI_RESULT Import(const ZIL_DATE &date);
    or
DTI_RESULT Import(int year, int month, int day);
    or
DTI_RESULT Import(const ZIL_ICHAR *string,
    DTF_FLAGS dtFlags = DTF_NO_FLAGS);
    or
DTI_RESULT Import(int packedDate);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions set the value of the ZIL_DATE object.

The first overloaded function sets the date information according to the system date.

- *returnValue*$_{out}$ is the result of the import operation. *returnValue* can have one of the following values:

  DTI_AMBIGUOUS—The month name was ambiguous (e.g., "01-JU-92").

  DTI_GREATER_THAN_RANGE—The date was greater than the maximum value of a negatively open-ended range.

  DTI_INVALID—An invalid date format was encountered (e.g., "31 Jan, 1992").

DTI_INVALID_NAME—Either the month name or the day-of-week name was invalid (e.g., "Tuesday **Jaan** 28, 1992" or "**Tyesday** Jan 28, 1992").

DTI_LESS_THAN_RANGE—The date was less than the minimum value of a positively open-ended range.

DTI_OK—The date was entered in a correct format and within the valid range.

DTI_OUT_OF_RANGE—The date value was out of range (e.g., "Jan 33, 1992").

DTI_VALUE_MISSING—The required date value was missing (e.g., "5, 1991").

The second overloaded function copies the date information from the *date* reference argument.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *date*$_{in}$ is a reference pointer to a previously constructed date.

The third overloaded function sets the date information according to specified integer arguments.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *year*$_{in}$ is the year. This argument must be 0 if no year value is to be used with the date, or a value in the range 100 to 32,767.

- *month*$_{in}$ is the month. This argument must be 0 if no month value is to be used with the date, or a value in the range 1 (January) to 12 (December).

- *day*$_{in}$ is the day. This argument must be 0 if no day value is to be used with the date, or a value in the range 1 to 31 that should be valid for the specified month and year.

The fourth overloaded function sets the date using information passed in a string. The following algorithm is used to determine the proper order and meaning of date values:

1—Any number greater than 31 is assumed to be the year.

2—If the number is less than 100, the basis year is added to the value. See **ZIL_DATE::SetBasis( )** below for information about the basis year. Year values below 100 are not allowed in the ZIL_DATE class.

3—Any number between 13 and 31 is assumed to be the day. In ambiguous situations where both the day and month values are less than 13, the country code date format (e.g., DTF_US_FORMAT, DTF_ASIAN_FORMAT) is used to determine the order of date values.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *string*$_{in}$ is a pointer to the date string. If this is an empty string (i.e., ""), the ZIL_DATE will be set to "blank." Passing a blank ZIL_DATE to the **UIW_DATE::DataSet( )** function will cause the date field to be displayed as blank space. See the DataSet section of "Chapter 5—UIW_DATE" in *Programmer's Reference Volume 2* for more information.

- *dtFlags*$_{in}$ specifies how the date string should be interpreted. The following flags (declared in **UI_GEN.HPP**) override the country dependent information (supplied by the operating system):

  DTF_EUROPEAN_FORMAT—Forces the date to be interpreted in the European format (i.e., *day/month/year*), regardless of the default country information.

  DTF_ASIAN_FORMAT—Forces the date to be interpreted in the Asian format (i.e., *year/month/day*), regardless of the default country information.

  DTF_MILITARY_FORMAT—Forces the date to be formatted in the United States Air Force format, regardless of the default country information. The air force format is ordered by *day month year* where *month* is either a 3-letter abbreviated word and *year* is a two-digit year value (if the DTF_SHORT_YEAR or DTF_SHORT_MONTH flags are set) or *month* is spelled-out and *year* is a four-digit value. The air force style is used as the default. However, in order to accommodate the formats used in other branches of the military, other date formatting options (e.g., zero fill, upper case, etc.) may be used in conjunction with the standard military format.

  DTF_NO_FLAGS—Does not associate any special flags with the ZIL_DATE object. In this case, the string will be interpreted using the default country information. This flag should not be used in conjunction with any other DTF flags.

DTF_SYSTEM—Sets the date value according to the system date if the string is blank or NULL. For example, if the DTF_SYSTEM flag were set and a NULL string value was specified, the date would be set to the system date.

DTF_US_FORMAT—Forces the date to be interpreted in the U.S. format (i.e., *month/day/year*), regardless of the default country information.

The fifth overloaded function sets the date information through a packed integer argument.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *packedDate*$_{in}$ is a packed representation of the date (whose format is the same as the MS-DOS file dates). This argument is packed according to the following bit pattern:

  bits 0-4 specify the day,
  bits 5-8 specify the month, and
  bits 9-15 specify the year minus 1980 (e.g., a value of 5 means 1985).

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE date; // Initialize a system date.

    // Import the date in various forms and print out the results.
    char stringDate[128];
    date.Import(1990, 1, 1);
    date.Export(stringDate, DTF_NO_FLAGS);
    printf("String date value: %s\n", stringDate);
    date.Import("1-1-1990", DTF_NO_FLAGS);
    date.Export(stringDate, DTF_MILITARY_FORMAT);
    printf("String date value: %s\n", stringDate);

    // The destructor for date is automatically called when the
    // scope of this function ends.
}
```

ZIL_DATE::SetBasis

Syntax

#include <ui_gen.hpp>

void SetBasis(int *_basisYear*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the year being used as a basis for date manipulation by the ZIL_DATE object.

- *_basisYear*$_{in}$ is the year to be used as the basis. The basis year identifies the century to be used to resolve two-digit year abbreviations. For example, if the basis year is 1800, a year of 63 is resolved to be 1863. The basis year by default is obtained from the operating system.

ZIL_DATE::operator =

Syntax

```
#include <ui_gen.hpp>

ZIL_INT32 operator = (ZIL_INT32 days);
    or
ZIL_INT32 operator = (const ZIL_DATE &date);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first operator overload assigns the value specified by *days* to the ZIL_DATE object.

- *returnValue*$_{out}$ is the number of days in the resulting date. This raw value is returned so that the operator may be used in a statement containing other operations.

- *days*$_{in}$ is the date, given in the number of days, to be assigned to the ZIL_DATE object.

The second operator overload assigns the value specified by *date* to the ZIL_DATE object.

- *returnValue*$_{out}$ is the number of days in the resulting date. This raw value is returned so that the operator may be used in a statement containing other operations.

- *date*$_{in}$ is the date to be assigned to the ZIL_DATE object.

Example

```
#include <ui_gen.hpp>

AddOneWeek(ZIL_DATE currentDate, ZIL_DATE &nextWeek)
{
    ZIL_INT32 oneWeek = 7;

    // Adding 1 week to the current date gives the next week.
    nextWeek = currentDate + oneWeek;
}
```

ZIL_DATE::operator +

Syntax

#include <ui_gen.hpp>

ZIL_INT32 operator + (ZIL_INT32 *days*);
or
ZIL_INT32 operator + (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload adds the value *days* to the ZIL_DATE object.

- *returnValue*$_{out}$ is the number of days resulting from the addition operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *days*$_{in}$ is the number of days to be added to the ZIL_DATE object.

The second operator overload adds the date contained in *date* to the ZIL_DATE object.

- *returnValue*$_{out}$ is the number of days resulting from the addition operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *date*$_{in}$ is the date to be added to the ZIL_DATE object.

Example

```
#include <ui_gen.hpp>

AddOneWeek(ZIL_DATE currentDate, ZIL_DATE &nextWeek)
{
    ZIL_INT32 oneWeek = 7;

    // Adding 1 week to the current date gives the next week.
    nextWeek = currentDate + oneWeek;
}
```

ZIL_DATE::operator -

Syntax

#include <ui_gen.hpp>

ZIL_INT32 operator - (ZIL_INT32 *days*);
or
ZIL_INT32 operator - (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first operator overload subtracts the value *days* from the ZIL_DATE object.

- *returnValue*$_{out}$ is the number of days resulting from the subtraction operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *days*$_{in}$ is the number of days to be subtracted from the ZIL_DATE object.

The second operator overload subtracts the date contained in *date* from the ZIL_DATE object.

- *returnValue*$_{out}$ is the difference, in days, between the ZIL_DATE object and the date contained in *date*. This raw value is returned so that the operator may be used in a statement containing other operations.

- *date*$_{in}$ is the date to be subtracted from the ZIL_DATE object.

Example

```
#include <ui_gen.hpp>

SubtractOneWeek(ZIL_DATE currentDate, ZIL_DATE &lastWeek)
{
    ZIL_INT32 oneWeek = 7;

    // Subtracting 1 week from the current date gives the previous week.
    lastWeek = currentDate - oneWeek;
}
```

ZIL_DATE::operator >

Syntax

#include <ui_gen.hpp>

int operator > (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_DATE object is chronologically greater than the date specified by *date*.

- *returnValue*$_{out}$ is TRUE if the ZIL_DATE object is chronologically greater than *date*. Otherwise, *returnValue* is FALSE.

- *date*$_{in}$ is the date to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE currentDate; // Initialize a system date.
    ZIL_DATE twentyFirstCentury("Jan. 1, 2000");

    // Check the dates.
    if (currentDate > twentyFirstCentury ||
        currentDate == twentyFirstCentury)
        printf("The twenty first century has already come.\n");
}
```

ZIL_DATE::operator >=

Syntax

#include <ui_gen.hpp>

int operator >= (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_DATE object is chronologically greater than or equal to the date specified by *date*.

- *returnValue*$_{out}$ is TRUE if the ZIL_DATE object is chronologically greater than or equal to *date*. Otherwise, *returnValue* is FALSE.

- *date*$_{in}$ is the date to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE currentDate; // Initialize a system date.
    ZIL_DATE twentyFirstCentury("Jan. 1, 2000");

    // Check the dates.
    if (currentDate >= twentyFirstCentury)
        printf("The twenty first century has already come.\n");
}
```

ZIL_DATE::operator <

Syntax

#include <ui_gen.hpp>

int operator < (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_DATE object is chronologically less than the date specified by *date*.

- *returnValue*$_{out}$ is TRUE if the ZIL_DATE object is chronologically less than *date*. Otherwise, *returnValue* is FALSE.

- *date*$_{in}$ is the date to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE currentDate; // Initialize a system date.
    ZIL_DATE twentyFirstCentury("Jan. 1, 2000");

    // Check the dates.
    if (currentDate < twentyFirstCentury)
        printf("It's not the twenty first century.\n");
}
```

ZIL_DATE::operator <=

Syntax

#include <ui_gen.hpp>

int operator <= (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_DATE object is chronologically less than or equal to the date specified by *date*.

- *returnValue*$_{out}$ is TRUE if the ZIL_DATE object is chronologically less than or equal to *date*. Otherwise, *returnValue* is FALSE.

- *date*$_{in}$ is the date to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE currentDate; // Initialize a system date.
    ZIL_DATE endOfTwentiethCentury("Dec. 31, 1999");

    // Check the dates.
    if (currentDate <= endOfTwentiethCentury)
        printf("It's not the twenty first century.\n");
}
```

ZIL_DATE::operator ++

Syntax

#include <ui_gen.hpp>

ZIL_INT32 operator ++ (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload increments the value of the ZIL_DATE object by one day.

- *returnValue*$_{out}$ is the number of days after the ZIL_DATE object has been incremented. This raw value is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_gen.hpp>

AdvanceCurrentDate(ZIL_DATE &currentDate)
{
    // Advance the current date.
    ++currentDate;
}
```

ZIL_DATE::operator --

Syntax

#include <ui_gen.hpp>

ZIL_INT32 operator -- (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload decrements the value of the ZIL_DATE object by one day.

- *returnValue*$_{out}$ is the number of days after the ZIL_DATE object has been decremented. This raw value is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_gen.hpp>

DecrementCurrentDate(ZIL_DATE &currentDate)
{
    // Decrement the current date.
    --currentDate;
}
```

ZIL_DATE::operator +=

Syntax

#include <ui_gen.hpp>

void operator += (ZIL_INT32 *days*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload adds *days* to the ZIL_DATE object and copies the result back into the ZIL_DATE object.

- *days*$_{in}$ is the number of days to be added to the ZIL_DATE object.

Example

```
#include <ui_gen.hpp>

AddOneWeek(ZIL_DATE currentDate, ZIL_DATE &nextWeek)
{
    ZIL_INT32 oneWeek = 7;

    // Adding 1 week to the current date gives the next week.
    nextWeek = currentDate;
    nextWeek += oneWeek;
}
```

ZIL_DATE::operator -=

Syntax

#include <ui_gen.hpp>

void operator -= (ZIL_INT32 *days*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload subtracts *days* from the ZIL_DATE object and copies the result back into the ZIL_DATE object.

- $days_{in}$ is the number of days to be subtracted from the ZIL_DATE object.

Example

```
#include <ui_gen.hpp>
SubtractWeeks(ZIL_DATE currentDate, ZIL_DATE &lastWeek)
{
    ZIL_INT32 oneWeek = 7;

    // Subtracting 1 week from the current date gives the previous week.
    lastWeek = currentDate;
    lastWeek -= oneWeek;
}
```

ZIL_DATE::operator ==

Syntax

#include <ui_gen.hpp>

int operator == (const ZIL_DATE &*date*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_DATE object is chronologically equal to the date specified by *date*.

- $returnValue_{out}$ is TRUE if the ZIL_DATE object is chronologically equal to *date*. Otherwise, *returnValue* is FALSE.

- $date_{in}$ is the date to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE currentDate; // Initialize a system date.
    ZIL_DATE newYears1990("Jan. 1, 1990");

    // Check the dates.
    if (currentDate == newYears1990)
        printf("It's new years day 1990.\n")
}
```

ZIL_DATE::operator !=

Syntax

#include <ui_gen.hpp>

int operator != (const ZIL_DATE *&date*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_DATE object is chronologically not equal to the date specified by *date*.

- *returnValue*$_{out}$ is TRUE if the ZIL_DATE object is chronologically not equal to *date*. Otherwise, *returnValue* is FALSE.
- *date*$_{in}$ is the date to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_DATE currentDate; // Initialize a system date.
    ZIL_DATE newYears1990("Jan. 1, 1990");

    // Check the dates.
    if (currentDate != newYears1990)
        printf("It is not new years day 1990.\n")
}
```

CHAPTER 52 – ZIL_DECORATION

The ZIL_DECORATION class object is used to maintain decorations, or images, for an object. Any object that needs to be drawn by Zinc has a pointer to the ZIL_DECORATION object containing that object's images. The object can get a pointer to the appropriate ZIL_DECORATION object through the ZIL_DECORATION_MANAGER, which maintains a list of all ZIL_DECORATION objects. The images are kept in ZIL_TEXT_ELEMENT and ZIL_BITMAP_ELEMENT objects. Because each instance of an object can have its own ZIL_DECORATION object, any combination of locale images can be used simultaneously.

The ZIL_DECORATION class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_DECORATION : public ZIL_I18N
{
public:
    ZIL_DECORATION(void);
#if defined(ZIL_LOAD)
    virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY *object);
#endif
#if defined(ZIL_STORE)
    virtual void ClassStoreData(ZIL_STORAGE_OBJECT *object);
#endif
    int noOfTextElements;
    ZIL_TEXT_ELEMENT *text;
    int noOfBitmapElements;
    ZIL_BITMAP_ELEMENT *bitmap;
    ZIL_ICHAR *GetText(ZIL_NUMBERID numberID, int useDefault = FALSE) const;
    ZIL_UINT8 *GetBitmap(ZIL_NUMBERID numberID,
        int useDefault = FALSE) const;
protected:
    virtual void AssignData(const ZIL_I18N *data);
    virtual void DeleteData(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *noOfTextElements* indicates how many text images are maintained by the ZIL_DECORATION object.
- *text* is the list of ZIL_TEXT_ELEMENT objects that contain the text images.
- *noOfBitmapElements* indicates how many bitmap images are maintained by the ZIL_DECORATION object.

- *bitmap* is the list of ZIL_BITMAP_ELEMENT objects that contain the bitmap images.

ZIL_DECORATION::ZIL_DECORATION

Syntax

#include <ui_gen.hpp>

ZIL_DECORATION(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new ZIL_DECORATION object.

ZIL_DECORATION::AssignData

Syntax

#include <ui_gen.hpp>

virtual void AssignData(const ZIL_I18N **data*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function assigns the data maintained by *data* to the ZIL_DECORATION object. The *noOfTextElements* value, the *noOfBitmapElements* value, the *text* pointer, and the *bitmap* pointer are copied. This function does not create a new copy of the data, but simply assigns the pointers.

- $data_{in}$ is a pointer to the ZIL_DECORATION object containing the data that is to be assigned.

ZIL_DECORATION::DeleteData

Syntax

#include <ui_gen.hpp>

virtual void DeleteData(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function deletes the data maintained by this object if *allocated* is TRUE. The text in each ZIL_TEXT_ELEMENT, the bitmap in each ZIL_BITMAP_ELEMENT, the list of ZIL_TEXT_ELEMENT objects, and the list of ZIL_BITMAP_ELEMENT objects are deleted.

ZIL_DECORATION::GetBitmap

Syntax

#include <ui_gen.hpp>

ZIL_UINT8 *GetBitmap(ZIL_NUMBERID *numberID*, int *useDefault* = FALSE) const;

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the bitmap maintained by the ZIL_BITMAP_ELEMENT object identified by *numberID*.

- *returnValue*$_{out}$ is a pointer to the bitmap.
- *numberID*$_{in}$ is a value identifying the ZIL_BITMAP_ELEMENT.
- *useDefault*$_{in}$ indicates if the default bitmap should be used if no match is found on *numberID*. If *useDefault* is TRUE, the bitmap from the first ZIL_BITMAP_-ELEMENT is returned if no ZIL_BITMAP_ELEMENT objects matched *numberID*. If no match was found and *useDefaults* is FALSE, NULL is returned.

ZIL_DECORATION::GetText

Syntax

#include <ui_gen.hpp>

ZIL_ICHAR *GetText(ZIL_NUMBERID *numberID*, int *useDefault* = FALSE) const;

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the text image maintained by the ZIL_TEXT_ELEMENT object identified by *numberID*.

- *returnValue*$_{out}$ is a pointer to the text string.
- *numberID*$_{in}$ is a value identifying the ZIL_TEXT_ELEMENT.
- *useDefault*$_{in}$ indicates if the default text image should be used if no match is found on *numberID*. If *useDefault* is TRUE, the text from the first ZIL_TEXT_ELEMENT is returned if no ZIL_TEXT_ELEMENT objects matched *numberID*. If no match was found and *useDefaults* is FALSE, NULL is returned.

Storage Members

This section describes those class members that are used for storage purposes.

ZIL_DECORATION::ClassLoadData

Syntax

#include <ui_gen.hpp>

virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load ZIL_DECORATION data from a persistent object data file. The data is loaded from the current directory. This function is typically not used by the programmer.

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY object that contains the data. For more information on persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

ZIL_DECORATION::ClassStoreData

Syntax

#include <ui_gen.hpp>

virtual void ClassStoreData(ZIL_STORAGE_OBJECT *_object_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to store ZIL_DECORATION data in a persistent object data file. The data is stored in the current directory. This function is typically not used by the programmer.

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the data will be stored. For more information on persistent objects, see "Chapter 68—ZIL_STORAGE_OBJECT."

CHAPTER 53 – ZIL_DECORATION_MANAGER

The ZIL_DECORATION_MANAGER class object is used to maintain a list of ZIL_-DECORATION objects. Each ZIL_DECORATION object contains decorations for library objects. A decoration is the image used to draw the object. In graphics mode, the decoration is a bitmap that is displayed on the object. In text mode, the decoration is a text string made up of the characters used to display the object. Because Zinc does all the drawing in DOS and Curses, this class is used extensively in these environments. Other environments may or may not use it for some objects.

The ZIL_DECORATION_MANAGER class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_DECORATION_MANAGER : public ZIL_I18N_MANAGER
{
public:
    ZIL_DECORATION_MANAGER(void);
    virtual ZIL_I18N *CreateData(void);

    static void FreeDecorations(const ZIL_DECORATION *decorations);
    static void LoadDefaultDecorations(const ZIL_ICHAR *decorationName);
    static const ZIL_DECORATION *UseDecorations(const ZIL_DECORATION
        *decorations);
    static const ZIL_DECORATION *UseDecorations(const ZIL_ICHAR *className,
        const ZIL_ICHAR *decorationName = ZIL_NULLP(ZIL_ICHAR));

    static void SetDecorations(const ZIL_ICHAR *className,
        ZIL_TEXT_ELEMENT *defaultText, ZIL_BITMAP_ELEMENT *defaultBitmap);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_DECORATION_MANAGER::ZIL_DECORATION_MANAGER

Syntax

#include <ui_gen.hpp>

ZIL_DECORATION_MANAGER(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new ZIL_DECORATION_MANAGER object.

ZIL_DECORATION_MANAGER::CreateData

Syntax

```
#include <ui_gen.hpp>

virtual ZIL_I18N *CreateData(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function creates a new ZIL_DECORATION object. Because it is a pure virtual function at the base ZIL_I18N_MANAGER class level, the generic code in the ZIL_I18N_MANAGER class can use it to create the proper data object.

- *returnValue*$_{out}$ is a pointer to the new ZIL_DECORATION object that was created.

ZIL_DECORATION_MANAGER::FreeDecorations

Syntax

#include <ui_gen.hpp>

static void FreeDecorations(const ZIL_DECORATION **decorations*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function releases the ZIL_DECORATION object from use by decrementing the ZIL_DECORATION object's *useCount* member. Whenever a library object requests the use of a ZIL_DECORATION object, it does so by calling the **UseDecorations( )** function, which marks the ZIL_DECORATION object as used by incrementing its *useCount* member. When the library object is done using the ZIL_DECORATION object, it must release it by calling this function. If the releasing object was the last object using the ZIL_DECORATION object, this function will deallocate the data being maintained by the ZIL_DECORATION object unless it contains the default data.

- $decorations_{in}$ is a pointer to the ZIL_DECORATION object that is being released.

ZIL_DECORATION_MANAGER::LoadDefaultDecorations

Syntax

#include <ui_gen.hpp>

static void LoadDefaultDecorations(const ZIL_ICHAR **decorationsName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the default decorations for the application. Any objects that are using the default decorations at the time this function is called will start using the new default images. If necessary, this function loads the default images data from the **I18N.DAT** file.

- *decorationsName*$_{in}$ is the two-letter ISO country name identifying which images are to be the default for the application.

ZIL_DECORATION_MANAGER::SetDecorations

Syntax

#include <ui_gen.hpp>

static void SetDecorations(const ZIL_ICHAR **className*,
ZIL_TEXT_ELEMENT **defaultText*, ZIL_BITMAP_ELEMENT **defaultBitmap*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function places the default images for a particular object in the list of images maintained by the ZIL_DECORATION_MANAGER class. An image must be placed in the list using this function before it can be accessed using the **UseDecorations( )** function. The images are assumed to be for the country identified by the *isoImageName* global variable. This variable and the default images are defined in the **IMG_DEF.CPP** file. If different default images are desired, simply copy an **IMG_<ISO>.CPP** file from the

ZINC\SOURCE\INTL directory to the ZINC\SOURCE directory and rename it to **IMG_DEF.CPP**. Then rebuild the library.

- *className*$_{in}$ is the class name of the object for which the image is being set. This typically corresponds to the *_className* member variable of the object.

- *defaultText*$_{in}$ is the ZIL_TEXT_ELEMENT class that contains the text mode character image for the object.

- *defaultBitmap*$_{in}$ is the ZIL_BITMAP_ELEMENT class that contains the graphics mode bitmap image for the object.

ZIL_DECORATION_MANAGER::UseDecorations

Syntax

#include <ui_gen.hpp>

static ZIL_DECORATION *UseDecorations(const ZIL_DECORATION **decorations*);
or
static const ZIL_DECORATION *UseDecorations(const ZIL_ICHAR
**decorationsName* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions mark a ZIL_DECORATION object as used by incrementing its *useCount* member. Whenever a library object requests the use of a ZIL_DECORATION object, it marks the object as used by calling this function, which increments the object's *useCount* member. When the library object is done using the ZIL_DECORATION object, it must release it by calling the **FreeDecorations( )** function.

The first overloaded function takes a pointer to the ZIL_DECORATION object being marked as used.

- *returnValue*$_{out}$ is a pointer to the ZIL_DECORATION object.

- *language*$_{in}$ is a pointer to the ZIL_DECORATION object that is to be marked as used.

The second overloaded function takes the decorations name. If load capability is enabled (i.e., **ZIL_LOAD** was defined when the library was compiled) this function will load the data from the **I18N.DAT** file if necessary. Otherwise, the data must have been compiled and linked into the application.

- *returnValue*$_{out}$ is a pointer to the ZIL_DECORATION object.

- *decorationsName*$_{in}$ is the two-letter ISO country name identifying which images are to be used.

CHAPTER 54 – ZIL_DELTA_STORAGE_OBJECT

The ZIL_DELTA_STORAGE_OBJECT class object is used to store changes, or deltas, to objects. By using delta storage, entire objects don't need to be saved if only a small part of the object changed. A prime use for delta storage is for creating international applications. A window with several dozen objects on it may be created in the Designer. If the application is to be used in several different languages, then the strings on the window need to be translated. Rather than storing a complete copy of the window for each language, however, the original window is stored and only the changes to the objects, such as the new text, are saved.

The ZIL_DELTA_STORAGE_OBJECT class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_DELTA_STORAGE_OBJECT : public ZIL_STORAGE_OBJECT
{
public:              // Read/Write support
    ZIL_DELTA_STORAGE_OBJECT(ZIL_STORAGE_OBJECT_READ_ONLY *_object,
        ZIL_STORAGE &file, const ZIL_ICHAR *name,
        ZIL_OBJECTID nObjectID, UIS_FLAGS pFlags = UIS_READWRITE);
    ~ZIL_DELTA_STORAGE_OBJECT(void);
    int Store(ZIL_INT16 value);
    int Store(ZIL_UINT16 value);
    int Store(ZIL_INT32 value);
    int Store(ZIL_UINT32 value);
    int Store(ZIL_INT8 value);
    int Store(ZIL_UINT8 value);
    int Store(void *buff, int size, int length);
    int Store(const ZIL_ICHAR *string);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_DELTA_STORAGE_OBJECT::ZIL_DELTA_STORAGE_-OBJECT

Syntax

#include <ui_gen.hpp>

ZIL_DELTA_STORAGE_OBJECT(ZIL_STORAGE_OBJECT_READ_ONLY **object*, ZIL_STORAGE &*file*, const ZIL_ICHAR **name*,

ZIL_OBJECTID *nObjectID*, UIS_FLAGS *pFlags* = UIS_READWRITE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new ZIL_DELTA_STORAGE_OBJECT class object.

- $object_{in}$ is the pointer to the original object. When the new object is stored, this pointer is referenced to determine if a delta version of the object needs to be stored.
- $file_{in}$ is the file where the delta object will be stored.
- $name_{in}$ is the name of the delta object.
- $nObjectID_{in}$ is the *objectID* for the delta object.
- $pFlags_{in}$ indicates how the storage object is to be opened. The following UIS_FLAGS are supported:

  UIS_READ—Allows read only access to the object.

  UIS_READWRITE—Allows read and write access to the object. This flag allows modifications to be made to the object.

  UIS_CREATE—Creates an object and allows write access to it. Any previous object will be deleted.

  UIS_OPENCREATE—Opens an existing object for read and write access. If the object does not exist, it is created for read and write access.

ZIL_DELTA_STORAGE_OBJECT::~ZIL_DELTA_STORAGE_-OBJECT

Syntax

#include <ui_gen.hpp>

virtual ~ZIL_DELTA_STORAGE_OBJECT(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the ZIL_DELTA_-STORAGE_OBJECT object.

ZIL_DELTA_STORAGE_OBJECT::Store

Syntax

#include <ui_gen.hpp>

int Store(ZIL_INT16 *value*);
or
int Store(ZIL_UINT16 *value*);
or
int Store(ZIL_INT32 *value*);
or
int Store(ZIL_UINT32 *value*);
or
int Store(ZIL_UINT8 *value*);
or
int Store(ZIL_INT8 *value*);
or
int Store(void **buff*, int *size*, int *length*);

or

int Store(const ZIL_ICHAR **string*);

Portability

These functions are available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first six overloaded functions write information to the storage file according to the type of value given.

- *returnValue*$_{out}$ is the number of bytes written.
- *value*$_{in}$ is the numeric value to be written. The following values are supported:

  ZIL_INT8—A number whose value is between -128 and 127 (8 bits, signed).

  ZIL_UINT8—A number whose value is between 0 and 255 (8 bits, unsigned).

  ZIL_INT16—A number whose value is between -32,768 and 32,767 (16 bits, signed).

  ZIL_UINT16—A number whose value is between 0 and 65,535 (16 bits, unsigned).

  ZIL_INT32—A number whose value is between -2,147,483,648 and 2,147,483,647 (32 bits, signed).

  ZIL_UINT32—A number whose value is between 0 and 4,294,967,295 (32 bits, unsigned).

The seventh overloaded function writes information into the storage file according to the following values:

- *returnValue*$_{out}$ is the number of bytes written.
- *buff*$_{in}$ is a pointer to the buffer that contains the information to be written.

- $size_{in}$ is the size of each item to be written.

- $length_{in}$ is the number of items to be written.

In general, programmers are discouraged from using this function, because the integrity of the type of value being stored cannot be guaranteed across environments. For example, the storage size of a value (e.g., int) in DOS might be different than that in Motif. All of the other **Store( )** functions, however, are the same across environments.

The eighth overloaded function writes information into the storage file according to the following value:

- $returnValue_{out}$ is the number of bytes written.

- $string_{in}$ is a pointer to the string that is to be written.

CHAPTER 55 – ZIL_DELTA_STORAGE_OBJECT_READ_ONLY

The ZIL_DELTA_STORAGE_OBJECT_READ_ONLY class object is used to read changes, or deltas, for an object from a file. By using delta storage, entire objects don't need to be saved if only a small part of the object changed. A prime use for delta storage is for creating international applications. A window with several dozen objects on it may be created in the Designer. If the application is to be used in several different languages, then the strings on the window need to be translated. Rather than storing a complete copy of the window for each language, however, the original window is stored and only the changes to the objects, such as the new text, are saved.

The ZIL_DELTA_STORAGE_OBJECT_READ_ONLY class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_DELTA_STORAGE_OBJECT_READ_ONLY :
    public ZIL_STORAGE_OBJECT_READ_ONLY
{
public:             // Read-Only support
    ZIL_DELTA_STORAGE_OBJECT_READ_ONLY(
        ZIL_STORAGE_OBJECT_READ_ONLY *_object,
        ZIL_STORAGE_READ_ONLY &file, const ZIL_ICHAR *name,
        ZIL_OBJECTID nObjectID);
    ~ZIL_DELTA_STORAGE_OBJECT_READ_ONLY(void);

    int Load(ZIL_INT16 *value);
    int Load(ZIL_UINT16 *value);
    int Load(ZIL_INT32 *value);
    int Load(ZIL_UINT32 *value);
    int Load(ZIL_UINT8 *value);
    int Load(ZIL_INT8 *value);
    int Load(void *buff, int size, int length);
    int Load(ZIL_ICHAR *string, int length);
    int Load(ZIL_ICHAR **string);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_DELTA_STORAGE_OBJECT_READ_ONLY::ZIL_DELTA_-STORAGE_OBJECT_READ_ONLY

Syntax

```
#include <ui_gen.hpp>

ZIL_DELTA_STORAGE_OBJECT_READ_ONLY(
    ZIL_STORAGE_OBJECT_READ_ONLY *object,
    ZIL_STORAGE_READ_ONLY &file, const ZIL_ICHAR *name,
    ZIL_OBJECTID nObjectID);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new ZIL_DELTA_STORAGE_OBJECT_READ_ONLY class object. The ZIL_DELTA_STORAGE_OBJECT_READ_ONLY that is created is passed to the **Load( )** member function of the window object as the ZIL_STORAGE_OBJECT_-READ_ONLY parameter.

- $object_{in}$ is a pointer to the object. If a pointer to the object that is already opened is passed in, both the original object and the deltas are loaded. If this pointer is NULL, it is assumed that the original object has already been loaded and only the deltas are loaded.

- $file_{in}$ is the file where the delta object is located.

- $name_{in}$ is the name of the delta object.

- $nObjectID_{in}$ is the *objectID* for the delta object.

ZIL_DELTA_STORAGE_OBJECT_READ_ONLY::~ZIL_DELTA_-STORAGE_OBJECT_READ_ONLY

Syntax

#include <ui_gen.hpp>

virtual ~ZIL_DELTA_STORAGE_OBJECT_READ_ONLY(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the ZIL_DELTA_-STORAGE_OBJECT_READ_ONLY object.

ZIL_DELTA_STORAGE_OBJECT_READ_ONLY::Load

Syntax

#include <ui_gen.hpp>

int Load(ZIL_INT16 **value*);
or
int Load(ZIL_UINT16 **value*);
or
int Load(ZIL_INT32 **value*);
or
int Load(ZIL_UINT32 **value*);
or
int Load(ZIL_UINT8 **value*);
or
int Load(ZIL_INT8 **value*);
or
int Load(void **buff*, int *size*, int *length*);

or

int Load(ZIL_ICHAR **string*, int *length*);

or

int Load(ZIL_ICHAR ***string*);

Portability

These functions are available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first six overloaded functions read information from the storage file according to the type of value given.

- *returnValue*$_{out}$ is the number of bytes read.
- *value*$_{out}$ is the numeric value read. The following values are supported:

  ZIL_INT8—A number whose value is between -128 and 127 (8 bits, signed).

  ZIL_UINT8—A number whose value is between 0 and 255 (8 bits, unsigned).

  ZIL_INT16—A number whose value is between -32,768 and 32,767 (16 bits, signed).

  ZIL_UINT16—A number whose value is between 0 and 65,535 (16 bits, unsigned).

  ZIL_INT32—A number whose value is between -2,147,483,648 and 2,147,483,647 (32 bits, signed).

  ZIL_UINT32—A number whose value is between 0 and 4,294,967,295 (32 bits, unsigned).

The seventh overloaded function reads information from the storage file according to the following values:

- *buff*$_{out}$ is a pointer to the buffer that will receive the information. This buffer must be large enough to contain the information read.

- *size*$_{in}$ is the size of each item to be read.

- *length*$_{in}$ is the number of items to be read.

In general, programmers are discouraged from using this function, because the integrity of the type of value being loaded cannot be guaranteed across environments. For example, the storage size of a value in DOS might be different than that in Motif. All of the other **Load( )** functions, however, are the same across environments.

The eighth overloaded function reads information from the storage file according to the following values:

- *string*$_{out}$ is a pointer to the character buffer that will receive the information. This buffer must be large enough to contain the information read.

- *length*$_{in}$ is the number of characters to read.

The ninth overloaded function reads information from the storage file according to the following values:

- *string*$_{out}$ is a pointer to a string pointer where the information will be written. This string is allocated by the library.

CHAPTER 56 – ZIL_I18N

The ZIL_I18N class is the base class for the classes that maintain internationalization data. Derived classes include ZIL_DECORATION, ZIL_LANGUAGE, and ZIL_LOCALE. The ZIL_I18N class provides those member variables and functions that are common to the derived classes.

The ZIL_I18N class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_I18N : public UI_ELEMENT
{
    friend class ZIL_EXPORT_CLASS ZIL_I18N_MANAGER;
public:
    const ZIL_ICHAR *className;
    const ZIL_ICHAR *pathName;
    ZIL_ICHAR name[12];
    int useCount;
    int error;

    ZIL_I18N(void);
    ~ZIL_I18N(void);

#if defined(ZIL_LOAD)
    static int Traverse(ZIL_STORAGE_READ_ONLY *storage,
        const ZIL_ICHAR *_path);
    void Load(ZIL_STORAGE_READ_ONLY *storage,
        ZIL_STORAGE_OBJECT_READ_ONLY *object);
    virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY *object);
#endif
#if defined(ZIL_STORE)
    static int Traverse(ZIL_STORAGE *storage, const ZIL_ICHAR *_path,
        int create = FALSE);
    void Store(ZIL_STORAGE *storage, ZIL_STORAGE_OBJECT *object);
    virtual void ClassStoreData(ZIL_STORAGE_OBJECT *object);
#endif
    static ZIL_STORAGE_READ_ONLY *defaultStorage;
    static ZIL_ICHAR *i18nName;
protected:
    ZIL_UINT8 allocated;
    ZIL_UINT8 defaults;

    virtual void AssignData(const ZIL_I18N *data);
    virtual void DeleteData(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *className* is a string that identifies the object with which the data maintained by the ZIL_I18N class is associated.

- *pathName* is the pathname off the ZIL_INTERNATIONAL directory within the **I18N.DAT** internationalization data file where the data for this object is located. *pathName* is "DECORATION" for the ZIL_DECORATION class, "LANGUAGE" for the ZIL_LANGUAGE class, and "LOCALE" for the ZIL_LOCALE class.

- *name* identifies the country or language for which the internationalization data applies. Typically this is the two-letter ISO country or language code.

- *useCount* indicates how many objects are currently using the instance of this object. *useCount* is updated in the **UseI18N( )** and **FreeI18N( )** functions and their derived equivalents (i.e., **UseLanguage( )**, etc.).

- *error* contains any error codes returned by *defaultStorage*.

- *defaultStorage* is the data file that contains internationalization data. By default this file is **I18N.DAT**.

- *i18nName* is the name of the internationalization data file. By default, *i18nName* is "i18n.dat."

- *allocated* indicates if the memory for the data maintained by the object was allocated by the library. If the memory was allocated by the library, *allocated* is TRUE. Otherwise, *allocated* is FALSE. If *allocated* is TRUE, the data can be deleted by the library.

- *defaults* indicates if the instance of this class contains the default data.

ZIL_I18N::ZIL_I18N

Syntax

#include <ui_gen.hpp>

ZIL_I18N(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This constructor creates a new ZIL_I18N class object.

ZIL_I18N::~ZIL_I18N

Syntax

#include <ui_gen.hpp>

~ZIL_I18N(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the information associated with the ZIL_I18N object, including the data maintained by the class if *allocated* is TRUE.

ZIL_I18N::AssignData

Syntax

#include <ui_gen.hpp>

virtual void AssignData(const ZIL_I18N **data*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function is a stub that does nothing. It is provided in the event that a derived class does not need to implement the function.

- $data_{in}$ is not used.

ZIL_I18N::DeleteData

Syntax

#include <ui_gen.hpp>

virtual void DeleteData(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is a stub that does nothing. It is provided in the event that a derived class does not need to implement the function.

Storage Members

This section describes those members that are used for storage purposes.

ZIL_I18N::ClassLoadData

Syntax

#include <ui_gen.hpp>

virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is a stub that does nothing. It is provided in the event that a derived class does not need to implement the function.

- $object_{in}$ is not used.

ZIL_I18N::ClassStoreData

Syntax

#include <ui_gen.hpp>

virtual void ClassStoreData(ZIL_STORAGE_OBJECT **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is a stub that does nothing. It is provided in the event that a derived class does not need to implement the function.

- $object_{in}$ is not used.

ZIL_I18N::Load

Syntax

#include <ui_gen.hpp>

virtual void Load(ZIL_STORAGE_READ_ONLY **storage*,
ZIL_STORAGE_OBJECT_READ_ONLY **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load ZIL_I18N data from a persistent object data file. This function is typically not used by the programmer.

- $storage_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the data. For more information on persistent object files, see "Chapter 70—ZIL_-STORAGE_READ_ONLY."

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the data will be loaded. For more information on loading information from persistent object files, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

ZIL_I18N::Store

Syntax

#include <ui_gen.hpp>

virtual void Store(ZIL_STORAGE *_storage_, ZIL_STORAGE_OBJECT *_object_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to store ZIL_I18N data in a persistent object data file. This function is typically not used by the programmer.

- $storage_{in}$ is a pointer to the ZIL_STORAGE where the data will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the data will be stored. For more information on loading persistent objects, see "Chapter 68—ZIL_-STORAGE_OBJECT."

ZIL_I18N::Traverse

Syntax

static int Traverse(ZIL_STORAGE_READ_ONLY *_storage_, const ZIL_ICHAR *_path_);
or
static int Traverse(ZIL_STORAGE *_storage_, const ZIL_ICHAR *_path_,
int *create* = FALSE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These functions traverse the internationalization data file to the directory specified by *path*. The first function is used for read-only files. The second function is used for files that can be written to.

- *returnValue*$_{out}$ indicates whether the function was able to traverse the internationalization data file to the appropriate subdirectory. If the function was able to traverse the data file correctly, *returnValue* will be 0. If the function was not successful, *returnValue* will be non-zero.

- *storage*$_{in}$ is a pointer to the data file where the internationalization data is located. Typically, this will be the data file pointed to by *defaultStorage*.

- *_path*$_{in}$ is the path to which the file should be traversed.

- *create*$_{in}$ specifies if the function should create the subdirectory if it does not already exist. If *create* is TRUE, the subdirectory will be created. Otherwise, the subdirectory will not be created.

CHAPTER 57 – ZIL_I18N_MANAGER

The ZIL_I18N_MANAGER class object is an abstract class that defines the behavior of derived internationalization manager classes. The manager classes maintain a list of "data blocks" that contain bitmaps, text images, locale information, or language translations. Derived manager classes include the ZIL_DECORATION_MANAGER, the ZIL_-LANGUAGE_MANAGER and the ZIL_LOCALE_MANAGER.

The ZIL_I18N_MANAGER class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_I18N_MANAGER : public UI_LIST
{
public:
    ZIL_ICHAR *defaultName;
    virtual ZIL_I18N *CreateData(void) = 0;
    void FreeI18N(const ZIL_I18N *i18n);
    void LoadDefaultI18N(const ZIL_ICHAR *i18nName);
    ZIL_I18N *UseI18N(const ZIL_I18N *i18n);
    ZIL_I18N *UseI18N(const ZIL_ICHAR *className,
        const ZIL_ICHAR *i18nName);
};
```

General Members

This section describes those members that are used for general purposes.

- *defaultName* is the two-letter ISO name identifying the default language or locale for the application.

ZIL_I18N_MANAGER::CreateData

Syntax

#include <ui_gen.hpp>

virtual ZIL_I18N *CreateData(void) = 0;

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function creates a new ZIL_I18N object (or derived object). This function is a pure virtual function and so it has no definition for the ZIL_I18N_MANAGER class. Each derived manager class implements this function.

- *returnValue*$_{out}$ is a pointer to the new ZIL_I18N object (or derived object) that was created.

ZIL_I18N_MANAGER::FreeI18N

Syntax

#include <ui_gen.hpp>

void FreeI18N(const ZIL_I18N **i18n*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function releases the ZIL_I18N object from use by decrementing the ZIL_I18N object's *useCount* member. Whenever a library object requests the use of a ZIL_I18N object, it does so by calling the **UseI18N( )** function, which marks the ZIL_I18N object as used by incrementing its *useCount* member. When the library object is done using the ZIL_I18N object, it must release it by calling this function. If the releasing object was the last object using the ZIL_I18N object, this function will deallocate the data being maintained by the ZIL_I18N object unless it contains the default data.

- $i18n_{in}$ is a pointer to the ZIL_I18N object that is being released.

ZIL_I18N_MANAGER::LoadDefaultI18N

Syntax

#include <ui_gen.hpp>

void LoadDefaultI18N(const ZIL_ICHAR *i18nName);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the default language or locale for the application. Any objects that are using the default information at the time this function is called will start using the new default data. If necessary, this function loads the default internationalization data from the **I18N.DAT** file.

- $i18nName_{in}$ is the two-letter ISO name identifying the language or locale which is to be the default for the application.

ZIL_I18N_MANAGER::UseI18N

Syntax

#include <ui_gen.hpp>

ZIL_I18N *UseI18N(const ZIL_I18N *i18n);
or
ZIL_I18N *UseI18N(const ZIL_ICHAR *className, const ZIL_ICHAR *i18nName);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded functions mark a ZIL_I18N object as used by incrementing its *useCount* member. Whenever a library object requests the use of a ZIL_I18N object, it marks the object as used by calling this function, which increments the object's *useCount* member. When the library object is done using the ZIL_I18N object, it must release it by calling the **FreeI18N( )** function.

The first overloaded function takes a pointer to the ZIL_I18N object being marked as used.

- *returnValue*$_{out}$ is a pointer to the ZIL_I18N object.
- *i18n*$_{in}$ is a pointer to the ZIL_I18N object that is to be marked as used.

The second overloaded function takes the class name of the object and the internationalization name. If load capability is enabled (i.e., **ZIL_LOAD** was defined when the library was compiled) this function will load the data from the **I18N.DAT** file if necessary. Otherwise, the data must have been compiled and linked into the application.

- *returnValue*$_{out}$ is a pointer to the ZIL_I18N object.
- *className*$_{in}$ is the class name of the object for which the internationalization data is being requested. This typically corresponds to the *_className* member variable of the object.
- *i18nName*$_{in}$ is the two-letter ISO name identifying which set of data is requested. *i18nName* is either the country code or the language code, depending on the type of derived manager making the request. In this way, the country- or language-specific data for an object can be used.

CHAPTER 58 – ZIL_INTERNATIONAL

The ZIL_INTERNATIONAL class is the base class for internationalization in Zinc Application Framework. This class maintains the default ZIL_LOCALE and ZIL_MAP_-CHARS classes and also provides many replacement functions for **Ctype**, string and file functions. These functions need to be overloaded to support Unicode 16-bit characters.

All UIW_ objects in the library are derived from ZIL_INTERNATIONAL through UI_-WINDOW_OBJECT, thus giving the objects access to these overloaded functions through inheritance. Because of this, accessing the overloaded functions from within a member function is transparent; by calling **strdup**, for instance, you get the Zinc-overloaded **strdup**. So this portable functionality comes with no extra effort to you, the programmer. In addition, all these overloaded functions are static members and public, so the functions can be accessed globally as well.

The ZIL_INTERNATIONAL class structure is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_INTERNATIONAL
{
    friend class ZIL_EXPORT_CLASS ZIL_LOCALE;
    friend class ZIL_EXPORT_CLASS ZIL_LANGUAGE;
    friend class ZIL_EXPORT_CLASS ZIL_MAP_CHARS;
public:
    friend class ZIL_EXPORT_CLASS ZIL_STORAGE;
    friend class ZIL_EXPORT_CLASS ZIL_STORAGE_OBJECT;

    virtual ~ZIL_INTERNATIONAL(void);

    // Posix time() support
    static ZIL_INT32 minutesWestGMT;
    void TimeStamp(ZIL_UINT32 *value);

    static void DefaultI18nInitialize(void);
    static void CharMapInitialize(void);
    static void OSI18nInitialize(ZIL_ICHAR *langName,
        int forceInitialization = FALSE);
    static void I18nInitialize(const ZIL_ICHAR localeName,
        const ZIL_ICHAR languageName);

    // Support for international Unicode/ISO helper functions.
    static int chartod(const ZIL_ICHAR value);
    static int IsNonspacing(ZIL_ICHAR value);

    // Support for international Ctype functions.
    static int IsAlnum(ZIL_ICHAR value);
    static int IsAlpha(ZIL_ICHAR value);
    static int IsAscii(ZIL_ICHAR value);
    static int IsCntrl(ZIL_ICHAR value);
    static int IsDigit(ZIL_ICHAR value);
    static int IsGraph(ZIL_ICHAR value);
    static int IsLower(ZIL_ICHAR value);
    static int IsPrint(ZIL_ICHAR value);
    static int IsPunct(ZIL_ICHAR value);
    static int IsSpace(ZIL_ICHAR value);
    static int IsUpper(ZIL_ICHAR value);
```

```
    static int IsXDigit(ZIL_ICHAR value);
    static ZIL_ICHAR ToLower(ZIL_ICHAR value);
    static ZIL_ICHAR ToUpper(ZIL_ICHAR value);

    // Support for internationalized ANSI routines.
#if defined(ZIL_NEXTSTEP)
    static double strtod(const ZIL_ICHAR *nptr);
    static int strtoi(const ZIL_ICHAR *nptr);
    static long strtol(const ZIL_ICHAR *nptr);
#else
    static int atoi(const ZIL_ICHAR *nptr);
    static long atol(const ZIL_ICHAR *nptr);
    static double atof(const ZIL_ICHAR *nptr);
#endif

    static long strtol(const ZIL_ICHAR *nptr, ZIL_ICHAR **endptr, int base);
    static unsigned long strtoul(const ZIL_ICHAR *nptr, ZIL_ICHAR **endptr,
        int base);
    static double strtod(const ZIL_ICHAR *nptr, ZIL_ICHAR **endptr);

    static ZIL_ICHAR *strcpy(ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static int strcmp(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static int strncmp(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2, int n);
    static ZIL_ICHAR *strncpy(ZIL_ICHAR *s1, const ZIL_ICHAR *s2, int n);

    static ZIL_ICHAR *strcat(ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static ZIL_ICHAR *strncat(ZIL_ICHAR *s1, const ZIL_ICHAR *s2, int n);

#if !defined(__SC__) || defined(ZIL_MACINTOSH)
    static int strcoll(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
#endif
    static int strxfrm(ZIL_ICHAR *s1, const ZIL_ICHAR *s2, int n);
    static ZIL_ICHAR *strchr(const ZIL_ICHAR *s, int c);
    static int strcspn(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static ZIL_ICHAR *strpbrk(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static ZIL_ICHAR *strrchr(const ZIL_ICHAR *s, int c);
    static int strspn(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static ZIL_ICHAR *strstr(const ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static ZIL_ICHAR *strtok(ZIL_ICHAR *s1, const ZIL_ICHAR *s2);
    static ZIL_ICHAR *strerror(int errnum);

    // Zinc (non-ANSI) routines
    static int stricmp(const ZIL_ICHAR *a, const ZIL_ICHAR *b);
    static int strnicmp(const ZIL_ICHAR *a, const ZIL_ICHAR *b, int n);
    static ZIL_ICHAR *strlwr(ZIL_ICHAR *string);
    static ZIL_ICHAR *strupr(ZIL_ICHAR *string);
    static void strstrip(ZIL_ICHAR *string, ZIL_ICHAR c);
    static ZIL_ICHAR *strdup(const ZIL_ICHAR *string);
    static int WildStrcmp(ZIL_ICHAR *str, ZIL_ICHAR *pattern);
    static void StripHotMark(ZIL_ICHAR *fillLine);

    // Ansi routines
    static int strlen(const ZIL_ICHAR *string);
    static void itoa(ZIL_INT32 value, ZIL_ICHAR *string, int radix,
        int pad = 0);
    static void strrepc(ZIL_ICHAR *string, int c, int repc);
    static int sprintf(ZIL_ICHAR *buffer, const ZIL_ICHAR *format, ...);
    static int sscanf(ZIL_ICHAR *buffer, const ZIL_ICHAR *format, ...);

    // File support routines.
    static int chdir(const ZIL_ICHAR *path);
    static ZIL_ICHAR *getcwd(ZIL_ICHAR *buffer, unsigned length);
    static ZIL_ICHAR *getenv(const ZIL_ICHAR *envname);
    static int open(const ZIL_ICHAR *path, int access, unsigned mode = 0);
    static int rename(const ZIL_ICHAR *oldPath, const ZIL_ICHAR *newPath);
    static int stat(const ZIL_ICHAR *path, void *);
    static ZIL_ICHAR *tmpnam(ZIL_ICHAR *path);
    static int unlink(const ZIL_ICHAR *path);
```

```
    // Character mapping routines
    static char *MapText(const ZIL_ICHAR *mapped,
        char *unMapped = ZIL_NULLP(char), int allocate = TRUE);
    static ZIL_ICHAR *UnMapText(const char *unMapped,
        ZIL_ICHAR *mapped = ZIL_NULLP(ZIL_ICHAR), int allocate = TRUE);
    static ZIL_ICHAR *ISOtoUNICODE(const char *isoString,
        ZIL_ICHAR *retValue = ZIL_NULLP(ZIL_ICHAR));

    // File support routines.
    static void ConvertFromFilename(ZIL_ICHAR *dst,
        const ZIL_FILE_CHAR *src);
    static void ConvertToFilename(ZIL_FILE_CHAR *dst, const ZIL_ICHAR *src);

    // Character mapping routines
    static ZIL_ICHAR *ISOtoICHAR(const char *isoString,
        ZIL_ICHAR *icharString = ZIL_NULLP(ZIL_ICHAR));
    static int LoadICHARtoHardware(const ZIL_ICHAR *mapName,
        const ZIL_ICHAR *extraName);
    static ZIL_ICHAR UnMapChar(const char *hardware);
    static char *MapChar(ZIL_ICHAR unicode);

#if defined(ZIL_UNICODE)
    static int mblen(const char *hardware);
    static int wcstombs(char *s, const ZIL_ICHAR *pwcs, int n = -1);
    static int mbstowcs(ZIL_ICHAR *pwcs, const char *s, int n = -1);
    static ZIL_ICHAR *DecomposeCharacter(ZIL_ICHAR val);
    static ZIL_ICHAR *DecomposeString(const ZIL_ICHAR *str);
#endif

    // I18N member variables and functions.
public:
    static void ParseLangEnv(ZIL_ICHAR *codeSet, ZIL_ICHAR *locName,
        ZIL_ICHAR *langName);
    static const ZIL_LOCALE *defaultLocale;
    static const ZIL_LOCALE canonicalLocale;
    static ZIL_MAP_CHARS *defaultCharMap;

    static ZIL_ICHAR _blankString[];
    static ZIL_ICHAR _errorString[];

    static void MachineName(void);
    static ZIL_ICHAR machineName[32];
};
```

General Members

This section describes those members used for general purposes.

- *minutesWestGMT* is how far west of Greenwich Mean Time the locale is, measured in minutes.

The use of the **Ctype**, string, and file support functions is the same as described for the C library with three exceptions. The first exception is that the **Ctype** functions are renamed to be consistent with Zinc coding standards (i.e., each "word" in the function name begins with a capital letter). This is done because most of these functions are actually implemented as macros in many compilers and need to be renamed to avoid symbol clashes.

The second difference is that the Zinc-overloaded functions use **ZIL_ICHAR** instead of **char**. For a description of the **ZIL_ICHAR** type, see "Appendix A—Support Definitions" of *Programmer's Reference Volume 2*.

The third difference is that the **printf** function has some enhanced formatting ability. If a '%n' is encountered in the formatting string, where n is an integer, the ordering of the fields will be altered so that the field will be the n-th field.

We will not discuss the use of these functions here. Refer to your C library reference for assistance with these functions.

We encourage you to use the Zinc implementation of these functions instead of the C library implementation even if you have no immediate plans to internationalize your applications. It will require little extra overhead and minimal extra effort, if any, but will provide a much easier path to internationalizing the application if you decide to do so in the future.

ZIL_INTERNATIONAL::CharMapInitialize

Syntax

```
#include <ui_gen.hpp>

static void CharMapInitialize(void);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function creates a new ZIL_MAP_CHARS object maintained by *defaultCharMap*.

ZIL_INTERNATIONAL::chartod

Syntax

#include <ui_gen.hpp>

static int chartod(const ZIL_ICHAR *value*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the integer value of the character passed in. This function is used for determining the value of a number from the string representation of the number.

- *returnValue*$_{out}$ is the integer value of the character that was passed in. Thus, if the character was a digit, *returnValue* will be that digit's value. If the character that was passed in is not a digit, *returnValue* will be -1.

- *value*$_{in}$ is the character whose integer value is to be returned.

ZIL_INTERNATIONAL::ConvertFromFilename

Syntax

#include <ui_gen.hpp>

static void ConvertFromFilename(ZIL_ICHAR **dst*, const ZIL_FILE_CHAR **src*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts an environment-specific filename string to a Unicode filename string. A special function is necessary to convert filenames to ensure that any characters that may cause problems as part of a filename are not translated incorrectly (e.g., '/' or '\'). The ZIL_FILE_CHAR type may be different in each environment, depending on the size of the character type in that environment.

- dst_{out} is a pointer to a buffer where the converted filename will be placed. This buffer must be big enough to hold the converted filename.

- src_{in} is a pointer to the filename string that is to be converted.

ZIL_INTERNATIONAL::ConvertToFilename

Syntax

#include <ui_gen.hpp>

static void ConvertToFilename(ZIL_FILE_CHAR *dst, const ZIL_ICHAR *src);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts a Unicode filename string to an environment-specific filename string. A special function is necessary to convert filenames to ensure that any characters that may cause problems as part of a filename are not translated incorrectly (e.g., '/' or

'\'). The ZIL_FILE_CHAR type may be different in each environment, depending on the size of the character type in that environment.

- dst_{out} is a pointer to a buffer where the converted filename will be placed. This buffer must be big enough to hold the converted filename.

- src_{in} is a pointer to the string that is to be converted.

ZIL_INTERNATIONAL::DecomposeCharacter

Syntax

#include <ui_gen.hpp>

static ZIL_ICHAR *DecomposeCharacter(ZIL_ICHAR *val*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function splits a composed Unicode character into the individual characters it is made from. Some languages use characters as modifiers in certain contexts. One or more modifiers may be combined with other characters to form the desired character. It may be necessary to decompose the character in order to properly collate it. This functionality is only included in the library if the library is built with **ZIL_DECOMPOSE** defined in **UI_ENV.HPP**. If the application will not need this functionality, make sure **ZIL_DECOMPOSE** is not defined and rebuild the library.

- $returnValue_{out}$ is the string formed from the individual characters obtained by decomposing *val*.

- val_{in} is the Unicode character that is to be decomposed.

ZIL_INTERNATIONAL::DecomposeString

Syntax

#include <ui_gen.hpp>

static ZIL_ICHAR *DecomposeString(const ZIL_ICHAR *_str_);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function decomposes the characters in a Unicode string. See the description of **DecomposeCharacter( )**, above, for more details on composed characters. This functionality is only included in the library if the library is built with **ZIL_DECOMPOSE** defined in **UI_ENV.HPP**.

ZIL_INTERNATIONAL::DefaultI18nInitialize

Syntax

#include <ui_gen.hpp>

static void DefaultI18nInitialize(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function initializes the *defaultLocale* member. It is called from the constructor of the Event Manager as the program is starting up.

ZIL_INTERNATIONAL::I18nInitialize

Syntax

#include <ui_gen.hpp>

static void I18nInitialize(const ZIL_ICHAR **localeName*,
const ZIL_ICHAR **languageName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function initializes the language and locale information being used by the application.

- $localeName_{in}$ is the two-letter ISO country code that identifies which locale is to be initialized.

- $languageName_{in}$ is the two-letter ISO language code that identifies which language is to be initialized.

ZIL_INTERNATIONAL::IsNonSpacing

Syntax

#include <ui_gen.hpp>

static int IsNonSpacing(ZIL_ICHAR *value*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function determines if a character requires space when rendered. For example, some languages (e.g., Thai) contain characters that distinguish a related character in a string. The distinguishing character will appear above, below, before or after the character to be distinguished. Such a distinguishing character would be non-spacing since it is rendered in the region of the screen occupied by the distinguished character.

- *returnValue*$_{out}$ indicates whether the character is a spacing or non-spacing character. *returnValue* will be FALSE if the character is a spacing character, or TRUE if the character is non-spacing.

- *value*$_{in}$ is the Unicode character whose spacing requirements are to be determined.

ZIL_INTERNATIONAL::ISOtoICHAR

Syntax

#include <ui_gen.hpp>

static ZIL_ICHAR *ISOtoICHAR(const char **isoString*,
    ZIL_ICHAR **icharString* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts an 8-bit ISO8859-1 string to a Unicode string. The conversion is

performed by padding the high-order byte with zeros. This can be done because the first 256 entries in the Unicode character set are the ISO8859-1 characters. If no destination buffer is passed in, a buffer will be allocated by the function.

- *returnValue*$_{out}$ is a pointer to a buffer containing the generated Unicode string.
- *isoString*$_{in}$ is a pointer to the ISO8859-1 string that is to be converted.
- *unicodeString*$_{out}$ is a pointer to a buffer to which the generated Unicode string will be copied. If this pointer is used, the buffer must be big enough to hold the converted string. If no buffer is passed in the function will allocate a buffer. This buffer will need to be deleted by the programmer when he is done with the buffer.

ZIL_INTERNATIONAL::ISOtoUNICODE

Syntax

```
#include <ui_gen.hpp>

static ZIL_ICHAR *ISOtoUNICODE(const char *isoString,
    ZIL_ICHAR *retValue = ZIL_NULLP(ZIL_ICHAR));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts an 8-bit ISO8859-1 string to a Unicode string. The conversion is performed by padding the high-order byte with zeros. This can be done because the first 256 entries in the Unicode character set are the ISO8859-1 characters. If no destination buffer is passed in, a buffer will be allocated by the function.

- *returnValue*$_{out}$ is a pointer to a buffer containing the generated Unicode string.
- *isoString*$_{in}$ is a pointer to the ISO8859-1 string that is to be converted.

- *retaValue*$_{out}$ is a pointer to a buffer to which the generated Unicode string will be copied. If this pointer is used, the buffer must be big enough to hold the converted string. If no buffer is passed in the function will allocate a buffer. This buffer will need to be deleted by the programmer when he is done with the buffer.

ZIL_INTERNATIONAL::LoadICHARtoHardware

Syntax

```
#include <ui_gen.hpp>

static int LoadICHARtoHardware(const ZIL_ICHAR *mapName,
    const ZIL_ICHAR *extraName);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function loads map tables to provide mapping between the Unicode character set and the hardware character set. The hardware character set is the character set used by the operating system in the environment on which the program is running.

- *returnValue*$_{out}$ indicates whether the function was successful in loading the map tables. *returnValue* is 0 if the map tables were loaded successfully. It is non-zero if not successful.

- *mapName*$_{in}$ is the name of the map table to be loaded. This table is a standard table for mapping characters between the Unicode character set and the particular hardware character set.

- *extraName*$_{in}$ is the name of a map table that contains exceptions to the *mapName* map table. For instance, it is possible for the same character set on different operating systems to be slightly different (i.e., some characters may be in different locations in the character set). This map table resolves those problems by providing the proper mapping for known exceptions. This map table will be searched before the *mapName*

map table. If a mapping is found in this map table, the *mapName* table will not be searched.

ZIL_INTERNATIONAL::MapChar

Syntax

#include <ui_gen.hpp>

static char *MapChar(ZIL_ICHAR *unicode*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function maps a character from the Unicode character set to the hardware character set. **MapChar** will allocate space for the resulting string which the programmer is responsible for deleting.

- $returnValue_{out}$ is a pointer to the hardware string.
- $unicode_{in}$ is the Unicode character that is to be mapped to the hardware character set.

ZIL_INTERNATIONAL::MapText

Syntax

#include <ui_gen.hpp>

static char *MapText(const ZIL_ICHAR **mapped*, char **unmapped* = ZIL_NULLP(char), int *allocate* = TRUE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function maps a string from the Unicode character set to the hardware character set. It does this by calling the **MapText( )** function for the *defaultCharMap* member. **MapText** may allocate space for the resulting string which the programmer would be responsible for deleting.

- *returnValue*$_{out}$ is a pointer to the hardware string.
- *mapped*$_{in}$ is the Unicode string that is to be mapped to the hardware character set.
- *unmapped*$_{out}$ is a buffer in which the hardware string will be placed. If used, this buffer must be large enough to contain the string. If no buffer is passed in, the function can be directed to allocate a buffer or to use a temporary buffer.
- *allocate*$_{in}$ specifies if the function should allocate a buffer for the hardware string. If *allocate* is TRUE and no buffer was passed through the *unmapped* argument, a new buffer is allocated. Otherwise no buffer is allocated.

ZIL_INTERNATIONAL::mblen

Syntax

```
#include <ui_gen.hpp>

static int mblen(const char *hardware);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function calculates how many bytes long a character is. The characters in some character sets may be from one to four bytes long. This function is used to determine the length of the first character in a string of multi-byte characters. This function calls the **mblen( )** function of the *defaultCharMap* member.

- *returnValue*$_{out}$ is the number of bytes in the first character of the string passed in.
- *hardware*$_{in}$ is the multi-byte character string of which the first character's size is required.

ZIL_INTERNATIONAL::mbstowcs

Syntax

#include <ui_gen.hpp>

static int mbstowcs(ZIL_ICHAR **pwcs*, const char **s*, int *n* = -1);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts a multi-byte character string to a wide-character Unicode string. The source string is made up of characters from any hardware character set. This function calls the **mbstowcs( )** function of the *defaultCharMap* member.

- *returnValue* is a count of how many characters are in the converted string.
- *pwcs*$_{out}$ is a pointer to a buffer in which the converted wide-character Unicode string will be placed. This buffer must be large enough to contain the string.
- *s*$_{in}$ is the source string to be converted. This string is made up of characters from the local hardware character set.

- n_{in} is a count of how many characters are to be converted. If *n* is less than 0, the strlen of *s* is used. **strlen** will provide the maximum number of characters that the input string may contain since **strlen** will not necessarily return the number of actual characters in the string, but rather the number of 8-bit values in the string. Some characters may be more than 8-bits wide.

ZIL_INTERNATIONAL::OSI18nInitialize

Syntax

#include <ui_gen.hpp>

static void OSI18nInitialize(ZIL_ICHAR **langName*, int *forceInitialization* = FALSE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function loads language and locale data from the operating system.

- $langName_{out}$ is the two-letter ISO language name in use by the operating system. *langName* is a buffer that should be allocated by the programmer.

- $forceInitialization_{in}$ specifies what the function should do if the locale data has already been initialized. If *forceInitialization* is TRUE, the locale data will be loaded from the operating system even if it has already been initialized. If *forceInitializtion* is FALSE, the locale data will not be loaded from the operating system if it has already been initialized. This function is called from the constructor of the Event Manager as the program is starting up.

ZIL_INTERNATIONAL::StripHotMark

Syntax

#include <ui_gen.hpp>

static void StripHotMark(ZIL_ICHAR **fillLine*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function strips the hotkey marker (i.e., '&') from a string.

- $fillLine_{in/out}$ is the string that is to have its hotkey markers removed. The new string is placed back into the existing buffer after having the hotkey markers removed.

ZIL_INTERNATIONAL::strstrip

Syntax

#include <ui_gen.hpp>

static void strstrip(ZIL_ICHAR **string*, ZIL_ICHAR *c*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function strips all occurrences of *c* from *string*.

- $string_{in/out}$ is the string that is to be stripped.
- c_{in} is the character that is to be removed from *string*.

ZIL_INTERNATIONAL::TimeStamp

Syntax

#include <ui_gen.hpp>

void TimeStamp(ZIL_UINT32 **value*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the current time specified in milliseconds since January 1, 1970.

- $value_{out}$ is the number of milliseconds that have passed since January 1, 1970.

ZIL_INTERNATIONAL::UnMapChar

Syntax

#include <ui_gen.hpp>

static ZIL_ICHAR UnMapChar(const char **hardware*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function unmaps a character from the hardware character set and returns the equivalent character from the Unicode character set. It does this by calling the **UnMapChar( )** function for the *defaultCharMap* member.

- *returnValue*$_{out}$ is the unmapped Unicode character.
- *hardware*$_{in}$ is a pointer to a buffer containing the mapped hardware character.

ZIL_INTERNATIONAL::UnMapText

Syntax

```
#include <ui_gen.hpp>

static ZIL_ICHAR *UnMapText(const char *unmapped,
    ZIL_ICHAR *mapped = ZIL_NULLP(ZIL_ICHAR), int allocate = TRUE);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function unmaps a string from a hardware character set and restores it to a Unicode character string.

- *returnValue*$_{out}$ is a pointer to the unmapped Unicode text.

- *unmapped*$_{in}$ is a pointer to a buffer containing the mapped hardware text.

- *mapped*$_{out}$ is a pointer to a buffer in which the unmapped Unicode text will be placed.

- *allocate*$_{in}$ indicates if the function should allocate a buffer for the unmapped Unicode text. If *allocate* is TRUE and no buffer is passed through the *mapped* argument, the function will allocate a buffer. This buffer must be deleted by the programmer when he is done with it.

ZIL_INTERNATIONAL::wcstombs

Syntax

#include <ui_gen.hpp>

static int wcstombs(char *s, const ZIL_ICHAR *pwcs, int n = -1);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts a wide-character Unicode string to a multi-byte character string. The destination string will be made up of characters from the hardware character set. This function calls the **wcstombs( )** function of the *defaultCharMap* member.

- *returnValue* is a count of how many characters are in the converted string.

- s_{out} is a pointer to a buffer in which the multi-byte character string will be placed after it has been converted from the Unicode string. This string will be made up of characters from the local hardware character set. The buffer must be large enough to hold the converted string.

- *pwcs*$_{in}$ is a pointer to the wide-character Unicode string.

- n_{in} is a count of how many characters are to be converted. If *n* is less than 0, the **strlen** of *s* is used.

ZIL_INTERNATIONAL::WildStrcmp

Syntax

#include <ui_gen.hpp>

static int WildStrcmp(ZIL_ICHAR **str*, ZIL_ICHAR **pattern*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function is a **strcmp** that can accommodate wild card characters (i.e., '*' and '?').

- $returnValue_{out}$ indicates the result of the compare. If the two strings matched, *returnValue* will be 0. Otherwise it will be a non-zero value.

- str_{in} is a pointer to the string that is to be compared against.

- $pattern_{in}$ is a pointer to the string that contains the pattern to be compared for.

Internationalization Members

This section describes those class members that are used for internationalization purposes.

- *defaultLocale* is the default ZIL_LOCALE object that is used to format data for a particular locale.

- *canonicalLocale* is a ZIL_LOCALE class that is used when converting objects from one locale to another, particularly when storing the object in a file. A consistent

format must be used so that data can be properly interpreted regardless of which locale the data was formatted for when stored or which locale it needs to be formatted for when loaded. *canonicalLocale* provides the consistent formatting information.

- *defaultCharMap* is the ZIL_MAP_CHARS object that is used to map characters among character sets.
- *_blankString* is an empty string.
- *_errorString* is the default error message.
- *machineName* is a string that identifies the type of hardware on which the program is running.

ZIL_INTERNATIONAL::MachineName

Syntax

```
#include <ui_gen.hpp>

static void MachineName(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	☐ Windows	☐ OS/2
☐ Macintosh	☐ OSF/Motif	☐ Curses	☐ NEXTSTEP

Remarks

This function identifies the hardware platform being used and sets *machineName* accordingly. This function is available in DOS mode only.

ZIL_INTERNATIONAL::ParseLangEnv

Syntax

#include <ui_gen.hpp>

static void ParseLangEnv(ZIL_ICHAR *_codeSet_, ZIL_ICHAR *_locName_, ZIL_ICHAR *_langName_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function queries the operating system to learn which language, locale and character set should be used. It determines which to set up by inspecting the *ZINC_LANG* environment variable, if it has been defined. The value of *ZINC_LANG* should have the format *language[_locale][.codeSet]*, where *language* is the two-letter ISO language code to be used, *_locale* is the two-letter ISO country code to be used and *.codeSet* is the character set to be used for the hardware character set.

- $codeSet_{out}$ is a string identifying which character set should be used. The buffer pointed to by *codeSet* must be allocated by the programmer.

- $\_locName_{out}$ is the two-letter ISO country code specified in the *ZINC_LANG* environment variable. The buffer pointed to by *_locName* must be allocated by the programmer.

- $\_langName_{out}$ is the two-letter ISO language code specified in the *ZINC_LANG* environment variable. The buffer pointed to by *_langName* must be allocated by the programmer.

CHAPTER 59 – ZIL_LANGUAGE

The ZIL_LANGUAGE class object is used to maintain language translations for an object. Any object that needs string translations has a pointer to the ZIL_LANGUAGE object containing that object's translations. The object can get a pointer to the appropriate ZIL_-LANGUAGE object through the ZIL_LANGUAGE_MANAGER, which maintains a list of all ZIL_LANGUAGE objects. The strings are each kept in a ZIL_LANGUAGE_-ELEMENT. Because each instance of an object can have its own ZIL_LANGUAGE object, any combination of languages can be used simultaneously.

The ZIL_LANGUAGE class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_LANGUAGE : public ZIL_I18N
{
public:
    ZIL_LANGUAGE(void);
#if defined(ZIL_LOAD)
    ZIL_LANGUAGE(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY));
    virtual void Load(const ZIL_ICHAR *name,
        ZIL_STORAGE_READ_ONLY *file = ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
        ZIL_STORAGE_OBJECT_READ_ONLY *object =
            ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY));
    void Load(ZIL_STORAGE_READ_ONLY *storage,
            ZIL_STORAGE_OBJECT_READ_ONLY *object);
    virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY *object);
#endif
#if defined(ZIL_STORE)
    virtual void Store(const ZIL_ICHAR *name,
        ZIL_STORAGE *file = ZIL_NULLP(ZIL_STORAGE),
        ZIL_STORAGE_OBJECT *object = ZIL_NULLP(ZIL_STORAGE_OBJECT));
    void Store(ZIL_STORAGE *storage, ZIL_STORAGE_OBJECT *object);
    virtual void ClassStoreData(ZIL_STORAGE_OBJECT *object);
#endif
    int noOfElements;
    ZIL_LANGUAGE_ELEMENT *data;
    ZIL_ICHAR *GetMessage(ZIL_NUMBERID numberID,
        int useDefault = FALSE) const;
protected:
    virtual void AssignData(const ZIL_I18N *data);
    virtual void DeleteData(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *noOfElements* indicates how many strings are maintained by the ZIL_LANGUAGE object.
- *data* is the list of ZIL_LANGUAGE_ELEMENT objects that contain the translated strings.

ZIL_LANGUAGE::ZIL_LANGUAGE

Syntax

#include <ui_gen.hpp>

ZIL_LANGUAGE(void);

Remarks

This constructor creates a new ZIL_LANGUAGE object.

ZIL_LANGUAGE::AssignData

Syntax

#include <ui_gen.hpp>

virtual void AssignData(const ZIL_I18N **data*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function assigns the data maintained by *data* to the ZIL_LANGUAGE object. The *noOfElements* value and the *data* pointer are copied. This function does not create a new copy of the data, but simply assigns the pointer.

- $data_{in}$ is a pointer to the ZIL_I18N object containing the data that is to be assigned.

ZIL_LANGUAGE::DeleteData

Syntax

#include <ui_gen.hpp>

virtual void DeleteData(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function deletes the data maintained by this object if *allocated* is TRUE. The text in each ZIL_LANGUAGE_ELEMENT as well as the list of ZIL_LANGUAGE_ELEMENT objects is deleted.

ZIL_LANGUAGE::GetMessage

Syntax

#include <ui_gen.hpp>

ZIL_ICHAR *GetMessage(ZIL_NUMBERID *numberID*,
    int *useDefault* = FALSE) const;

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the string maintained by the ZIL_LANGUAGE_ELEMENT object identified by *numberID*.

- *returnValue*$_{out}$ is the translated string.
- *numberID*$_{in}$ is a value identifying the ZIL_LANGUAGE_ELEMENT.
- *useDefault*$_{in}$ indicates if the default text should be used if no match is found on *numberID*. If *useDefault* is TRUE, the text of the first ZIL_LANGUAGE_ELEMENT is returned if no ZIL_LANGUAGE_ELEMENT objects matched *numberID*. If no match was found and *useDefaults* is FALSE, NULL is returned.

Storage Members

This section describes those class members that are used for storage purposes.

ZIL_LANGUAGE::ZIL_LANGUAGE

Syntax

```
#include <ui_gen.hpp>

ZIL_LANGUAGE(const ZIL_ICHAR *name,
    ZIL_STORAGE_READ_ONLY *file =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *object =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY));
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced constructor is used to load ZIL_LANGUAGE data from a persistent object data file. It is typically not used by the programmer.

- $name_{in}$ is the name of the object to be loaded.
- $file_{in}$ is a pointer to the ZIL_STORAGE_READ_ONLY object that contains the data. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_-READ_ONLY."
- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the data will be loaded. For more information on loading information from persistent object files, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

ZIL_LANGUAGE::ClassLoadData

Syntax

#include <ui_gen.hpp>

virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load ZIL_LANGUAGE data from a persistent object data file. The data is loaded from the current directory. This function is typically not used by the programmer.

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY object that contains the data. For more information on persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

ZIL_LANGUAGE::ClassStoreData

Syntax

#include <ui_gen.hpp>

virtual void ClassStoreData(ZIL_STORAGE_OBJECT *_object_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to store ZIL_LANGUAGE data in a persistent object data file. The data is stored in the current directory. This function is typically not used by the programmer.

- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the data will be stored. For more information on persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

ZIL_LANGUAGE::Load

Syntax

#include <ui_gen.hpp>

virtual void Load(const ZIL_ICHAR *_name_,
    ZIL_STORAGE_READ_ONLY *_file_ =
        ZIL_NULLP(ZIL_STORAGE_READ_ONLY),
    ZIL_STORAGE_OBJECT_READ_ONLY *_object_ =
        ZIL_NULLP(ZIL_STORAGE_OBJECT_READ_ONLY));
    or
void Load(ZIL_STORAGE_READ_ONLY *_storage_,
    ZIL_STORAGE_OBJECT_READ_ONLY *_object_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load ZIL_LANGUAGE data from a persistent object data file. This function is typically not used by the programmer.

- $name_{in}$ is the name of the object to be loaded.
- $file_{in}$ and $storage_{in}$ are pointers to the ZIL_STORAGE_READ_ONLY object that contains the data. For more information on persistent object files, see "Chapter 70—ZIL_STORAGE_READ_ONLY."
- $object_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY where the data will be loaded. For more information on loading information from persistent object files, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

ZIL_LANGUAGE::Store

Syntax

```
#include <ui_gen.hpp>

virtual void Store(const ZIL_ICHAR *name,
    ZIL_STORAGE *file = ZIL_NULLP(ZIL_STORAGE),
    ZIL_STORAGE_OBJECT *object = ZIL_NULLP(ZIL_STORAGE_OBJECT));
    or
void Store(ZIL_STORAGE *storage, ZIL_STORAGE_OBJECT *object);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to store ZIL_LANGUAGE data in a persistent object data file. This function is typically not used by the programmer.

- *name*$_{in}$ is the name of the object to be stored.
- *file*$_{in}$ and *storage*$_{in}$ are pointers to the ZIL_STORAGE where the data will be stored. For more information on persistent object files, see "Chapter 66—ZIL_STORAGE."
- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the data will be stored. For more information on loading persistent objects, see "Chapter 68—ZIL_-STORAGE_OBJECT."

CHAPTER 60 – ZIL_LANGUAGE_ELEMENT

The ZIL_LANGUAGE_ELEMENT structure is used by the ZIL_LANGUAGE class to provide a translated text string.

The ZIL_LANGUAGE_ELEMENT class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS ZIL_LANGUAGE_ELEMENT
{
    ZIL_ICHAR *text;
    ZIL_NUMBERID numberID;
    ZIL_ICHAR stringID[ZIL_STRINGID_LEN];

    void SwapData(ZIL_LANGUAGE_ELEMENT &language);
};
```

General Members

This section describes those members that are used for general purposes.

- *text* is the text maintained by the ZIL_LANGUAGE_ELEMENT.
- *numberID* is a numeric value used to identify the ZIL_LANGUAGE_ELEMENT.
- *stringID* is a string value used to identify the ZIL_LANGUAGE_ELEMENT.

ZIL_LANGUAGE_ELEMENT::SwapData

Syntax

#include <ui_gen.hpp>

void SwapData(ZIL_LANGUAGE_ELEMENT *&language*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function swaps the contents of the ZIL_LANGUAGE_ELEMENT with the contents of *language*.

- *language*$_{in}$ is the ZIL_LANGUAGE_ELEMENT whose contents are to be swapped with the ZIL_LANGUAGE_ELEMENT.

CHAPTER 61 – ZIL_LANGUAGE_MANAGER

The ZIL_LANGUAGE_MANAGER class object is used to maintain a list of ZIL_-LANGUAGE objects. Each ZIL_LANGUAGE class contains translations for a particular language for a single object.

The ZIL_LANGUAGE_MANAGER class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_LANGUAGE_MANAGER : public ZIL_I18N_MANAGER
{
public:
    ZIL_LANGUAGE_MANAGER(void);
    virtual ZIL_I18N *CreateData(void);

    static void FreeLanguage(const ZIL_LANGUAGE *language);
    static void LoadDefaultLanguage(const ZIL_ICHAR *languageName);
    static const ZIL_LANGUAGE *UseLanguage(const ZIL_LANGUAGE *language);
    static const ZIL_LANGUAGE *UseLanguage(const ZIL_ICHAR *className,
        const ZIL_ICHAR *languageName = ZIL_NULLP(ZIL_ICHAR));

    static void SetLanguage(const ZIL_ICHAR *className,
        ZIL_PRIVATE_LANGUAGE_ELEMENT *defaultMessages);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_LANGUAGE_MANAGER::ZIL_LANGUAGE_MANAGER

Syntax

#include <ui_gen.hpp>

ZIL_LANGUAGE_MANAGER(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new ZIL_LANGUAGE_MANAGER object.

ZIL_LANGUAGE_MANAGER::CreateData

Syntax

#include <ui_gen.hpp>

virtual ZIL_I18N *CreateData(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual function creates a new ZIL_LANGUAGE object. Because it is a pure virtual function at the base ZIL_I18N_MANAGER class level, the generic code in the ZIL_-I18N_MANAGER class can use it to create the proper data object.

- *returnValue*$_{out}$ is a pointer to the new ZIL_LANGUAGE object that was created.

ZIL_LANGUAGE_MANAGER::FreeLanguage

Syntax

#include <ui_gen.hpp>

static void FreeLanguage(const ZIL_LANGUAGE **language*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function releases the ZIL_LANGUAGE object from use by decrementing the ZIL_-LANGUAGE object's *useCount* member. Whenever a library object requests the use of a ZIL_LANGUAGE object, it does so by calling the **UseLanguage( )** function, which marks the ZIL_LANGUAGE object as used by incrementing the its *useCount* member. When the library object is done using the ZIL_LANGUAGE object, it must release it by calling this function. If the releasing object was the last object using the ZIL_-LANGUAGE object, this function will deallocate the data being maintained by the ZIL_-LANGUAGE object unless it contains the default data.

- $language_{in}$ is a pointer to the ZIL_LANGUAGE object that is being released.

ZIL_LANGUAGE_MANAGER::LoadDefaultLanguage

Syntax

#include <ui_gen.hpp>

static void LoadDefaultLanguage(const ZIL_ICHAR **languageName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the default language for the application. Any objects that are using the default language information at the time this function is called will start using the new

default data. If necessary, this function loads the default language data from the **I18N.DAT** file.

- *languageName*$_{in}$ is the two-letter ISO name identifying the language which is to be the default for the application.

ZIL_LANGUAGE_MANAGER::SetLanguage

Syntax

#include <ui_gen.hpp>

static void SetLanguage(const ZIL_ICHAR **className*,
ZIL_PRIVATE_LANGUAGE_ELEMENT **defaultMessages*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function places the default translations for a particular object in the list of translations maintained by the ZIL_LANGUAGE_MANAGER class. A translation must be placed in the list using this function before the translations can be accessed using the **UseLanguage( )** function. The translations are assumed to be in the language identified by the *isoLanguageName* global variable. This variable and the default translations are defined in the **LANG_DEF.CPP** file. If a different default language is desired, simply copy a **LANG_<ISO>.CPP** file from the ZINC\SOURCE\INTL directory to the ZINC\-SOURCE directory and rename it to **LANG_DEF.CPP**. Then rebuild the library.

- *className*$_{in}$ is the class name of the object for which the language data is being set. This typically corresponds to the *_className* member variable of the object.

- *defaultMessages*$_{in}$ is the ZIL_PRIVATE_LANGUAGE_ELEMENT class that contains the translations for the object. The ZIL_PRIVATE_LANGUAGE_ELEMENT class is simply a ZIL_LANGUAGE_ELEMENT class except that in Unicode mode it does not have the **SwapData( )** member function.

ZIL_LANGUAGE_MANAGER::UseLanguage

Syntax

#include <ui_gen.hpp>

static const ZIL_LANGUAGE *UseLanguage(const ZIL_LANGUAGE **language*);
or
static const ZIL_LANGUAGE *UseLanguage(const ZIL_ICHAR **className*,
const ZIL_ICHAR **languageName* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions mark a ZIL_LANGUAGE object as used by incrementing its *useCount* member. Whenever a library object requests the use of a ZIL_LANGUAGE object, it marks the object as used by calling this function, which increments the object's *useCount* member. When the library object is done using the ZIL_LANGUAGE object, it must release it by calling the **FreeLanguage( )** function.

The first overloaded function takes a pointer to the ZIL_LANGUAGE object being marked as used.

- $returnValue_{out}$ is a pointer to the ZIL_LANGUAGE object.
- $language_{in}$ is a pointer to the ZIL_LANGUAGE object that is to be marked as used.

The second overloaded function takes the class name of the object and the internationalization name. If load capability is enabled (i.e., **ZIL_LOAD** was defined when the library was compiled) this function will load the data from the **I18N.DAT** file if necessary. Otherwise, the data must have been compiled and linked into the application.

- $returnValue_{out}$ is a pointer to the ZIL_LANGUAGE object.

- *className*$_{in}$ is the class name of the object for which the internationalization data is being requested. This typically corresponds to the *_className* member variable of the object.

- *languageName*$_{in}$ is the two-letter ISO name identifying the language to be used.

CHAPTER 62 – ZIL_LOCALE

The ZIL_LOCALE class object is used to maintain locale information for a particaular country for all objects. Any object that needs locale information has a pointer to the ZIL_LOCALE object containing the data for the desired country. The object can get a pointer to the appropriate ZIL_LOCALE object through the ZIL_LOCALE_MANAGER, which maintains a list of all ZIL_LOCALE objects. Because each instance of an object can have its own ZIL_LOCALE object, each field can be formatted for a different locale, if desired.

The ZIL_LOCALE class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_LOCALE : public ZIL_I18N
{
public:
    ZIL_LOCALE(void);
#if defined(ZIL_LOAD)
    virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY *object);
#endif
#if defined(ZIL_STORE)
    virtual void ClassStoreData(ZIL_STORAGE_OBJECT *object);
#endif
    ZIL_LOCALE_ELEMENT data;
#if defined(ZIL_MSDOS) || defined(ZIL_MSWINDOWS) || defined(ZIL_OS2) ||
    defined(ZIL_CURSES) || defined(ZIL_MACINTOSH)
    static int oemCountryCode;
#endif
protected:
    virtual void AssignData(const ZIL_I18N *data);
    virtual void DeleteData(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *data* is the ZIL_LOCALE_ELEMENT object that contains the locale data for this locale.

- *oemCountryCode* is the country code for the environment on which the application is running. This value is used to set the locale data.

ZIL_LOCALE::ZIL_LOCALE

Syntax

#include <ui_gen.hpp>

ZIL_LOCALE(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new ZIL_LOCALE class object.

ZIL_LOCALE::AssignData

Syntax

#include <ui_gen.hpp>

virtual void AssignData(const ZIL_I18N **data*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function assigns the data maintained by *data* to the ZIL_LOCALE object. The *data* is copied.

- *data*$_{in}$ is a pointer to the ZIL_LOCALE object containing the data that is to be assigned.

ZIL_LOCALE::DeleteData

Syntax

#include <ui_gen.hpp>

virtual void DeleteData(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function deletes the data maintained by this object.

Storage Members

This section describes those class members that are used for storage purposes.

ZIL_LOCALE::ClassLoadData

Syntax

#include <ui_gen.hpp>

virtual void ClassLoadData(ZIL_STORAGE_OBJECT_READ_ONLY **object*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to load ZIL_LOCALE data from a persistent object data file. The data is loaded from the current directory. This function is typically not used by the programmer.

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT_READ_ONLY object that contains the data. For more information on persistent objects, see "Chapter 69—ZIL_STORAGE_OBJECT_READ_ONLY."

ZIL_LOCALE::ClassStoreData

Syntax

```
#include <ui_gen.hpp>

virtual void ClassStoreData(ZIL_STORAGE_OBJECT *object);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function is used to store ZIL_LOCALE data in a persistent object data file. The data is stored in the current directory. This function is typically not used by the programmer.

- *object*$_{in}$ is a pointer to the ZIL_STORAGE_OBJECT where the data will be stored. For more information on persistent objects, see "Chapter 68—ZIL_STORAGE_-OBJECT."

CHAPTER 63 – ZIL_LOCALE_ELEMENT

The ZIL_LOCALE_ELEMENT structure is used by the ZIL_LOCALE class to provide locale information for objects.

The ZIL_LOCALE_ELEMENT structure is declared in **UI_GEN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS ZIL_LOCALE_ELEMENT
{
    ZIL_ICHAR decimalSeparator[4];
    ZIL_ICHAR monDecimalSeparator[4];
    ZIL_ICHAR thousandsSeparator[4];
    ZIL_ICHAR monThousandsSeparator[4];
    ZIL_ICHAR currencySymbol[8];
    char grouping[10];
    char monGrouping[10];
    ZIL_ICHAR intCurrencySymbol[5];
    int posCurrencyPrecedes;
    int negCurrencyPrecedes;
    int fractionDigits;
    int intFractionDigits;
    ZIL_ICHAR positiveSign[4];
    int posSignPrecedes;
    int posSpaceSeparation;
    ZIL_ICHAR negativeSign[4];
    int negSignPrecedes;
    int negSpaceSeparation;

    ZIL_ICHAR *bnumLeftParen;
    ZIL_ICHAR *bnumRightParen;

    ZIL_ICHAR *timeStringFormat;
    ZIL_ICHAR *dateStringFormat;
    ZIL_ICHAR *dateTimeStringFormat;
    ZIL_ICHAR *time12StringFormat;
    ZIL_ICHAR *defDigits;
    ZIL_ICHAR *altDigits;

    ZIL_ICHAR timeSeparator[4];
    ZIL_ICHAR dateSeparator[4];
    int defaultDateFlags;
    int defaultTimeFlags;
};
```

General Members

This section describes those members that are used for general purposes.

NOTE: The following examples use the United States format unless otherwise specified.

- *decimalSeparator* is the system's decimal separator (e.g., 100.00).

- *monDecimalSeparator* is the system's currency decimal separator (e.g., $100.00).

- *thousandsSeparator* is the system's thousands separator (e.g., 100,000).

- *monThousandsSeparator* is the system's currency thousands separator (e.g., $100,000.00).

- *currencySymbol* is the system's currency symbol (e.g., '**$**').

- *grouping* is a string that indicates the format to be used for grouping digits in a number. For more specific information, see the ANSI Standard Specification for the C Programming Language.

- *monGrouping* is a string that indicates the format to be used for grouping digits in a monetary number. For more specific information, see the ANSI Standard Specification for the C Programming Language.

- *intCurrencySymbol* is the system's international currency symbol (e.g., '**USD**').

- *posCurrencyPrecedes* is TRUE if the currency symbol precedes the currency amount for positive currency values (e.g., '$100,000.00'). Otherwise, *posCurrencyPrecedes* is FALSE and the currency symbol will be displayed following the currency amount.

- *negCurrencyPrecedes* is TRUE if the currency symbol precedes the currency amount for negative currency values (e.g., '-$100,000.00'). Otherwise, *negCurrencyPrecedes* is FALSE and the currency symbol will be displayed following the currency amount.

- *fractionDigits* specifies the number of fractional digits to display after the decimal point on currency values (e.g., $100.**00**).

- *intFractionDigits* specifies the number of fractional digits to display after the decimal point on currency values in international format (e.g., USD100.**00**).

- *positiveSign* specifies the symbol for positive values (e.g., +100 or 100).

- *posSignPrecedes* is TRUE if the symbol for positive amounts is displayed before the currency symbol. Otherwise, *posSignPrecedes* is FALSE and the symbol will be displayed following the amount.

- *posSpaceSeparation* is TRUE if there is a space separator between the currency symbol and the currency amount when the currency is positive. Otherwise, *posSpaceSeparation* is FALSE.

- *negativeSign* specifies the symbol for negative values (e.g., -100).

- *negSignPrecedes* is TRUE if the symbol for negative amounts is displayed before the currency symbol. Otherwise, *negSignPrecedes* is FALSE and the symbol will be displayed following the amount.

- *negSpaceSeparation* is TRUE if there is a space separator between the currency symbol and the currency amount when the currency is negative. Otherwise, *negSpaceSeparation* is FALSE.

- *bnumLeftParen* is the symbol used to the left of a negative number if the number format calls for encompassing negative symbols.

- *bnumRightParen* is the symbol used to the right of a negative number if the number format calls for encompassing negative symbols.

- *timeStringFormat* is the system's current time format (e.g., **12:00a**).

- *dateStringFormat* is the system's current date format (e.g., **12/25/91**).

- *dateTimeStringFormat* is the system's current format for presenting a date and time together.

- *time12StringFormat* is the system's current format for presenting a time.

- *defDigits* is a string containing the default digits to use when a '%d' is encountered in a **printf** format string.

- *altDigits* is a string containing the alternate digits to use when a '%ad' is encountered in a **printf** format string.

- *timeSeparator* is the system's time separator (e.g., 12**:**00).

- *dateSeparator* is the system's date separator (e.g., 12/25/91).

- *defaultDateFlags* is the default date flags as obtained from the operating system.

- *defaultTimeFlags* is the default time flags as obtained from the operating system.

CHAPTER 64 – ZIL_LOCALE_MANAGER

The ZIL_LOCALE_MANAGER class object is used to maintain a list of ZIL_LOCALE objects. Each ZIL_LOCALE class contains all formatting information for a particular locale.

The ZIL_LOCALE_MANAGER class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_LOCALE_MANAGER : public ZIL_I18N_MANAGER
{
public:
    ZIL_LOCALE_MANAGER(void);
    virtual ZIL_I18N *CreateData(void);

    static void FreeLocale(const ZIL_LOCALE *locale);
    static void LoadDefaultLocale(const ZIL_ICHAR *localeName);
    static const ZIL_LOCALE *UseLocale(const ZIL_LOCALE *locale);
    static const ZIL_LOCALE *UseLocale(const ZIL_ICHAR *localeName =
        ZIL_NULLP(ZIL_ICHAR));

    static void SetLocale(const ZIL_ICHAR *localeName,
        ZIL_LOCALE_ELEMENT *defaultLocale);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_LOCALE_MANAGER::ZIL_LOCALE_MANAGER

Syntax

#include <ui_gen.hpp>

ZIL_LOCALE_MANAGER(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This constructor creates a new ZIL_LOCALE_MANAGER object.

ZIL_LOCALE_MANAGER::CreateData

Syntax

#include <ui_gen.hpp>

virtual ZIL_I18N *CreateData(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function creates a new ZIL_LOCALE object. Because it is a pure virtual function at the base ZIL_I18N_MANAGER class level, the generic code in the ZIL_-I18N_MANAGER class can use it to create the proper data object.

- *returnValue*$_{out}$ is a pointer to the new ZIL_LOCALE object that was created.

ZIL_LOCALE_MANAGER::FreeLocale

Syntax

#include <ui_gen.hpp>

static void FreeLocale(const ZIL_LOCALE *_locale_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function releases the ZIL_LOCALE object from use by decrementing the ZIL_-LOCALE object's *useCount* member. Whenever a library object requests the use of a ZIL_LOCALE object, it does so by calling the **UseLocale( )** function, which marks the ZIL_LOCALE object as used by incrementing its *useCount* member. When the library object is done using the ZIL_LOCALE object, it must release it by calling this function. If the releasing object was the last object using the ZIL_LOCALE object, this function will deallocate the data being maintained by the ZIL_LOCALE object unless it contains the default data.

- $locale_{in}$ is a pointer to the ZIL_LOCALE object that is being released.

ZIL_LOCALE_MANAGER::LoadDefaultLocale

Syntax

#include <ui_gen.hpp>

static void LoadDefaultLocale(const ZIL_ICHAR **localeName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the default locale for the application. Any objects that are using the default locale information at the time this function is called will start using the new

default data. If necessary, this function loads the default locale data from the **I18N.DAT** file.

- *localeName*$_{in}$ is the two-letter ISO name identifying the locale which is to be the default for the application.

ZIL_LOCALE_MANAGER::SetLocale

Syntax

#include <ui_gen.hpp>

static void SetLocale(const ZIL_ICHAR **localeName*,
ZIL_LOCALE_ELEMENT **defaultLocale*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function places the default locale data for a particular object in the list of locale information maintained by the ZIL_LOCALE_MANAGER class. Locale information must be placed in the list using this function before it can be accessed using the **UseLocale( )** function. The default locale information is defined in the **LOC_DEF.CPP** file. If a different default locale is desired, simply copy a **LOC_<ISO>.CPP** file from the ZINC\SOURCE\INTL directory to the ZINC\SOURCE directory and rename it to **LOC_DEF.CPP**. Then rebuild the library.

- *className*$_{in}$ is the class name of the object for which the locale data is being set. This typically corresponds to the *_className* member variable of the object.

- *defaultLocale*$_{in}$ is the ZIL_LOCALE_ELEMENT class that contains the default locale information for the object.

ZIL_LOCALE_MANAGER::UseLocale

Syntax

```
#include <ui_gen.hpp>

static ZIL_LOCALE *UseLocale(const ZIL_LOCALE *locale);
    or
static const ZIL_LOCALE *UseLocale(const ZIL_ICHAR *localeName =
    ZIL_NULLP(ZIL_ICHAR));
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions mark a ZIL_LOCALE object as used by incrementing its *useCount* member. Whenever a library object requests the use of a ZIL_LOCALE object, it marks the object as used by calling this function, which increments the object's *useCount* member. When the library object is done using the ZIL_LOCALE object, it must release it by calling the **FreeLocale( )** function.

The first overloaded function takes a pointer to the ZIL_LOCALE object being marked as used.

- *returnValue*$_{out}$ is a pointer to the ZIL_LOCALE object.
- *locale*$_{in}$ is a pointer to the ZIL_LOCALE object that is to be marked as used.

The second overloaded function takes the internationalization name. If load capability is enabled (i.e., **ZIL_LOAD** was defined when the library was compiled) this function will load the data from the **I18N.DAT** file if necessary. Otherwise, the data must have been compiled and linked into the application.

- *returnValue*$_{out}$ is a pointer to the ZIL_LOCALE object.
- *localeName*$_{in}$ is the two-letter ISO name identifying the locale to be used.

CHAPTER 65 – ZIL_MAP_CHARS

The ZIL_MAP_CHARS class object is used to map characters between the Zinc standard character set and the "hardware" character set. The Zinc standard character set is Unicode, if the application is running in Unicode mode, or ISO8859-1 if not. The hardware character set is the character set in use on the system. The ZIL_MAP_CHARS class loads and maintains the required character map tables. The mapping provided by this class allows applications to properly interpret entered data at program execution. But this mapping also allows applications, like the Designer, to load a text file that was created using one character set and save it in another character set. At the time of this printing, map tables were available for the following character sets in Unicode mode: IBM 932, including extra tables for AT and NEC machines; Big Five; IBM 938, including an extra table for AT machines; IBM 1381, including an extra table for AT machines; IBM 949, including an extra table for AT machines; EUC JIS, including an extra table for Motif; IBM 437; IBM 737; IBM 850; IBM 852; IBM 855; IBM 857; IBM 860; IBM 861; IBM 863; IBM 865; IBM 866; IBM 869; IBM 1251; Macintosh; and NEXTSTEP. Map tables were available for the following character sets in ISO8859-1 mode (i.e., non-Unicode mode): IBM 437; IBM 737; IBM 850; IBM 852; IBM 855; IBM 857; IBM 860; IBM 861; IBM 863; IBM 865; IBM 866; IBM 869; IBM 1251; Macintosh; and NEXTSTEP. The complete list of available tables can be determined using the Browse utility and inspecting the **I18N.DAT** file.

The ZIL_MAP_CHARS class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_MAP_CHARS : public ZIL_I18N
{
public:
    ZIL_MAP_CHARS(const ZIL_ICHAR *_mapName, const ZIL_ICHAR *extraName);
    ZIL_MAP_CHARS(const ZIL_ICHAR *_mapName, const void *fromStandard,
        const void *toStandard, int _doDelete);
    ~ZIL_MAP_CHARS();
    char *MapChar(ZIL_ICHAR mapped);
    char *MapText(const ZIL_ICHAR *mapped,
        char *unMapped = ZIL_NULLP(char), int allocate = TRUE);
    ZIL_ICHAR UnMapChar(const char *unMapped);
    ZIL_ICHAR *UnMapText(const char *unMapped,
        ZIL_ICHAR *mapped = ZIL_NULLP(ZIL_ICHAR), int allocate = TRUE);

#if defined(ZIL_UNICODE)
    int mblen(const char *hardware);
    int wcstombs(char *s, const ZIL_ICHAR *pwcs, int n= -1);
    int mbstowcs(ZIL_ICHAR *pwcs, const char *s, int n = -1);
#endif
    ZIL_ICHAR dirSepStr[2];
    int error;      // Returned error of storage
    ZIL_ICHAR name[12];
};
```

General Members

This section describes those members that are used for general purposes.

- *dirSepStr* is the character used to separate directories in the environment on which the application is running. For example, on Posix systems, directories are separated with the '/' character, but on Japanese systems, directories are separated with the '¥' character.

- *error* indicates if there were any errors when accessing the storage file where the map table is located.

- *name* is the name of the map table.

ZIL_MAP_CHARS::ZIL_MAP_CHARS

Syntax

#include <ui_gen.hpp>

ZIL_MAP_CHARS(const ZIL_ICHAR **_mapName*, const ZIL_ICHAR **extraName*);
or
ZIL_MAP_CHARS(const ZIL_ICHAR **_mapName*, const void **fromStandard*,
const void **toStandard*, int *_doDelete*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors create a new ZIL_MAP_CHARS class object.

The first overloaded constructor loads the map tables from the **I18N.DAT** file.

- *_mapName*$_{in}$ identifies the map table to be loaded based on the character set used by the environment. For example, in Windows NT *_mapName* is "Unicode" since Windows NT uses the Unicode character set. In OS/2, however, *_mapName* may be "IBM_850" since OS/2 commonly uses code page 850.

- *extraName*$_{in}$ is the name of the map table that contains exceptions to the map table identified by *_mapName*. Some character sets may be arranged slightly differently on different operating systems. This map table contains mappings for those characters that are known to be in different locations. It also contains some characters that Zinc uses that are not part of the normal character sets, such as text mode line draw characters.

The second overloaded constructor uses pointers to existing map tables.

- *_mapName*$_{in}$ identifies the map table based on the character set used by the environment. For example, in Windows NT *_mapName* is "Unicode" since Windows NT uses the Unicode character set. In OS/2, however, *_mapName* may be "IBM_850" since OS/2 commonly uses code page 850.

- *fromStandard*$_{in}$ is a map table that provides character mappings from the Zinc standard character set (either Unicode or ISO8859-1) to the hardware character set.

- *toStandard*$_{in}$ is a map table that provides character mappings from the hardware character set to the Zinc standard character set. This map table will not be used in Unicode mode since the *fromStandard* map table is small enough that a simple search can provide the mapping from the hardware character set to Unicode.

- *_doDelete*$_{in}$ specifies if the map tables can be deleted.

ZIL_MAP_CHARS::~ZIL_MAP_CHARS

Syntax

```
#include <ui_gen.hpp>

virtual ~ZIL_MAP_CHARS(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the ZIL_MAP_-CHARS object.

ZIL_MAP_CHARS::MapChar

Syntax

```
#include <ui_gen.hpp>

char *MapChar(ZIL_ICHAR mapped);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function maps a character from the Zinc standard character set to the hardware character set. **MapChar** uses static space for the return string, so its value should be copied, and should not be deleted.

- $returnValue_{out}$ is a pointer to the hardware string.
- $mapped_{in}$ is the Zinc standard character that is to be mapped to the hardware character set.

ZIL_MAP_CHARS::MapText

Syntax

#include <ui_gen.hpp>

char *MapText(const ZIL_ICHAR **mapped*, char **unmapped* = ZIL_NULLP(char),
int *allocate* = TRUE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function maps a string from the Zinc standard character set to the hardware character set. **MapText** may allocate space for the resulting string which the programmer would be responsible for deleting.

- *returnValue*$_{out}$ is a pointer to the hardware string.
- *mapped*$_{in}$ is the Zinc standard character string that is to be mapped to the hardware character set.
- *unmapped*$_{out}$ is a buffer in which the hardware string will be placed. If used, this buffer must be large enough to contain the string. If no buffer is passed in, the function can be directed to allocate a buffer or to use a temporary buffer.
- *allocate*$_{in}$ specifies if the function should allocate a buffer for the hardware string. If *allocate* is TRUE and no buffer was passed through the *unmapped* argument, a new buffer is allocated which the programmer is responsible for freeing. Otherwise, a static buffer is used.

ZIL_MAP_CHARS::mblen

Syntax

#include <ui_gen.hpp>

int mblen(const char *_hardware_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function calculates how many bytes long a character is. The characters in some character sets may be from one to four bytes long. This function is used to determine the length of the first character in a string of multi-byte characters. This function is defined in Unicode mode only.

- $returnValue_{out}$ is the number of bytes in the first character of the string passed in.
- $hardware_{in}$ is the multi-byte character string of which the first character's size is required.

ZIL_MAP_CHARS::mbstowcs

Syntax

#include <ui_gen.hpp>

int mbstowcs(ZIL_ICHAR *_pwcs_, const char *_s_, int _n_ = -1);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts a multi-byte character string to a wide-character Unicode string. The source string is made up of characters from any hardware character set. This function is defined in Unicode mode only.

- *returnValue* is a count of how many characters are in the converted string.
- $pwcs_{out}$ is a pointer to a buffer in which the converted wide-character Unicode string will be placed. This buffer must be large enough to contain the string.
- s_{in} is the source string to be converted. This string is made up of characters from the local hardware character set.
- n_{in} is a count of how many characters are to be converted. If *n* is less than 0, the strlen of *s* is used. **strlen** will provide the maximum number of characters that the input string may contain since **strlen** will not necessarily return the number of actual characters in the string, but rather the number of 8-bit values in the string. Some characters may be more than 8-bits wide.

ZIL_MAP_CHARS::UnMapChar

Syntax

#include <ui_gen.hpp>

ZIL_ICHAR UnMapChar(const char **unMapped*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function unmaps a character from the hardware character set and returns the equivalent character from the Zinc standard character set.

- *returnValue*$_{out}$ is the unmapped Zinc standard character.
- *unMapped*$_{in}$ is a pointer to a buffer containing the hardware character.

ZIL_MAP_CHARS::UnMapText

Syntax

```
#include <ui_gen.hpp>

ZIL_ICHAR *UnMapText(const char *unmapped,
    ZIL_ICHAR *mapped = ZIL_NULLP(ZIL_ICHAR), int allocate = TRUE);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function unmaps a string from a hardware character set to a Zinc standard character string.

- *returnValue*$_{out}$ is a pointer to the unmapped Zinc standard text.
- *unmapped*$_{in}$ is a pointer to a buffer containing the mapped hardware text.

- *mapped*$_{out}$ is a pointer to a buffer in which the unmapped Zinc standard text will be placed.

- *allocate*$_{in}$ indicates if the function should allocate a buffer for the unmapped Zinc standard text. If *allocate* is TRUE and no buffer is passed through the *mapped* argument, the function will allocate a buffer. The programmer is responsible for deleting the buffer. If allocate is FALSE, a static buffer is used.

ZIL_MAP_CHARS::wcstombs

Syntax

#include <ui_gen.hpp>

int wcstombs(char *s, const ZIL_ICHAR *$pwcs$, int n = -1);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts a wide-character Unicode string to a multi-byte character string. The destination string will be made up of characters from the hardware character set. This function is defined in Unicode mode only.

- *returnValue* is a count of how many characters are in the converted string.

- s_{out} is a pointer to a buffer in which the multi-byte character string will be placed after it has been converted from the Unicode string. This string will be made up of characters from the local hardware character set. The buffer must be large enough to hold the converted string.

- $pwcs_{in}$ is a pointer to the wide-character Unicode string.

- n_{in} is a count of how many characters are to be converted. If n is less than 0, the **strlen** of s is used.

CHAPTER 66 – ZIL_STORAGE

The ZIL_STORAGE class is used to write Zinc Application Framework data files. It is created as a class so that the file can be treated as an object, which does the writing. Because ZIL_STORAGE is derived from ZIL_STORAGE_READ_ONLY, this class inherits reading functionality.

Although the ZIL_STORAGE is stored in a file, it should be thought of as a file system and not just a file. The ZIL_STORAGE class is similar, in design, to the Unix file system. This means that within a ZIL_STORAGE object, there can be many files (i.e., objects derived from ZIL_STORAGE_OBJECT) and levels of sub-directories. The programmer has the ability to copy, delete and move files across directories. The maximum length of a ZIL_STORAGE object is about 16 megabytes with the maximum size of an individual object being 4 megabytes. A single ZIL_STORAGE object may contain a maximum of 16,000 objects (i.e., ZIL_STORAGE_OBJECT.)

The ZIL_STORAGE class is typically used for persistent objects (e.g., objects created using Zinc Designer) and for storing internationalization data. It is also commonly used as a simple data base.

The ZIL_STORAGE class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_STORAGE : public ZIL_STORAGE_READ_ONLY
{
public:             // Read/Write Storage
    ZIL_STORAGE(void);
    ZIL_STORAGE(const ZIL_ICHAR *name, UIS_FLAGS pFlags = UIS_READWRITE);
    ~ZIL_STORAGE(void);
    int DestroyObject(const ZIL_ICHAR *name);
    int Flush(void);
    int Link(const ZIL_ICHAR *path1, const ZIL_ICHAR *path2);
    int MkDir(const ZIL_ICHAR *newName);
    int RenameObject(const ZIL_ICHAR *oldObject, const ZIL_ICHAR *newName);
    int RmDir(const ZIL_ICHAR *name);
    int Save(int revisions = 0);
    int SaveAs(const ZIL_ICHAR *newName, int revisions = 0);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_STORAGE::ZIL_STORAGE

Syntax

#include <ui_gen.hpp>

ZIL_STORAGE(void);
or
ZIL_STORAGE(const ZIL_ICHAR **name*, UIS_FLAGS *pFlags* = UIS_READWRITE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors both create a new ZIL_STORAGE class object.

The first overloaded constructor creates a ZIL_STORAGE with no associated disk file.

The second overloaded constructor creates a ZIL_STORAGE and binds it to a disk file.

- $name_{in}$ is the name of the file to be opened. *name* can include a path, if desired. If the storage file cannot be opened, this function will use UI_PATH functions to search other paths for the file. For example, "~zinc~examples~*.dat" will return the first **.DAT** file found with that path. Notice that the '~' character is used as the directory separator. The '*' character is considered to be a wildcard character.

- $pFlags_{in}$ indicates how a file is to be opened. The following UIS_FLAGS are supported:

  UIS_READ—Opens the file for read access only.

  UIS_READWRITE—Opens the file for read and write access. This flag allows modifications to be made to the file.

  UIS_CREATE—Creates and opens a file for write access. Any previous file will be deleted.

UIS_OPENCREATE—Opens an existing object for read and write access. If the object does not exist, it is created for read and write access.

UIS_TEMPORARY—Creates the file as a temporary file. When ZIL_STORAGE is destroyed, the file will be deleted.

Example

```
#include <ui_win.hpp>

UI_HELP_SYSTEM::UI_HELP_SYSTEM(char *pathName,
    UI_WINDOW_MANAGER *windowManager, UI_HELP_CONTEXT helpContext) :
    defaultHelpContext(helpContext)
{
    // Open the help storage unit.
    storage = new ZIL_STORAGE(pathName, UIS_READ);
    if (storage->storageError)
    {
        delete storage;
        storage = NULL;
    }
    .
    .
    .

}
```

ZIL_STORAGE::~ZIL_STORAGE

Syntax

#include <ui_gen.hpp>

~ZIL_STORAGE(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the class information associated with the ZIL_STORAGE object and closes any files opened by the ZIL_STORAGE constructor. If a file was opened with the UIS_TEMPORARY flag, it will be deleted when this destructor is called.

Example

```
#include <ui_win.hpp>

UI_HELP_SYSTEM::~UI_HELP_SYSTEM(void)
{
    if (storage)
        delete storage;
    delete helpWindow;
}
```

ZIL_STORAGE::DestroyObject

Syntax

#include <ui_gen.hpp>

int DestroyObject(const ZIL_ICHAR *name);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This removes an object from the ZIL_STORAGE file. After it is removed, the object is destroyed. The file space associated with the object is not freed, but is re-used if a new object is written to the file.

- *returnValue*$_{out}$ is 0 on success. If a failure occurred, -1 is returned.
- *name*$_{in}$ is the name of the object to be destroyed.

Example

```
#include <ui_win.hpp>

int RemoveDirectory(ZIL_STORAGE *storage, const char *name,
    const char *directoryName)
{
    // Clean the directory.
    for (name = FindFirstObject(name); name; name = FindFirstObject(name))
        DestroyObject(name);
```

```
    storage->ChDir("..");
    storage->RmDir(directoryName);
}
```

ZIL_STORAGE::Flush

Syntax

#include <ui_gen.hpp>

int Flush(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function writes the internal cache buffer to a temporary file. One use of this function would be to save backup copies of a file within a timer function. **Flush( )** does not update the actual storage file. To commit the changes to the storage file, use **Save( )**.

- *returnValue*$_{out}$ is 0 on success and -1 if an error occurs.

Example

```
#include <ui_gen.hpp>

int TimerBackup(ZIL_STORAGE *storage)
{
    .
    .
    .
    storage->Flush();
}
```

ZIL_STORAGE::Link

Syntax

#include <ui_gen.hpp>

int Link(const ZIL_ICHAR *path1*, const ZIL_ICHAR *path2*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function gives an existing object a second name. This allows a second (or later) instance of an object within a **.DAT** file to reference, or point to, the data stored with the original instance of the object. Thus, many objects can use the same data without duplicating the data for each instance. After this function is called, both names refer to the same object. Deleting one name will not delete the other name or the object. This is different than a rename.

- $returnValue_{out}$ is 0 on success and -1 if an error occurs.
- $path1_{in}$ is the original name (including its path) of the object .
- $path2_{in}$ is the new name (including its path) by which the object can also be referenced.

Example

```
#include <ui_gen.hpp>

int EmployeeSetup(void)
{
    .
    .
    .

    storage->Link("~employees~Blake", "~development~Blake");
}
```

ZIL_STORAGE::MkDir

Syntax

#include <ui_gen.hpp>

int MkDir(const ZIL_ICHAR *newName);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function makes a new directory within a ZIL_STORAGE file.

- *returnValue*$_{out}$ is 0 on success and -1 on failure.
- *newName*$_{in}$ is the name of the directory to be created. For example, "~UI_HPP~MYDIR" can be specified to make the directory "MYDIR" in the UI_HPP subdirectory.

Example

```
#include <ui_gen.hpp>

main(int argc, char *argv[])
{
    .
    .
    .

    // Create the help directory.
    ZIL_STORAGE *helpFile = new ZIL_STORAGE(fileName, UIS_READWRITE);
    if (helpFile->storageError)
    {
        delete helpFile;
        helpFile = new ZIL_STORAGE(fileName, UIS_CREATE | UIS_READWRITE);
    }
    helpFile->MkDir("UI_HPP");
    if (newHelpDirectory)
        helpFile->RmDir("UI_HELP_CONTEXT");
    helpFile->MkDir("UI_HELP_CONTEXT");

    // Print genhelp status.
    PrintStatus("PROCESSING %s:\n", fileName);
```

```
    ZIL_OBJECTID helpID = 0;

    // Generate the HPP directory.
    helpFile->ChDir("~UI_HPP");
    ZIL_STORAGE_OBJECT *hppElement = new ZIL_STORAGE_OBJECT(*helpFile,
        "HELP_CONTEXTS", ID_HELP_CONTEXT, UIS_CREATE | UIS_READWRITE);

    // Generate the help contexts.
    helpFile->ChDir("~UI_HELP_CONTEXT");
    .
    .
    .
}
```

ZIL_STORAGE::RenameObject

Syntax

#include <ui_gen.hpp>

int RenameObject(const ZIL_ICHAR **oldObject*, const ZIL_ICHAR **newName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function changes the name (i.e., *stringID*) of an object inside the storage object.

- *returnValue*$_{out}$ is 0 on success and -1 on failure.
- *oldObject*$_{in}$ is the name of the object whose name is to be changed.
- *newName*$_{in}$ is the new name of the object.

Example

```
#include <ui_gen.hpp>

ExampleFunction(ZIL_STORAGE *storage)
{
    .
```

```
    .
    .
    storage->RenameObject("Item1", "FirstItem");
}
```

ZIL_STORAGE::RmDir

Syntax

#include <ui_gen.hpp>

int RmDir(const ZIL_ICHAR *name);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function removes a directory within a ZIL_STORAGE file.

- $returnValue_{out}$ is 0 on success and -1 on failure.
- $name_{in}$ is the name of the directory to be removed.

NOTE: A directory must be empty in order for it to be deleted.

Example

```
#include <ui_win.hpp>

main(int argc, char *argv[])
{
    .
    .
    .
    // Create the help directory.
    ZIL_STORAGE *helpFile = new ZIL_STORAGE(fileName, UIS_READWRITE);
    if (helpFile->storageError)
    {
        delete helpFile;
        helpFile = new ZIL_STORAGE(fileName, UIS_CREATE | UIS_READWRITE);
```

```
    }
    helpFile->MkDir("UI_HPP");
    if (newHelpDirectory)
        helpFile->RmDir("UI_HELP_CONTEXT");
    helpFile->MkDir("UI_HELP_CONTEXT");

    // Print genhelp status.
    PrintStatus("PROCESSING %s:\n", fileName);
    ZIL_OBJECTID helpID = 0;

    // Generate the HPP directory.
    helpFile->ChDir("~UI_HPP");
    ZIL_STORAGE_OBJECT *hppElement = new ZIL_STORAGE_OBJECT(*helpFile,
        "HELP_CONTEXTS", ID_HELP_CONTEXT, UIS_CREATE | UIS_READWRITE);

    // Generate the help contexts.
    helpFile->ChDir("~UI_HELP_CONTEXT");
    .
    .
    .
}
```

ZIL_STORAGE::Save

Syntax

#include <ui_gen.hpp>

int Save(int *revisions* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function saves the storage file and all of the information contained in it. This operation (or a call to **SaveAs( )**) must be performed even if each individual object is stored. Since some objects are saved in temporary files, this is the only way to ensure that the information is saved to the main storage file.

- *returnValue*$_{out}$ is 0 on success, or -1 on failure.

- *revisions*$_{in}$ is the number of backup files to be kept. Backup files are files with the .BK? extension where the "?" denotes which backup number the file is. For example, **TEST.BK1** would be the most recent backup of the file **TEST.DAT**, **TEST.BK2** would be the previous backup of the file **TEST.DAT**, etc.

NOTE: A backup file is only created the first time **Save( )** is called. The different backup file revisions are created from previous times the file was opened. To create another backup file, you must close and then re-open the storage.

Example

```
#include <ui_gen.hpp>

int ZIL_STORAGE::SaveAs(const char *newName, int revisions)
{
    if (!FlagSet(flags, UIS_READWRITE))
    {
        storageError = EACCES;
        return -1;
    }
    if (modified) (void) time(&sb->modifytime);
    Flush();
    StripFullPath(newName, pname, fname);
    firstTime = 1;
    Save(revisions);
    return 0;
}
```

ZIL_STORAGE::SaveAs

Syntax

#include <ui_gen.hpp>

int SaveAs(ZIL_ICHAR **newName*, int *revisions* = 0);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function saves the storage file and all of the information contained in it. This operation (or a call to **Save( )**) must be performed even if each individual object is stored. Since some objects are saved in temporary files, this is the only way to ensure that the information is saved to the main storage file.

- *returnValue*$_{out}$ is 0 on success, or -1 on failure.
- *newName*$_{in}$ is the new name of the storage file.
- *revisions*$_{in}$ is the number of backup files to be kept. Backup files are files with the .BK? extension where the "?" denotes which backup number the file is. For example, **TEST.BK1** would be the most recent backup of the file **TEST.DAT**, **TEST.BK2** would be the previous backup of the file **TEST.DAT**, etc.

NOTE: A backup file is only created the first time **SaveAs( )** is called. The different backup file revisions are created from previous times the file was opened. To create another backup file, you must close and then re-open the storage.

Example

```
#include <ui_gen.hpp>

int CloseAll(ZIL_STORAGE *storage, const char *newName, int revisions)
{
    char currentName[129];

    Flush();
    StorageName(currentName);
    if (!strcmp(currentName, newName));
        Save(revisions);
    else
        SaveAs(newName, revisions);
    return 0;
}
```

CHAPTER 67 – ZIL_STORAGE_DIRECTORY

The ZIL_STORAGE_DIRECTORY class object provides a directory pointer and the functionality to manipulate the directory pointer. It is used by ZIL_STORAGE_READ_-ONLY and ZIL_STORAGE to maintain multiple directory pointers. A new instance of ZIL_STORAGE_DIRECTORY can only be created using the **ZIL_STORAGE_READ_-ONLY::OpenDir( )** function. This class is typically not used by the programmer.

The ZIL_STORAGE_DIRECTORY class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_STORAGE_DIRECTORY
{
public:
    ~ZIL_STORAGE_DIRECTORY(void);
    directoryEntry *ReadDir(void);
    void RewindDir(void);
    void SeekDir(ZIL_UINT16 _position);
    ZIL_UINT16 TellDir(void);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_STORAGE_DIRECTORY::~ZIL_STORAGE_DIRECTORY

Syntax

#include <ui_gen.hpp>

virtual ~ZIL_STORAGE_DIRECTORY(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the ZIL_STORAGE_DIRECTORY object.

ZIL_STORAGE_DIRECTORY::ReadDir

Syntax

```
#include <ui_gen.hpp>

directoryEntry *ReadDir(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function obtains information about the current directory.

- *returnValue*$_{out}$ is a pointer to **directoryEntry**, a structure that contains some data about the directory.

ZIL_STORAGE_DIRECTORY::RewindDir

Syntax

```
#include <ui_gen.hpp>

void RewindDir(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function repositions the directory file pointer to the position it was at when the ZIL_-STORAGE_DIRECTORY object was created.

ZIL_STORAGE_DIRECTORY::SeekDir

Syntax

```
#include <ui_gen.hpp>

void SeekDir(ZIL_UINT16 _position);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function positions the file pointer to the position specified by *_position*. This function should only be used with a value obtained from **TellDir( )**.

- $\_position_{in}$ is the position to which the file pointer should be set.

ZIL_STORAGE_DIRECTORY::TellDir

Syntax

```
#include <ui_gen.hpp>

ZIL_UINT16 TellDir(void);
```

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This advanced function returns the current position of the file pointer. This position should only be used for setting the position with the **SeekDir( )** function.

- *returnValue*$_{out}$ is the current position of the file pointer.

CHAPTER 68 – ZIL_STORAGE_OBJECT

The ZIL_STORAGE_OBJECT class is used to store data in Zinc Application Framework data files. The most common use is to store persistent objects (e.g., objects created using Zinc Designer) using Zinc data files created with ZIL_STORAGE. Although the ZIL_-STORAGE_OBJECT is stored in a file, it should be thought of as a file and not a record in a file. A ZIL_STORAGE_OBJECT may have many pieces of data associated with it. As each piece of data is stored to, or loaded from, the ZIL_STORAGE_OBJECT its file pointer is advanced so that it is pointing to the next piece of data. Because ZIL_STOR-AGE_OBJECT is derived from ZIL_STORAGE_OBJECT_READ_ONLY, this class can also read from the ZIL_STORAGE file. See "Chapter 66—ZIL_STORAGE" in this manual for more information regarding data files.

The ZIL_STORAGE_OBJECT class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_STORAGE_OBJECT : public
    ZIL_STORAGE_OBJECT_READ_ONLY
{
public:             // Read/Write support
    ZIL_STORAGE_OBJECT(void);
    ZIL_STORAGE_OBJECT(ZIL_STORAGE &file, const ZIL_ICHAR *name,
        OBJECTID nObjectID, UIS_FLAGS pFlags = UIS_READWRITE);
    ~ZIL_STORAGE_OBJECT(void);

    void SetCTime(ZIL_INT32 val);
    void SetMTime(ZIL_INT32 val);
    void Touch(void);
    virtual int Store(ZIL_INT16 value);
    virtual int Store(ZIL_UINT16 value);
    virtual int Store(ZIL_INT32 value);
    virtual int Store(ZIL_UINT32 value);
    virtual int Store(ZIL_INT8 value);
    virtual int Store(ZIL_UINT8 value);
    virtual int Store(void *buff, int size, int length);
    virtual int Store(const ZIL_ICHAR *string);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_STORAGE_OBJECT::ZIL_STORAGE_OBJECT

Syntax

#include <ui_gen.hpp>

ZIL_STORAGE_OBJECT(void);
or
ZIL_STORAGE_OBJECT(ZIL_STORAGE *&file*, const ZIL_ICHAR **name*,
ZIL_OBJECTID *nObjectID*, UIS_FLAGS *pFlags* = UIS_READWRITE);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded constructors each create a new ZIL_STORAGE_OBJECT.

The first overloaded constructor creates a ZIL_STORAGE_OBJECT with no associated object. This advanced constructor is reserved for internal use only.

The second overloaded constructor creates a ZIL_STORAGE_OBJECT with the following parameters:

- $file_{in}$ is the file containing the object. If the object is not found, it will be created if UIS_CREATE or UIS_OPENCREATE is specified.
- $name_{in}$ is the name of the object.
- $nObjectID_{in}$ is the *objectID* of the object.
- $pFlags_{in}$ indicates how the storage object is to be opened. The following UIS_FLAGS are supported:

  UIS_READ—Allows read only access to the object.

UIS_READWRITE—Allows read and write access to the object. This flag allows modifications to be made to the object.

UIS_CREATE—Creates an object and allows write access to it. Any previous object will be deleted.

UIS_OPENCREATE—Opens an existing object for read and write access. If the object does not exist, it is created for read and write access.

Example

```
#include <ui_win.hpp>

void UIW_WINDOW::Load(const char *name, ZIL_STORAGE *directory,
    ZIL_STORAGE_OBJECT *file)
{
    // Check for a valid directory and file.
    int tempDirectory = FALSE, tempFile = FALSE;
    if (name && !file)
    {
        char pathName[128], fileName[32], objectName[32];
        ZIL_STORAGE::StripFullPath(name, pathName, fileName, objectName);
        if (!directory)
        {
            ZIL_STORAGE::AppendFullPath(pathName, pathName, fileName);
            ZIL_STORAGE::ChangeExtension(pathName, ".dat");
            directory = new ZIL_STORAGE(pathName, UIS_READ);
            tempDirectory = TRUE;
        }
        if (!file)
        {
            if (objectName[0] == '\0')
                strcpy(objectName, fileName);
            directory->ChDir("~UIW_WINDOW");
            file = new ZIL_STORAGE_OBJECT(*directory, objectName, ID_WINDOW,
                UIS_READ);
            if (file->objectError)
            .
            .
            .

        }
    }
    .
    .
    .

}
```

ZIL_STORAGE_OBJECT::~ZIL_STORAGE_OBJECT

Syntax

#include <ui_gen.hpp>

~ZIL_STORAGE_OBJECT(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the class information associated with the ZIL_STORAGE_-OBJECT.

Example

```
#include <ui_win.hpp>

void UIW_WINDOW::Load(const char *name, ZIL_STORAGE *directory,
    ZIL_STORAGE_OBJECT *file)
{
    .
    .
    .

    // Clean up the file and storage.
    if (tempFile)
        delete file;
    if (tempDirectory)
        delete directory;
}
```

ZIL_STORAGE_OBJECT::SetCTime

Syntax

#include <ui_gen.hpp>

void SetCTime(ZIL_INT32 *val*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the create time for the object.

- val_{in} is the new create time.

ZIL_STORAGE_OBJECT::SetMTime

Syntax

#include <ui_gen.hpp>

void SetMTime(ZIL_INT32 *val*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the modify time for the object.

- val_{in} is the new modify time.

ZIL_STORAGE_OBJECT::Store

Syntax

#include <ui_gen.hpp>

int Store(ZIL_INT16 *value*);
or
int Store(ZIL_UINT16 *value*);
or
int Store(ZIL_INT32 *value*);
or
int Store(ZIL_UINT32 *value*);
or
int Store(ZIL_UINT8 *value*);
or
int Store(ZIL_INT8 *value*);
or
int Store(void **buff*, int *size*, int *length*);
or
int Store(const ZIL_ICHAR **string*);

Portability

These functions are available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first six overloaded functions write information to the storage file according to the type of value given.

- $returnValue_{out}$ is the number of bytes written.
- $value_{in}$ is the numeric value to be written. The following values are supported:

  ZIL_INT8—A number whose value is between -128 and 127 (8 bits, signed).

  ZIL_UINT8—A number whose value is between 0 and 255 (8 bits, unsigned).

ZIL_INT16—A number whose value is between -32,768 and 32,767 (16 bits, signed).

ZIL_UINT16—A number whose value is between 0 and 65,535 (16 bits, unsigned).

ZIL_INT32—A number whose value is between -2,147,483,648 and 2,147,483,647 (32 bits, signed).

ZIL_UINT32—A number whose value is between 0 and 4,294,967,295 (32 bits, unsigned).

The seventh overloaded function writes information into the storage file according to the following values:

- *returnValue*$_{out}$ is the number of bytes written.
- *buff*$_{in}$ is a pointer to the buffer that contains the information to be written.
- *size*$_{in}$ is the size of each item to be written.
- *length*$_{in}$ is the number of items to be written.

In general, programmers are discouraged from using this function, because the integrity of the type of value being stored cannot be guaranteed across environments. For example, the storage size of a value (e.g., int) in DOS might be different than that in Motif. All of the other **Store( )** functions, however, are the same across environments.

The eighth overloaded function writes information into the storage file according to the following value:

- *returnValue*$_{out}$ is the number of bytes written.
- *string*$_{in}$ is a pointer to the string that is to be written.

ZIL_STORAGE_OBJECT::Touch

Syntax

#include <ui_gen.hpp>

void Touch(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function sets *ZIL_STORAGE::inode.modifyTime* (the time of the last modification) of the storage object to the current time.

Example

```
#include <ui_gen.hpp>

ExampleFunction(ZIL_STORAGE_OBJECT *object)
{
    .
    .
    .

    object->Touch();
}
```

CHAPTER 69 – ZIL_STORAGE_OBJECT_READ_ONLY

The ZIL_STORAGE_OBJECT_READ_ONLY class is used to load an object's data using Zinc Application Framework data files. The most common use is to load persistent objects (e.g., objects created using Zinc Designer) using Zinc data files created with ZIL_-STORAGE_READ_ONLY. Although the ZIL_STORAGE_OBJECT_READ_ONLY is stored in a file, it should be thought of as a file and not a record in a file. A ZIL_-STORAGE_OBJECT may have many pieces of data associated with it. As each piece of data is loaded from the ZIL_STORAGE_OBJECT_READ_ONLY its file pointer is advanced so that it is pointing to the next piece of data. ZIL_STORAGE_OBJECT only allows data to be loaded from the file. If write access is needed use the ZIL_-STORAGE_OBJECT class. See "Chapter 70--ZIL_STORAGE_READ_ONLY" in this manual for more information regarding data files.

The ZIL_STORAGE_OBJECT_READ_ONLY class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_STORAGE_OBJECT_READ_ONLY : public
    ZIL_INTERNATIONAL
{
public:             // Read-Only support
    int objectError;
    OBJECTID objectID;
    ZIL_ICHAR *stringID;

    ZIL_STORAGE_OBJECT_READ_ONLY(void);
    ZIL_STORAGE_OBJECT_READ_ONLY(ZIL_STORAGE_READ_ONLY &file,
        const ZIL_ICHAR *name, OBJECTID nObjectID);
    virtual ~ZIL_STORAGE_OBJECT_READ_ONLY(void);

    long Seek(long _position);
    ZIL_STATS_INFO *Stats(void);
    ZIL_STORAGE_READ_ONLY *Storage(void);
    long Tell(void);
    virtual int Load(ZIL_INT16 *value);
    virtual int Load(ZIL_UINT16 *value);
    virtual int Load(ZIL_INT32 *value);
    virtual int Load(ZIL_UINT32 *value);
    virtual int Load(ZIL_UINT8 *value);
    virtual int Load(ZIL_INT8 *value);
    virtual int Load(void *buff, int size, int length);
    virtual int Load(ZIL_ICHAR *string, int length);
    virtual int Load(ZIL_ICHAR **string);

    virtual int Store(void *buff, int size, int length);
};
```

General Members

This section describes those members that are used for general purposes.

- *objectError* is the result of the last attempt to load this object from a file. This value is set to one of the values defined by *errno*. For more information see the global variable *errno* in your compiler language reference manual.
- *objectID* is the *objectID* for the type of object being loaded.
- *stringID* is the name of the object.

ZIL_STORAGE_OBJECT_READ_ONLY::ZIL_STORAGE_-OBJECT_READ_ONLY

Syntax

#include <ui_gen.hpp>

ZIL_STORAGE_OBJECT_READ_ONLY(void);
or
ZIL_STORAGE_OBJECT_READ_ONLY(ZIL_STORAGE_READ_ONLY *&file*,
const ZIL_ICHAR **name*, ZIL_OBJECTID *nObjectID*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors each create a new ZIL_STORAGE_OBJECT_READ_-ONLY.

The first overloaded constructor creates a ZIL_STORAGE_OBJECT_READ_ONLY with no associated object. This advanced constructor is reserved for internal use only.

The second overloaded constructor creates a ZIL_STORAGE_OBJECT_READ_ONLY with the following parameters:

- *file*$_{in}$ is the file containing the object.
- *name*$_{in}$ is the name of the object.
- *nObjectID*$_{in}$ is the *objectID* of the object.

Example

```
#include <ui_win.hpp>

void UIW_WINDOW::Load(const char *name, ZIL_STORAGE_READ_ONLY *directory,
    ZIL_STORAGE_OBJECT_READ_ONLY *file)
{
    // Check for a valid directory and file.
    int tempDirectory = FALSE, tempFile = FALSE;
    if (name && !file)
    {
        char pathName[128], fileName[32], objectName[32];
        ZIL_STORAGE_READ_ONLY::StripFullPath(name, pathName, fileName,
            objectName);
        if (!directory)
        {
            ZIL_STORAGE_READ_ONLY::AppendFullPath(pathName, pathName, fileName);
            ZIL_STORAGE_READ_ONLY::ChangeExtension(pathName, ".dat");
            directory = new ZIL_STORAGE_READ_ONLY(pathName, UIS_READ);
            tempDirectory = TRUE;
        }
        if (!file)
        {
            if (objectName[0] == '\0')
                strcpy(objectName, fileName);
            directory->ChDir("~UIW_WINDOW");
            file = new ZIL_STORAGE_OBJECT_READ_ONLY(*directory, objectName,
                ID_WINDOW, UIS_READ);
            if (file->objectError)
            .
            .
            .

        }
    }
    .
    .
    .

}
```

ZIL_STORAGE_OBJECT_READ_ONLY::~ZIL_STORAGE_-OBJECT_READ_ONLY

Syntax

#include <ui_gen.hpp>

~ZIL_STORAGE_OBJECT_READ_ONLY(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the class information associated with the ZIL_STORAGE_-OBJECT_READ_ONLY.

Example

```
#include <ui_win.hpp>

void UIW_WINDOW::Load(const char *name, ZIL_STORAGE_READ_ONLY *directory,
    ZIL_STORAGE_OBJECT_READ_ONLY *file)
{
    .
    .
    .

    // Clean up the file and storage.
    if (tempFile)
        delete file;
    if (tempDirectory)
        delete directory;
}
```

ZIL_STORAGE_OBJECT_READ_ONLY::Load

Syntax

#include <ui_gen.hpp>

int Load(ZIL_INT16 **value*);
or
int Load(ZIL_UINT16 **value*);
or
int Load(ZIL_INT32 **value*);
or
int Load(ZIL_UINT32 **value*);
or
int Load(ZIL_UINT8 **value*);
or
int Load(ZIL_INT8 **value*);
or
int Load(void **buff*, int *size*, int *length*);
or
int Load(ZIL_ICHAR **string*, int *length*);
or
int Load(ZIL_ICHAR ***string*);

Portability

These functions are available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first six overloaded functions read information from the storage file according to the type of value given.

- *returnValue*$_{out}$ is the number of bytes read.
- *value*$_{out}$ is the numeric value read. The following values are supported:

  ZIL_INT8—A number whose value is between -128 and 127 (8 bits, signed).

ZIL_UINT8—A number whose value is between 0 and 255 (8 bits, unsigned).

ZIL_INT16—A number whose value is between -32,768 and 32,767 (16 bits, signed).

ZIL_UINT16—A number whose value is between 0 and 65,535 (16 bits, unsigned).

ZIL_INT32—A number whose value is between -2,147,483,648 and 2,147,483,647 (32 bits, signed).

ZIL_UINT32—A number whose value is between 0 and 4,294,967,295 (32 bits, unsigned).

The seventh overloaded function reads information from the storage file according to the following values:

- $buff_{out}$ is a pointer to the buffer that will receive the information. This buffer must be large enough to contain the information read.
- $size_{in}$ is the size of each item to be read.
- $length_{in}$ is the number of items to be read.

In general, programmers are discouraged from using this function, because the integrity of the type of value being loaded cannot be guaranteed across environments. For example, the storage size of a value in DOS might be different than that in Motif. All of the other **Load( )** functions, however, are the same across environments.

The eighth overloaded function reads information from the storage file according to the following values:

- $string_{out}$ is a pointer to the character buffer that will receive the information. This buffer must be large enough to contain the information read.
- $length_{in}$ is the number of characters to read.

The ninth overloaded function reads information from the storage file according to the following values:

- $string_{out}$ is a pointer to a string pointer where the information will be written. This string is allocated by the library.

ZIL_STORAGE_OBJECT_READ_ONLY::Seek

Syntax

#include <ui_gen.hpp>

long Seek(long *_position*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function positions the file pointer to the position specified by *_position*. This function should only be used with a value obtained from **Tell( )**.

- $returnValue_{out}$ is the updated file position.
- $\_position_{in}$ is the position to which the file pointer should be set.

ZIL_STORAGE_OBJECT_READ_ONLY::Stats

Syntax

#include <ui_gen.hpp>

ZIL_STATS_INFO *Stats(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns some statistics regarding the ZIL_STORAGE_OBJECT_READ_-ONLY.

- *returnValue*$_{out}$ is a pointer to a ZIL_STATS_INFO structure. For more information regarding ZIL_STATS_INFO, see the beginning of "Chapter 70—ZIL_STORAGE_-READ_ONLY." If an error occurs, NULL is returned.

ZIL_STORAGE_OBJECT_READ_ONLY::Storage

Syntax

#include <ui_gen.hpp>

ZIL_STORAGE_READ_ONLY *Storage(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns a pointer to the ZIL_STORAGE_READ_ONLY that contains the ZIL_STORAGE_OBJECT_READ_ONLY.

- *returnValue*$_{out}$ is a pointer to a ZIL_STORAGE_READ_ONLY file.

ZIL_STORAGE_OBJECT_READ_ONLY::Store

Syntax

#include <ui_gen.hpp>

virtual int Store(void **buff*, int *size*, int *length*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual function allows the programmer to have low-level access to the file.

This function writes information into the storage file according to the following values. In general, programmers are discouraged from using this function, because the integrity of the type of value being loaded cannot be guaranteed across environments. For example, the storage size of a value (e.g., int) in DOS might be different than that in Motif. All of the other **Store( )** functions, however, are the same for DOS and Motif.

- $buff_{in/out}$ is a pointer to the buffer that contains the information to be written.
- $size_{in}$ is the size of each item to be written.
- $length_{in}$ is the number of items to be written.

ZIL_STORAGE_OBJECT_READ_ONLY::Tell

Syntax

```
#include <ui_gen.hpp>

long Tell(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This advanced function returns the current position of the file pointer.

- *returnValue*$_{out}$ is the current position of the file pointer.

CHAPTER 70 – ZIL_STORAGE_READ_ONLY

The ZIL_STORAGE_READ_ONLY class is used to read Zinc Application Framework data files. It is created as a class so that the file can be treated as an object, which does the reading.

Although the ZIL_STORAGE_READ_ONLY is stored in a file, it should be thought of as a file system and not just a file. The ZIL_STORAGE_READ_ONLY class is similar, in design, to the Unix file system. This means that within a ZIL_STORAGE_READ_-ONLY object, there can be many files (i.e., objects derived from ZIL_STORAGE_-READ_ONLY_OBJECT) and levels of sub-directories. The programmer has the ability to copy, delete and move files across directories. The maximum length of a ZIL_-STORAGE_READ_ONLY object is about 16 megabytes with the maximum size of an individual object being 4 megabytes. A single ZIL_STORAGE_READ_ONLY object may contain a maximum of 16,000 objects (i.e., ZIL_STORAGE_READ_ONLY_-OBJECT.)

ZIL_STORAGE_READ_ONLY is typically used to retrieve persistent objects (e.g., objects created using Zinc Designer) to be retrieved. Another common use for ZIL_-STORAGE_READ_ONLY is as a simple data base.

The ZIL_STORAGE_READ_ONLY class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS ZIL_STATS_INFO
{
public:
    ZIL_INT32 size;
    ZIL_INT32 createTime;
    ZIL_INT32 modifyTime;
    ZIL_UINT16 useCount;
    ZIL_UINT16 revision;
    ZIL_UINT16 countryID;
    ZIL_INODE_NUMBER inum;
};

class ZIL_EXPORT_CLASS ZIL_STORAGE_READ_ONLY : public ZIL_INTERNATIONAL
{
public:             // Static file system support routines
    void StorageName(ZIL_ICHAR *buff);
    static void AppendFullPath(ZIL_ICHAR *fullPath,
        const ZIL_ICHAR *pathName = ZIL_NULLP(ZIL_ICHAR),
        const ZIL_ICHAR *fileName = ZIL_NULLP(ZIL_ICHAR),
        const ZIL_ICHAR *extension = ZIL_NULLP(ZIL_ICHAR));
    static void ChangeExtension(ZIL_ICHAR *name,
        const ZIL_ICHAR *newExtension);
    static void StripFullPath(const ZIL_ICHAR *fullPath,
        ZIL_ICHAR *pathName = ZIL_NULLP(ZIL_ICHAR),
        ZIL_ICHAR *fileName = ZIL_NULLP(ZIL_ICHAR),
        ZIL_ICHAR *objectName = ZIL_NULLP(ZIL_ICHAR),
        ZIL_ICHAR *objectPathName = ZIL_NULLP(ZIL_ICHAR));
    static void TempName(ZIL_ICHAR *tempname);
```

```
    static int ValidName(const ZIL_ICHAR *name, int createStorage = FALSE);
protected:
    static void MakeFullPath(ZIL_ICHAR *tmppath);

public:             // Read-Only support
    static int cacheSize;
    static UI_PATH *searchPath;
    int storageError;

    ZIL_STORAGE_READ_ONLY(void);
    ZIL_STORAGE_READ_ONLY(const ZIL_ICHAR *name); // Read Only
    virtual ~ZIL_STORAGE_READ_ONLY(void);
    int ChDir(const ZIL_ICHAR *newName);
    int GetCWD(ZIL_ICHAR *path, int pathLen);
    ZIL_STORAGE_DIRECTORY *OpenDir(const ZIL_ICHAR *name);
    ZIL_STATS_INFO *Stats(void);
    int Version(void);
public:
    ZIL_ICHAR *FindFirstObject(const ZIL_ICHAR *pattern);
    ZIL_ICHAR *FindNextObject(void);
    ZIL_ICHAR *FindFirstID(ZIL_UINT16 id);
    ZIL_ICHAR *FindNextID(void);
};
```

General Members

This section describes those members that are used for general purposes.

- *ZIL_STATS_INFO* contains the status of the file access operations.

  size is the size, in bytes, of the object or file.

  createTime contains the time when the object or file was created. *createTime* uses the C language type *time_t*.

  modifyTime contains the time when the object or file was last modified. *modifyTime* uses the C language type *time_t*.

  useCount is the number of times the object is used. MS-DOS files are used only once.

  revision is the revision number of the file or object (i.e., the number of times that a file or object has been modified.)

  countryID denotes the ID of the country for which the object was created. A value of 0 is used to denote the current country.

  inum is the inode number of the object. (No further documentation of this member is provided.)

- *cacheSize* indicates how much memory is to be used as a read and write cache. The default *cacheSize* is 8 Kbytes.

- *searchPath* contains the search path for the ZIL_STORAGE_READ_ONLY file when it is opened.

- *storageError* is the result of the last file access. This value is set to one of the values defined by *errno*. For more information see the global variable *errno* in the compiler language reference manual.

ZIL_STORAGE_READ_ONLY::ZIL_STORAGE_READ_ONLY

Syntax

#include <ui_gen.hpp>

ZIL_STORAGE_READ_ONLY(void);
or
ZIL_STORAGE_READ_ONLY(const ZIL_ICHAR **name*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors both create a new ZIL_STORAGE_READ_ONLY class object.

The first overloaded constructor creates a ZIL_STORAGE_READ_ONLY with no associated disk file.

The second overloaded constructor creates a ZIL_STORAGE_READ_ONLY and binds it to a disk file.

- $name_{in}$ is the name of the file to be opened. It may contain a path name. If the storage file cannot be opened, this function will use UI_PATH functions to search

other paths for the file. For example, "~zinc~examples~*.dat" will return the first **.DAT** file found with that path. Notice that the '~' character is used as the directory separator. The '*' character is considered to be a wildcard character.

Example

```
#include <ui_win.hpp>

UI_HELP_SYSTEM::UI_HELP_SYSTEM(char *pathName,
    UI_WINDOW_MANAGER *windowManager, UI_HELP_CONTEXT helpContext) :
    defaultHelpContext(helpContext)
{
    // Open the help storage unit.
    storage = new ZIL_STORAGE_READ_ONLY(pathName);
    if (storage->storageError)
    {
        delete storage;
        storage = NULL;
    }
    .
    .
    .

}
```

ZIL_STORAGE_READ_ONLY::~ZIL_STORAGE_READ_ONLY

Syntax

#include <ui_gen.hpp>

~ZIL_STORAGE_READ_ONLY(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This destructor destroys the class information associated with the ZIL_STORAGE_-READ_ONLY object and closes any files opened by the ZIL_STORAGE_READ_ONLY constructor. If a file was opened with the UIS_TEMPORARY flag, it will be deleted when this destructor is called.

Example

```
#include <ui_win.hpp>

UI_HELP_SYSTEM::~UI_HELP_SYSTEM(void)
{
    if (storage)
        delete storage;
    delete helpWindow;
}
```

ZIL_STORAGE_READ_ONLY::AppendFullPath

Syntax

#include <ui_gen.hpp>

static void AppendFullPath(ZIL_ICHAR **fullPath*,
    const ZIL_ICHAR **pathName* = ZIL_NULLP(ZIL_ICHAR),
    const ZIL_ICHAR **fileName* = ZIL_NULLP(ZIL_ICHAR),
    const ZIL_ICHAR **extension* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function combines fragments of the path, file name and extension in order to construct a complete path name.

- $fullPath_{out}$ is the complete path name that is passed back.
- $pathName_{in}$ is the name of the path.
- $fileName_{in}$ is the name of the storage file.
- $extension_{in}$ is the extension to the file name (e.g., ".dat").

Example

```
#include <ui_win.hpp>

UI_WINDOW_OBJECT *UI_WINDOW_OBJECT::New(const char *name,
    ZIL_STORAGE_READ_ONLY *directory,
    ZIL_STORAGE_READ_ONLY_OBJECT *file)
{
    // Check for a valid directory and file.
    int tempDirectory = FALSE;
    if (name && !file)
    {
        char pathName[128], fileName[32], objectName[32];
        ZIL_STORAGE_READ_ONLY::StripFullPath(name, pathName, fileName,
            objectName);
        if (!directory)
        {
            ZIL_STORAGE_READ_ONLY::AppendFullPath(pathName, pathName, fileName);
            ZIL_STORAGE_READ_ONLY::ChangeExtension(pathName, ".dat");
            directory = new ZIL_STORAGE_READ_ONLY(pathName, UIS_READ);
            tempDirectory = TRUE;
        }
        if (!file)
            return (new UIW_WINDOW(name, directory, NULL));
    }
    .
    .
    .
}
```

ZIL_STORAGE_READ_ONLY::ChangeExtension

Syntax

#include <ui_gen.hpp>

static void ChangeExtension(ZIL_ICHAR **name*, const ZIL_ICHAR **newExtension*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function changes the extension (e.g., ".dat") associated with the filename.

- $name_{out}$ is the full name of the file, possibly including the path.

- *newExtension*$_{in}$ is the new extension that will replace the previous extension (if any).

Example

```
#include <ui_win.hpp>

UI_WINDOW_OBJECT *UI_WINDOW_OBJECT::New(const char *name,
    ZIL_STORAGE_READ_ONLY *directory,
    ZIL_STORAGE_READ_ONLY_OBJECT *file)
{
    // Check for a valid directory and file.
    int tempDirectory = FALSE;
    if (name && !file)
    {
        char pathName[128], fileName[32], objectName[32];
        ZIL_STORAGE_READ_ONLY::StripFullPath(name, pathName, fileName,
            objectName);
        if (!directory)
        {
            ZIL_STORAGE_READ_ONLY::AppendFullPath(pathName, pathName, fileName);
            ZIL_STORAGE_READ_ONLY::ChangeExtension(pathName, ".DAT");
            directory = new ZIL_STORAGE_READ_ONLY(pathName, UIS_READ);
            tempDirectory = TRUE;
        }
        if (!file)
            return (new UIW_WINDOW(name, directory, NULL));
    }
    .
    .
    .

}
```

ZIL_STORAGE_READ_ONLY::ChDir

Syntax

#include <ui_gen.hpp>

int ChDir(const ZIL_ICHAR **newName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function changes the current working directory within a ZIL_STORAGE_READ_-ONLY file.

- *returnValue*$_{out}$ is 0 on success and -1 on failure.

- *newName*$_{in}$ is the name of the directory that will become the new current working directory. *newName* specifies a single sub-directory and not an entire path. The character "." is used to refer to the current working directory and ".." is used to refer to the parent directory. ".." refers to the root directory if the current working directory is the root directory. The separator '~' is similar to the '\' in the DOS directory system.

Example

```
#include <ui_win.hpp>

main(int argc, char *argv[])
{
    .
    .
    .

    // Create the help directory.
    ZIL_STORAGE_READ_ONLY *helpFile = new ZIL_STORAGE_READ_ONLY(fileName,
        UIS_READWRITE);
    if (helpFile->storageError)
    {
        delete helpFile;
        helpFile = new ZIL_STORAGE_READ_ONLY(fileName, UIS_CREATE |
            UIS_READWRITE);
    }
    helpFile->MkDir("UI_HPP");
    if (newHelpDirectory)
        helpFile->RmDir("UI_HELP_CONTEXT");
    helpFile->MkDir("UI_HELP_CONTEXT");

    // Print genhelp status.
    PrintStatus("PROCESSING %s:\n", fileName);
    ZIL_OBJECTID helpID = 0;

    // Generate the HPP directory.
    helpFile->ChDir("~UI_HPP");
    ZIL_STORAGE_READ_ONLY_OBJECT *hppElement =
        new ZIL_STORAGE_READ_ONLY_OBJECT(*helpFile,
        "HELP_CONTEXTS", ID_HELP_CONTEXT, UIS_CREATE | UIS_READWRITE);

    // Generate the help contexts.
    helpFile->ChDir("~UI_HELP_CONTEXT");
    .
    .
    .

}
```

ZIL_STORAGE_READ_ONLY::FindFirstID

Syntax

#include <ui_gen.hpp>

ZIL_ICHAR *FindFirstID(ZIL_UINT16 *id*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function finds the first object in the current directory of the storage object whose *objectID* matches *id*.

- $returnValue_{out}$ is a pointer to a string containing the *stringID* of the object whose *objectID* matches *id*. If no match is found, *returnValue* is NULL.

- id_{in} is the objectID of the object to be located.

ZIL_STORAGE_READ_ONLY::FindFirstObject

Syntax

#include <ui_gen.hpp>

ZIL_ICHAR *FindFirstObject(const ZIL_ICHAR **pattern*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function finds the first object whose *stringID* matches *pattern* inside the storage object in its current directory.

- *returnValue*$_{out}$ is a pointer to a string containing the *stringID* of the object that matches *pattern*. If no match is found, *returnValue* is NULL.

- *pattern*$_{in}$ is the stringID of an object. *pattern* may contain wildcards. For example, if *pattern* were "i*", then **FindFirstObject( )** would return the *stringID* of the first object that has an "i" as the first letter of *stringID*. Additionally, the '?' wildcard may be used to specify a single unknown character such as "*.BK?".

ZIL_STORAGE_READ_ONLY::FindNextID

Syntax

```
#include <ui_gen.hpp>

ZIL_ICHAR *FindNextID(void);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function finds the next object in the current directory in the storage whose *objectID* matches the *objectID* that was used for the most recent call to **FindFirstID( )**. This function call must be preceded by a call to **FindFirstID( )**.

- *returnValue*$_{out}$ is a pointer to a string containing the *stringID* of the object whose *objectID* matches the *objectID* that was used for the most recent call to **FindFirstID( )**. If no match is found, *returnValue* is NULL.

ZIL_STORAGE_READ_ONLY::FindNextObject

Syntax

#include <ui_gen.hpp>

ZIL_ICHAR *FindNextObject(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function finds the next object in the current directory in the storage whose *stringID* matches the *pattern* of the last call to **FindFirstObject( )**. This function call must be preceded by a call to **FindFirstObject( )**.

- *returnValue*$_{out}$ is a pointer to a string containing the *stringID* of the object that matches the *pattern* of the last call to **FindFirstObject( )**. If no match is found, *returnValue* is NULL.

ZIL_STORAGE_READ_ONLY::GetCWD

Syntax

#include <ui_gen.hpp>

int GetCWD(ZIL_ICHAR **path*, int *pathLen*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the name of the current directory.

- *returnValue*$_{out}$ indicates the success of the call. If *returnValue* is zero, the call was successful. Otherwise, an error occurred.

- *path*$_{out}$ is the path name of the current working directory. This pointer must be a buffer allocated by the programmer.

- *pathLen*$_{in}$ is the length of the buffer supplied in *path*.

ZIL_STORAGE_READ_ONLY::MakeFullPath

Syntax

#include <ui_gen.hpp>

static void MakeFullPath(ZIL_ICHAR **tmppath*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function creates a full path name, including a drive letter, from a partial path name.

- *tmppath*$_{in/out}$ is the partial path. The function modifies the contents of *tmppath* to contain the full path for the partial path originally supplied.

ZIL_STORAGE_READ_ONLY::OpenDir

Syntax

#include <ui_gen.hpp>

ZIL_STORAGE_DIRECTORY *OpenDir(const ZIL_ICHAR *_name_);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function creates a directory pointer within the file. This function creates a new ZIL_STORAGE_DIRECTORY which allows multiple pointers to be maintained within the storage file.

- $returnValue_{out}$ is a pointer to the ZIL_STORAGE_DIRECTORY which points to the directory opened.

- $name_{in}$ is the path name of the directory to be opened.

ZIL_STORAGE_READ_ONLY::Stats

Syntax

#include <ui_gen.hpp>

ZIL_STATS_INFO *Stats(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns statistics regarding the ZIL_STORAGE_READ_ONLY object.

- *returnValue*$_{out}$ is a pointer to a ZIL_STATS_INFO structure. For more information regarding ZIL_STATS_INFO, see the beginning of this chapter. If an error occurs, NULL is returned.

ZIL_STORAGE_READ_ONLY::StorageName

Syntax

```
#include <ui_gen.hpp>

void StorageName(ZIL_ICHAR *buff);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the name of the file associated with the ZIL_STORAGE_READ_-ONLY object.

- *buff*$_{in/out}$ is a buffer used to pass back the name of the ZIL_STORAGE_READ_ONLY file. *buff* should be large enough to hold the largest path plus the NULL terminator.

Example

```
#include <ui_gen.hpp>

char *ExampleFunction(ZIL_STORAGE_READ_ONLY *storage)
{
    static char name[129];
    storage->StorageName(&name);
    .
    .
    .

    return (&name);
}
```

ZIL_STORAGE_READ_ONLY::StripFullPath

Syntax

#include <ui_gen.hpp>

static void StripFullPath(const ZIL_ICHAR *_fullPath_,
    ZIL_ICHAR *_pathName_ = ZIL_NULLP(ZIL_ICHAR),
    ZIL_ICHAR *_fileName_ = ZIL_NULLP(ZIL_ICHAR),
    ZIL_ICHAR *_objectName_ = ZIL_NULLP(ZIL_ICHAR),
    ZIL_ICHAR *_objectPathName_ = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function takes a full path name and divides it into its path and file name components. The arguments *fullPath*, *pathName*, *fileName*, *objectName* and *objectPathName* all have the NULL argument specified so that the information will not be saved if no other argument is provided.

- $fullPath_{in}$ is the complete path name that is passed down.
- $pathName_{in}$ is the name of the path.

- *fileName*$_{in}$ is the name of the storage file (including the extension).
- *objectName*$_{in}$ is the name of the specific object.
- *objectPathName*$_{in}$ is the path name for the specific object.

Example

```
#include <ui_win.hpp>

UI_WINDOW_OBJECT *UI_WINDOW_OBJECT::New(const char *name,
    ZIL_STORAGE_READ_ONLY *directory,
    ZIL_STORAGE_READ_ONLY_OBJECT *file)
{
    // Check for a valid directory and file.
    int tempDirectory = FALSE;
    if (name && !file)
    {
        char pathName[128], fileName[32], objectName[32], objectPathName[128];
        ZIL_STORAGE_READ_ONLY::StripFullPath(name, pathName, fileName,
            objectName, objectPathName);
        if (!directory)
        {
            ZIL_STORAGE_READ_ONLY::AppendFullPath(pathName, pathName, fileName);
            ZIL_STORAGE_READ_ONLY::ChangeExtension(pathName, ".dat");
            directory = new ZIL_STORAGE_READ_ONLY(pathName, UIS_READ);
            tempDirectory = TRUE;
        }
        if (!file)
            return (new UIW_WINDOW(name, directory, NULL));
    }
    .
    .
    .

}
```

ZIL_STORAGE_READ_ONLY::TempName

Syntax

#include <ui_gen.hpp>

static void TempName(ZIL_ICHAR **tempname*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function creates a temporary read and write file that has a unique file name.

- *tempname*$_{out}$ is a buffer that will contain a unique file name that can be used as a read and write file.

ZIL_STORAGE_READ_ONLY::ValidName

Syntax

#include <ui_gen.hpp>

static int ValidName(const ZIL_ICHAR *_name_, int _createStorage_ = FALSE);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function indicates whether the specified file exists on the disk.

- *returnValue*$_{out}$ is TRUE if the file exists or if it can be created. Otherwise, *returnValue* is FALSE.

- *name*$_{in}$ is the name of the file to be checked.

- *createStorage*$_{in}$, when TRUE, allows the name to not actually exist as long as the directory and the file name are valid. When *createStorage* is FALSE, the file must exist in the specified path and directory.

Example

```
#include <ui_gen.hpp>

main(int argc, char *argv[])
{
    // Make sure there is a specified text file.
```

```
    if (argc != 2)
    {
        printf("Usage: genhelp <text file name>\n");
        return (1);
    }
    // Open the text file.
    char fileName[128];
    strcpy(fileName, argv[1]);
    ZIL_STORAGE_READ_ONLY::ChangeExtension(fileName, ".txt");
    FILE *textFile = fopen(fileName, "rb");
    if (!textFile)
        printf("Could not open the text file: %s.\n", fileName);
    // Open the data file.
    ZIL_STORAGE_READ_ONLY::ChangeExtension(fileName, ".dat");
    if (!ZIL_STORAGE_READ_ONLY::ValidName(fileName, TRUE))
    {
        printf("Could not create the help data file: %s.\n", fileName);
        return (0);
    }
    .
    .
    .
}
```

ZIL_STORAGE_READ_ONLY::Version

Syntax

#include <ui_gen.hpp>

int Version(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function returns the version of ZIL_STORAGE_READ_ONLY used to create the file.

- *returnValue*$_{out}$ is an integer containing the ZIL_STORAGE_READ_ONLY version number. The version number is 400 for version 4.0 of Zinc Application Framework.

Example

```
#include <ui_gen.hpp>

ExampleFunction(ZIL_STORAGE_READ_ONLY *storage)
{
    int version = storage->Version();
    printf("The version of this data file is %d.\n", version);
}
```

CHAPTER 71 – ZIL_TEXT_ELEMENT

The ZIL_TEXT_ELEMENT structure is used by the ZIL_DECORATION class to provide the text mode decorations for objects. An object's decorations are those bitmaps or characters that are used to draw an image on the object. The decorations typically include a graphical image, or bitmap, for use in graphics mode and a textual image, or character string, for use in text mode. Most environments don't require these decorations since the operating system typically provides them. Zinc does all the drawing in DOS and Curses, however, so these environments use decorations extensively. An example of where a decoration would be used is the maximize button. In graphics mode, it typically has a small up-arrow bitmap. In text mode, though, it usually displays a left bracket, an up-arrow character, and a right-bracket; all text characters, of course. This class maintains the text images. See "Chapter 50—ZIL_BITMAP_ELEMENT" for information on the bitmaps used for decorations.

The ZIL_TEXT_ELEMENT structure is declared in **UI_GEN.HPP**. Its public and protected members are:

```
struct ZIL_EXPORT_CLASS ZIL_TEXT_ELEMENT
{
    ZIL_ICHAR *text;
    ZIL_NUMBERID numberID;
    ZIL_ICHAR stringID[ZIL_STRINGID_LEN];
};
```

General Members

This section describes those members that are used for general purposes.

- *text* is the character string maintained by the ZIL_TEXT_ELEMENT.
- *numberID* is a numeric value used to identify the ZIL_TEXT_ELEMENT.
- *stringID* is a string value used to identify the ZIL_TEXT_ELEMENT.

CHAPTER 72 – ZIL_TIME

The ZIL_TIME class is a lower-level class used to store and manipulate time values. It is not a window object. See "Chapter 29—UIW_TIME" of *Programmer's Reference Volume 2* for information about the time window object.

The ZIL_TIME class is declared on **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_TIME : public ZIL_UTIME
{
public:
    ZIL_TIME(void);
    ZIL_TIME(const ZIL_TIME &time);
    ZIL_TIME(int hour, int minute, int second = 0, int hundredth = 0);
    ZIL_TIME(const ZIL_ICHAR *string, TMF_FLAGS tmFlags = TMF_NO_FLAGS);
    ZIL_TIME(int packedTime);
    void Export(int *hour, int *minute, int *second = ZIL_NULLP(int),
        int *hundredth = ZIL_NULLP(int));
    void Export(ZIL_ICHAR *string, TMF_FLAGS tmFlags);
    void Export(int *packedTime);
    TMI_RESULT Import(void);
    TMI_RESULT Import(const ZIL_TIME &time);
    TMI_RESULT Import(int hour, int minute, int second = 0,
        int hundredth = 0);
    TMI_RESULT Import(const ZIL_ICHAR *string, TMF_FLAGS tmFlags);
    TMI_RESULT Import(int packedTime);

    long operator=(long hundredths);
    long operator=(const ZIL_TIME &time);
    long operator+(long hundredths);
    long operator+(const ZIL_TIME &time);
    long operator-(long hundredths);
    long operator-(const ZIL_TIME &time);
    long operator++(void);
    long operator--(void);
    void operator+=(long hundredths);
    void operator-=(long hundredths);
    int operator==(ZIL_TIME& time);
    int operator!=(ZIL_TIME& time);
    int operator>(ZIL_TIME& time);
    int operator>=(ZIL_TIME& time);
    int operator<(ZIL_TIME& time);
    int operator<=(ZIL_TIME& time);
};
```

General Members

This section describes those members that are used for general purposes.

ZIL_TIME::ZIL_TIME

Syntax

```
#include <ui_gen.hpp>

ZIL_TIME(void);
    or
ZIL_TIME(const ZIL_TIME &time);
    or
ZIL_TIME(int hour, int minute, int second = 0, int hundredth = 0);
    or
ZIL_TIME(const ZIL_ICHAR *string, TMF_FLAGS tmFlags = TMF_NO_FLAGS);
    or
ZIL_TIME(int packedTime);
```

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors create a new ZIL_TIME class object.

The first overloaded constructor takes no arguments. It sets the time information according to the system's time.

The second overloaded constructor is a copy constructor that takes a previously constructed ZIL_TIME object to specify the default time.

- $time_{in}$ is a reference pointer to a previously constructed ZIL_TIME object.

The third overloaded constructor uses integer arguments to specify the default time.

- $hour_{in}$ is the hour. This argument must be in the range from 0 to 23.
- $minute_{in}$ is the minute. This argument must be in the range from 0 to 59.

- *second*$_{in}$ is the second. This argument must be in the range from 0 to 59.

- *hundredth*$_{in}$ is the hundredths of a second. This argument must be in the range from 0 to 99.

The fourth overloaded constructor uses a string argument to specify the default time.

- *string*$_{in}$ is a string that contains the time information.

- *tmFlags*$_{in}$ specifies how to interpret the time string. The following flags (declared in **UI_GEN.HPP**) override the country dependent information (supplied by the operating system):

  TMF_COLON_SEPARATOR—Formats the time with colons separating the time fields. For example, 12 p.m. is formatted as 12:00pm.

  TMF_HUNDREDTHS—Formats the time with a hundredths of seconds value. For example, if the time is "12:15:10.09pm" and the TMF_HUNDREDTHS flag is set, the value "12" is interpreted as hours, the value "15" is interpreted as minutes, "10" is interpreted as seconds, and the "09" is interpreted as hundredths of seconds.

  TMF_LOWER_CASE—Converts the time to lower-case.

  TMF_NO_FLAGS—Does not associate any special flags with the ZIL_TIME object. In this case, the time will be formatted using the default country information. This is the default argument if no other argument is specified. This flag should not be used in conjunction with any other TMF flags.

  TMF_NO_HOURS—Formats the time with no hour. For example, if the time is "12:15" and the TMF_NO_HOURS flag is set, the value "12" is interpreted as minutes and "15" is interpreted as seconds.

  TMF_NO_MINUTES—Formats the time with no minute value. For example, if the time is "12:15" and the TMF_NO_MINUTES flag is set, the value "12" is interpreted as seconds and the value "15" is interpreted as hundredths of seconds.

  TMF_NO_SEPARATOR—Does not place a separator between time fields.

  TMF_SECONDS—Formats the time with a seconds value. For example, if the time is "12:15:10" and the TMF_SECONDS flag is set, the value "12" is

interpreted as hours, the value "15" is interpreted as minutes and "10" is interpreted as seconds.

TMF_SYSTEM—Sets the time value according to the system time if the string is blank or NULL. For example, if the TMF_SYSTEM flag is set and a NULL string value is specified, the time will be set to the system time.

TMF_TWELVE_HOUR—Formats the time using a 12 hour format, regardless of the default country information.

TMF_TWENTY_FOUR_HOUR—Formats the time using a 24 hour format, regardless of the default country information.

TMF_UPPER_CASE—Converts the time to upper-case.

TMF_ZERO_FILL—Forces the hour, minute, second and hundredths fields to be zero filled when their values are less than 10.

The fifth overloaded constructor uses a packed integer argument to specify the default time.

- *packedTime*$_{in}$ is a packed representation of the time (whose format is the same as the MS-DOS file times). This argument is packed according to the following bit pattern:

  bits 0-4 specify the seconds divided by 2 (e.g., a value of 5 means 10 seconds),
  bits 5-10 specify the minutes (0 through 59) and
  bits 11-15 specify the hours (0 through 59).

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME time1;                              // System time initialization.
    ZIL_TIME time2(12, 0, 0);                    // Integer initialization.
    ZIL_TIME *time3 = new ZIL_TIME("12:00:00pm");   // String initialization.
    .
    .
    .

}
```

ZIL_TIME::Export

Syntax

#include <ui_gen.hpp>

void Export(int **hour*, int **minute*, int **second* = ZIL_NULLP(int),
int **hundredth* = ZIL_NULLP(int));
or
void Export(ZIL_ICHAR **string*, TMF_FLAGS *tmFlags*);
or
void Export(int **packedTime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first overloaded function returns time information through the four integer arguments.

- $hour_{out}$ is a pointer to the variable that is to contain the hour. If this argument is NULL, no hour information is returned. Otherwise, this argument will be set within the range from 0 to 23.

- $minute_{out}$ is a pointer to the variable that is to contain the minute. If this argument is NULL, no minute information is returned. Otherwise, this argument will be set within the range from 0 to 59.

- $second_{out}$ is a pointer to the variable that is to contain the second. If this argument is NULL, no second information is returned. Otherwise, this argument will be set within the range from 0 to 59.

- $hundredth_{out}$ is a pointer to the variable that is to contain the hundredths of a second. If this argument is NULL, no hundredths information is returned. Otherwise, this argument will be set within the range from 0 to 99.

The second overloaded function returns the time information through the *string* argument.

- *string*$_{out}$ is a pointer to a string that gets the formatted time. This string must be long enough to contain the time.

- *tmFlags*$_{in}$ specifies how the return time should be formatted. The following flags (declared in **UI_GEN.HPP**) override the country dependent information (supplied by the operating system):

TMF_COLON_SEPARATOR—Formats the time with colons separating the time fields.	`12:00`
	`13:00:00`
	`12:00 a.m.`

TMF_HUNDREDTHS—Formats the time with a hundredths of seconds value.	`1:05:00.00`
	`23:15:05.99`
	`7:45:59.00 a.m.`

TMF_LOWER_CASE—Converts the time to lower-case.	`12:00 p.m.` `1:00 a.m.`

TMF_NO_FLAGS—Does not associate any special flags with the ZIL_TIME object. In this case, the time will be formatted using the default country information. This is the default argument if no other argument is specified. This flag should not be used in conjunction with any other TMF flags.	`12:00`
	`13:00:00`
	`12:00 a.m.`

TMF_NO_HOURS—Formats the time with no hour.	`37:59` `56:43.99`
TMF_NO_MINUTES—Formats the time with no minute value.	`12:56` `11:45.99`
TMF_NO_SEPARATOR—Does not place a separator between time fields.	`1200` `130000`

TMF_SECONDS—Formats the time with a seconds value.	`12:00:05 a.m.`
	`1:13:25`
	`16:00:00`

TMF_TWELVE_HOUR—Formats the time using a 12 hour format, regardless of the default country information.	`12:00 a.m.`
	`1:00 p.m.`
	`5:00 p.m.`

TMF_TWENTY_FOUR_HOUR—Formats the	`12:00`
	`13:00`
	`17:00`

time using a 24 hour format, regardless of the default country information.

TMF_UPPER_CASE—Converts the time to upper-case.

```
12:00 P.M.
1:00 A.M.
```

TMF_ZERO_FILL—Forces the hour, minute and second values to be zero filled when their values are less than 10.

```
01:10 a.m
13:05:03
01:01 p.m.
```

The third overloaded function returns time information through a packed integer argument.

- *packedTime*$_{out}$ is a packed representation of the time (whose format is the same as the MS-DOS file times). This argument is packed according to the following bit pattern:

  bits 0-4 specify the seconds divided by 2 (e.g., a value of 5 means 10 seconds),
  bits 5-10 specify the minutes (0 through 59) and
  bits 11-15 specify the hours (0 through 59).

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME time;      // Use a system time.

    int hour, minute, second;
    time.Export(&hour, &minute, &second);
    printf("Integer time value: hour-%d, minute-%d, second-%d\n",
        hour, minute, second);

    char stringTime[128];
    time.Export(stringTime, TMF_NO_FLAGS);
    printf("String time value: %s", stringTime);

    // The destructor for time is automatically called when the
    // scope of this function ends.
}
```

ZIL_TIME::Import

Syntax

#include <ui_gen.hpp>

TMI_RESULT Import(void);

or

TMI_RESULT Import(const ZIL_TIME &*time*);

or

TMI_RESULT Import(int *hour*, int *minute*, int *second* = 0, int *hundredth* = 0);

or

TMI_RESULT Import(const ZIL_ICHAR **string*, TMF_FLAGS *tmFlags*);

or

TMI_RESULT Import(int *packedTime*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions set the value of the ZIL_TIME object.

The first overloaded function sets the time information according to the system time.

- *returnValue*$_{out}$ is the result of the import operation. *returnValue* can have one of the following values:

  TMI_GREATER_THAN_RANGE—The time was greater than the maximum value of a negatively open-ended range.

  TMI_INVALID—The time was invalid or was in an invalid format.

  TMI_LESS_THAN_RANGE—The time was less than the minimum value of a positively open-ended range.

  TMI_OK—The time was successfully imported.

  TMI_OUT_OF_RANGE—The time was out of the valid range for times.

  TMI_VALUE_MISSING—All of the required field values were not present.

The second overloaded function copies the time information from the *time* reference argument.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *time*$_{in}$ is a reference pointer to a previously constructed time.

The third overloaded function sets the time information according to specified integer arguments.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *hour*$_{in}$ is the hour. This argument must be in the range from 0 to 23.

- *minute*$_{in}$ is the minute. This argument must be in the range from 0 to 59.

- *second*$_{in}$ is the second. This argument must be in the range from 0 to 59.

- *hundredth*$_{in}$ is the hundredths of a second. This argument must be in the range from 0 to 99.

The fourth overloaded function sets the time using information passed in a string.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *string*$_{in}$ is a pointer to the time string. If this is an empty string (i.e., ""), the ZIL_TIME will be set to "blank." Passing a blank ZIL_TIME to the **UIW_TIME::DataSet( )** function will cause the time field to be displayed as blank space. See the DataSet section of "Chapter 29—UIW_TIME" of *Programmer's Reference Volume 2* for more information.

- *tmFlags*$_{in}$ specifies how the time should be formatted. The following flags (declared in **UI_GEN.HPP**) override the country dependent information (supplied by the operating system):

  TMF_HUNDREDTHS—Formats the time with a hundredths of seconds value. For example, if the time is "12:15:10.09pm" and the TMF_HUNDREDTHS flag is set, the value "12" is interpreted as hours, the value "15" is interpreted as minutes, "10" is interpreted as seconds, and the "09" is interpreted as hundredths of seconds.

TMF_NO_FLAGS—Does not associate any special flags with the ZIL_TIME object. In this case, the time will be formatted using the default country information. This flag should not be used in conjunction with any other TMF flags.

TMF_NO_HOURS—Formats the time with no hour. For example, if the time is "12:15" and the TMF_NO_HOURS flag is set, the value "12" is interpreted as minutes and "15" is interpreted as seconds.

TMF_NO_MINUTES—Formats the time with no minute value. For example, if the time is "12:15" and the TMF_NO_MINUTES flag is set, the value "12" is interpreted as seconds and the value "15" is interpreted as hundredths of seconds.

TMF_SECONDS—Formats the time with a seconds value. For example, if the time is "12:15:10" and the TMF_SECONDS flag is set, the value "12" is interpreted as hours, the value "15" is interpreted as minutes and "10" is interpreted as seconds.

The fifth overloaded function sets the time information through a packed integer argument.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.

- *packedTime*$_{in/out}$ is a packed representation of the time (whose format is the same as the MS-DOS file times). This argument is packed according to the following bit pattern:

  bits 0-4 specify the seconds divided by 2 (e.g., a value of 5 means 10 seconds),
  bits 5-10 specify the minutes (0 through 59) and
  bits 11-15 specify the hours (0 through 59).

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME time;      // Initialize a system time.

    // Import the time in various forms, then print out
    // the results.
    char stringTime[128];
    time.Import(20, 0);
    time.Export(stringTime, TMF_NO_FLAGS);
```

```
    printf("String time value: %s\n", stringTime);

    time.Import("8:00 p.m.", TMF_SECONDS);
    time.Export(stringTime, TMF_TWENTY_FOUR_HOUR);
    printf("String time value: %s\n", stringTime);

    // The destructor for time is automatically called when the
    // scope of this function ends.
}
```

ZIL_TIME::operator =

Syntax

#include <ui_gen.hpp>

long operator = (long *hundredths*);
or
long operator = (const ZIL_TIME &*time*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first operator overload assigns the value specified by *hundredths* to the ZIL_TIME object.

- *returnValue*$_{out}$ is the number of hundredths of seconds in the resulting time. This raw value is returned so that the operator may be used in a statement containing other operations.

- *hundredths*$_{in}$ is the time, given in the number of hundredths of seconds, to be assigned to the ZIL_TIME object.

The second operator overload assigns the value specified by *time* to the ZIL_TIME object.

- *returnValue*$_{out}$ is the number of hundredths of seconds in the resulting time. This raw value is returned so that the operator may be used in a statement containing other operations.

- *time*$_{in}$ is the time to be assigned to the ZIL_TIME object.

Example

```
#include <ui_gen.hpp>

AddOneHour(ZIL_TIME currentTime, ZIL_TIME &nextHour, ZIL_TIME &hourAfterNext)
{
    long oneHour = 360000L;
    ZIL_TIME twoHours(2, 0);

    // Adding 1 hour to the current time gives the next hour.
    nextHour = currentTime + oneHour;

    // Adding 2 hour to the current time gives the following hour.
    hourAfterNext = currentTime + twoHours;
}
```

ZIL_TIME::operator +

Syntax

#include <ui_gen.hpp>

long operator + (long *hundredths*);
or
long operator + (const ZIL_TIME *&time*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first operator overload adds the value *hundredths* to the ZIL_TIME object.

- *returnValue*$_{out}$ is the number of hundredths of seconds resulting from the addition operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *hundredths*$_{in}$ is the number of hundredths of seconds to be added to the ZIL_TIME object.

The second operator overload adds the value of *time* to the ZIL_TIME object.

- *returnValue*$_{out}$ is the value resulting from the addition operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *time*$_{in}$ is the time to be added to the ZIL_TIME object.

Example

```
#include <ui_gen.hpp>

AddOneHour(ZIL_TIME currentTime, ZIL_TIME &nextHour, ZIL_TIME &hourAfterNext)
{
    long oneHour = 360000L;
    ZIL_TIME twoHours(2, 0);

    // Adding 1 hour to the current time gives the next hour.
    nextHour = currentTime + oneHour;

    // Adding 2 hours to the current time gives the following hour.
    hourAfterNext = currentTime + twoHours;
}
```

ZIL_TIME::operator -

Syntax

#include <ui_gen.hpp>

long operator - (long *hundredths*);
or
long operator - (const ZIL_TIME &*time*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

The first operator overload subtracts the value *hundredths* from the ZIL_TIME object.

- *returnValue*$_{out}$ is the number of hundredths of seconds resulting from the subtraction operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *hundredths*$_{in}$ is the number of hundredths of seconds to be subtracted from the ZIL_TIME object.

The second operator overload subtracts the value of *time* from the ZIL_TIME object.

- *returnValue*$_{out}$ is the value resulting from the subtraction operation. This raw value is returned so that the operator may be used in a statement containing other operations.

- *time*$_{in}$ is the time to be subtracted from the ZIL_TIME object.

Example

```
#include <ui_gen.hpp>

SubtractOneHour(ZIL_TIME currentTime, ZIL_TIME &previousHour,
    ZIL_TIME &twoHoursBefore)
{
    long oneHour = 360000L;
    ZIL_TIME twoHours(2, 0);

    // Subtracting 1 hour from the current time gives the previous hour.
    previousHour = currentTime - oneHour;

    // Subtracting 2 hours from the current time gives the hour
    // two hours previous.
    twoHoursBefore = currentTime - twoHours;
}
```

ZIL_TIME::operator >

Syntax

#include <ui_gen.hpp>

int operator > (ZIL_TIME &*time*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_TIME object is chronologically greater than the time specified by *time*.

- $returnValue_{out}$ is TRUE if the ZIL_TIME object is chronologically greater than *time*. Otherwise, *returnValue* is FALSE.

- $time_{in}$ is the time to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME currentTime; // Initialize a system time.
    ZIL_TIME midnight("12:00am");

    // Check the time.
    if (currentTime == midnight)
        printf("It's exactly midnight.\n");
    else if (currentTime > midnight)
        printf("We're in the wee hours of the morning.\n");
    else
        printf("It's still late night.\n");
}
```

ZIL_TIME::operator >=

Syntax

#include <ui_gen.hpp>

int operator >= (ZIL_TIME &*time*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_TIME object is chronologically greater than or equal to the time specified by *time*.

- $returnValue_{out}$ is TRUE if the ZIL_TIME object is chronologically greater than or equal to *time*. Otherwise, *returnValue* is FALSE.
- $time_{in}$ is the time to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME currentTime; // Initialize a system time.
    ZIL_TIME midnight("12:00am");

    // Check the time.
    if (currentTime >= midnight)
        printf("Tomorrow is here.\n");
    else
        printf("It's still late night.\n");
}
```

ZIL_TIME::operator <

Syntax

#include <ui_gen.hpp>

int operator < (ZIL_TIME &*time*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_TIME object is chronologically less than the time specified by *time*.

- $returnValue_{out}$ is TRUE if the ZIL_TIME object is chronologically less than *time*. Otherwise, *returnValue* is FALSE.

- $time_{in}$ is the time to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME currentTime;   // Initialize a system time.
    ZIL_TIME midnight("12:00am");

    // Check the time.
    if (currentTime < midnight)
        printf("It's still late night.\n");
    else
        printf("Tomorrow is here.\n");
}
```

ZIL_TIME::operator <=

Syntax

#include <ui_gen.hpp>

int operator <= (ZIL_TIME *&time*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_TIME object is chronologically less than or equal to the time specified by *time*.

- *returnValue*$_{out}$ is TRUE if the ZIL_TIME object is chronologically less than or equal to *time*. Otherwise, *returnValue* is FALSE.

- *time*$_{in}$ is the time to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME currentTime; // Initialize a system time.
    ZIL_TIME midnight("12:00am");

    // Check the time.
    if (midnight <= currentTime)
        printf("It's still late night.\n");
    else
        printf("Tomorrow is here.\n");
}
```

ZIL_TIME::operator ++

Syntax

#include <ui_gen.hpp>

long operator ++ (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload increments the ZIL_TIME by one hundredth of a second.

- *returnValue*$_{out}$ is the number of hundredths of seconds after the ZIL_TIME object has been incremented. This raw value is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_gen.hpp>
AdvanceCurrentTime(ZIL_TIME &currentTime)
{
    // Advance the current time.
    ++currentTime;
}
```

ZIL_TIME::operator --

Syntax

#include <ui_gen.hpp>

long operator -- (void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload decrements the ZIL_TIME by one hundredth of a second.

- *returnValue*$_{out}$ is the number of hundredths of seconds after the ZIL_TIME object has been decremented. This raw value is returned so that the operator may be used in a statement containing other operations.

Example

```
#include <ui_gen.hpp>

DecrementCurrentTime(ZIL_TIME &currentTime)
{
    // Advance the current Time.
    --currentTime;
}
```

ZIL_TIME::operator +=

Syntax

#include <ui_gen.hpp>

void operator += (long *hundredths*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator adds *hundredths* to the ZIL_TIME object and copies the result back into the ZIL_TIME object.

- $hundredths_{in}$ is the number of hundredths of seconds to be added to the ZIL_TIME object.

Example

```
#include <ui_gen.hpp>

AddOneHour(ZIL_TIME *currentTime)
{
    long oneHour = 360000L;

    // Add 1 hour.
    *currentTime += oneHour;
}
```

ZIL_TIME::operator -=

Syntax

#include <ui_gen.hpp>

void operator -= (long *hundredths*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator subtracts *hundredths* from the ZIL_TIME object and copies the result back into the ZIL_TIME object.

- $hundredths_{in}$ is the number of hundredths of seconds to be subtracted from the ZIL_TIME object.

Example

```
#include <ui_gen.hpp>

SubtractHour(ZIL_TIME *currentTime)
{
    long oneHour = 360000L;
    // Subtract 1 hour.
    *currentTime -= oneHour;
}
```

ZIL_TIME::operator ==

Syntax

#include <ui_gen.hpp>

int operator == (ZIL_TIME *&time*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_TIME object is chronologically equal to the time specified by *time*.

- $returnValue_{out}$ is TRUE if the ZIL_TIME object is chronologically equal to *time*. Otherwise, *returnValue* is FALSE.
- $time_{in}$ is the time to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME currentTime;    // Initialize a system time.
    ZIL_TIME midnight("12:00am");

    // Check the time.
```

```
    if (currentTime == midnight)
        printf("It's exactly midnight.\n");
    else if (currentTime > midnight)
        printf("We're in the wee hours of the morning.\n");
    else
        printf("It's still late night.\n");
}
```

ZIL_TIME::operator !=

Syntax

#include <ui_gen.hpp>

int operator != (ZIL_TIME *&time*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_TIME object is chronologically not equal to the time specified by *time*.

- $returnValue_{out}$ is TRUE if the ZIL_TIME object is chronologically not equal to *time*. Otherwise, *returnValue* is FALSE.

- $time_{in}$ is the time to be compared.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_TIME currentTime; // Initialize a system time.
    ZIL_TIME startTime("12:00am");

    // Check the time.
    if ((currentTime != startTime) && (currentTime < startTime))
        printf("It's still not time yet!\n");
}
```

CHAPTER 73 – ZIL_UTIME

The ZIL_UTIME class object is used to maintain and manipulate a unified time and date value.

The ZIL_UTIME class is declared in **UI_GEN.HPP**. Its public and protected members are:

```
class ZIL_EXPORT_CLASS ZIL_UTIME : public ZIL_INTERNATIONAL
{
public:
    static ZIL_ICHAR _dayName[];
    static ZIL_ICHAR _monthName[];
    static ZIL_ICHAR _timeName[];
    static int defaultInitialized;

    enum UTMI_RESULT
    {
        UTMI_OK = 0,            // Time successfully imported.
        UTMI_INVALID,           // Invalid time value or format.
        UTMI_VALUE_MISSING,     // Required value not present.
        UTMI_OUT_OF_RANGE,      // Time out of range (used by UIW_TIME)
        UTMI_LESS_THAN_RANGE,   // Time less than positively open-ended
                                // range.
        UTMI_GREATER_THAN_RANGE // Time greater than negatively open-ended
                                // range.
    };

    ZIL_UTIME(void);
    ZIL_UTIME(const ZIL_UTIME &utime);
    ZIL_UTIME(const ZIL_ICHAR *string);
    ZIL_UTIME(int year, int month, int day, int hour, int minute,
        int second, int milliSecond);
    virtual ~ZIL_UTIME(void);
    int DaysInMonth(void);
    int DaysInYear(void);
    void Export(int *year, int *month, int *day, int *hour, int *minute,
        int *second, int *milliSecond);
    int Export(ZIL_ICHAR *string, int maxsize, const ZIL_ICHAR *format);
    int Export(ZIL_ICHAR *string, int maxsize);
    UTMI_RESULT Import(void);
    UTMI_RESULT Import(const ZIL_UTIME &utime);
    const ZIL_ICHAR *Import(const ZIL_ICHAR *string,
        const ZIL_ICHAR *format);
    int LeapYear(void);

    ZIL_UTIME *operator=(const ZIL_UTIME &utime);
    ZIL_UTIME *operator+(const ZIL_UTIME &utime);
    ZIL_UTIME *operator-(const ZIL_UTIME &utime);
    int operator==(const ZIL_UTIME &utime);
    int operator!=(const ZIL_UTIME &utime);
    int operator>(const ZIL_UTIME &utime);
    int operator>=(const ZIL_UTIME &utime);
    int operator<(const ZIL_UTIME &utime);
    int operator<=(const ZIL_UTIME &utime);

    void SetLanguage(const ZIL_ICHAR *languageName = ZIL_NULLP(ZIL_ICHAR));
    void SetLocale(const ZIL_ICHAR *localeName);

protected:
    ZIL_UINT32 jday;
    ZIL_INT32 usec;
```

```
    int recurse;
    const ZIL_LOCALE *myLocale;
    const ZIL_LANGUAGE *myDayStrings;
    const ZIL_LANGUAGE *myMonthStrings;
    const ZIL_LANGUAGE *myTimeStrings;

    void ConvertJday(int *pYear, int *pMonth, int *pDay, int *pDayOfWeek);
    void ConvertUsec(int *hour, int *minute, int *second, int *milliSecond);
    int DayOfWeek(void);
    void Import(int year, int month, int day,
            int hour, int minute, int second, int millisecond);
    void MakeCanonical(void);
public:
    int basisYear;
    int zoneOffset;
};
```

General Members

This section describes those members that are used for general purposes.

- *_dayName* is a string used to identify the ZIL_MESSAGE_LIST structure maintained by the ZIL_INTERNATIONAL class that contains the strings used for day names. By default, *_dayName* is "ZIL_DAY."

- *_monthName* is a string used to identify the ZIL_MESSAGE_LIST structure maintained by the ZIL_INTERNATIONAL class that contains the strings used for month names. By default, *_monthName* is "ZIL_MONTH."

- *_timeName* is a string used to identify the ZIL_MESSAGE_LIST structure maintained by the ZIL_INTERNATIONAL class that contains the strings used for time names. By default, *_timeName* is "ZIL_TIME."

- *defaultInitialized* indicates if the default language strings for this object have been set up. The default strings are located in the file **LANG_DEF.CPP**. If *defaultInitialized* is TRUE, the strings have been set up. Otherwise they have not been. *defaultInitialized* is set to TRUE when the strings are set up in the object's constructor.

- *jday* is the Julian date representation of the date being maintained by the ZIL_UTIME class.

- *usec* is the number of milliseconds in the time being maintained by the ZIL_UTIME class.

- *recurse* is a flag used when importing new date and time values from a string. *recurse* is set by the function and should not be used by the programmer.

- *myLocale* is the ZIL_LOCALE class that contains the formatting information for dates and times.
- *myDayStrings* is the ZIL_LANGUAGE object that contains the string translations for the days of the week.
- *myMonthStrings* is the ZIL_LANGUAGE object that contains the string translations for the days of the month.
- *myTimeStrings* is the ZIL_LANGUAGE object that contains the string translations for times.
- *basisYear* is the year from which dates are offset if the date does not contain a full year. For example, if *basisYear* is 1900, then a year of 90 is assumed to be 1990.
- *zoneOffset* indicates how many timezones are between the current locale and the Greenwich timezone.

ZIL_UTIME::ZIL_UTIME

Syntax

#include <ui_win.hpp>

ZIL_UTIME(void);
or
ZIL_UTIME(const ZIL_UTIME *&utime*);
or
ZIL_UTIME(const ZIL_ICHAR **string*);
or
ZIL_UTIME(int *year*, int *month*, int *day*, int *hour*, int *minute*, int *second*, int *milliSecond*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

These overloaded constructors create a new ZIL_UTIME class object.

The first overloaded constructor creates a ZIL_UTIME object using the system's data and time.

The second overloaded constructor is a copy constructor that takes a previously constructed ZIL_UTIME object to specify the date and time.

- *utime*$_{in}$ is a pointer to a previously constructed ZIL_UTIME object.

The third overloaded constructor uses a string argument to specify the date and time.

- *string*$_{in}$ is a string that contains the date and time information. The format must be consistent with the format specified in **ZIL_LOCALE::dateTimeStringFormat**. By default, the format is "YYYY-mm-dd HH:MM:SS.KK" where Y is a year digit, m is a month digit, d is a day digit, H is an hour digit, M is a minute digit, S is a second digit and K is a thousandths of second digit.

The fourth overloaded constructor uses integer arguments to specify the date and time.

- *year*$_{in}$ is the year. This argument must be either 0, if no year value is to be used with the date, or a value in the range from 100 to 32,767.

- *month*$_{in}$ is the month. This argument must be either 0, if no month value is to be used with the date, or a value in a range from 1 (January) to 12 (December).

- *day*$_{in}$ is the day. This argument must be either 0, if no day value is to be used with the date, or a value in a range from 1 to 31 that should be valid for the specified month and year.

- *hour*$_{in}$ is the hour. This argument must be in the range from 0 to 23.

- *minute*$_{in}$ is the minute. This argument must be in the range from 0 to 59.

- *second*$_{in}$ is the second. This argument must be in the range from 0 to 59.

- *milliSecond*$_{in}$ is the thousandths of a second. This argument must be in the range from 0 to 999.

ZIL_UTIME::~ZIL_UTIME

Syntax

#include <ui_gen.hpp>

virtual ~ZIL_UTIME(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This virtual destructor destroys the class information associated with the ZIL_UTIME object.

ZIL_UTIME::ConvertJday

Syntax

#include <ui_gen.hpp>

void ConvertJday(int **pYear*, int **pMonth*, int **pDay*, int **pDayOfWeek*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts the Julian date into integer values for the year, month, day and day of week.

- *pYear*$_{out}$ is the year associated with the date.
- *pMonth*$_{out}$ is the month associated with the date, where 1 is January and 12 is December.
- *pDay*$_{out}$ is the day of the month associated with the date.
- *pDayOfWeek*$_{out}$ is the day of week associated with the date, where 1 is Sunday and 7 is Saturday.

ZIL_UTIME::ConvertUsec

Syntax

#include <ui_gen.hpp>

void ConvertUsec(int **hour*, int **minute*, int **second*, int **millisecond*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function converts the time into integer values for the hour, minute, second and millisecond.

- *hour*$_{out}$ is the hour associated with the time.
- *minute*$_{out}$ is the minute associated with the time.
- *second*$_{out}$ is the second associated with the time.
- *millisecond*$_{out}$ is the millisecond associated with the time.

ZIL_UTIME::DayOfWeek

Syntax

#include <ui_gen.hpp>

int DayOfWeek(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the numerical value of the day of the week (Sunday = 1, Monday = 2, . . . Saturday = 7) for the ZIL_UTIME object.

NOTE: DayOfWeek( ) may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

- *returnValue*$_{out}$ is the day of the week.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_UTIME utime;

    // Print the current day of week.
    printf("Today is %d.\n", utime.DayOfWeek());
}
```

ZIL_UTIME::DaysInMonth

Syntax

#include <ui_gen.hpp>

int DaysInMonth(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the number of days in the month specified by the ZIL_UTIME object. For example, if the date were December 15, 1993, **DaysInMonth** would return 31.

NOTE: DaysInMonth( ) may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

- *returnValue*$_{out}$ is the number of days in the month.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    // Print the number of days in the current month.
    ZIL_UTIME utime;
    printf("This month has %d days.\n", utime.DaysInMonth());
}
```

ZIL_UTIME::DaysInYear

Syntax

#include <ui_gen.hpp>

int DaysInYear(void);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function returns the number of days in the year specified by the ZIL_UTIME object. For example, if the date were January 15, 1992, **DaysInYear( )** would return 366 (i.e., 1 extra day for leap year).

NOTE: DaysInYear( ) may return questionable values for dates before 1753 due to the switch from the Julian calendar to the Gregorian calendar.

- *returnValue*$_{out}$ is the number of days in the year.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    // Print the number of days in the year.
    ZIL_UTIME utime;
    printf("This year has %d days.\n", utime.DaysInYear());
}
```

ZIL_UTIME::Export

Syntax

#include <ui_gen.hpp>

void Export(int **year*, int **month*, int **day*, int **hour*, int **minute*,
int **second*, int **milliSecond*);
or
int Export(ZIL_ICHAR **string*, int *maxSize*, const ZIL_ICHAR **format*);
or
int Export(ZIL_ICHAR **string*, int *maxSize*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions obtain the value of the ZIL_UTIME object.

The first overloaded function returns date and time information through several integer arguments.

- $year_{out}$ is the year associated with the date.
- $month_{out}$ is the month associated with the date.
- day_{out} is the day of the month associated with the date.
- $hour_{out}$ is the hour associated with the time.
- $minute_{out}$ is the minute associated with the time.
- $second_{out}$ is the second associated with the time.
- $milliSecond_{out}$ is the millisecond associated with the time.

The second overloaded function returns date information through the *string* argument, using *format* to format the string.

- *returnValue*$_{out}$ indicates if the export was successful. *returnValue* is non-zero if the export was successful. Otherwise, the export was unsuccessful.

- *string*$_{in/out}$ is a pointer to a string that gets the formatted utime. This string must be long enough to contain the combined time and date.

- *maxSize*$_{in}$ is the size of the string buffer.

- *format*$_{in}$ specifies how the string is to be formatted. *format* is a **printf**-style format string that uses special symbols to represent the various possible fields.

The third overloaded function returns the date information through the *string* argument.

- *returnValue*$_{out}$ indicates if the export was successful. *returnValue* is non-zero if the export was successful. Otherwise, the export was unsuccessful.

- *string*$_{out}$ is a pointer to a string that gets the formatted utime. This string must be long enough to contain the combined time and date.

- *maxSize*$_{in}$ is the size of the string buffer.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_UTIME utime;

    // Print out the time and date.
    char stringUtime[128];
    utime.Export(stringUtime, 128);
    printf("String value: %s", stringUtime);

    // The destructor for utime is automatically called when the
    // scope of this function ends.
}
```

ZIL_UTIME::Import

Syntax

#include <ui_gen.hpp>

UTMI_RESULT Import(void);
or
UTMI_RESULT Import(const ZIL_UTIME *&utime*);
or
const ZIL_ICHAR *Import(const ZIL_ICHAR **string*, const ZIL_ICHAR **format*);
or
void Import(int *year*, int *month*, int *day*, int *hour*, int *minute*, int *second*, int *millisecond*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

These overloaded functions set the value of the ZIL_UTIME object.

The first overloaded function sets the date and time information according to the system information.

- *returnValue*$_{out}$ is the result of the import operation. *returnValue* can have one of the following values:

  UTMI_GREATER_THAN_RANGE—The date or time value was greater than the maximum value in a range that goes to negative infinity.

  UTMI_INVALID—An invalid format was encountered (e.g., "31 Jan, 1992").

  UTMI_LESS_THAN_RANGE—The date or time value was less than the minimum value in a range that goes to positive infinity.

  UTMI_OK—The date and time were entered in a correct format and within the valid range.

UTMI_OUT_OF_RANGE—The date or time value was out of range (e.g., "Jan 33, 1992").

UTMI_VALUE_MISSING—A required date or time value was missing (e.g., "5, 1991").

The second overloaded function copies the date and time information from the *utime* reference argument.

- *returnValue*$_{out}$ is the result of the import operation. See the first function for possible values.
- *utime*$_{in}$ is a pointer to a previously constructed utime.

The third overloaded function copies the time and date information from the *string* argument.

- *returnValue*$_{out}$ is the date and time string that resulted from the import.
- *string*$_{in}$ is a string that contains the date and time information.
- *format*$_{in}$ is a **printf**-style format string that specifies how the date and time information can be parsed from *string*.

The fourth overloaded function copies the date and time information from the specific date and time values.

- *year*$_{in}$ is the year to associate with the date.
- *month*$_{in}$ is the month to associate with the date.
- *day*$_{in}$ is the day to associate with the date.
- *hour*$_{in}$ is the hour to associate with the time.
- *minute*$_{in}$ is the minute to associate with the time.
- *second*$_{in}$ is the second to associate with the time.
- *millisecond*$_{in}$ is the millisecond to associate with the time.

Example

```
#include <ui_gen.hpp>

ExampleFunction()
{
    ZIL_UTIME utime;

    // Import the time and date and print out the results.
    char stringUtime[128];
    utime.Import("1994-1-28 1:35:00.0", defaultLocale->dateTimeStringFormat);
    utime.Export(stringUtime, 128);
    printf("String value: %s\n", stringUtime);

    // The destructor for utime is automatically called when the
    // scope of this function ends.
}
```

ZIL_UTIME::LeapYear

Syntax

#include <ui_gen.hpp>

int LeapYear(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function indicates if the year is a leap year.

- *returnValue*$_{out}$ indicates if the year is a leap year. *returnValue* is TRUE if the year is a leap year. Otherwise it is FALSE.

ZIL_UTIME::MakeCanonical

Syntax

#include <ui_gen.hpp>

void MakeCanonical(void);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function ensures that *jday* and *usec* are synchronized. For example, if a number of milliseconds are added to the utime, *usec* may contain a value greater than the number of milliseconds in a day. If this happens, *jday* needs to be updated by an extra day and *usec* needs to be updated so that it represents a proper time for the date.

ZIL_UTIME::SetLanguage

Syntax

#include <ui_gen.hpp>

void SetLanguage(const ZIL_ICHAR **languageName* = ZIL_NULLP(ZIL_ICHAR));

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This function sets the language to be used by the object. The string translations for the object will be loaded and the object's *myDayStrings*, *myMonthStrings*, and *myTimeStrings* members will be updated to point to the new ZIL_LANGUAGE objects. By default, the object uses the language identified in the **LANG_DEF.CPP** file, which compiles into the library. (If a different default language is desired, simply copy a **LANG_<ISO>.CPP** file from the ZINC\SOURCE\INTL directory to the \ZINC\SOURCE directory, and rename it to **LANG_DEF.CPP** before compiling the library.) The language translations are loaded from the **I18N.DAT** file, so it must be shipped with your application.

- *languageName*$_{in}$ is the two-letter ISO language code identifying which language the object should use.

ZIL_UTIME::SetLocale

Syntax

- #include <ui_gen.hpp>

  void SetLocale(const ZIL_ICHAR **localeName*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This function sets the locale to be used by the object. The locale information for the object will be loaded and the object's *myLocale* member will be updated to point to the new ZIL_LOCALE object. By default, the object uses the locale identified in the **LOC_DEF.CPP** file, which compiles into the library. (If a different default locale is desired, simply copy a **LOC_<ISO>.CPP** file from the ZINC\SOURCE\INTL directory to the \ZINC\SOURCE directory, and rename it to **LOC_DEF.CPP** before compiling the library.) The locale information is loaded from the **I18N.DAT** file, so it must be shipped with your application.

- *localeName*$_{in}$ is the two-letter ISO country code identifying which locale information the object should use.

ZIL_UTIME::operator =

Syntax

#include <ui_gen.hpp>

ZIL_UTIME *operator = (const ZIL_UTIME &*utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload assigns the value specified by *utime* to the ZIL_UTIME object.

- *returnValue*$_{out}$ is a pointer to the ZIL_UTIME object after it has been updated. This pointer is returned so that the operator may be used in a statement containing other operations.

- *utime*$_{in}$ is the time and date to be assigned to the ZIL_UTIME object.

Example

```
#include <ui_gen.hpp>

AssignUtime(ZIL_UTIME aUtime, ZIL_UTIME &anotherUtime)
{
    anotherUtime = aUtime;
}
```

ZIL_UTIME::operator +

Syntax

#include <ui_gen.hpp>

ZIL_UTIME *operator + (const ZIL_UTIME *&utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload adds the value contained in *utime* to the ZIL_UTIME object.

- *returnValue*$_{out}$ is a pointer to the ZIL_UTIME object after it has been updated. This pointer is returned so that the operator may be used in a statement containing other operations.

- *utime*$_{in}$ is the time and date to be added to the ZIL_UTIME object.

Example

```
#include <ui_gen.hpp>

AddUtime(ZIL_UTIME aUtime, ZIL_UTIME &anotherUtime)
{
    ZIL_UTIME currentUtime;

    anotherUtime = aUtime + currentUtime;
}
```

ZIL_UTIME::operator -

Syntax

#include <ui_gen.hpp>

ZIL_UTIME *operator - (const ZIL_UTIME &*utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload subtracts the value contained in *utime* from the ZIL_UTIME object.

- $returnValue_{out}$ is a pointer to the ZIL_UTIME object after it has been updated. This pointer is returned so that the operator may be used in a statement containing other operations.

- $utime_{in}$ is the time and date to be subtracted from the ZIL_UTIME object.

Example

```
#include <ui_gen.hpp>

SubtractUtime(ZIL_UTIME aUtime, ZIL_UTIME &anotherUtime)
{
    ZIL_UTIME currentUtime;

    anotherUtime = aUtime - currentUtime;
}
```

ZIL_UTIME::operator >

Syntax

#include <ui_gen.hpp>

int operator > (const ZIL_UTIME *&utime*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_UTIME object is chronologically greater than the utime specified by *utime*.

- $returnValue_{out}$ is TRUE if the ZIL_UTIME object is chronologically greater than *utime*. Otherwise, *returnValue* is FALSE.
- $utime_{in}$ is the time and date to be compared.

ZIL_UTIME::operator >=

Syntax

#include <ui_gen.hpp>

int operator >= (const ZIL_UTIME *&utime*);

Portability

This function is available on the following environments:

- DOS Text
- DOS Graphics
- Windows
- OS/2
- Macintosh
- OSF/Motif
- Curses
- NEXTSTEP

Remarks

This operator overload determines whether the ZIL_UTIME object is chronologically greater than or equal to the utime specified by *utime*.

- *returnValue*$_{out}$ is TRUE if the ZIL_UTIME object is chronologically greater than or equal to *utime*. Otherwise, *returnValue* is FALSE.

- *utime*$_{in}$ is the time and date to be compared.

ZIL_UTIME::operator <

Syntax

#include <ui_gen.hpp>

int operator < (const ZIL_UTIME *&utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_UTIME object is chronologically less than the utime specified by *utime*.

- *returnValue*$_{out}$ is TRUE if the ZIL_UTIME object is chronologically less than *utime*. Otherwise, *returnValue* is FALSE.

- *utime*$_{in}$ is the time and date to be compared.

ZIL_UTIME::operator <=

Syntax

#include <ui_gen.hpp>

int operator <= (const ZIL_UTIME &*utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_UTIME object is chronologically less than or equal to the utime specified by *utime*.

- $returnValue_{out}$ is TRUE if the ZIL_UTIME object is chronologically less than or equal to *utime*. Otherwise, *returnValue* is FALSE.

- $utime_{in}$ is the time and date to be compared.

ZIL_UTIME::operator ==

Syntax

#include <ui_gen.hpp>

int operator == (const ZIL_UTIME &*utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_UTIME object is chronologically equal to the utime specified by *utime*.

- *returnValue*$_{out}$ is TRUE if the ZIL_UTIME object is chronologically equal to *utime*. Otherwise, *returnValue* is FALSE.

- *utime*$_{in}$ is the time and date to be compared.

ZIL_UTIME::operator !=

Syntax

#include <ui_gen.hpp>

int operator != (const ZIL_UTIME *&utime*);

Portability

This function is available on the following environments:

■ DOS Text	■ DOS Graphics	■ Windows	■ OS/2
■ Macintosh	■ OSF/Motif	■ Curses	■ NEXTSTEP

Remarks

This operator overload determines whether the ZIL_UTIME object is chronologically not equal to the utime specified by *utime*.

- *returnValue*$_{out}$ is TRUE if the ZIL_UTIME object is chronologically not equal to *utime*. Otherwise, *returnValue* is FALSE.

- *utime*$_{in}$ is the time and date to be compared.

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