

# 21

## FLOATING WINDOWS

*Includes Demonstration Program FloatingWindows*

### Floating Windows

Floating windows are windows which stay in front of all of an application's document windows. They are typically used to display tool, pattern, colour, and other choices to be made available to the user. Examples of floating windows are shown at Fig 1.

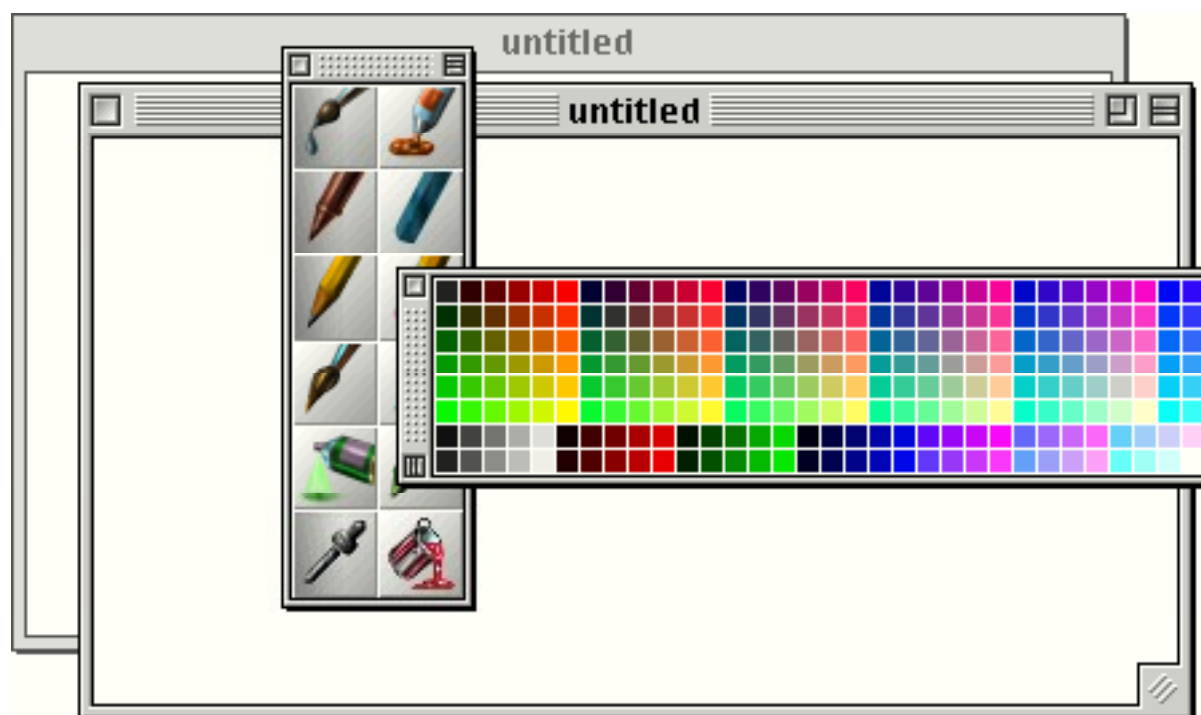


FIG 1 - FLOATING WINDOWS - EXAMPLES

### Front-To-Back Ordering of On-Screen Objects

The fact that floating windows always remain in front of an application's document windows leads naturally to a consideration of the correct front-to-back ordering of on-screen interface objects. Within an application, this front-to-back ordering should be as follows:

- Help balloons.
- Menus.

- System windows.<sup>1</sup>
- Modal and movable modal dialog and alert boxes.
- Floating windows.
- Document windows and modeless dialog boxes.

Note that floating windows should remain behind modal and movable modal dialog and alert boxes, reflecting the fact that, whatever choices the user can make from a floating window, those choices relate only to operations within the application's document windows and not to operations within modal dialogs and alert boxes.

In terms of front-to-back ordering, floating windows, unlike document windows, are all basically equal. Unless they actually overlap each other, there is no visual cue of any front-to-back ordering as there is with normal windows. Because of this equality, floating windows should almost always appear in the active state. The exception is when a modal or movable modal dialog or alert box is presented to the user. When this occurs, the appearance of all floating windows should be changed to reflect the inactive state. As a further refinement, the content of the window should be dimmed to further suggest to the user that the floating windows are irrelevant to operations within the dialog box or alert box.

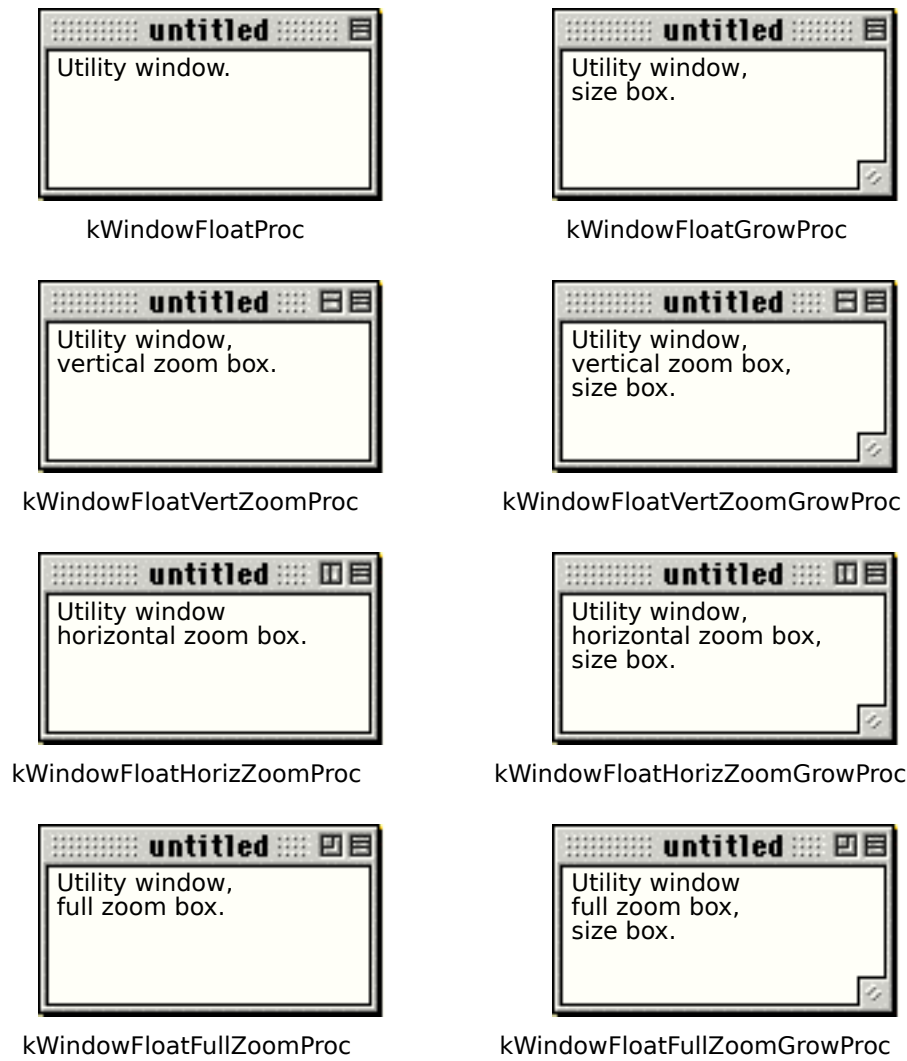
## ***Floating Window Types***

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Figs 2 and 3 show the sixteen available window types for floating windows and the constants that represent those types.

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<sup>1</sup> System windows are windows which can appear in an application's window list but which are not directly created by the application. These windows appear in front of all windows created by the application. An example of a system window is a notification alert box.



**FIG 2 - WINDOW TYPES FOR FLOATING WINDOWS (TITLE BAR AT TOP)**



**FIG 3 - WINDOW TYPES FOR FLOATING WINDOWS (TITLE BAR AT LEFT)**

## Window Definition IDs

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The WDEF resource IDs for the floating window types are 66, and 67. The window definition IDs are as follows:

WDEF Resource ID	Variation Code	Window Definition ID (Value)	Window Definition ID (Constant)
66	1	$66 * 16 + 1 = 1057$	kWindowFloatProc
66	3	$66 * 16 + 3 = 1059$	kWindowFloatGrowProc
66	5	$66 * 16 + 5 = 1061$	kWindowFloatVertZoomProc
66	7	$66 * 16 + 7 = 1063$	kWindowFloatVertZoomGrowProc
66	9	$66 * 16 + 9 = 1065$	kWindowFloatHorizZoomProc
66	11	$66 * 16 + 11 = 1067$	kWindowFloatHorizZoomGrowProc
66	13	$66 * 16 + 13 = 1069$	kWindowFloatFullZoomProc
66	15	$66 * 16 + 15 = 1071$	kWindowFloatFullZoomGrowProc
67	1	$67 * 16 + 1 = 1073$	kWindowFloatSideProc
67	3	$67 * 16 + 3 = 1075$	kWindowFloatSideGrowProc
67	5	$67 * 16 + 5 = 1077$	kWindowFloatSideVertZoomProc
67	7	$67 * 16 + 7 = 1079$	kWindowFloatSideVertZoomGrowProc
67	9	$67 * 16 + 9 = 1081$	kWindowFloatSideHorizZoomProc
67	11	$67 * 16 + 11 = 1083$	kWindowFloatSideHorizZoomGrowProc
67	13	$67 * 16 + 13 = 1085$	kWindowFloatSideFullZoomProc
67	15	$67 * 16 + 15 = 1087$	kWindowFloatSideFullZoomGrowProc

## Implementing Floating Windows — Considerations

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### Activate Events

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The most significant aspect of implementing floating windows has to do with activate events.

**The Single Active Window Problem.** The Window Manager was written on the assumption that there is only ever one active window. However, this will not be the case in an application which implements floating windows. (See Fig 1, in which two floating windows and one document window are active at the same time.) Accordingly, you will need to work around how the Window Manager generates activate events and how the Toolbox Event Manager reports them to an application.

**The Single Deactivate Event Problem.** Because the Window Manager works on the principle that only one window is ever active, only one deactivate event is generated for every activate event. This behaviour will not suffice for an application with floating windows when a modal or movable modal dialog receives the activate event. In that case, a deactivate event is required not only for the frontmost document window but for all of the visible floating windows as well.

These two problems mean that you must not use those Window Manager functions, such as `SelectWindow`, `ShowWindow`, and `HideWindow`, which implicitly generate activate and deactivate events. Instead, you must use lower-level functions like `BringToFront`, `ShowHide`, and `HiliteWindow` to simulate the higher-level calls.

**Activate Events and Document Windows.** Other cases that the Window Manager does not handle well occur when the frontmost document window is closed or when a new document window is created in front of other document windows. If floating windows are present, these document windows do not receive the needed activate and deactivate events, since the application is essentially removing or creating windows in the middle of the window list. Accordingly, your application must itself manage the activation and deactivation of the relevant windows.

**Activate Events and Modal Windows.** When a modal window is to appear, your application will need to deactivate all visible floating windows and the active document

window. When the user dismisses the modal window, your application must re-activate each of those windows.

These considerations require that you subvert the system software's normal window activation/deactivation activities and divide the window list into two sections, specifically, the section occupied by the floating windows (which must always be at the beginning of the overall list) and the section occupied by the document windows.

### **Opening, Closing, Showing and Hiding**

Floating windows should be opened at application launch and should remain open until the application is closed. Since Open... and Close items in the File menu should apply only to document windows, items in some other appropriate menu should be provided to allow the user to toggle each floating window between the hidden and showing state.

A floating window's close box should simply hide the window, not close it. For that reason, the close box in floating windows should be conceived of as a "hide" box rather than as a go-away box.

**Application in the Background.** Floating windows should be hidden by the owner application when that application receives a suspend event. This is to avoid user confusion arising from one application's floating windows being visible when another application is in the foreground. The floating windows should be shown again only when the application receives a subsequent resume event.

### **Implementing Floating Windows — Substitute and Supporting Functions**

Implementing floating windows in an application basically involves providing a number of application-defined substitute and supporting functions, many of which perform the necessary subversion of the system software's normal window activation/deactivation activities and treat the window list as comprising separate document windows and floating windows sections.

The following reflects the implementation methodology used in the demonstration program associated with this chapter.

#### **Main Substitute Functions**

The substitute functions are those functions used in lieu of the Macintosh Toolbox functions that would ordinarily be used in a non-floating windows environment. The main substitute functions<sup>2</sup>, the actions performed by those functions, and the Toolbox calls they replace, are as follows:

<b>Substitute</b>	<b>Replaces</b>	<b>Actions Performed</b>
FW_GetNewCWindow	GetNewCWindow	Create floating and document windows based on a resource template. When a new floating window is opened, bring that window to the very front of any existing windows. When a new document window is opened, move that window to immediately behind the last floating window, and in front of any document windows which may already be open.
FW_DisposeWindow	DisposeWindow	Dispose of document windows. Activate the next document window in the window list, and call DisposeWindow to remove the specified document window from the screen and the window list and discard all its data storage.
FW_SelectWindow	SelectWindow	Bring the window (floating or document) in which the mouse-down occurred as far forward in the window list as it should

<sup>2</sup> The names of the replacement and supplementary functions shown in the following are, of course, purely arbitrary. You may use whatever names you like. The names shown are those used in the demonstration program.

		come. If it is a floating window, makes it the absolute frontmost window. If it is a document window, make it the frontmost window behind the floating windows.
FW_HideWindow	HideWindow	Hide the specified window. As with <code>HideWindow</code> , if the frontmost (floating or document) window is to be hidden, place it behind the window immediately behind it in its section of the window list so that, when it is shown again, it will no longer be frontmost window in its section.
FW_ShowWindow	ShowWindow	Show the specified window. As with <code>ShowWindow</code> , show the window without changing its position in the window list. If the window being shown is the frontmost document window, deactivate the window behind it, and activate the window being shown. If the specified window is a floating window, and if a modal or movable modal dialog box is present, show the window in the inactive state.
FW_DragWindow	DragWindow	Drag the specified window around, ensuring that, if it is a document window, it remains behind the floating windows. As with <code>DragWindow</code> , do not bring the window forward if the Command key is held down during the drag.

### **Additional Substitute Functions**

The demonstration program associated with this chapter uses the `refCon` field of all document and floating window window structures to store a handle to a special structure containing information relevant to window management in the floating windows environment. This means that the use of the window structure's `refCon` field is denied to the application for other purposes (such as, for example, storing a handle to a document structure).

To compensate for this, a reference constant field is included in the special structure containing information relevant to window management. This field may be used to store the value that you would ordinarily assign to the window structure's `refCon` field. The following additional substitute functions pertain to assigning a value to, and retrieving that value from, this field:

<b>Substitute</b>	<b>Replaces</b>	<b>Actions Performed</b>
FW_SetWRefCon	SetWRefCon	Assign a value to the reference constant field of a structure whose handle is assigned to the <code>refCon</code> field of a window's window structure.
FW_GetWRefCon	GetWRefCon	Get the value in the reference constant field of a structure whose handle is assigned to the <code>refCon</code> field of a window's window structure.

### **Supporting Functions**

The main supporting functions, and the actions performed by those functions, are as follows:

<b>Function</b>	<b>Actions Performed</b>
FW_doSuspendEvent	Hide any floating windows, and unhighlight and deactivate the frontmost document window. (Call this function when the application receives a suspend event.)
FW_doResumeEvent	Show all floating windows which were visible when the application was sent to the background, and highlight and activate the front document window. (Call this function when the application receives a suspend event.)

FW_deactivateFloatsAndFirstDocWin	Unhighlight and deactivate any visible floating windows and the frontmost document window. (Call this function immediately before a modal or movable modal dialog or alert box is invoked.)
FW_activateFloatsAndFirstDocWin	Highlight and activate those windows which were visible and activated before FW_deactivateFloatersAndFirstDocWin was called. (Call this function immediately after an alert or modal dialog box is dismissed.)
FW_findFrontNonFloatWindow	Find the first visible non-floating window in the window list. (Call this function when you need the pointer to the frontmost document window or when you need to determine whether any document windows are currently open.)
FW_validateWindowList	Ensure that all floating windows are in front of all document windows. (Call this function, as a safety measure, immediately prior to opening and closing document windows.)

## ***Floating Windows Library Functions***

In the accompanying demonstration program files, the source code pertaining to implementing a floating windows environment has been compiled as a library. The following are the prototypes for those functions in the library that need to be called from an application.

### ***Main Substitute Functions***

```
function FW_GetNewCWindow(var theWindowPtr : WindowPtr; windResourceID : Sint16;
    behind : WindowPtr; activateFunctionUPP : ActivateHandlerUPP;
    isFloater : boolean) : OSErr;
procedure FW_DisposeWindow(theWindowPtr : WindowPtr);
procedure FW_SelectWindow(theWindowPtr : WindowPtr);
procedure FW_HideWindow(theWindowPtr : WindowPtr);
procedure FW_ShowWindow(theWindowPtr : WindowPtr);
procedure FW_DragWindow(theWindowPtr : WindowPtr; startPoint : Point; {const} var draggingBounds : Rect);
```

### ***Additional Substitute Functions***

```
function FW_GetWRefCon(theWindowPtr : WindowPtr) : Sint32;
procedure FW_SetWRefCon(theWindowPtr : WindowPtr; refCon : Sint32);
```

### ***Supporting Functions***

```
procedure FW_doSuspendEvent;
procedure FW_doResumeEvent;
procedure FW_activateFloatsAndFirstDocWin;
procedure FW_deactivateFloatsAndFirstDocWin;
function FW_findFrontNonFloatWindow : WindowPtr;
procedure FW_validateWindowList;
```

## Demonstration Program

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```

{
FloatingWindows.p
//
// This program utilises custom libraries titled FloatingLib68K (for the 68K project) and
// FloatingLibPPC (for the PowerPC project), for which the source code is provided.
// At startup, it open two floating windows and a Document window. Subsequently,
// Document windows, a modal alert box, a movable modal dialog, and the Standard File
// open dialog box may be opened and closed, and the floating windows may be hidden and
// shown, so as to prove correct behaviour of all windows in a floating windows
// environment.
//
// The program utilises the following resources:
//
// • An 'MBAR' resource, and 'MENU' resources for Apple, File, Edit and Floaters menus
//   (preload, non-purgeable).
//
// • 'WIND' resources (purgeable) (initially not visible) for the Document and floating
//   windows.
//
// • An 'ALRT' resource (purgeable), and associated 'DITL', 'alrx', and 'dftb' resources
//   (purgeable), for an alert invoked by the user choosing the About FloatingWindows
//   item in the Apple menu.
//
// • A 'DLOG' resource (purgeable), and associated 'DITL', 'dlgx', and 'dftb' resources
//   (purgeable), for a movable modal dialog box invoked when the user chooses the Find
//   item in the Edit menu.
//
// • 'PICT' resources (non-purgeable) containing pictures to be drawn in the floating
//   windows.
//
// • A 'STR#' resource (purgeable) containing error strings for an error alert box.
//
// • An icon family (purgeable), which provides an icon drawn in the Document windows.
//
// • A 'SIZE' resource with the acceptSuspendResumeEvents, DoesActivateOnFGSwitch, and
//   is32BitCompatible flags set.
}

program FloatingWindows;

//
.....
..... includes

uses

  { Universal Interfaces. }
  Appearance, Devices, Dialogs, Fonts, StandardFile, TextUtils, ToolUtils,

  { Interfaces for the FloatingWindow libraries. }
  FloatingLib;

//
.....
..... constants

const

rMenuBar = 128;
mApple = 128;
iAbout = 1;
mFile = 129;
iNew = 1;
iOpen = 2;
iClose = 4;
iQuit = 12;
mEdit = 130;
iFind = 9;
mFloaters = 131;
iColours = 1;
iTools = 2;
rDocumentWindow = 128;

```



```

rFloaterColoursWindow = 129;
rFloaterToolsWindow = 130;
rColoursPictActive = 128;
rColoursPictInactive = 129;
rToolsPictActive = 130;
rToolsPictInactive = 131;
rAboutAlert = 128;
rFindDialog = 129;
rIconSuite = 128;
rErrorStrings = 128;

kFloaterKind = 7;
eWindowNotCreatedError = -2;
eInvalidWindowOrderingError = -3;

//
.....
..... typedefs

type

DocRecord = record
    iconSuiteHdl : Handle;
end;

DocRecordPtr = ^DocRecord;
DocRecordHandle = ^DocRecordPtr;

//
.....
..... global variables

var

gActivateColoursFloaterProc : ActivateHandlerProc;
gActivateToolsFloaterProc : ActivateHandlerProc;
gActivateWindowProc : ActivateHandlerProc;
gDone : boolean;
gInBackground : boolean;
gColoursFloaterPtr : WindowPtr;
gToolsFloaterPtr : WindowPtr;
gIconSuiteHdl : Handle;

mainMenuBarHdl : Handle;
mainMenuHdl : MenuHandle;
mainEvent : EventRecord;
mainErr : OSErr;

//
.....
..... routine prototypes

procedure DoInitManagers; forward;
procedure DoOpenDocumentWindow; forward;
procedure DoOpenFloatingWindows; forward;
procedure DoEvents({const}var theEvent : EventRecord); forward;
procedure DoMouseDown({const}var theEvent : EventRecord); forward;
procedure DoUpdate({const}var theEvent : EventRecord); forward;
procedure DoActivateWindow(theWindowPtr : WindowPtr; becomingActive : boolean); forward;
procedure DoActivateColoursFloater(theWindowPtr : WindowPtr; becomingActive : boolean); forward;
procedure DoActivateToolsFloater(theWindowPtr : WindowPtr; becomingActive : boolean); forward;
procedure DoAdjustMenus; forward;
procedure DoMenuChoice(menuChoice : SInt32); forward;
procedure DoFloatersMenu(theItem : SInt16); forward;
procedure DoAboutBox; forward;
procedure DoStandardFileOpen; forward;
procedure DoOpenFindDialog; forward;
procedure DoCloseDocWindow; forward;
procedure DoDrawWindowContent(theWindowPtr : WindowPtr; isActive : boolean); forward;
procedure DoErrorAlert(errorCode : OSErr); forward;

//   DoInitManagers

procedure DoInitManagers;
    var
        osError : OSErr;

    begin
        MaxApplZone;

```

```

MoreMasters;

InitGraf(@qd.thePort);
InitFonts;
InitWindows;
InitMenus;
TEInit;
InitDialogs(nil);

InitCursor;
FlushEvents(everyEvent, 0);

osError := RegisterAppearanceClient;

end;
  { of procedure DoInitManagers }

```

```

// ♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦ DoOpenDocumentWindow

```

```

procedure DoOpenDocumentWindow;
var
  theWindowPtr : WindowPtr;
  osError : OSErr;
  docRecordHdl : DocRecordHandle;

begin
  FW_validateWindowList;

  osError := FW_GetNewCWindow(theWindowPtr, rDocumentWindow, WindowPtr(-1),
                              gActivateWindowProc, false);
  if (osError = noErr) then
    begin
      docRecordHdl := DocRecordHandle(NewHandle(sizeof(DocRecord)));
      if (docRecordHdl = nil) then
        begin
          ExitToShell;
          end;
      FW_SetWRefCon(theWindowPtr, SInt32(docRecordHdl));
      docRecordHdl^.iconSuiteHdl := gIconSuiteHdl;

      FW_ShowWindow(theWindowPtr);
    end
  else begin
    DoErrorAlert(osError);
  end;
end;
  { of procedure DoOpenDocumentWindow }

```

```

// ♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦ DoOpenFloatingWindows

```

```

procedure DoOpenFloatingWindows;
var
  osError : OSErr;
  thePicture : PicHandle;

begin
  osError := FW_GetNewCWindow(gColoursFloaterPtr, rFloaterColoursWindow, WindowPtr(-1),
                              gActivateColoursFloaterProc, true);
  if (osError = noErr) then
    begin
      thePicture := GetPicture(rColoursPictActive);
      SetWindowPic(gColoursFloaterPtr, thePicture);
      FW_ShowWindow(gColoursFloaterPtr);
    end
  else begin
    DoErrorAlert(osError);
  end;

  osError := FW_GetNewCWindow(gToolsFloaterPtr, rFloaterToolsWindow, WindowPtr(-1),
                              gActivateToolsFloaterProc, true);
  if (osError = noErr) then
    begin
      thePicture := GetPicture(rToolsPictActive);
      SetWindowPic(gToolsFloaterPtr, thePicture);
      FW_ShowWindow(gToolsFloaterPtr);
    end
  else begin
    DoErrorAlert(osError);
  end;
end;

```

```

    { of procedure DoOpenFloatingWindows }

// DoEvents
procedure DoEvents({const} var theEvent : EventRecord);
var
  charCode : SInt8;

begin
  case theEvent.what of

    mouseDown: begin
      DoMouseDown(theEvent);
    end;

    keyDown, autoKey: begin
      charCode := SInt8(BAnd(theEvent.message, charCodeMask));
      if (BAnd(theEvent.modifiers, cmdKey) <> 0) then
        begin
          DoAdjustMenus;
          DoMenuChoice(MenuEvent(theEvent));
        end;
      end;

    updateEvt: begin
      DoUpdate(theEvent);
    end;

    osEvt: begin
      if (BAnd(BSR(theEvent.message, 24), $000000FF) = suspendResumeMessage) then
        begin
          if (BAnd(theEvent.message, resumeFlag) <> 0) then
            begin
              gInBackground := false;
              FW_doResumeEvent;
            end
          else begin
              gInBackground := true;
              FW_doSuspendEvent;
            end;
          end;
        end;
      end;

    otherwise begin
      end;

  end;
  { of case statement }
end;
  { of procedure DoEvents }

// DoMouseDown
procedure DoMouseDown({const} var theEvent : EventRecord);
var
  partCode : SInt16;
  theWindowPtr : WindowPtr;
  growRect : Rect;
  newSize : UInt32;

begin
  partCode := FindWindow(theEvent.where, theWindowPtr);

  case partCode of

    inMenuBar: begin
      DoAdjustMenus;
      DoMenuChoice(MenuSelect(theEvent.where));
    end;

    inContent: begin
      if (theWindowPtr <> FrontWindow) then
        begin
          FW_SelectWindow(theWindowPtr);
        end;
      end;

    inDrag: begin
      FW_DragWindow(theWindowPtr, theEvent.where, qd.screenBits.bounds);
    end;
  end;
end;

```



```

var
oldPort : GrafPtr;
thePicture : PicHandle;
pictResourceID : SInt16;

begin
GetPort(oldPort);
SetPort(theWindowPtr);

if becomingActive then
begin
pictResourceID := rColoursPictActive;
end
else begin
pictResourceID := rColoursPictInactive;
end;
thePicture := GetPicture(pictResourceID);

DrawPicture(thePicture, thePicture^^.picFrame);
SetWindowPic(theWindowPtr, thePicture);

if not becomingActive then
begin
SetPort(oldPort);
end;
end;
{ of procedure DoActivateColoursFloater }

// DoActivateToolsFloater DoActivateToolsFloater
procedure DoActivateToolsFloater(theWindowPtr : WindowPtr; becomingActive : boolean);
var
oldPort : GrafPtr;
thePicture : PicHandle;
pictResourceID : SInt16;

begin
GetPort(oldPort);
SetPort(theWindowPtr);

if (becomingActive) then
begin
pictResourceID := rToolsPictActive;
end
else begin
pictResourceID := rToolsPictInactive;
end;
thePicture := GetPicture(pictResourceID);

DrawPicture(thePicture, thePicture^^.picFrame);
SetWindowPic(theWindowPtr, thePicture);

if not becomingActive then
begin
SetPort(oldPort);
end;
end;
{ of procedure DoActivateToolsFloater }

// DoAdjustMenus DoAdjustMenus
procedure DoAdjustMenus;
var
fileMenuHdl, floatMenuHdl : MenuHandle;
isVisible : boolean;

begin
fileMenuHdl := GetMenuHandle(mFile);
floatMenuHdl := GetMenuHandle(mFloaters);

if (FW_findFrontNonFloatWindow = nil) then
begin
DisableItem(fileMenuHdl, iClose);
end
else begin
EnableItem(fileMenuHdl, iClose);
end;

isVisible := WindowPeek(gColoursFloaterPtr)^.visible;
if isVisible then

```

## Version 2.1

```
begin
  CheckItem(floatMenuHdl, iColours, true);
end
else begin
  CheckItem(floatMenuHdl, iColours, false);
end;

isVisible := WindowPeek(gToolsFloaterPtr)^.visible;
if isVisible then
  begin
    CheckItem(floatMenuHdl, iTools, true);
  end
else begin
  CheckItem(floatMenuHdl, iTools, false);
end;

DrawMenuBar;
end;
{ of procedure DoAdjustMenus }

// DoMenuChoice

procedure DoMenuChoice(menuChoice : SInt32);
var
  menuID, menuItem : SInt16;
  itemName : Str255;
  daDriverRefNum : SInt16;

begin
  menuID := HiWord(menuChoice);
  menuItem := LoWord(menuChoice);

  if (menuID = 0) then
    begin
      Exit(DoMenuChoice);
    end;

  case menuID of

    mApple: begin
      if (menuItem = iAbout) then
        begin
          DoAboutBox;
        end
      else begin
        GetMenuItemText(GetMenuHandle(mApple), menuItem, itemName);
        daDriverRefNum := OpenDeskAcc(itemName);
        end;
      end;

    mFile: begin
      case menuItem of

        iNew: begin
          DoOpenDocumentWindow;
        end;

        iOpen: begin
          DoStandardFileOpen;
        end;

        iClose: begin
          DoCloseDocWindow;
        end;

        iQuit: begin
          gDone := true;
        end;

        otherwise begin
          end;
        end;
      { of case statement }
    end;

    mEdit: begin
      if (menuItem = iFind) then
        begin
          DoOpenFindDialog;
        end;
      end;
    end;
  end;
end;
```

```

        end;

    mFloaters: begin
        DoFloatersMenu(menuItem);
    end;

    otherwise begin
        end;

    end;
    { of case statement }

    HiliteMenu(0);
end;
    { of procedure DoMenuChoice }

// DoFloatersMenu DoFloatersMenu
procedure DoFloatersMenu(menuItem : SInt16);
var
    floaterWindowPtr : WindowPtr;
    isVisible : boolean;

begin
    if (menuItem = iColours) then
        begin
            floaterWindowPtr := gColoursFloaterPtr;
        end
    else if (menuItem = iTools) then
        begin
            floaterWindowPtr := gToolsFloaterPtr;
        end;

    isVisible := WindowPeek(floaterWindowPtr)^.visible;

    if isVisible then
        begin
            FW_HideWindow(floaterWindowPtr);
        end
    else begin
        FW_ShowWindow(floaterWindowPtr);
    end;
end;
    { of procedure DoFloatersMenu }

// DoAboutBox DoAboutBox
procedure DoAboutBox;
var
    alertResult : SInt16;

begin
    FW_deactivateFloatsAndFirstDocWin;

    alertResult := Alert(rAboutAlert, nil);

    FW_activateFloatsAndFirstDocWin;
end;
    { of procedure DoAboutBox }

// DoStandardFileOpen DoStandardFileOpen
procedure DoStandardFileOpen;
var
    fileTypeList : SFileTypeList;
    fileReply : StandardFileReply;

begin
    fileTypeList[0] := '****';

    FW_deactivateFloatsAndFirstDocWin;

    StandardGetFile(nil, -1, @fileTypeList, fileReply);

    FW_activateFloatsAndFirstDocWin;
end;
    { of procedure DoStandardFileOpen }

// DoOpenFindDialog DoOpenFindDialog

```

## Version 2.1

```
procedure DoOpenFindDialog;
var
  theDialogPtr : DialogPtr;
  itemHit : SInt16;
  ignoredErr : OSErr;

begin
  FW_deactivateFloatsAndFirstDocWin;

  theDialogPtr := GetNewDialog(rFindDialog, nil, WindowPtr(-1));
  ignoredErr := SetDialogDefaultItem(theDialogPtr, kStdOkItemIndex);

  repeat
    begin
      ModalDialog(nil, itemHit);
    end;
  until ((itemHit = kStdOkItemIndex) or (itemHit = kStdCancelItemIndex));

  DisposeDialog(theDialogPtr);

  FW_activateFloatsAndFirstDocWin;
end;
{ of procedure DoOpenFindDialog }

// DoCloseDocWindow
procedure DoCloseDocWindow;
var
  theWindowPtr : WindowPtr;
  docRecordHdl : DocRecordHandle;

begin
  FW_validateWindowList;

  theWindowPtr := FW_findFrontNonFloatWindow;

  if (theWindowPtr <> nil) then
    begin
      docRecordHdl := DocRecordHandle(FW_GetWRefCon(theWindowPtr));
      DisposeHandle(Handle(docRecordHdl));

      FW_DisposeWindow(theWindowPtr);
    end;
end;
{ of procedure DoCloseDocWindow }

// DoDrawWindowContent
procedure DoDrawWindowContent(theWindowPtr : WindowPtr; isActive : boolean);
var
  docRecordHdl : DocRecordHandle;
  theRect : Rect;
  iconSuiteHdl : Handle;
  ignoredErr : OSErr;

begin
  docRecordHdl := DocRecordHandle(FW_GetWRefCon(theWindowPtr));
  iconSuiteHdl := docRecordHdl^^.iconSuiteHdl;

  SetRect(theRect, 5, 5, 37, 37);

  if isActive then
    begin
      ignoredErr := PlotIconSuite(theRect, kAlignNone, kTransformNone, iconSuiteHdl);
    end
  else begin
    ignoredErr := PlotIconSuite(theRect, kAlignNone, kTransformDisabled, iconSuiteHdl);
  end;
end;
{ of procedure DoDrawWindowContent }

// DoErrorAlert
procedure DoErrorAlert(errorCode : OSErr);
var
  paramRec : AlertStdAlertParamRec;
  errorString : Str255;
  itemHit : SInt16;
  ignoredErr : OSErr;
```



```

begin
paramRec.movable := true;
paramRec.helpButton := false;
paramRec.filterProc := nil;
paramRec.defaultText := StringPtr(kAlertDefaultOKText);
paramRec.cancelText := nil;
paramRec.otherText := nil;
paramRec.defaultButton := kAlertStdAlertOKButton;
paramRec.cancelButton := 0;
paramRec.position := kWindowDefaultPosition;

if (errorCode = eWindowNotCreatedError) then
begin
GetIndString(errorString, rErrorStrings, 1);
end
else if (errorCode = eInvalidWindowOrderingError) then
begin
GetIndString(errorString, rErrorStrings, 2);
end;

ignoredErr := StandardAlert(kAlertStopAlert, @errorString, nil, @paramRec, itemHit);
ExitToShell;
end;
{ of procedure DoErrorAlert }

// ..... main
begin
//
..... initialise managers

DoInitManagers;

// .....
create routine descriptors

gActivateWindowProc := DoActivateWindow;
gActivateColoursFloaterProc := DoActivateColoursFloater;
gActivateToolsFloaterProc := DoActivateToolsFloater;

// ..... set
up menu bar and menus

mainMenuBarHdl := GetNewMBar(rMenuBar);
if (mainMenuBarHdl = nil) then
begin
ExitToShell;
end;
SetMenuBar(mainMenuBarHdl);
DrawMenuBar;

mainMenuHdl := GetMenuHandle(mApple);
if (mainMenuHdl = nil) then
begin
ExitToShell;
end
else begin
AppendResMenu(mainMenuHdl, 'DRVR');
end;

//
..... get icon suite

mainErr := GetIconSuite(gIconSuiteHdl, rIconSuite, kSelectorAllLargeData);

//
..... set up windows

DoOpenDocumentWindow;
DoOpenFloatingWindows;

//
..... enter event loop

gDone := false;

```

```

while not gDone do
  begin
  if WaitNextEvent(everyEvent, mainEvent, 15, nil) then
    begin
    DoEvents(mainEvent);
    end;
  end;
end.

{ }

{ FloatingLib.p }
{ }

unit FloatingLib;

interface

uses

{ ..... interfaces }

{ Universal Interfaces. }
LowMem, MixedMode;

{ ..... constants }

const

kFloaterKind = 7;
eWindowNotCreatedError = -2;
eInvalidWindowOrderingError = -3;

{ ..... define the custom
activation function }

{
const

kActivateHandlerProcInfo = kPascalStackBased + $10 * kNoByteCode + $40 * kFourByteCode + $100 * kTwoByteCode;
}

type

ActivateHandlerProc = procedure(theWindowPtr : WindowPtr; activate : boolean);
ActivateHandlerProcPtr = ^ActivateHandlerProc;

{ ..... type definitions }

type

refConExtend = record
  activateFunctionProc : ActivateHandlerProc;
  wasVisible : boolean;
  replacementRefCon : SInt32;
end;

refConExtendPtr = ^refConExtend;
refConExtendHandle = ^refConExtendPtr;

{ ..... routine prototypes }

function FW_GetNewCWindow(var theWindowPtr : WindowPtr; windResourceID : SInt16; behind : WindowPtr;
  activateFunctionProc : ActivateHandlerProc; isFloater : boolean) : OSErr;
procedure FW_DisposeWindow(theWindowPtr : WindowPtr);
procedure FW_SelectWindow(theWindowPtr : WindowPtr);
procedure FW_HideWindow(theWindowPtr : WindowPtr);

```









```

procedure FW_DragWindow(theWindowPtr : WindowPtr; startPoint : Point; {const} var draggingBounds : Rect);
var
  topLimit : SInt16;
  newHorizontalWindowPosition : SInt16;
  newVerticalWindowPosition : SInt16;
  dragRect : Rect;
  horizontalOffset : SInt16;
  verticalOffset : SInt16;
  savePort : GrafPtr;
  windowManagerPort : GrafPtr;
  theKeyMap : KeyMap;
  commandKeyDown : boolean;
  dragRegionHdl : RgnHandle;
  windowContentRegionHdl : RgnHandle;
  dragResult : SInt32;

begin
  commandKeyDown := false;

  if WaitMouseUp then
    begin
      topLimit := LMGetMBarHeight + 4;
      dragRect := draggingBounds;
      if (dragRect.top < topLimit) then
        begin
          dragRect.top := topLimit;
        end;

      GetPort(savePort);
      GetWMgrPort(windowManagerPort);
      SetPort(windowManagerPort);

      SetClip(GetGrayRgn);

      GetKeys(theKeyMap);
      if (BAnd(theKeyMap[1], $8000) <> 0) then
        begin
          commandKeyDown := true;
        end;

      if ((commandKeyDown = true) or (getWindowKind(theWindowPtr) <> kFloaterKind)) then
        begin
          if (commandKeyDown = false) then
            begin
              ClipAbove(FW_findFrontNonFloatWindow);
            end
          else begin
              ClipAbove(theWindowPtr);
            end;
        end;

      dragRegionHdl := NewRgn;
      CopyRgn(getStructureRegion(theWindowPtr), dragRegionHdl);

      dragResult := DragGrayRgn(dragRegionHdl, startPoint, dragRect, dragRect, noConstraint,
                               nil);
      SetPort(savePort);

      if (dragResult <> 0) then
        begin
          horizontalOffset := BAnd(dragResult, $FFFF);
          verticalOffset := BSR(dragResult, 16);

          if (verticalOffset <> -32768) then
            begin
              windowContentRegionHdl := NewRgn;
              CopyRgn(getContentRegion(theWindowPtr), windowContentRegionHdl);

              newHorizontalWindowPosition := windowContentRegionHdl^.rgnBBox.left +
                                             horizontalOffset;
              newVerticalWindowPosition := windowContentRegionHdl^.rgnBBox.top +
                                           verticalOffset;
              MoveWindow(theWindowPtr, newHorizontalWindowPosition, newVerticalWindowPosition,
                         false);

              DisposeRgn(windowContentRegionHdl);
            end;
        end;
    end;
end;

```









```

{ deactivateWindow }
procedure deactivateWindow(theWindowPtr : WindowPtr);
begin
  highlightAndActivateWindow(theWindowPtr, false);
end;

{ highlightAndActivateWindow }
procedure highlightAndActivateWindow(theWindowPtr : WindowPtr; activate : boolean);
var
  activateFunctionProc : ActivateHandlerProc;

begin
  if (theWindowPtr = nil) then
    begin
      Exit(highlightAndActivateWindow);
    end;

  getActivateHandler(theWindowPtr, activateFunctionProc);

  HiliteWindow(theWindowPtr, activate);

  if (activateFunctionProc <> nil) then
    begin
      activateFunctionProc(theWindowPtr, activate);
    end;
end;

{ findLastFloatingWindow }
function findLastFloatingWindow : WindowPtr;
var
  theWindowPtr : WindowPtr;
  lastFloatingWindowPtr : WindowPtr;

begin
  theWindowPtr := LMGetWindowList;

  lastFloatingWindowPtr := nil;

  while (theWindowPtr <> nil) do
    begin
      if (getWindowKind(theWindowPtr) = kFloaterKind) then
        begin
          lastFloatingWindowPtr := theWindowPtr;
        end;

      theWindowPtr := getNextWindow(theWindowPtr);
    end;

  findLastFloatingWindow := lastFloatingWindowPtr;
end;

{ checkWindowOrdering }
function checkWindowOrdering(isFloater : boolean; var behind : WindowPtr) : OSErr;
var
  result : OSErr;
  lastFloaterPtr : WindowPtr;

begin
  result := noErr;

  if isFloater then
    begin
      if (((behind = nil) and (FW_findFrontNonFloatWindow <> nil)) or
        ((behind <> WindowPtr(-1)) and (getWindowKind(behind) <> kFloaterKind))) then
        begin
          result := eInvalidWindowOrderingError;
        end;
      end
    else begin
      lastFloaterPtr := findLastFloatingWindow;

      if (lastFloaterPtr <> nil) then
        begin
          if (behind = WindowPtr(-1)) then
            begin

```



```

windowKind := getWindowKind(theWindowPtr);

if ((windowKind = kDialogWindowKind) and ((windowVariant = 2) or (windowVariant = 3))) then
  begin
    isWindowModal := true;
  end
else begin
  isWindowModal := false;
end;
end;

{ } bringFloatersToFront }

procedure bringFloatersToFront(theWindowPtr : WindowPtr);
var
  thisFloaterPtr : WindowPtr;

begin
  while ((theWindowPtr <> nil) and (getWindowKind(theWindowPtr) <> kFloaterKind)) do
    begin
      theWindowPtr := getNextWindow(theWindowPtr);
    end;

    if (theWindowPtr = nil) then
      begin
        Exit(bringFloatersToFront);
      end;

    thisFloaterPtr := theWindowPtr;

    bringFloatersToFront(getNextWindow(theWindowPtr));

    BringToFront(thisFloaterPtr);
  end;

end;

{ } isFrontProcess }

function isFrontProcess : boolean;
var
  frontPSN : ProcessSerialNumber;
  currentPSN : ProcessSerialNumber;
  getFrontProcessResult : OSErr;
  getCurrentProcessResult : OSErr;
  ignoredErr : OSErr;
  isSameProcess : boolean;

begin
  isSameProcess := false;

  getFrontProcessResult := GetFrontProcess(frontPSN);
  getCurrentProcessResult := GetCurrentProcess(currentPSN);

  if ((getFrontProcessResult = noErr) and (getCurrentProcessResult = noErr)) then
    begin
      ignoredErr := SameProcess(frontPSN, currentPSN, isSameProcess);
    end;

  isFrontProcess := isSameProcess;
end;

{ } getIsWindowVisible }

function getIsWindowVisible(theWindowPtr : WindowPtr) : boolean;
begin
  getIsWindowVisible := WindowPeek(theWindowPtr)^.visible;
end;

{ } getNextWindow }

function getNextWindow(theWindowPtr : WindowPtr) : WindowPtr;
begin
  getNextWindow := WindowPtr(WindowPeek(theWindowPtr)^.nextWindow);
end;

{ } getWindowKind }

function getWindowKind(theWindowPtr : WindowPtr) : SInt16;
begin
  if (theWindowPtr <> nil) then
    begin

```

## Version 2.1

```
        getWindowKind := WindowPeek(theWindowPtr^.windowKind);
    end
else begin
    getWindowKind := 0;
end;
end;

{ }

function getStructureRegion(theWindowPtr : WindowPtr) : RgnHandle;
begin
    getStructureRegion := WindowPeek(theWindowPtr^.strucRgn);
end;

{ }

function getContentRegion(theWindowPtr : WindowPtr) : RgnHandle;
begin
    getContentRegion := WindowPeek(theWindowPtr^.contRgn);
end;

{ }

procedure getActivateHandler(theWindowPtr : WindowPtr; var theActivateProc : ActivateHandlerProc);
var
    refConExtendHdl : refConExtendHandle;

begin
    theActivateProc := nil;

    refConExtendHdl := refConExtendHandle(GetWRefCon(theWindowPtr));
    if (refConExtendHdl <> nil) then
        begin
            theActivateProc := refConExtendHdl^^.activateFunctionProc;
        end;
    end;

{ }

procedure setActivateHandler(theWindowPtr : WindowPtr;
    activateFunctionProc : ActivateHandlerProc);
var
    refConExtendHdl : refConExtendHandle;

begin
    refConExtendHdl := refConExtendHandle(GetWRefCon(theWindowPtr));
    if (refConExtendHdl <> nil) then
        begin
            refConExtendHdl^^.activateFunctionProc := activateFunctionProc;
            SetWRefCon(theWindowPtr, SInt32(refConExtendHdl));
        end;
    end;

end.
{ of unit FloatingLib }

{ }
```

## Demonstration Program Comments

With regard to the source code file FloatingLib.p, which contains all the special functions required to implement floating windows, two options are available. Firstly, FloatingLib.p may be added to the FloatingWindows.µ project, along with the source code file FloatingWindows.p, in the normal way. Secondly, FloatingLib.p may be compiled as a library (68K or PowerPC, as required) and added to the FloatingWindows.µ project as such, along with the interface file FloatingWindowsLib.p. The latter option has been adopted in the accompanying demonstration program package.

When this program is run, the user should open and close document windows, hide and show the floating windows (using the Floater menu items and the windows' close boxes), open and close the About FloatingWindows... modal alert box, open and close the Find movable modal dialog box (using the Find item in the Edit menu), open and close the Standard File open dialog, and send/bring the application to the background/foreground. In particular, the user should observe the following:

- Document window behaviour, in terms of activation and deactivation, is identical to that observed in a normal window environment, including when:

- The program is sent to the background and brought to the foreground.
- A document window is closed or a new document window is opened.
- The About FloatingWindows... modal alert box, the Find... movable modal dialog box, or the Standard File open dialog is invoked.
- An inactive document window is dragged with the Command key held down.
- Floating window behaviour is as follows:
  - The floating window frames are drawn in the inactive state, and their content is dimmed, when the alert and dialog boxes are invoked.
  - The floating windows are hidden when the application is sent to the background and shown again when the application is brought to the foreground.
- When document windows are clicked, the icon at the top left of the window is drawn in such a way (normal or dimmed) as to prove that the application "knows" which document windows to activate and deactivate.

## ***FloatingWindows.p***

---

### ***constants***

---

rDocumentWindow and the following two constants represent the resource IDs of the 'WIND' resources for document windows, the "Colours" floating window, and the "Tools" floating window. The next four constants represent the resource IDs of four 'PICT' resources used by the floating windows.

kFloaterKind will be assigned to the windowKind field of the floating window window structures. The next two constants represent error codes that may be returned by a call to the window creation function in FloatingLib.c.

### ***type definitions***

---

A document structure of type DocRecord will be created for each document window. For the purposes of this demonstration, this is simply to prove the correct operation of the two substitute functions FW\_SetWRefCon and FW\_GetWRefCon. (These functions will assign/retrieve the handle to the window's document structure to/from a reference constant field in a special structure created by the window creation function in FloatingLib.p.)

### ***Global Variables***

---

gColoursFloaterPtr and gToolsFloaterPtr will be assigned pointers to the colour graphics port structures for the floating windows. glconSuiteHdl will be assigned a handle to an icon suite.

### ***main program block***

---

The call to GetIconSuite creates an icon family. The appropriate icon from this family will be drawn in the top left corner of document windows. The handle will be assigned to the single field in the document window's document structure.

The next two lines call application-defined routines which open one document window and both floating windows.

### ***DoOpenDocumentWindow***

---

DoOpenDocumentWindow opens a document window.

Firstly, FW\_validateWindowList is called as a safety measure to ensure that all floating windows are in front of all document windows (if any).

FW\_GetNewCWindow is called to create the window. The function for the document window activation function is passed in the fourth parameter. false is passed in the fifth parameter to indicate to FW\_GetNewCWindow that this is not a floating window.

If FW\_GetNewCWindow does not return an error, a block for a document record is created and the handle is assigned by FW\_SetWRefCon to the reference constant field of a structure created by FW\_GetNewCWindow. (FW\_GetNewCWindow assigns the handle to this latter structure to the window's refCon field.) The handle to the icon family is assigned to the single field of the document structure.

FW\_ShowWindow is called to show the window.

If FW\_GetNewCWindow does return an error, an application-defined routine is called to handle the error.

### ***DoOpenFloatingWindows***

---

DoOpenFloatingWindows opens both floating windows.

## Version 2.1

For each of the two floating windows, `FW_GetNewCWindow` is called to create the window. The function pointer to the appropriate window activation function is passed in the fourth parameter. `true` is passed in the fifth parameter to indicate to `FW_GetNewCWindow` that this is a floating window.

If `FW_GetNewCWindow` does not return an error, `GetPicture` loads the specified 'PICT' resource, `SetWindowPic` stores the handle to the picture structure in the `windowPic` field of the window structure (meaning that the Window Manager will draw the picture in the window instead of generating update events for it), and `FW_ShowWindow` is called to display the floating window.

If `FW_GetNewCWindow` does return an error, an application-defined routine is called to handle the error.

### **DoEvents**

Note that activate events are ignored in the main event loop area because, in a floating windows environment, the normal windows activation/deactivation mechanism must be over-ruled.

At the `suspendResumeMessage` case in the `osEvt` case, `FW_doResumeEvent` is called for a resume event and `FW_doResumeEvent` is called for a suspend event.

### **DoMouseDown**

At the `inContent` case, if the window in which the mouse-down occurred is not the front window, `FW_SelectWindow` is called.

At the `inDrag` case, `FW_DragWindow` is called.

At the `inGoAway` case, if the window is one of the floating windows, `FW_HideWindow` is called to hide the window. If the window is a document window, `FW_DisposeWindow` is called to dispose of the window.

### **DoUpdate**

An update event results in a call to `DoDrawWindowContent`, which draws an icon in the window in the appropriate state (normal or dimmed). (Recall that, because of the `SetWindowPic` calls in the function `DoOpenFloatingWindows`, the floating windows will not receive update events. Accordingly, the only windows redrawn by the application in this demonstration are the document windows.)

### **DoActivateWindow**

`DoActivateWindow` is called from functions within `FloatingLib.p`. It is not called from within `FloatingWindows.p`.

`DoActivateWindow` is the window activation function for document windows. `DoDrawWindowContent` is called to draw an icon in the window in the state (normal or dimmed) specified by the `becomingActive` parameter.

### **DoActivateColoursFloater and DoActivateToolsFloater**

`DoActivateColoursFloater` and `DoActivateToolsFloater` are called from functions within `FloatingLib.p`. They are not called from within `FloatingWindows.p`.

These two functions are the window activation functions for the floating windows. Depending on whether the window is being activated or deactivated, the appropriate picture (normal or dimmed) is drawn in the window and `SetWindowPic` is called to store the handle to the picture structure in the `windowPic` field of the window structure (meaning that the Window Manager will draw the picture in the window instead of generating update events for it).

### **DoAdjustMenus**

`FW_findFrontNonFloatWindow` is called to determine whether any document windows are currently open. If not, the Close item in the File menu is disabled.

If the floating windows are currently hidden, the relevant item in the Floaters menu is unchecked, otherwise it is checked.

### **DoFloatersMenu**

`DoFloatersMenu` further processes Floater menu choices.

If the floating window relating to the chosen menu item is currently showing, `FW_HideWindow` is called to hide the window, otherwise `FW_ShowWindow` is called to show the window.

### **DoAboutBox, DoStandardFileOpen and DoOpenFindDialog**

`DoAboutBox` is called when the user chooses the About FloatingWindows... item in the Apple menu.

`FW_deactivateFloatsAndFirstDocWin` is called to deactivate all the document and floating windows before `Alert` is called to



display the About alert box. When the alert box is dismissed, FW\_activateFloatsAndFirstDocWin is called to return the windows to the activation status they were in prior to the call to FW\_deactivateFloatsAndFirstDocWin.

The same activation/deactivation procedure is followed in the functions DoStandardFileOpen and DoOpenFindDialog.

### ***DoCloseDocWindow***

---

DoCloseDocWindow is called in response to a choice of the Close item in the File menu and to a click in a document window's close box.

FW\_validateWindowList is called as a safety measure to ensure that all floating windows are in front of all document windows.

The call to FW\_findFrontNonFloatWindow returns a pointer to the front document window (and also confirms that at least one document window is open. FW\_GetWRefCon is called to get the handle to the window's document structure, which allows that block to be disposed of. FW\_DisposeWindow is then called to dispose of the block containing the special data structure created by FW\_GetNewCWindow, to remove the window from the screen and window list, and to discard all the window's data storage.

### ***DoDrawWindowContent***

---

DoDrawDocWindowContent is called when an update event is received and when the document window activate function is called from within FloatingLib.p. It simply draws an icon in the top left of the window in the state (normal or dimmed) specified by the isActive formal parameter.

### ***FloatingLib.p***

---

FloatingLib.p contains the special functions required to support a floating windows environment, including functions which are called in lieu of the usual calls to GetNewCWindow, DisposeWindow, SelectWindow, HideWindow, ShowWindow, DragWindow, SetWRefCon, and GetWRefCon.

### ***constants***

---

kFloaterKind will be assigned to the windowKind field of the window structures for floating windows. The next two constants represent error codes returned by FW\_GetNewCWindow.

### ***type definitions***

---

A record of type refConExtend will be created for all windows, and a handle to that record will be assigned to the window record's refCon field. The function for the relevant window activation function will be assigned to the first field. The second field will be used to keep track of the window's visibility status. The third field may be used by the application for those purposes for which it would normally use the window structure's refCon field.

### ***FW\_GetNewCWindow***

---

To create a window, FW\_GetNewCWindow is called in lieu of the usual call to GetNewCWindow. The isFloater parameter specifies whether the window is to be a document window or a floating window.

At the first line, failure is assumed.

CheckWindowOrdering is called to ensure that the behind formal parameter is not attempting to open the window at an inappropriate "behind" or "in front of" location in the window list. As part of this process, and in the case of document windows, CheckWindowOrdering changes a behind assignment of WindowPtr(-1) to the pointer to the last floating window, causing the window to be opened behind that floating window rather than in front of all windows. Apart from that particular case, inappropriate behind specifications will cause an error to be returned.

The call to NewHandle creates a block for a refConExtend structure. If this call is not successful, the function exits and an error code is returned to the calling function.

The call to GetNewCWindow creates the window, following which a pointer to the window is returned to the calling function. The next three lines assign the handle to the refConExtend structure to the window structure's refCon field and assign the previous value in the refCon field to the refConExtend structure's replacementRefCon field. The next line assigns the function for the window's activation function to the refConExtend structure's activateFunctionProc field.

If the visible field of the window's window structure indicates that the window is currently visible, and if the application is currently not the front process, ShowHide is called to hide the window and setWasVisible is called to record the visibility status of the window by assigning true to the refConExtend structure's wasVisible field. (This block caters for the possibility of windows being created while the application is in the background, for example, by Apple events. It prevents the window from being highlighted on creation.)

If the call to GetNewCWindow was not successful, the subsequent if block is bypassed, DisposeHandle is called to dispose of the refConExtend structure, and an error code is returned to the calling function.

## **FW\_DisposeWindow**

FW\_DisposeWindow is called in lieu of the usual call to DisposeWindow.

If the specified window (which will invariably be a document window) is visible, a call is made to FW\_HideWindow so that the next document window in the list (if any) is activated. The window's refConExtend structure is then disposed of, following which DisposeWindow is called to remove the window from the screen, remove it from the window list, and discard all its data storage.

## **FW\_SelectWindow**

FW\_SelectWindow is called in lieu of the usual call to SelectWindow. It selects the window and brings it to the front of its section of the window list. Selecting a floating window makes it the absolute frontmost window on the screen, whereas selecting a document window makes it the frontmost window behind the floating windows (or, if no floating windows are open, the absolute frontmost window).

The first line determines whether the application is the front process.

If the window clicked is of the floating kind, that fact is recorded and the pointer to the current front floating window is retrieved. Otherwise, if the window clicked is a document window, that fact is recorded, and pointers to the first document window and last floating window in the window list are retrieved.

If the window clicked is not the current front window in either the floating or document window sections of the window list and if the window clicked is a floating window, that window is brought to the very front of the list by the call to BringToFront. Otherwise, if the window clicked is a document window: if the application is the front process, the current front document window is deactivated; if there are no floating windows, BringToFront is called to bring the window to the front; if there are floating windows, SendBehind is called to locate the window immediately behind the last floating window; if the application is the front process, the window is activated.

## **FW\_HideWindow**

FW\_HideWindow is called in lieu of the usual call to HideWindow. If the window is the frontmost window, it is moved behind the window immediately behind it.

At the first two lines, if the window is not visible, the function returns without doing anything.

The next line gets the pointer to the frontmost window. If this window is not a floating window, a variable is set to record that fact.

The next line gets the pointer to the first document window.

The call to ShowHide hides the specified window without affecting the front-to-back ordering of the windows.

If the newly hidden window is the front floating window, and if the next window in the list (if any) is a floating window, BringToFront is called to bring that next window to the front. Otherwise, if the newly hidden window is the first document window, and if there is another visible document window, SendBehind is called to move the newly hidden window behind that visible document window. Also, if the application is the front process, that visible document window is activated.

## **FW\_ShowWindow**

FW\_ShowWindow is called in lieu of the usual call to ShowWindow. If the specified (hidden) window is the frontmost document window, the window behind it is deactivated and the specified window is activated. If the window is modal, the function makes sure it is in front.

At the first two lines, if the specified window is currently visible, the function returns without doing anything. The next line determines whether the application is the front process.

The next line records whether the specified window is a floating window. The line after that records whether the front window is a modal window.

At the next block, if the specified window is a modal window, BringToFront is called to bring it to the front (without activating it).

Before proceeding further, FW\_validateWindowList is called as a safety measure to ensure that all windows in the window list are in the right place.

If the application is not the front process, and the specified window is a floating window, it is marked as visible so that it will be shown on resume. (The function SetWasVisible assigns true to the wasVisible field of the window's refConExtend structure.)

The large if block executes only if the application is the front process. If the specified window is modal, two local variables are set to true (ensuring that modal windows will always be activated and highlighted). If the front window is modal, these variables are set to false (ensuring that, whatever the specified window type, it will not be activated and highlighted when a modal window is up). If neither the specified nor front window is modal:

- If the specified window is a floating window, the two local variables are set to true. (New floating windows are always highlighted and activated.)

- If the specified window is a document window, and it is the only document window, the two local variables are set to true so that it will be highlighted and activated. If it is not the only document window: the two local variables are initially set to false (assume the specified window is behind the front one); the window list is walked to determine whether the specified window is coming up in front of the frontmost document window, in which case the front document window is deactivated and the variables are set so that the specified window will be highlighted and activated.

If the application is not the front process (the last else block), the two local variables are set to false so that no highlighting/activation will occur.

HiliteState is called to either unhighlight or highlight the specified window depending on the result of the previous machinations. If the previous machinations determined that the window should be activated, the function for the window's activation is retrieved from the window's refConExtend structure and called.

## **FW\_DragWindow**

FW\_DragWindow is called in lieu of the usual call to DragWindow. It drags the specified window around, ensuring that document windows remain behind floating windows. Like DragWindow, FW\_DragWindow does not bring the window forward if the Command key is held down during the drag.

WaitMouseUp tests whether the mouse button has remained down since the last mouse-down event. If it has, the following occurs.

The first block adjusts the top of the dragging rectangle so that it is below the menu bar. The next block saves the current colour graphics port and sets the window manager port as the current colour graphics port. The call to SetClip sets the clipping region to the region below the menu bar.

The next three lines check whether the Command key is down and, if so, set a variable to record that fact.

If the Command key is not down and the window is not a floating window, the ClipAbove call sets the clipping region to the gray region minus the structure regions of all windows in front of the front non-floating window. (In this instance, the front document window is being dragged, so the windows in front are the floating windows.) If the window is not a floating window and the Command key is down, the ClipAbove call sets the clipping region to the gray region minus the structure regions of all windows in front of the window being dragged. (In this instance, there could be one or more document windows, as well as floating windows, above the document window being dragged.)

The next two lines create a region to drag, specifically, the structure region of the specified window. This is passed as a parameter to the call to DragGrayRgn, which moves a dotted outline of the region, following the mouse as it moves and retaining control until the mouse button is released.

When the mouse button is released, SetPort sets the colour graphics port to the saved earlier.

DragGrayRgn returns an SInt32. If the mouse was outside the slop rectangle when the button was released, -32768 is returned in both words, otherwise the high word contains the vertical distance moved and the low word contains the horizontal distance moved. If the value returned is not zero, the value in both words is retrieved. If the mouse was not outside the slop rectangle, the new horizontal and vertical global coordinates are calculated and passed as a parameter in the MoveWindow call, which moves the window to the new location without bringing it to the front.

If the Command key was not down during the drag (the third last line), the call to FW\_SelectWindow brings the window to the absolute front of the window list (floating window) or to the front of the document windows section of the list (document window).

## **FW\_doSuspendEvent**

FW\_doSuspendEvent hides any visible floating windows and deactivates the frontmost document window. It should be called when the application receives a suspend event.

The first line gets the pointer to the front window's window structure from the low-memory global WindowList.

If the first visible window is modal, the floating and front document windows will already be deactivated, so the function simply returns.

The while loop executes for all floating windows. The current visibility status of the window is saved to the wasVisible field of its window's refConExtend structure. If the window is visible, it is hidden without affecting the front-to-back ordering of the open windows.

At the last block, if there are any document windows, the frontmost document window is deactivated.

## **FW\_doResumeEvent**

FW\_doResumeEvent shows all floating windows which were hidden by FW\_doSuspendEvent. As each window is shown, the activation function for that window is called. This function should be called when the application receives a resume event.

The first line gets the pointer to the front window's window structure from the low-memory global WindowList.

## *Version 2.1*

If the first visible window is modal, the floating and front document windows will already be activated, so the function simply returns.

The while loop executes for all floating windows. The saved visibility status of the window is retrieved from the wasVisible field of its window's refConExtend structure. If the window was visible when FW\_doSuspendEvent was called, it is shown without affecting the front-to-back ordering of the open windows.

At the last block, if there are any document windows, the frontmost document window is activated.

### **FW\_activateFloatsAndFirstDocWin**

FW\_activateFloatsAndFirstDocWin activates those windows which were visible and activated before deactivateFloatersAndFirstDocWin was called. It should be called immediately after an modal alert or dialog box is dismissed.

The first two lines cause the function to assume that, if a modal dialog is up, the caller did not really mean to call this function.

The next line determines if the application is the front process.

If the application is in the background, the floating windows should be hidden rather than shown, so FW\_doSuspendEvent is called.

If the application is in the foreground, activateWindow is called on all visible windows in the list up to but not including the second document window in the list.

### **FW\_deactivateFloatsAndFirstDocWin**

FW\_deactivateFloatsAndFirstDocWin deactivates all visible floating windows and the active document window. It should be called immediately before an modal alert or dialog box is dismissed.

The first line is a safety check to ensure that the window ordering has not been changed.

deactivateWindow is called on all visible windows in the list up to but not including the second document window in the list.

### **FW\_findFrontNonFloatWindow**

FW\_findFrontNonFloatWindow returns a pointer to the first visible window in the window list that is not a floating window.

### **FW\_validateWindowList**

FW\_validateWindowList is called from FW\_ShowWindow and FW\_deactivateFloatsAndFirstDocWin. It should also be called from the application immediately before document windows are opened and closed. It is intended to cater for the remote possibility that document windows might somehow have been pulled in front of floating windows, in which case it will pull the floating windows to the front.

If there are no floating windows, the function simply returns. If the first window in the window list is a floating window, the function assumes that all is well. (Note that the function does not check whether a document window is "between" the floating windows.) If the first window is modal, the function returns.

If a return has not occurred prior to the last line, that line calls a function which brings the floating windows to the front.

### **FW\_GetWRefCon and FW\_SetWRefCon**

FW\_GetWRefCon and FW\_SetWRefCon retrieve/assign values from/to the replacementRefCon field of the window's refConExtend structure.

### **activateWindow, deactivateWindow, and highlightAndActivateWindow**

activateWindow and/or deactivateWindow are called from FW\_SelectWindow, FW\_HideWindow, FW\_ShowWindow, FW\_doSuspendEvent, FW\_doResumeEvent, FW\_deactivateFloatsAndFirstDocWin, and FW\_activateFloatsAndFirstDocWin. They simply set a Boolean variable to indicate whether the specified window is to be highlighted and activated or unhighlighted and deactivated, and then pass further processing to highlightAndActivateWindow.

highlightAndActivateWindow highlights or unhighlights the specified window, retrieves the universal procedure pointer to the window's activation function from the window's refConExtend structure, and calls that function.

### **findLastFloatingWindow**

findLastFloatingWindow returns a pointer to last floating window in the window list.

## ***checkWindowOrdering***

---

checkWindowOrdering is called from FW\_GetNewCWindow to ensure that the behind formal parameter is not attempting to open the window at an inappropriate "behind" or "in front of" location in the window list. As part of this process, and in the case of document windows, checkWindowOrdering changes a behind assignment of WindowPtr(-1) to the pointer to the last floating window, causing the window to be opened behind that floating window rather than in front of all windows. Apart from that particular case, inappropriate behind specifications will cause an error to be returned.

If the window to be created is a floating window, an error will be returned if:

- The behind formal parameter calls for the window to be created behind all other windows when non-floating windows exist.
- The behind formal parameter specifies the window behind which the new window is to be created and that window is not a floating window.

If the window to be created is a document window, and if a floating window exists:

- If the behind formal parameter specifies that the window should be created in front of all other windows, the behind parameter is changed so that the window will be created behind the last floating window.
- If the behind formal parameter specifies that the window behind which the window is to be opened is a floating window, but it is not the last floating window, an error is returned.

## ***getNextVisibleWindow, getWasVisible, and setWasVisible***

---

getNextVisibleWindow returns the pointer to the next visible window in the window list.

getWasVisible returns the value in the wasVisible field of the specified window's refConExtend structure.

setWasVisible sets the value in the wasVisible field of the specified window's refConExtend structure.

## ***isWindowModal***

---

isWindowModal determines whether a window is modal.

If the value in the window structure's windowKind field is kDialogWindowKind and the window's variant code is 2 or 3 (the variant codes for kWindowModalDialogProc and kWindowMovableModalDialogProc dialog boxes), true is returned.

This function assumes that an application's modeless dialog boxes will not use kWindowGrowDocumentProc or kWindowVertZoomDocumentProc windows (which also have variant codes of 2 and 3). It also assumes that only kWindowModalDialogProc and kWindowMovableModalDialogProc windows will be used for modal and movable modal dialog boxes. If this is not the case, this function will have to be modified.

## ***bringFloatersToFront***

---

bringFloatersToFront is called from FW\_validateWindowList in the unlikely event that the floating windows are not in front of the document windows. This is a recursive function (that is, it calls itself) that brings all floating windows to the front of the window list.

When the while loop finds a floating window, the function remembers it (thisFloaterPtr = theWindowPtr) and then calls itself to look further. When the end of the window list is reached (thisWindow = nil), the function "unwinds", calling BringToFront on each found floating window.

## ***isFrontProcess***

---

isFrontProcess compares the serial numbers of the current process and the front process and returns true if they are the same, that is, the application is the front process.

## ***getIsWindowVisible, getNextWindow, getWindowKind, getStructureRegion, and getContentRegion***

---

getIsWindowVisible returns the value in the visible field of the specified window's window structure. getNextWindow returns the value in the nextWindow field of the specified window's window structure. getWindowKind returns the value in the windowKind field of the specified window's window structure. getStructureRegion returns the RgnHandle in the strucRgn field of the specified window's window structure. getContentRegion returns the RgnHandle in the contRgn field of the specified window's window structure.

**getActivateHandler and setActivateHandler**

getActivateHandler returns the function in the activateFunctionProc field of the specified window's refConExtend structure.

setActivateHandler assigns a function to the activateFunctionProc field of the specified window's refConExtend structure.