DirectDraw

This section provides information about the DirectDraw® component of the DirectX® application programming interface (API). Information is divided into the following groups:

About DirectDraw

Why Use DirectDraw?

Getting Started: Basic Graphics Concepts

DirectDraw Architecture

DirectDraw Essentials

DirectDraw Tutorials

DirectDraw Reference

DirectDraw Tools and Samples

# About DirectDraw

DirectDraw® is the component of the DirectX® application programming interface (API) that allows you to directly manipulate display memory, the hardware blitter, hardware overlay support, and flipping surface support. DirectDraw provides this functionality while maintaining compatibility with existing Microsoft® Windows®-based applications and device drivers.

DirectDraw is a software interface that provides direct access to display devices while maintaining compatibility with the Windows graphics device interface (GDI). It is not a high-level application programming interface (API) for graphics. DirectDraw provides a device-independent way for games and Windows subsystem software, such as three-dimensional (3-D) graphics packages and digital video codecs, to gain access to the features of specific display devices.

DirectDraw works with a wide variety of display hardware, ranging from simple SVGA monitors to advanced hardware implementations that provide clipping, stretching, and non-RGB color format support. The interface is designed so that your applications can enumerate the capabilities of the underlying hardware and then use any supported hardware-accelerated features. Features that are not implemented in hardware are emulated by DirectX.

DirectDraw provides device-dependent access to display memory in a device-independent way. Essentially, DirectDraw manages display memory. Your application need only recognize some basic device dependencies that are standard across hardware implementations, such as RGB and YUV color formats and the pitch between raster lines. You need not call specific procedures to use the blitter or manipulate palette registers. Using DirectDraw, you can manipulate display memory with ease, taking full advantage of the blitting and color decompression capabilities of different types of display hardware without becoming dependent on a particular piece of hardware.

DirectDraw provides excellent game graphics on computers running Windows 95 and later and Windows NT® version 4.0 or Windows 2000.

# Why Use DirectDraw?

The DirectDraw component brings many powerful features to you, the Windows graphics programmer:

The hardware abstraction layer (HAL) of DirectDraw provides a consistent interface through which to work directly with the display hardware, getting maximum performance.

DirectDraw assesses the video hardware's capabilities, making use of special hardware features whenever possible. For example, if your video card supports hardware blitting, DirectDraw delegates blits to the video card, greatly increasing performance. Additionally, DirectDraw provides a hardware emulation layer (HEL) to support features when the hardware does not.

DirectDraw exists under Windows, gaining the advantage of 32-bit memory addressing and a flat memory model that the operating system provides. DirectDraw presents video and system memory as large blocks of storage, not as small segments. If you've ever used segment:offset addressing, you will quickly begin to appreciate this "flat" memory model.

DirectDraw makes it easy for you to implement page flipping with multiple back buffers in full-screen applications. For more information, see Page Flipping and Back Buffering.

Support for clipping in windowed or full-screen applications.

Support for 3-D z-buffers.

Support for hardware-assisted overlays with z-ordering.

Access to image-stretching hardware.

Simultaneous access to standard and enhanced display-device memory areas.

Other features include custom and dynamic palettes, exclusive hardware access, and resolution switching.

These features combine to make it possible for you to write applications that easily outperform standard Windows GDI-based applications and even MS-DOS applications.

# Getting Started: Basic Graphics Concepts

This section provides an overview of graphics programming with DirectDraw. Each concept discussed here begins with a non-technical overview, followed by some specific information about how DirectDraw supports it.

You don't need to be a graphics guru to benefit from this overview—in fact, if you are one you might want to skip this section entirely and move on to the more detailed information in the DirectDraw Essentials section. If you're familiar with Windows programming in C and C++ or Visual Basic, you won't have difficulty digesting this information. When you finish reading these topics, you will have a solid understanding of basic DirectDraw graphics programming concepts.

The following topics are discussed:

Device-Independent Bitmaps

Drawing Surfaces

Blitting

Page Flipping and Back Buffering

Introduction to Rectangles

## Device-Independent Bitmaps

Windows, and therefore DirectX, uses the device-independent bitmap (DIB) as its native graphics file format. Essentially, a DIB is a file containing an image's dimensions, the number of colors it uses, values describing those colors, and data that describes each pixel. Additionally, a DIB contains some lesser-used parameters, like information about file compression, significant colors (if all are not used), and physical dimensions of the image (in case it will end up in print). DIB files usually have the .bmp file extension, although they might occasionally have a .dib extension.

[C++]

Because the DIB is so pervasive in Windows programming, the Platform SDK already contains many functions that you can use with DirectX. For example, the following application-defined function, taken from the Ddutil.cpp file that comes with the DirectX APIs in the Platform SDK, combines Win32® and DirectX functions to load a DIB onto a DirectX surface.

extern "C" IDirectDrawSurface \* DDLoadBitmap(IDirectDraw \*pdd,

LPCSTR szBitmap, int dx, int dy)

{

HBITMAP hbm;

BITMAP bm;

DDSURFACEDESC ddsd;

IDirectDrawSurface \*pdds;

//

// This is the Win32 part.

// Try to load the bitmap as a resource.

// If that fails, try it as a file.

//

hbm = (HBITMAP)LoadImage(

GetModuleHandle(NULL), szBitmap,

IMAGE\_BITMAP, dx, dy, LR\_CREATEDIBSECTION);

if (hbm == NULL)

hbm = (HBITMAP)LoadImage(

NULL, szBitmap, IMAGE\_BITMAP, dx, dy,

LR\_LOADFROMFILE|LR\_CREATEDIBSECTION);

if (hbm == NULL)

return NULL;

//

// Get the size of the bitmap.

//

GetObject(hbm, sizeof(bm), &bm);

//

// Now, return to DirectX function calls.

// Create a DirectDrawSurface for this bitmap.

//

ZeroMemory(&ddsd, sizeof(ddsd));

ddsd.dwSize = sizeof(ddsd);

ddsd.dwFlags = DDSD\_CAPS | DDSD\_HEIGHT |DDSD\_WIDTH;

ddsd.ddsCaps.dwCaps = DDSCAPS\_OFFSCREENPLAIN;

ddsd.dwWidth = bm.bmWidth;

ddsd.dwHeight = bm.bmHeight;

if (pdd->CreateSurface(&ddsd, &pdds, NULL) != DD\_OK)

return NULL;

DDCopyBitmap(pdds, hbm, 0, 0, 0, 0);

DeleteObject(hbm);

return pdds;

}

For more detailed information about DIB files, see the Platform SDK.

[C++,Visual Basic]

## Drawing Surfaces

Drawing surfaces receive video data to eventually be displayed on the screen as images (bitmaps, to be exact). In most Windows programs, you get access to the drawing surface using a Win32 function such as **GetDC**, which stands for get the device context (DC). After you have the device context, you can start painting the screen. However, Win32 graphics functions are provided by an entirely different part of the system, the graphics device interface (GDI). The GDI is a system component that provides an abstraction layer that enables standard Windows applications to draw to the screen.

The drawback of GDI is that it wasn't designed for high-performance multimedia software, it was made to be used by business applications like word processors and spreadsheet applications. GDI provides access to a video buffer in system memory, not video memory, and doesn't take advantage of special features that some video cards provide. In short, GDI is great for most business applications, but its performance is too slow for multimedia or game software.

On the other hand, DirectDraw can give you drawing surfaces that represent actual video memory. This means that when you use DirectDraw, you can write directly to the memory on the video card, making your graphics routines extremely fast. These surfaces are represented as contiguous blocks of memory, making it easy to perform addressing within them.

For more detailed information, see Surfaces.

## Blitting

The term *blit* is shorthand for "bit block transfer," which is the process of transferring blocks of data from one place in memory to another. Graphics programmers use blitting to transfer graphics from one place in memory to another. Blits are often used to perform sprite animation, which is discussed later.

For more information on blitting in DirectDraw, see Blitting to Surfaces.

## Page Flipping and Back Buffering

Page flipping is key in multimedia, animation, and game software. Software page flipping is analogous to the way animation can be done with a pad of paper. On each page the artist changes the figure slightly, so that when you flip between sheets rapidly the drawing appears animated.

Page flipping in software is very similar to this process. Initially, you set up a series of DirectDraw surfaces that are designed to "flip" to the screen the way artist's paper flips to the next page. The first surface is referred to as the primary surface, and the surfaces behind it are called back buffers. Your application writes to a back buffer, then flips the primary surface so that the back buffer appears on screen. While the system is displaying the image, your software is again writing to a back buffer. The process continues as long as you're animating, allowing you to animate images quickly and efficiently.

DirectDraw makes it easy for you to set up page flipping schemes, from a relatively simple double-buffered scheme (a primary surface with one back buffer) to more sophisticated schemes that add additional back buffers. For more information see DirectDraw Tutorials and Flipping Surfaces.

## Introduction to Rectangles

Throughout DirectDraw and Windows programming, objects on the screen are referred to in terms of bounding rectangles. The sides of a bounding rectangle are always parallel to the sides of the screen, so the rectangle can be described by two points, the top-left corner and bottom-right corner. Most applications use the **RECT** structure to carry information about a bounding rectangle to use when blitting to the screen or performing hit detection.

[C++]

In C++, the **RECT** structure has the following definition:

typedef struct tagRECT {

LONG left; // This is the top-left corner's x-coordinate.

LONG top; // The top-left corner's y-coordinate.

LONG right; // The bottom-right corner's x-coordinate.

LONG bottom; // The bottom-right corner's y-coordinate.

} RECT, \*PRECT, NEAR \*NPRECT, FAR \*LPRECT;

[Visual Basic]

In Visual Basic, the **RECT** type has the following definition:

Type RECT

Left As Long // This is the top-left corner's x-coordinate.

Top As Long // The top-left corner's y-coordinate.

Right As Long // The bottom-right corner's x-coordinate.

Bottom As Long // The bottom-right corner's y-coordinate.

End Type

In the preceding example, the **left** and **top** members are the x- and y-coordinates of a bounding rectangle's top-left corner. Similarly, the **right** and **bottom** members make up the coordinates of the bottom-right corner. The following diagram illustrates how you can visualize these values.



In the interest of efficiency, consistency, and ease of use, all DirectDraw blitting functions work with rectangles. However, you can create the illusion of nonrectangular blit operations by using transparent blitting. For more information, see Transparent Blitting.

# DirectDraw Architecture

This section contains general information about the relationship between the DirectDraw component and the rest of DirectX, the operating system, and the system hardware. The following topics are discussed:

Architectural Overview for DirectDraw

DirectDraw Object Types

Hardware Abstraction Layer (HAL)

Software Emulation

System Integration

## Architectural Overview for DirectDraw

Multimedia software requires high-performance graphics. Through DirectDraw, Microsoft enables a much higher level of efficiency and speed in graphics-intensive applications for Windows than is possible with GDI, while maintaining device independence. DirectDraw provides tools to perform such key tasks as:

Manipulating multiple display surfaces

Accessing the video memory directly

Page flipping

Back buffering

Managing the palette

Clipping

Additionally, DirectDraw enables you to query the display hardware's capabilities at run time, then provide the best performance possible given the host computer's hardware capabilities.

As with other DirectX components, DirectDraw uses the hardware to its greatest possible advantage, and provides software emulation for most features when hardware support is unavailable. Device independence is possible through use of the hardware abstraction layer, or HAL. For more information about the HAL, see the hardware abstraction layer.

[C++]

The DirectDraw component provides services through COM-based interfaces. In the most recent iteration, these interfaces are **IDirectDraw7**, **IDirectDrawSurface7**, **IDirectDrawPalette**, **IDirectDrawClipper**, and **IDirectDrawVideoPort**. Note that, in addition to these interfaces, DirectDraw continues to support all previous versions. The DirectDraw component doesn't expose an **IDirectDraw3**, **IDirectDraw5**, or **IDirectDraw6** interface, the interface versions skipped from **IDirectDraw2** to **IDirectDraw4** and then from **IDirectDraw4** to **IDirectDraw7**.

For more information about COM concepts that you should understand to create applications with the DirectX APIs in the Platform SDK, see The Component Object Model.

The DirectDraw object represents the display adapter and exposes its methods through the **IDirectDraw**, **IDirectDraw2**, **IDirectDraw4**,and **IDirectDraw7** interfaces. In most cases you will use the **DirectDrawCreateEx** function to create the newest iteration of a DirectDraw object, but you can also create one with the **CoCreateInstance** COM function. For more information, see Creating DirectDraw Objects by Using CoCreateInstance.

After creating a DirectDraw object, you can create surfaces for it by calling the **IDirectDraw7::CreateSurface** method. Surfaces represent the memory on the display hardware, but can exist on either video memory or system memory. DirectDraw extends support for palettes, clipping (useful for windowed applications), and video ports through its other interfaces.

[Visual Basic]

The DirectDraw component provides services through classes in the DirectX for Visual Basic type library. In the most recent iteration, these classes are **DirectDraw7**, **DirectDrawSurface7**, **DirectDrawPalette**, **DirectDrawClipper**.

In addition, the type library provides objects used to enumerate drivers, modes and surfaces. These are **DirectDrawEnum**, **DirectDrawEnumModes**, and **DirectDrawEnumSurfaces**.

The DirectDraw object created from the **DirectDraw7** class represents the display adapter. To create this object you will use the **DirectDrawCreate** method of the global **DirectX7** object.

After creating a DirectDraw object, you can create surfaces for it by calling the **DirectDraw7.CreateSurface** method. Surfaces represent the memory on the display hardware, but can exist on either video memory or system memory. DirectDraw extends support for palettes, and clipping (useful for windowed applications) through its other interfaces.

## DirectDraw Object Types

You can think of DirectDraw as being composed of several objects that work together. This section briefly describes the objects you use when working with the DirectDraw component, organized by object type. For detailed information, see DirectDraw Essentials.

[C++]

The DirectDraw component uses the following objects:

**DirectDraw object**

The DirectDraw object is the heart of all DirectDraw applications. It's the first object you create, and you use it to make all other related objects. You create a DirectDraw object by calling the **DirectDrawCreateEx** function. DirectDraw objects expose their functionality through the **IDirectDraw**, **IDirectDraw2**, **IDirectDraw4**,and **IDirectDraw7** interfaces. For more information, see The DirectDraw Object.

**DirectDrawSurface object**

The DirectDrawSurface object (casually referred to as a "surface") represents an area in memory that holds data to be displayed on the monitor as images or moved to other surfaces. You usually create a surface by calling the **IDirectDraw7::CreateSurface** method of the DirectDraw object with which it will be associated. DirectDrawSurface objects expose their functionality through the **IDirectDrawSurface**, **IDirectDrawSurface2**, **IDirectDrawSurface3**, **IDirectDrawSurface4**,and **IDirectDrawSurface7** interfaces. For more information, see Surfaces.

**DirectDrawPalette object**

The DirectDrawPalette object (casually referred to as a "palette") represents a 16- or 256-color indexed palette to be used with a surface. It contains a series of indexed RGB triplets that describe colors associated with values within a surface. You do not use palettes with surfaces that use a pixel format depth greater than 8 bits. You can create a DirectDrawPalette object by calling the **IDirectDraw7::CreatePalette** method. DirectDrawPalette objects expose their functionality through the **IDirectDrawPalette** interface. For more information, see Palettes.

**DirectDrawClipper object**

The DirectDrawClipper object (casually referred to as a "clipper") helps you prevent blitting to certain portions of a surface or beyond the bounds of a surface. You can create a clipper by calling the **IDirectDraw7::CreateClipper** method. DirectDrawClipper objects expose their functionality through the **IDirectDrawClipper** interface. For more information, see Clippers.

**DirectDrawVideoPort object**

The DirectDrawVideoPort object represents video-port hardware present in some systems. This hardware allows direct access to the frame buffer without accessing the CPU or using the PCI bus. You can create a DirectDrawVideoPort object by calling a **QueryInterface** method for the DirectDraw object, specifying the IID\_IDDVideoPortContainer reference identifier. DirectDrawVideoPort objects expose their functionality through the **IDDVideoPortContainer** and **IDirectDrawVideoPort** interfaces. For more information, see Video Ports.

[Visual Basic]

The DirectDraw component uses the following objects:

**DirectDraw object**

The DirectDraw object is the heart of all DirectDraw applications. It's the first object you create, and you use it to make all other related objects. You create a DirectDraw object by calling the **DirectX7.DirectDrawCreate** method. DirectDraw objects expose their functionality through the methods of the **DirectDraw7** object. For more information, see The DirectDraw Object.

**DirectDrawSurface object**

The DirectDrawSurface object (casually referred to as a "surface") represents an area in memory that holds data to be displayed on the monitor as images or moved to other surfaces. You create a surface by calling the **DirectDraw7.CreateSurface** method of the DirectDraw object with which it will be associated. DirectDrawSurface objects expose their functionality through the methods of the **DirectDrawSurface7** object. For more information, see Surfaces.

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**DirectDrawClipper object**

The DirectDrawClipper object (casually referred to as a "clipper") helps you prevent blitting to certain portions of a surface or beyond the bounds of a surface. You can create a clipper by calling the **DirectDraw7.CreateClipper** method. DirectDrawClipper objects expose their functionality through the **DirectDrawClipper** interface. For more information, see Clippers.

## Hardware Abstraction Layer (HAL)

DirectDraw provides device independence through the hardware abstraction layer (HAL). The HAL is a device-specific interface, provided by the device manufacturer, that DirectDraw uses to work directly with the display hardware. Applications never interact with the HAL. Rather, with the infrastructure that the HAL provides, DirectDraw exposes a consistent set of interfaces and methods that an application uses to display graphics. The device manufacturer implements the HAL in a combination of 16-bit and 32-bit code under Windows. Under Windows NT/Windows 2000, the HAL is always implemented in 32-bit code. The HAL can be part of the display driver or a separate DLL that communicates with the display driver through a private interface that driver's creator defines.

The DirectDraw HAL is implemented by the chip manufacturer, board producer, or original equipment manufacturer (OEM). The HAL implements only device-dependent code and performs no emulation. If a function is not performed by the hardware, the HAL does not report it as a hardware capability. Additionally, the HAL does not validate parameters; DirectDraw does this before the HAL is invoked.

## Software Emulation

When the hardware does not support a feature through the hardware abstraction layer (HAL), DirectDraw attempts to emulate it. This emulated functionality is provided through the hardware emulation layer (HEL). The HEL presents its capabilities to DirectDraw just as the HAL would. And, as with the HAL, applications never work directly with the HEL. The result is transparent support for almost all major features, regardless of whether a given feature is supported by hardware or through the HEL.

Obviously, software emulation cannot equal the performance that hardware features provide. You can query for the features the hardware supports by using the **IDirectDraw7::GetCaps** method in C++ or the corresponding **DirectDraw7.GetCaps** method in Visual Basic. By examining these capabilities during application initialization, you can adjust application parameters to provide optimum performance over varying levels of hardware performance.

In some cases, certain combinations of hardware supported features and emulation can result in slower performance than emulation alone. For example, if the display device driver supports DirectDraw but not stretch blitting, noticeable performance losses will occur when stretch blitting from video memory surfaces. This happens because video memory is often slower than system memory, forcing the CPU to wait when accessing video memory surfaces. If your application uses a feature that isn't supported by the hardware, it is sometimes best to create surfaces in system memory, thereby avoiding performance losses created when the CPU accesses video memory.

For more information, see Hardware Abstraction Layer (HAL).

## System Integration

The following diagram shows the relationships between DirectDraw, the graphics device interface (GDI), the hardware abstraction layer (HAL), the hardware emulation layer (HEL) and the hardware.



As the preceding diagram shows, a DirectDraw object exists alongside GDI, and both have direct access to the hardware through a device-dependent abstraction layer. Unlike GDI, DirectDraw makes use of special hardware features whenever possible. If the hardware does not support a feature, DirectDraw attempts to emulate it by using the HEL. DirectDraw can provide surface memory in the form of a device context, making it possible for you to use GDI functions to work with surface objects.

# DirectDraw Essentials

This section contains general information about the DirectDraw® component of DirectX®. Information is organized into the following groups:

Cooperative Levels

Display Modes

The DirectDraw Object

Surfaces

Palettes

Clippers

Multiple-Monitor Systems

Advanced DirectDraw Topics

## Cooperative Levels

In the following topics, this section introduces the concept of cooperative levels and describes some common usage situations:

About Cooperative Levels

Testing Cooperative Levels

### About Cooperative Levels

Cooperative levels describe how DirectDraw interacts with the display and how it reacts to events that might affect the display. Use the **IDirectDraw7::SetCooperativeLevel** method in C++ or the corresponding **DirectDraw7.SetCooperativeLevel** method in Visual Basic to set cooperative level of DirectDraw. For the most part, you use DirectDraw cooperative levels to determine whether your application runs as a full-screen program with exclusive access to the display or as a windowed application. However, DirectDraw cooperative levels can also have the following effects:

Enable DirectDraw to use Mode X resolutions. For more information, see Mode X and Mode 13 Display Modes.

Prevent DirectDraw from releasing exclusive control of the display or rebooting if the user presses CTRL + ALT + DEL (exclusive mode only).

Enable DirectDraw to minimize or maximize the application in response to activation events.

The normal cooperative level indicates that your DirectDraw application will operate as a windowed application. At this cooperative level you won't be able to change the primary surface's palette or perform page flipping.

Because applications can use DirectDraw with multiple windows, **IDirectDraw7::SetCooperativeLevel** and **DirectDraw7.SetCooperativeLevel** does not require a window handle to be specified if the application is requesting the DDSCL\_NORMAL mode. By passing a NULL in C++ or Nothing in Visual Basic to the window handle, all of the windows can be used simultaneously in normal Windows mode.

At the full-screen and exclusive cooperative level, you can use the hardware to its fullest. In this mode, you can set custom and dynamic palettes, change display resolutions, and implement page flipping. The exclusive (full-screen) mode does not prevent other applications from allocating surfaces, nor does it exclude them from using DirectDraw or GDI. However, it does prevent applications other than the one currently with exclusive access from changing the display mode or palette.

DirectDraw takes control of window activation events for full-screen, exclusive mode applications, sending WM\_ACTIVATEAPP messages to the window handle registered through the **SetCooperativeLevel** method as needed. DirectDraw only sends activation events to the top-level window. If your application creates child windows that require activation event messages, it is your responsibility to subclass the child windows.

**SetCooperativeLevel** maintains a binding between a process and a window handle. If **SetCooperativeLevel** is called once in a process, a binding is established between the process and the window. If it is called again in the same process with a different non-null window handle, it returns the DDERR\_HWNDALREADYSET error value. Some applications may receive this error value when DirectSound® specifies a different window handle than DirectDraw—they should specify the same, top-level application window handle.

[C++]

Note

Developers using Microsoft Foundation Classes (MFC) should keep in mind that the window handle given to the **SetCooperativeLevel** method should identify the application's top-level window, not a derived child window. To retrieve your MFC application's top level window handle, you could use the following code:

HWND hwndTop = AfxGetMainWnd()->GetSafeHwnd();

See also Multiple-Monitor Systems.

[C++,Visual Basic]

### Testing Cooperative Levels

Developers often use messages such as WM\_ACTIVATEAPP and WM\_DISPLAYCHANGE as notifications that their applications should restore or re-create the surfaces being used. In some cases, applications take action when they don't need to, or don't take action when they should. The **IDirectDraw7::TestCooperativeLevel** method in C++ or the corresponding **DirectDraw7.TestCooperativeLevel** method in Visual Basic makes it possible for your application to retrieve more information about the DirectDraw object's cooperative level and take appropriate steps to continue execution without mishap.

The **TestCooperativeLevel** method succeeds, returning DD\_OK, if your application can restore its surfaces (if it has not already done so) and continue to execute. Failure codes, on the other hand, are interpreted differently depending on the cooperative-level your application uses:

**Full-screen applications**

Full-screen applications receive the DDERR\_NOEXCLUSIVEMODE return value if they lose exclusive device access–for example, if the user pressed ALT+TAB to switch away from the current application. In this case, applications might call **TestCooperativeLevel** in a loop, exiting only when the method returns DD\_OK (meaning that exclusive mode was returned). In the body of the loop, the application should relinquish control of the CPU to prevent using cycles unnecessarily. Windows supports functions such as the **WaitMessage** or **Sleep** Win32 functions for this purpose.

Any existing surfaces should be restored by calling the **IDirectDrawSurface7::Restore** or **IDirectDraw7::RestoreAllSurfaces** methods in C++ or **DirectDrawSurface7.Restore** in Visual Basic, and their contents reloaded before displaying them.

**Windowed applications**

Windowed applications (those that use the normal cooperative level) receive DDERR\_EXCLUSIVEMODEALREADYSET if another application has taken exclusive device access. In this case, no action should be taken until the application with exclusive access loses it. This situation is similar to the case for a full-screen application; a windowed application might loop until **TestCooperativeLevel** returns DD\_OK before restoring and reloading its surfaces. As mentioned previously, in a loop like this applications should avoid unnecessarily using CPU cycles by relinquishing CPU control periodically during the loop.

The **TestCooperativeLevel** method returns DDERR\_WRONGMODE to windowed applications when the display mode has changed. In this case, the application should destroy and re-create any surfaces before continuing execution.

## Display Modes

This section contains general information about DirectDraw display modes. The following topics are discussed:

About Display Modes

Determining Supported Display Modes

Setting Display Modes

Restoring Display Modes

Mode X and Mode 13 Display Modes

Support for High Resolutions and True-Color Bit Depths

### About Display Modes

A display mode is a hardware setting that describes the dimensions and bit-depth of graphics that the display hardware sends to the monitor from the primary surface. Display modes are described by their defining characteristics: width, height, and bit-depth. For instance, most display adapters can display graphics 640 pixels wide and 480 pixels tall, where each pixel is 8 bits of data. In shorthand, this display mode is called 6404808. As the dimensions of a display mode get larger or as the bit-depth increases, more display memory is required.

There are two types of display modes: palettized and non-palettized. For palettized display modes, each pixel is a value representing an index into an associated palette. The bit depth of the display mode determines the number of colors that can be in the palette. For instance, in an 8-bit palettized display mode, each pixel is a value from 0 to 255. In such a display mode, the palette can contain 256 entries.

Non-palettized display modes, as their name states, do not use palettes. The bit depth of a non-palettized display mode indicates the total number of bits that are used to describe a pixel.

The primary surface and any surfaces in the primary flipping chain match the display mode's dimensions, bit depth and pixel format. For more information, see Pixel Formats.

### Determining Supported Display Modes

[C++]

Because display hardware varies, not all devices will support all display modes. To determine the display modes supported on a given system, call the **IDirectDraw7::EnumDisplayModes** method. By setting the appropriate values and flags, the **EnumDisplayModes** method can list all supported display modes or confirm that a single display mode that you specify is supported. The method's first parameter, *dwFlags*, controls extra options for the method; in most cases, you will set *dwFlags* to 0 to ignore extra options. The second parameter, *lpDDSurfaceDesc*, is the address of a **DDSURFACEDESC2** structure that describes a given display mode to be confirmed; you'll usually set this parameter to NULL to request that all modes be listed. The third parameter, *lpContext*, is a pointer that you want DirectDraw to pass to your callback function; if you don't need any extra data in the callback function, use NULL here. Last, you set the *lpEnumModesCallback* parameter to the address of the callback function that DirectDraw will call for each supported mode.

The callback function you supply when calling **EnumDisplayModes** must match the prototype for the **EnumModesCallback** function. For each display mode that the hardware supports, DirectDraw calls your callback function passing two parameters. The first parameter is the address of a **DDSURFACEDESC2** structure that describes one supported display mode, and the second parameter is the address of the application-defined data you specified when calling **EnumDisplayModes**, if any.

Examine the values in the **DDSURFACEDESC2** structure to determine the display mode it describes. The key structure members are the **dwWidth**, **dwHeight**, and **ddpfPixelFormat** members. The **dwWidth** and **dwHeight** members describe the display mode's dimensions, and the **ddpfPixelFormat** member is a **DDPIXELFORMAT** structure that contains information about the mode's bit depth.

The **DDPIXELFORMAT** structure carries information describing the mode's bit depth and tells you whether or not the display mode uses a palette. If the **dwFlags** member contains the DDPF\_PALETTEINDEXED1, DDPF\_PALETTEINDEXED2, DDPF\_PALETTEINDEXED4, or DDPF\_PALETTEINDEXED8 flag, the display mode's bit depth is 1, 2, 4 or 8 bits, and each pixel is an index into an associated palette. If **dwFlags** contains DDPF\_RGB, then the display mode is non-palettized and its bit depth is provided in the **dwRGBBitCount** member of the **DDPIXELFORMAT** structure.

[Visual Basic]

Because display hardware varies, not all devices will support all display modes. To determine the display modes supported on a given system, call the **DirectDraw7.GetDisplayModesEnum** method. The method returns a **DirectDrawEnumModes** object which is then used to retrieve descriptions of the supported display modes. By setting the appropriate values and flags, the **GetDisplayModesEnum** method fills the **DirectDrawEnumModes** object with the a list of all supported display modes or confirm that a single display mode that you specify is supported. The method's first parameter, *flags*, controls extra options for the method; in most cases, you will set *flags* to DDEDM\_DEFAULT to ignore extra options. The second parameter, *ddsd*, is a **DDSURFACEDESC2** type that describes a given display mode to be confirmed; you'll usually set this parameter to Nothing to request that all modes be listed.

After the **DirectDrawEnumModes** object is returned from the **GetDisplayModesEnum** method you can call the **DirectDrawEnumModes.GetCount** method to find out how many supported display modes are available. You then call **DirectDrawEnumModes.GetItem** to return a description of a single display mode from the collection of display modes in the **DirectDrawEnumModes** object.

Examine the values in the **DDSURFACEDESC2** type retrieved from the **GetItem** method to determine the display mode it describes. The key type members are the **lWidth**, **lHeight**, and **ddpfPixelFormat** members. The **lWidth** and **lHeight** members describe the display mode's dimensions, and the **ddpfPixelFormat** member is a **DDPIXELFORMAT** type that contains information about the mode's bit depth.

The **DDPIXELFORMAT** type carries information describing the mode's bit depth and tells you whether or not the display mode uses a palette. If the **lFlags** member contains the DDPF\_PALETTEINDEXED1, DDPF\_PALETTEINDEXED2, DDPF\_PALETTEINDEXED4, or DDPF\_PALETTEINDEXED8 flag, the display mode's bit depth is 1, 2, 4 or 8 bits, and each pixel is an index into an associated palette. If **lFlags** contains DDPF\_RGB, then the display mode is non-palettized and its bit depth is provided in the **lRGBBitCount** member of the **DDPIXELFORMAT** type.

### Setting Display Modes

You can set the display mode by using the **IDirectDraw7::SetDisplayMode** method in C++ or **DirectDraw7.SetDisplayMode** method in Visual Basic. The **SetDisplayMode** method accepts four parameters that describe the dimensions, bit depth, and refresh rate of the mode to be set. The method uses a fifth parameter to indicate special options for the given mode; this is currently only used to differentiate between Mode 13 and the Mode X 3202008 display mode.

[C++]

Although you can specify the desired display mode's bit depth, you cannot specify the pixel format that the display hardware will use for that bit depth. To determine the RGB bitmasks that the display hardware uses for the current bit depth, call **IDirectDraw7::GetDisplayMode** after setting the display mode. If the current display mode is not palettized, you can examine the mask values in the **dwRBitMask**, **dwGBitMask**, and **dwBBitMask** members in the **DDPIXELFORMAT** to determine the correct red, green, and blue bits. For more information, see Pixel Format Masks.

Modes can be changed by more than one application as long as they are all sharing a display card. You can change the bit depth of the display mode only if your application has exclusive access to the DirectDraw object. All DirectDrawSurface objects lose surface memory and become inoperative when the mode is changed. A surface's memory must be reallocated by using the **IDirectDrawSurface7::Restore** method.

The DirectDraw exclusive (full-screen) mode does not bar other applications from allocating DirectDrawSurface objects, nor does it exclude them from using DirectDraw or GDI functionality. However, it does prevent applications other than the one that obtained exclusive access from changing the display mode or palette.

Note

You can only call the **IDirectDraw7::SetDisplayMode** method from the thread that created the application window. For single threaded applications (the vast majority), this restriction isn't an issue.

[Visual Basic]

Although you can specify the desired display mode's bit depth, you cannot specify the pixel format that the display hardware will use for that bit depth. To determine the RGB bitmasks that the display hardware uses for the current bit depth, call **DirectDraw7.GetDisplayMode** after setting the display mode. If the current display mode is not palettized, you can examine the mask values in the **lRBitMask**, **lGBitMask**, and **lBBitMask** members of the **DDPIXELFORMAT** type to determine the correct red, green, and blue bits. For more information, see Pixel Format Masks.

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The DirectDraw exclusive (full-screen) mode does not bar other applications from allocating DirectDrawSurface objects, nor does it exclude them from using DirectDraw or GDI functionality. However, it does prevent applications other than the one that obtained exclusive access from changing the display mode or palette.

### Restoring Display Modes

[C++]

You can explicitly restore the display hardware to its original mode by calling the **IDirectDraw7::RestoreDisplayMode** method. If the display mode was set by calling **IDirectDraw7::SetDisplayMode** and your application takes the exclusive cooperative level, the original display mode is reset automatically when you set the application's cooperative level back to normal. (This behavior was first offered in the **IDirectDraw2** interface, and is offered by all newer versions of the interface.)

If you're using the **IDirectDraw** interface, you must always explicitly restore the display mode by using the **RestoreDisplayMode** method.

[Visual Basic]

You can explicitly restore the display hardware to its original mode by calling the **DirectDraw7.RestoreDisplayMode** method. If the display mode was set by calling **DirectDraw7.SetDisplayMode** and your application takes the exclusive cooperative level, the original display mode is reset automatically when you set the application's cooperative level back to normal.

### Mode X and Mode 13 Display Modes

DirectDraw supports both Mode 13 and Mode X display modes. Mode 13 is the linear unflippable 3202008 bits per pixel palettized mode known widely by its hexadecimal BIOS mode number: 13. For more information, see Mode 13 Support. Mode X is a hybrid display mode derived from the standard VGA Mode 13. This mode allows the use of up to 256 kilobytes (KB) of display memory (rather than the 64 KB allowed by Mode 13) by using the VGA display adapter's EGA multiple video plane system.

DirectDraw provides two Mode X modes (3202008 and 3202408) for all display cards. Some cards also support linear low-resolution modes. In linear low-resolution modes, the primary surface can be locked and directly accessed. This is not possible in Mode X modes.

[C++]

Mode X modes are available only if an application uses the DDSCL\_ALLOWMODEX, DDSCL\_FULLSCREEN, and DDSCL\_EXCLUSIVE flags when calling the **IDirectDraw7::SetCooperativeLevel** method. If DDSCL\_ALLOWMODEX is not specified, the **IDirectDraw7::EnumDisplayModes** method will not enumerate Mode X modes, and the **IDirectDraw7::SetDisplayMode** method will fail if a Mode X mode is requested.

Windows 95 and Windows NT/Windows 2000 do not natively support Mode X modes; therefore, when your application is in a Mode X mode, you cannot use the **IDirectDrawSurface7::Lock** or **IDirectDrawSurface7::Blt** methods to lock or blit to the primary surface. You also cannot use either the **IDirectDrawSurface7::GetDC** method on the primary surface, or GDI with a screen DC. Mode X modes are indicated by the DDSCAPS\_MODEX flag in the **DDSCAPS2** structure, which is part of the **DDSURFACEDESC2** structure returned by the **IDirectDrawSurface7::GetCaps** and **IDirectDraw7::EnumDisplayModes** methods.

[Visual Basic]

Mode X modes are available only if an application uses the DDSCL\_ALLOWMODEX, DDSCL\_FULLSCREEN, and DDSCL\_EXCLUSIVE flags when calling the **DirectDraw7.SetCooperativeLevel** method. If DDSCL\_ALLOWMODEX is not specified when setting the cooperative level, the **DirectDraw7.GetDisplayModesEnum** method will not enumerate Mode X modes, and the **DirectDraw7.SetDisplayMode** method will fail if a Mode X mode is requested.

Windows 95 and Windows NT/Windows 2000 do not natively support Mode X modes; therefore, when your application is in a Mode X mode, you cannot use the **DirectDrawSurface7.Lock** or **DirectDrawSurface7.Blt** methods to lock or blit to the primary surface. You also cannot use either the **DirectDrawSurface7.GetDC** method on the primary surface, or GDI with a screen DC. Mode X modes are indicated by the DDSCAPS\_MODEX flag in the **DDSCAPS2** type, which is part of the **DDSURFACEDESC2** type returned by the **DirectDrawSurface7.GetCaps** and **DirectDrawEnumModes** methods.

### Support for High Resolutions and True-Color Bit Depths

DirectDraw supports all of the screen resolutions and depths supported by the display device driver. DirectDraw allows an application to change the mode to any one supported by the computer's display driver, including all supported 24- and 32-bpp (true-color) modes.

DirectDraw also supports HEL blitting in true-color surfaces. If the display device driver supports blitting at these resolutions, the hardware blitter will be used for display-memory-to-display-memory blits. Otherwise, the HEL will be used to perform the blits.

[C++]

DirectDraw checks a list of known display modes against the display restrictions of the installed monitor. If DirectDraw determines that the requested mode is not compatible with the monitor, the call to the **IDirectDraw7::SetDisplayMode** method fails. Only modes that are supported on the installed monitor will be enumerated when you call the **IDirectDraw7::EnumDisplayModes** method.

[Visual Basic]

DirectDraw checks a list of known display modes against the display restrictions of the installed monitor. If DirectDraw determines that the requested mode is not compatible with the monitor, the call to the **DirectDraw7.SetDisplayMode** method fails. Only modes that are supported on the installed monitor will be enumerated when you call the **DirectDraw7.GetDisplayModesEnum** method.

## The DirectDraw Object

This section contains information about DirectDraw objects and how you can manipulate them through their **IDirectDraw**, **IDirectDraw2**, **IDirectDraw4**, or **IDirectDraw7** interfaces. The following topics are discussed:

What Are DirectDraw Objects?

What's New in IDirectDraw7?

Parent and Child Object Lifetimes

Multiple DirectDraw Objects per Process

Creating DirectDraw Objects by Using CoCreateInstance

### What Are DirectDraw Objects?

[C++]

The DirectDraw object is the heart of all DirectDraw applications and is an integral part of Direct3D® applications as well. It is the first object you create and, through it, you create all other related objects. For DirectX 7.0, a new method is introduced for creating the latest iteration of the DirectDraw object. The **DirectDrawCreateEx** function creates a DirectDraw object capable of exposing the newest set of Direct3D interfaces. In previous versions, you created a DirectDraw object by calling the **DirectDrawCreate** function, which returns an **IDirectDraw** interface. If you wanted to work with a different iteration of the interface (such as **IDirectDraw7**) to take advantage of new features it provides, you can query for it. (See Getting an IDirectDraw7 Interface.) In DirectX 7.0, you can still query for the **IDirectDraw7** interface after creating the DirectDraw object using **DirectDrawCreate**, but it will not support the new set of features of Direct3D. To use the new functionality of Direct3D, you must return an **IDirectDraw7** interface using the **DirectDrawCreateEx** function. Note that you can create multiple DirectDraw objects, one for each display device installed in a system.

[Visual Basic]

The DirectDraw object is the heart of all DirectDraw applications and is an integral part of Direct3D® applications as well. It is the first object you create and, through it, you create all other related objects. In Visual Basic, calling the **DirectX7.DirectDrawCreate** method creates a **DirectDraw7** object capable of exposing the newest set of Direct3D interfaces.

The DirectDraw object represents the display device and makes use of hardware acceleration if the display device for which it was created supports hardware acceleration. Each unique DirectDraw object can manipulate the display device and create surfaces, palettes, and clipper objects that are dependent on (or are, "connected to") the object that created them. For example, to create surfaces, you call the **IDirectDraw7::CreateSurface** method in C++ or the **DirectDraw7.CreateSurface** method in Visual Basic. Or, if you need a palette object to apply to a surface, call the **IDirectDraw7::CreatePalette** method in C++ or the **DirectDraw7.CreatePalette** method in Visual Basic. Additionally, the **IDirectDraw7** interface and **DirectDraw7** object exposes similar methods to create clipper objects.

You can create more than one instance of a DirectDraw object at a time. The simplest example of this is using two monitors on a Windows 95 or Windows NT 4.0 and earlier system. Although these operating systems don't support dual monitors on their own, it is possible to write a DirectDraw HAL for each display device. The display device Windows and GDI recognizes is the one that will be used when you create the instance of the default DirectDraw object. The display device that Windows and GDI do not recognize can be addressed by another, independent DirectDraw object that must be created by using the second display device's globally unique identifier (GUID). This GUID can be obtained by using the **DirectDrawEnumerate** function in C++ or the **DirectDrawEnum.GetGuid** method in Visual Basic.

The DirectDraw object manages all of the objects it creates. It controls the default palette (if the primary surface is in 8-bits-per-pixel mode), the default color key, and the hardware display mode. It tracks what resources have been allocated and what resources remain to be allocated.

### What's New in IDirectDraw7?

[C++]

This section details new features provided by the **IDirectDraw7** interface and describes its new features or how it behaves differently than its predecessor, **IDirectDraw4**. (Note that there is no **IDirectDraw3** interface, **IDirectDraw4** is the direct predecessor of **IDirectDraw7**.). The following topics are discussed:

New Features in IDirectDraw7

Getting an IDirectDraw7 Interface

The most obvious difference between the **IDirectDraw7** interface is the tighter integration with Direct3D textures. In previous versions of the DirectX, textures were created through the **IDirect3DTexture** interface. In DirectX 7.0, texture management has been moved to the **IDirectDrawSurface7** interface. These methods include:

**IDirectDrawSurface7::SetPriority**

**IDirectDrawSurface7::GetPriority**

**IDirectDrawSurface7::SetLOD**

**IDirectDrawSurface7::GetLOD**

Additional features added in this version include support for stereo flipping surfaces and refresh rate enumeration and cubic environment mapping.

[C++,Visual Basic]

#### New Features in IDirectDraw7

[C++]

Although there are no new methods added to the **IDirectDraw7** interface in DirectX 7.0, there is a tighter relationship between **IDirectDraw7** and Direct3D. **IDirectDraw7** objects will support **QueryInterface** for any **IDirect3D** interface, but will only allow subsequent **QueryInterface** calls for the same level of interface. This means that once **IDirect3D7** has been obtained from any DirectDraw object, no earlier Direct3D interfaces will be available from that object. Similarly, once any legacy Direct3D interface has been obtained from a DirectDraw object, **IDirect3D7** will not be available from that object.

Additionally, **IDirectDraw7** created surfaces do not allow Direct3D related **QueryInterface** calls (they will return E\_NOINTERFACE). Applications may only obtain **IDirect3DTexture** interfaces from surfaces created by **IDirectDraw4** or lower interfaces.

The practical result is that to use legacy Direct3D interfaces, applications should not use DirectDraw 7.0 interface versions, and to use DirectX 7.0 Direct3D interfaces, applications should use DirectX 7.0 DirectDraw interfaces.

A new DirectDraw object creation function, **DirectDrawCreateEx**, has been added in this release to obtain an **IDirectDraw7** interface and is further discussed in the next section Getting an IDirectDraw7 Interface.

[C++,Visual Basic]

#### Getting an IDirectDraw7 Interface

[C++]

DirectX 7.0 has a new function to create an **IDirectDraw7** interface, **DirectDrawCreateEx**. This function is the only way to create the newest iteration of this DirectDraw object which supports the new features of DirectDraw and Direct3D. The **IDirectDraw7** interface supersedes the **IDirectDraw4** interface. This new interface can be obtained by using the **DirectDrawCreateEx** function, as the following C++ example shows:

// Initialize DirectDraw

LPDIRECTDRAW7 lpDD7;

HRESULT hr;

if (FAILED(hr = DirectDrawCreateEx(NULL, (VOID\*\*)&lpDD7, IID\_IDirectDraw7, NULL)))

return FALSE;

if (FAILED(hr = lpDD7->SetCooperativeLevel(NULL, DDSCL\_NORMAL)))

return FALSE;

After getting an **IDirectDraw7** interface, you can begin calling its methods to take advantage of new features, performance improvements, and behavioral differences. Because some methods might change with the release of a new interface, mixing methods from an interface and its replacement (between **IDirectDraw4** and **IDirectDraw7**, for example) can cause unpredictable results.

[Visual Basic]

In Visual Basic, the DirectDraw object is obtained by calling the **DirectX7.DirectDrawCreate** method.

### Parent and Child Object Lifetimes

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

All objects you'll use in DirectDraw programming—the DirectDraw object, surfaces, palettes, clippers, and such—only exist in memory for as long as another object, such as an application, needs them. The time that passes from the moment when an object is created and placed in memory to when it is released and subsequently removed from memory is known as the object's lifetime. The Component Object Model (COM) followed by all DirectX components dictates that an object must keep track of how many other objects require its services. This number, known as a reference count, determines the object's lifetime. COM also dictates that an object expose the **IUnknown::AddRef** and **IUnknown::Release** methods to enable applications to explicitly manage its reference count; make sure you use these methods in accordance to COM rules.

You aren't the only one who is using the **IUnknown** methods to manage reference counts for objects—DirectDraw objects use them internally, too. When you use the **IDirectDraw7** interface (in contrast to **IDirectDraw2** or **IDirectDraw**) to create a "child" object like a surface, the child uses the **IUnknown::AddRef** method of the "parent" DirectDraw object to increment the parent's reference count.

When your application no longer needs an object, call the **Release** method to decrement its reference count. When the count reaches zero, the object is removed from memory. When a child object's reference count reaches zero, it calls the parent's **IUnknown::Release** method to indicate that there is one less object who will be needing the parent's services.

Implicitly allocated objects, such as the back-buffer surfaces in a flipping chain that you create with a single **IDirectDraw7::CreateSurface** call, are automatically deallocated when their parent DirectDrawSurface object is released. Also, you can only release a DirectDraw object from the thread that created the application window. For single-threaded applications, this restriction obviously doesn't apply, as there is only one thread. If your application created a primary flipping chain of two surfaces (created by a single **CreateSurface** call) that used an attached DirectDrawClipper object, the code to release these objects safely might look like:

// For this example, the g\_lpDDraw, g\_lpDDSurface, and

// g\_lpDDClip are valid pointers to objects.

void ReleaseDDrawObjects(void)

{

// If the DirectDraw object pointer is valid,

// it should be safe to release it and the objects it owns.

if(g\_lpDDraw)

{

// Release the DirectDraw object. (This call wouldn't

// be safe if the children were created through IDirectDraw2

// or IDirectDraw. See the following note for

// more information)

g\_lpDDraw->Release(), g\_lpDDraw = NULL;

// Now, release the clipper that is attached to the surfaces.

if(g\_lpDDClip)

g\_lpDDClip->Release(), g\_lpDDClip = NULL;

// Now, release the primary flipping chain. Note

// that this is only valid because the flipping

// chain surfaces were created with a single

// CreateSurface call. If they were explicitly

// created and attached, then they must also be

// explicitly released.

if(g\_lpDDSurface)

g\_lpDDSurface->Release(), g\_lpDDSurface = NULL;

}

}

Note

Earlier versions of the DirectDraw interface (**IDirectDraw2** and **IDirectDraw,** to be exact) behave differently than the most recent interface. When using these early interfaces, DirectDraw automatically releases all child objects when the parent itself is released. As a result, if you use these older interfaces, the order in which you release objects is critical. In this case, you should release the children of a DirectDraw object before releasing the DirectDraw object itself (or not release them at all, counting on the parent to do cleanup for you). Because the DirectDraw object releases the child objects, if you release the parent before the children, you are very likely to incur a memory fault for attempting to dereference a pointer that was invalidated when the parent object released its children.

Some older applications relied on the automatic release of child objects and neglected to properly release some objects when no longer needed. At the time, this practice didn't cause any negative side effects, however doing so when using the **IDirectDraw7** interface might result in memory leaks.

### Multiple DirectDraw Objects per Process

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

DirectDraw allows a process to call the **DirectDrawCreate** function as many times as necessary. A unique and independent interface to a unique and independent DirectDraw object is returned after each call. Each DirectDraw object can be used as desired; there are no dependencies between the objects. Each object behaves exactly as if it had been created by a unique process.

DirectDraw objects are independent of one another and the DirectDrawSurface, DirectDrawPalette, and DirectDrawClipper objects they create should not be used with other DirectDraw objects because they are automatically released when the parent DirectDraw object is destroyed. If they are used with another DirectDraw object, they might stop functioning if their parent object is destroyed, causing the remaining DirectDraw object to malfunction.

The exception is DirectDrawClipper objects created by using the **DirectDrawCreateClipper** function. These objects are independent of any particular DirectDraw object and can be used with one or more DirectDraw objects.

### Creating DirectDraw Objects by Using CoCreateInstance

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

You can create a DirectDraw object by using the **CoCreateInstance** function and the **IDirectDraw7::Initialize** method rather than the **DirectDrawCreate** function. The following steps describe how to create the DirectDraw object:

1 Initialize COM at the start of your application by calling **CoInitialize** and specifying NULL.

if (FAILED(CoInitialize(NULL)))

return FALSE;

2 Create the DirectDraw object by using **CoCreateInstance** and the **IDirectDraw7::Initialize** method.

ddrval = CoCreateInstance(&CLSID\_DirectDraw,

NULL, CLSCTX\_ALL, &IID\_IDirectDraw7, &lpdd);

if(!FAILED(ddrval))

ddrval = IDirectDraw7\_Initialize(lpdd, NULL);

In this call to **CoCreateInstance**, the first parameter, *CLSID\_DirectDraw*, is the class identifier of the DirectDraw driver object class, the *IID\_IDirectDraw7* parameter identifies the particular DirectDraw interface to be created, and the *lpdd* parameter points to the DirectDraw object that is retrieved. If the call is successful, this function returns an uninitialized object.

3 Before you use the DirectDraw object, you must call **IDirectDraw7::Initialize**. This method takes the driver GUID parameter that the **DirectDrawCreate** function typically uses (NULL in this case). After the DirectDraw object is initialized, you can use and release it as if it had been created by using the **DirectDrawCreate** function. If you do not call the **Initialize** method before using one of the methods associated with the DirectDraw object, a DDERR\_NOTINITIALIZED error will occur.

Before you close the application, close the COM library by using the **CoUninitialize** function.

CoUninitialize();

## Surfaces

This section contains information about DirectDrawSurface objects. The following topics are discussed:

Basic Concepts of Surfaces

Creating Surfaces

Flipping Surfaces

Blitting to Surfaces

Losing and Restoring Surfaces

COM Reference Count Semantics for Surfaces

Enumerating Surfaces

Updating Surface Characteristics

Accessing Surface Memory Directly

Gamma and Color Controls

Overlay Surfaces

Compressed Texture Surfaces

Private Surface Data

Surface Uniqueness Values

Using Non-local Video Memory Surfaces

Surfaces and Device Contexts

### Basic Concepts of Surfaces

This section contains information about the basic concepts associated with DirectDrawSurface objects. The following topics are discussed:

What Are Surfaces?

Surface Interfaces

Width vs. Pitch

Color Keying

Pixel Formats

#### What Are Surfaces?

A surface, or DirectDrawSurface object, represents a linear area of display memory. A surface usually resides in the display memory of the display card, although surfaces can exist in system memory. Unless specifically instructed otherwise during the creation of the DirectDrawSurface object, DirectDraw object will put the DirectDrawSurface object wherever the best performance can be achieved given the requested capabilities. DirectDrawSurface objects can take advantage of specialized processors on display cards, not only to perform certain tasks faster, but to perform some tasks in parallel with the system CPU.

[C++]

Using the **IDirectDraw7::CreateSurface** method, you can create a single surface object, complex surface-flipping chains, or three-dimensional surfaces. The **CreateSurface** method creates the requested surface or flipping chain and retrieves a pointer to the primary surface's **IDirectDrawSurface7** interface through which the object exposes its functionality.

The **IDirectDrawSurface7** interface enables you to indirectly access memory through blit methods, such as **IDirectDrawSurface7::BltFast**. The surface object can provide a device context to the display that you can use with GDI functions. Additionally, you can use **IDirectDrawSurface7** methods to directly access display memory. For example, you can use the **IDirectDrawSurface7::Lock** method to lock the display memory and retrieve the address corresponding to that surface. Addresses of display memory might point to visible frame buffer memory (primary surface) or to nonvisible buffers (off-screen or overlay surfaces). Nonvisible buffers usually reside in display memory, but can be created in system memory if required by hardware limitations or if DirectDraw is performing software emulation. In addition, the **IDirectDrawSurface7** interface extends other methods that you can use to set or retrieve palettes, or to work with specific types or surfaces, like flipping chains or overlays.

[Visual Basic]

Using the **DirectDraw7.CreateSurface** method, you can create a single surface object, complex surface-flipping chains, or three-dimensional surfaces. The **CreateSurface** method creates the requested surface or flipping chain and retrieves a pointer to the primary surface's **DirectDrawSurface7** object through which it exposes its functionality.

The **DirectDrawSurface7** object enables you to indirectly access memory through blit methods, such as **DirectDrawSurface7.BltFast**. The surface object can provide a device context to the display that you can use with GDI functions. Additionally, you can use **DirectDrawSurface7** methods to directly access display memory. For example, you can use the **DirectDrawSurface7.Lock** method to lock the display memory and retrieve the address corresponding to that surface. Addresses of display memory might point to visible frame buffer memory (primary surface) or to nonvisible buffers (off-screen or overlay surfaces). Nonvisible buffers usually reside in display memory, but can be created in system memory if required by hardware limitations or if DirectDraw is performing software emulation. In addition, the **DirectDrawSurface7** class extends other methods that you can use to set or retrieve palettes, or to work with specific types or surfaces, like flipping chains or overlays.

From this illustration, you can see that all surface are created by a DirectDraw object and are often used closely with palettes. Although each surface object can be assigned a palette, palettes aren't required for anything but primary surfaces that use pixel formats of 8-bits in depth or less.



#### Surface Interfaces

[C++]

DirectDrawSurface objects expose their functionality through the **IDirectDrawSurface**, **IDirectDrawSurface2**, **IDirectDrawSurface3**, **IDirectDrawSurface4**, and **IDirectDrawSurface7** interfaces. Each new interface version provides the same utility as its predecessors, with additional options available through new methods.

When you create a surface by calling the **IDirectDraw7::CreateSurface** method (or another creation method from **IDirectDraw7**), you receive a pointer to the surface's **IDirectDrawSurface7** interface. This behavior is different than previous versions of DirectX. Before the introduction of the **IDirectDraw7** interface, the **CreateSurface** method provided a pointer to a surface's **IDirectDrawSurface** interface. If you wanted to work with a different iteration of the interface, you had to query for it. When using **IDirectDraw7** this isn't the case, although you are free to query a surface for a previous iteration of an interface if you choose.

[Visual Basic]

DirectDrawSurface objects are created from the **DirectDrawSurface7** class. You call the **DirectDraw7.CreateSurface** method to return a DirectDrawSurface object.

#### Width vs. Pitch

Although the terms *width* and *pitch* are often used informally, they have very important (and distinctly different) meanings. As a result, you should understand the meanings for each, and how to interpret the values that DirectDraw uses to describe them.

[C++]

DirectDraw uses the **DDSURFACEDESC2** structure to carry information describing a surface. Among other things, this structure is defined to contain information about a surface's dimensions, as well as how those dimensions are represented in memory. The structure uses the **dwHeight** and **dwWidth** members to describe the logical dimensions of the surface. Both of these members are measured in pixels. Therefore, the **dwHeight** and **dwWidth** values for a 640480 surface are the same whether it is an 8-bit palettized surface or a 24-bit RGB surface.

The **DDSURFACEDESC2** structure contains information about how a surface is represented in memory through the **lPitch** member. The value in the **lPitch** member describes the surface's memory pitch (also called *stride*). Pitch is the distance, in bytes, between two memory addresses that represent the beginning of one bitmap line and the beginning of the next bitmap line. Because pitch is measured in bytes rather than pixels, a 6404808 surface will have a very different pitch value than a surface with the same dimensions but a different pixel format. Additionally, the pitch value sometimes reflects bytes that DirectDraw has reserved as a cache, so it is not safe to assume that pitch is simply the width multiplied by the number of bytes per pixel. Rather, you could visualize the difference between width and pitch as shown in the following illustration.

[Visual Basic]

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In this figure, the front buffer and back buffer are both 6404808, and the cache is 3844808.

[C++]

Pitch values are useful when you are directly accessing surface memory. For example, after calling the **IDirectDrawSurface7::Lock** method, the **lpSurface** member of the associated **DDSURFACEDESC2** structure contains the address of the top-left pixel of the locked area of the surface, and the **lPitch** member is the surface pitch. You access pixels horizontally by incrementing or decrementing the surface pointer by the number of bytes per pixel, and you move up or down by adding the pitch value to, or subtracting it from, the current surface pointer.

When accessing surfaces directly, take care to stay within the memory allocated for the dimensions of the surface and stay out of any memory reserved for cache. Additionally, when you lock only a portion of a surface, you must stay within the rectangle you specify when locking the surface. Failing to follow these guidelines will have unpredictable results. When rendering directly into surface memory, always use the pitch returned by the **Lock** method (or the **IDirectDrawSurface7::GetDC** method). Do not assume a pitch based solely on the display mode. If your application works on some display adapters but looks garbled on others, this may be the cause of your problem.

[Visual Basic]

Pitch values are useful when you are directly accessing surface memory. For example, after calling the **DirectDrawSurface7.Lock** method, the **lPitch** member is the surface pitch. You access pixels horizontally by incrementing or decrementing the surface pointer by the number of bytes per pixel, and you move up or down by adding the pitch value to, or subtracting it from, the current surface pointer.

When accessing surfaces directly, take care to stay within the memory allocated for the dimensions of the surface and stay out of any memory reserved for cache. Additionally, when you lock only a portion of a surface, you must stay within the rectangle you specify when locking the surface. Failing to follow these guidelines will have unpredictable results. When rendering directly into surface memory, always use the pitch returned by the **Lock** method (or the **DirectDrawSurface7.GetDC** method). Do not assume a pitch based solely on the display mode. If your application works on some display adapters but looks garbled on others, this may be the cause of your problem.

For more information, see Accessing Surface Memory Directly.

#### Color Keying

DirectDraw supports source and destination *color keying* for blits and overlay surfaces. Color keys enable you to display one image on top of another selectively, so that only certain pixels from the foreground rectangle are displayed, or only certain pixels on the background rectangle are overwritten.

[C++]

You supply a single color key or a range of colors for source or destination color keying by calling the **IDirectDrawSurface7::SetColorKey** method.

[Visual Basic]

You supply a single color key or a range of colors for source or destination color keying by calling the **DirectDrawSurface7.SetColorKey** method.

For more information about color keying, see the following topics:

Overlay Color Keys

Transparent Blitting

#### Pixel Formats

[C++]

Pixel formats dictate how data for each pixel in surface memory is to be interpreted. DirectDraw uses the **DDPIXELFORMAT** structure to describe various pixel formats. The **DDPIXELFORMAT** contains members to describe the following traits of a pixel format:

Palettized or non-palettized pixel format

If non-palettized, whether the pixel format is RGB or YUV

Bit depth

Bitmasks for the pixel format's components

You can retrieve information about an existing surface's pixel format by calling the **IDirectDrawSurface7::GetPixelFormat** method.

[Visual Basic]

Pixel formats dictate how data for each pixel in surface memory is to be interpreted. DirectDraw uses the **DDPIXELFORMAT** type to describe various pixel formats. The **DDPIXELFORMAT** contains members to describe the following traits of a pixel format:

Palettized or non-palettized pixel format

If non-palettized, whether the pixel format is RGB or YUV

Bit depth

Bitmasks for the pixel format's components

You can retrieve information about an existing surface's pixel format by calling the **DirectDrawSurface7.GetPixelFormat** method.

### Creating Surfaces

The DirectDrawSurface object represents a surface that usually resides in the display memory, but can exist in system memory if display memory is exhausted or if it is explicitly requested.

[C++]

Use the **IDirectDraw7::CreateSurface** method to create one surface or to simultaneously create multiple surfaces (a complex surface). When calling **CreateSurface**, you specify the dimensions of the surface, whether it is a single surface or a complex surface, and the pixel format (if the surface won't be using an indexed palette). All these characteristics are contained in a **DDSURFACEDESC2** structure, whose address you send with the call. If the hardware can't support the requested capabilities or if it previously allocated those resources to another DirectDrawSurface object, the call will fail.

[Visual Basic]

Use the **DirectDraw7.CreateSurface** method to create one surface or to simultaneously create multiple surfaces (a complex surface). When calling **CreateSurface**, you specify the dimensions of the surface, whether it is a single surface or a complex surface, and the pixel format (if the surface won't be using an indexed palette). All these characteristics are contained in a **DDSURFACEDESC2** type, whose address you send with the call. If the hardware can't support the requested capabilities or if it previously allocated those resources to another DirectDrawSurface object, the call will fail.

Creating single surfaces or multiple surfaces is a simple matter that requires only a few lines of code. There are a few common situations (and some less common ones) in which you will need to create surfaces. The following situations are discussed:

Creating the Primary Surface

Creating an Off-Screen Surface

Creating Complex Surfaces and Flipping Chains

Creating Wide Surfaces

Creating Client Memory Surfaces

[C++]

By default, for all surfaces except client memory surfaces, DirectDraw attempts to create a surface in local video memory. If there isn't enough local video memory available to hold the surface, DirectDraw will try to use non-local video memory (on some Accelerated Graphics Port-equipped systems), and fall back on system memory if all other types of memory are unavailable. You can explicitly request that a surface be created in a certain type of memory by including the appropriate flags in the associated **DDSCAPS2** structure when calling **IDirectDraw7::CreateSurface**.

[Visual Basic]

By default, for all surfaces except client memory surfaces, DirectDraw attempts to create a surface in local video memory. If there isn't enough local video memory available to hold the surface, DirectDraw will try to use non-local video memory (on some Accelerated Graphics Port-equipped systems), and fall back on system memory if all other types of memory are unavailable. You can explicitly request that a surface be created in a certain type of memory by including the appropriate flags in the associated **DDSCAPS2** type when calling **DirectDraw7.CreateSurface**.

#### Creating the Primary Surface

The primary surface is the surface currently visible on the monitor and is identified by the DDSCAPS\_PRIMARYSURFACE flag. You can only have one primary surface for each DirectDraw object.

When you create a primary surface, remember that the dimensions and pixel format implicitly match the current display mode. Therefore, this is the one time you don't need to declare a surface's dimensions or pixel format. If you do specify them, the call will fail and return DDERR\_INVALIDPARAMS—even if the information you used matches the current display mode.

[C++]

The following example shows how to prepare the **DDSURFACEDESC2** structure members relevant for creating the primary surface.

DDSURFACEDESC2 ddsd;

ddsd.dwSize = sizeof(ddsd);

// Tell DirectDraw which members are valid.

ddsd.dwFlags = DDSD\_CAPS;

// Request a primary surface.

ddsd.ddsCaps.dwCaps = DDSCAPS\_PRIMARYSURFACE;

After creating the primary surface, you can retrieve information about its dimensions and pixel format by calling its **IDirectDrawSurface7::GetSurfaceDesc** method.

[Visual Basic]

The following example shows how to prepare the **DDSURFACEDESC2** type members relevant for creating the primary surface.

Dim ddsd As DDSURFACEDESC2

// Tell DirectDraw which members are valid.

ddsd.lFlags = DDSD\_CAPS;

// Request a primary surface.

ddsd.ddsCaps.lCaps = DDSCAPS\_PRIMARYSURFACE;

After creating the primary surface, you can retrieve information about its dimensions and pixel format by calling its **DirectDrawSurface7.GetSurfaceDesc** method.

See also Display Modes.

#### Creating an Off-Screen Surface

[C++]

An off-screen surface is often used to cache bitmaps that will later be blitted to the primary surface or a back buffer. You must declare the dimensions of an off-screen surface by including the DDSD\_WIDTH and DDSD\_HEIGHT flags and the corresponding values in the **dwWidth** and **dwHeight** members. Additionally, you must include the DDSCAPS\_OFFSCREENPLAIN flag in the accompanying **DDSCAPS2** structure.

By default, DirectDraw creates a surface in display memory unless it will not fit, in which case it creates the surface in system memory. You can explicitly choose display or system memory by including the DDSCAPS\_SYSTEMMEMORY or DDSCAPS\_VIDEOMEMORY flags in the **dwCaps** member of the **DDSCAPS2** structure. The method fails, returning an error, if it can't create the surface in the specified location.

The following example shows how to prepare for creating a simple off-screen surface:

DDSURFACEDESC2 ddsd;

ddsd.dwSize = sizeof(ddsd);

// Tell DirectDraw which members are valid.

ddsd.dwFlags = DDSD\_CAPS | DDSD\_HEIGHT | DDSD\_WIDTH;

// Request a simple off-screen surface, sized

// 100 by 100 pixels.

//

// (This assumes that the off-screen surface we are about

// to create will match the pixel format of the

// primary surface.)

ddsd.ddsCaps.dwCaps = DDSCAPS\_OFFSCREENPLAIN;

ddsd.dwHeight = 100;

ddsd.dwWidth = 100;

Additionally, you can create surfaces whose pixel format differs from the primary surface's pixel format. However, in this case there is one drawback—you are limited to using system memory. The following code fragment shows how to prepare the **DDSURFACEDESC2** structure members in order to create an 8-bit palettized surface (assuming that the current display mode is something other than 8-bits per pixel).

ZeroMemory(&ddsd, sizeof(ddsd));

ddsd.dwSize = sizeof(ddsd);

ddsd.dwFlags = DDSD\_CAPS | DDSD\_HEIGHT | DDSD\_WIDTH | DDSD\_PIXELFORMAT;

ddsd.ddsCaps.dwCaps = DDSCAPS\_OFFSCREENPLAIN | DDSCAPS\_SYSTEMMEMORY;

ddsd.dwHeight = 100;

ddsd.dwWidth = 100;

ddsd.ddpfPixelFormat.dwSize = sizeof(DDPIXELFORMAT);

ddsd.ddpfPixelFormat.dwFlags = DDPF\_RGB | DDPF\_PALETTEINDEXED8;

// Set the bit depth for an 8-bit surface, but DO NOT

// specify any RGB mask values. The masks must be zero

// for a palettized surface.

ddsd.ddpfPixelFormat.dwRGBBitCount = 8;

[Visual Basic]

An off-screen surface is often used to cache bitmaps that will later be blitted to the primary surface or a back buffer. You must declare the dimensions of an off-screen surface by including the DDSD\_WIDTH and DDSD\_HEIGHT flags and the corresponding values in the **lWidth** and **lHeight** members. Additionally, you must include the DDSCAPS\_OFFSCREENPLAIN flag in the accompanying **DDSCAPS2** type.

By default, DirectDraw creates a surface in display memory unless it will not fit, in which case it creates the surface in system memory. You can explicitly choose display or system memory by including the DDSCAPS\_SYSTEMMEMORY or DDSCAPS\_VIDEOMEMORY flags in the **lCaps** member of the **DDSCAPS2** type. The method fails, returning an error, if it can't create the surface in the specified location.

The following example shows how to prepare for creating a simple off-screen surface:

Dim ddsd As DDSURFACEDESC2

// Tell DirectDraw which members are valid.

ddsd.lFlags = DDSD\_CAPS Or DDSD\_HEIGHT Or DDSD\_WIDTH

// Request a simple off-screen surface, sized

// 100 by 100 pixels.

//

// (This assumes that the off-screen surface we are about

// to create will match the pixel format of the

// primary surface.)

ddsd.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN

ddsd.lHeight = 100

ddsd.lWidth = 100

Additionally, you can create surfaces whose pixel format differs from the primary surface's pixel format. However, in this case there is one drawback—you are limited to using system memory. The following code fragment shows how to prepare the **DDSURFACEDESC2** type members in order to create an 8-bit palettized surface (assuming that the current display mode is something other than 8-bits per pixel).

ddsd.lFlags = DDSD\_CAPS Or DDSD\_HEIGHT Or DDSD\_WIDTH Or DDSD\_PIXELFORMAT

ddsd.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN Or DDSCAPS\_SYSTEMMEMORY

ddsd.lHeight = 100

ddsd.lWidth = 100

ddsd.ddpfPixelFormat.lFlags = DDPF\_RGB Or DDPF\_PALETTEINDEXED8

// Set the bit depth for an 8-bit surface, but DO NOT

// specify any RGB mask values. The masks must be zero

// for a palettized surface.

ddsd.ddpfPixelFormat.lRGBBitCount = 8

In previous versions of DirectX, the maximum width of off-screen surfaces was limited to the width of the primary surface. Beginning with DirectX 5.0, you can create surfaces as wide as you need, permitting that the display hardware can support them. Be careful when declaring wide off-screen surfaces; if the video card memory cannot hold a surface as wide as you request, the surface is created in system memory. If you explicitly choose video memory and the hardware can't support it, the call fails. For more information, see Creating Wide Surfaces.

#### Creating Complex Surfaces and Flipping Chains

[C++]

You can also create *complex surfaces*. A complex surface is a set of surfaces created with a single call to the **IDirectDraw7::CreateSurface** method. If the DDSCAPS\_COMPLEX flag is set when you call **CreateSurface** call, DirectDraw implicitly creates one or more surfaces in addition to the surface explicitly specified. You manage complex surfaces just like a single surfacea single call to the **IDirectDraw::Release** method releases all surfaces, and a single call to the **IDirectDrawSurface7::Restore** method restores them all. However, implicitly created surfaces cannot be detached. For more information, see **IDirectDrawSurface7::DeleteAttachedSurface**.

[Visual Basic]

You can also create *complex surfaces*. A complex surface is a set of surfaces created with a single call to the **DirectDraw7.CreateSurface** method. If the DDSCAPS\_COMPLEX flag is set when you call **CreateSurface** call, DirectDraw implicitly creates one or more surfaces in addition to the surface explicitly specified. You manage complex surfaces just like a single surfacea single call to the **DirectDrawSurface7.Restore** method restores them all. However, implicitly created surfaces cannot be detached. For more information, see **DirectDrawSurface7.DeleteAttachedSurface**.

One of the most useful complex surfaces you can create is a flipping chain. Usually, a flipping chain is made of a primary surface and one or more back buffers. The DDSCAPS\_FLIP flag indicates that a surface is part of a flipping chain. Creating a flipping chain this way requires that you also include the DDSCAPS\_COMPLEX flag.

[C++]

The following example shows how to prepare for creating a primary surface flipping chain.

DDSURFACEDESC2 ddsd2;

ddsd2.dwSize = sizeof(ddsd2);

// Tell DirectDraw which members are valid.

ddsd2.dwFlags = DDSD\_CAPS | DDSD\_BACKBUFFERCOUNT;

// Request a primary surface with a single

// back buffer

ddsd2.ddsCaps.dwCaps = DDSCAPS\_COMPLEX | DDSCAPS\_FLIP |

DDSCAPS\_PRIMARYSURFACE;

ddsd2.dwBackBufferCount = 1;

The previous example constructs a double-buffered flipping environmenta single call to the **IDirectDrawSurface7::Flip** method exchanges the surface memory of the primary surface and the back buffer. If you specify 2 for the value of the **dwBackBufferCount** member of the **DDSURFACEDESC2** structure, two back buffers are created, and each call to **Flip** rotates the surfaces in a circular pattern, providing a triple-buffered flipping environment. For more information, see Flipping Surfaces.

[Visual Basic]

The following example shows how to prepare for creating a primary surface flipping chain.

Dim ddsd2 As DDSURFACEDESC2

// Tell DirectDraw which members are valid.

ddsd2.lFlags = DDSD\_CAPS Or DDSD\_BACKBUFFERCOUNT

// Request a primary surface with a single

// back buffer

ddsd2.ddsCaps.lCaps = DDSCAPS\_COMPLEX Or DDSCAPS\_FLIP Or

DDSCAPS\_PRIMARYSURFACE

ddsd2.lBackBufferCount = 1

The previous example constructs a double-buffered flipping environmenta single call to the **DirectDrawSurface7.Flip** method exchanges the surface memory of the primary surface and the back buffer. If you specify 2 for the value of the **lBackBufferCount** member of the **DDSURFACEDESC2** type, two back buffers are created, and each call to **Flip** rotates the surfaces in a circular pattern, providing a triple-buffered flipping environment. For more information, see Flipping Surfaces.

Note

To create a flipping chain that comprises surfaces that will be used as 3-D render targets, be sure to include the DDSCAPS\_3DDEVICE capability flag in the surface description, as well as the DDSCAPS\_COMPLEX and DDSCAPS\_FLIP flags.

[C++]

Unlike the **CreateSurface** method exposed by the **IDirectDraw3** and earlier interfaces, you cannot use **IDirectDraw7::CreateSurface** to implicitly create a flipping chain of render target surfaces with an attached depth-buffer. The **DDSURFACEDESC2** structure that the **IDirectDraw7::CreateSurface** method accepts doesn't contain a field to specify a depth-buffer bit depth. As a result, applications must create a depth-buffer surface explicitly, then attach it to the back-buffer render target surface. For more information, see Depth Buffers.

#### Creating Wide Surfaces

DirectDraw allows you to create off-screen surfaces in video memory that are wider that the primary surface. This is only possible when display device support for wide surfaces is present.

[C++]

To check for wide surface support, call **IDirectDraw7::GetCaps** and look for the DDCAPS2\_WIDESURFACES flag in the **dwCaps2** member of the first **DDCAPS** structure you send with the call. If the flag is present, you can create video memory off-screen surfaces that are wider that the primary surface.

If you attempt to create a wide surface in video memory when the DDCAPS2\_WIDESURFACES flag isn't present, the attempt will fail and return DDERR\_INVALIDPARAMS. Note that attempting to create extremely large surfaces might still fail, even if the driver exposes the DDCAPS2\_WIDESURFACES flag.

Wide surfaces are always supported for system memory surfaces, video port surfaces, and execute buffers.

[Visual Basic]

To check for wide surface support, call **DirectDraw7.GetCaps** and look for the DDCAPS2\_WIDESURFACES flag in the **lCaps2** member of the first **DDCAPS** type you send with the call. If the flag is present, you can create video memory off-screen surfaces that are wider that the primary surface.

If you attempt to create a wide surface in video memory when the DDCAPS2\_WIDESURFACES flag isn't present, the attempt will fail and raise a DDERR\_INVALIDPARAMS error. Note that attempting to create extremely large surfaces might still fail, even if the driver exposes the DDCAPS2\_WIDESURFACES flag.

Wide surfaces are always supported for system memory surfaces.

#### Creating Client Memory Surfaces

Client memory surfaces are simply DirectDrawSurface objects that use system memory that your application has previously allocated to hold image data. Creating such a surface isn't common, but it isn't difficult to do and it can be useful for applications that need to use DirectDraw surface features on existing memory buffers.

[C++]

When creating surfaces, DirectDraw needs information about the dimensions of the surface (measured in pixels) and the surface pitch (measured in bytes), as well as the surface's pixel format. However, unlike creating other types of surfaces, this information for client memory surfaces doesn't tell DirectDraw how you want the surface to be created, it tells DirectDraw how you've already created it. You set these characteristics, plus the memory address of the buffer you've allocated, in the **DDSURFACEDESC2** structure you pass to the **IDirectDraw7::CreateSurface** method.

A client memory surfaces works just like a normal system-memory surface, with the exception that DirectDraw does not attempt to free the surface memory when it's no longer needed; freeing client allocated memory is the application's responsibility.

The following example shows how you might allocate memory and create a DirectDrawSurface object for a 6464 pixel 24-bit RGB surface:

// For this example, g\_lpDD is a valid IDirectDraw7 interface pointer.

#define WIDTH 64 // in pixels

#define HEIGHT 64

#define DEPTH 3 // in bytes (3bytes == 24 bits)

HRESULT hr;

LPVOID lpSurface = NULL;

HLOCAL hMemHandle = NULL;

DDSURFACEDESC2 ddsd2;

LPDIRECTDRAWSURFACE7 lpDDS;

// Allocate memory for a 64 by 64, 24-bit per pixel buffer.

// REMEMBER: The application is responsible for freeing this

// buffer when it is no longer needed.

if (lpSurface = malloc((size\_t)WIDTH\*HEIGHT\*DEPTH))

ZeroMemory(lpSurface, (DWORD)WIDTH\*HEIGHT\*DEPTH);

else

return DDERR\_OUTOFMEMORY;

// Initialize the surface description.

ZeroMemory(&ddsd2, sizeof(DDSURFACEDESC2));

ZeroMemory(&ddsd2.ddpfPixelFormat, sizeof(DDPIXELFORMAT));

ddsd2.dwSize = sizeof(ddsd2);

ddsd2.dwFlags = DDSD\_WIDTH | DDSD\_HEIGHT | DDSD\_LPSURFACE |

DDSD\_PITCH | DDSD\_PIXELFORMAT | DDSD\_CAPS;

ddsd2.ddsCaps.dwCaps = DDSCAPS\_OFFSCREENPLAIN |

DDSCAPS\_SYSTEMMEMORY;

ddsd2.dwWidth = WIDTH;

ddsd2.dwHeight= HEIGHT;

ddsd2.lPitch = (LONG)DEPTH \* WIDTH;

ddsd2.lpSurface = lpSurface;

// Set up the pixel format for 24-bit RGB (8-8-8).

ddsd2.ddpfPixelFormat.dwSize = sizeof(DDPIXELFORMAT);

ddsd2.ddpfPixelFormat.dwFlags= DDPF\_RGB;

ddsd2.ddpfPixelFormat.dwRGBBitCount = (DWORD)DEPTH\*8;

ddsd2.ddpfPixelFormat.dwRBitMask = 0x00FF0000;

ddsd2.ddpfPixelFormat.dwGBitMask = 0x0000FF00;

ddsd2.ddpfPixelFormat.dwBBitMask = 0x000000FF;

// Create the surface

hr = g\_lpDD->CreateSurface(&ddsd2, &lpDDS, NULL);

return hr;

[Visual Basic]

When creating surfaces, DirectDraw needs information about the dimensions of the surface (measured in pixels) and the surface pitch (measured in bytes), as well as the surface's pixel format. However, unlike creating other types of surfaces, this information for client memory surfaces doesn't tell DirectDraw how you want the surface to be created, it tells DirectDraw how you've already created it. You set these characteristics, plus the memory address of the buffer you've allocated, in the **DDSURFACEDESC2** type you pass to the **DirectDraw7.CreateSurface** method.

A client memory surfaces works just like a normal system-memory surface, with the exception that DirectDraw does not attempt to free the surface memory when it's no longer needed; freeing client allocated memory is the application's responsibility.

The following example shows how you might allocate memory and create a DirectDrawSurface object for a 6464 pixel 24-bit RGB surface:

'For this example, dd is a valid DirectDraw7 object.

Const cWIDTH = 64 'in pixels

Const cHEIGHT = 64

Const cDEPTH = 3 'in bytes (3 bytes = 24 bits)

Dim ddsd2 As DDSURFACEDESC2

Dim dds As DirectDrawSurface7

Private Sub Form\_Load()

'Initialize the surface description.

With ddsd2

.lFlags = DDSD\_WIDTH Or DDSD\_HEIGHT Or DDSD\_PITCH Or DDSD\_PIXELFORMAT Or DDSD\_CAPS

.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN Or DDSCAPS\_SYSTEMMEMORY

.lWidth = cWIDTH

.lHeight = cHEIGHT

.lPitch = cDEPTH \* cWIDTH

'Set up the pixel format for 24-bit RGB (8-8-8).

With .ddpfPixelFormat

.lFlags = DDPF\_RGB

.lRGBBitCount = cDEPTH \* 8

.lRBitMask = &HFF0000

.lGBitMask = &HFF00&

.lBBitMask = &HFF&

End With

End With

'Create the surface.

Set dds = dd.CreateSurface(ddsd2)

End Sub

### Flipping Surfaces

Any surface in DirectDraw can be constructed as a *flipping surface*. A flipping surface is any piece of memory that can be swapped between a *front buffer* and a *back buffer*. (This construct is commonly referred to as a *flipping chain*). Often, the front buffer is the primary surface, but it doesn't have to be.

[C++]

Typically, when you use the **IDirectDrawSurface7::Flip** method to request a surface flip operation, the pointers to surface memory for the primary surface and back buffers are swapped. Flipping is performed by switching pointers that the display device uses for referencing memory, not by copying surface memory. (The exception to this is when DirectDraw is emulating the flip, in which case it simply copies the surfaces. DirectDraw emulates flip operations if a back buffer cannot fit into display memory or if the hardware doesn't support DirectDraw.) When a flipping chain contains a primary surface and more than one back buffer, the pointers are switched in a circular pattern, as shown in the following illustration.

[Visual Basic]

Typically, when you use the **DirectDrawSurface7.Flip** method to request a surface flip operation, the pointers to surface memory for the primary surface and back buffers are swapped. Flipping is performed by switching pointers that the display device uses for referencing memory, not by copying surface memory. (The exception to this is when DirectDraw is emulating the flip, in which case it simply copies the surfaces. DirectDraw emulates flip operations if a back buffer cannot fit into display memory or if the hardware doesn't support DirectDraw.) When a flipping chain contains a primary surface and more than one back buffer, the pointers are switched in a circular pattern, as shown in the following illustration.



Other surfaces that are attached to a DirectDraw object, but not part of the flipping chain, are unaffected when the **Flip** method is called.

Remember, DirectDraw flips surfaces by swapping surface memory pointers within DirectDrawSurface objects, not by swapping the objects themselves. This means that, to blit to the back buffer in any type of flipping scheme, you always use the same DirectDrawSurface object — the one that was the back buffer when you created the flipping chain. Conversely, you always perform a flip operation by calling the front surface's **Flip** method.

[C++]

When working with visible surfaces, such as a primary surface flipping chain or a visible overlay surface flipping chain, the **Flip** method is asynchronous unless you include the DDFLIP\_WAIT flag. On these visible surfaces, the **Flip** method can return before the actual flip operation occurs in the hardware (because the hardware doesn't flip until the next vertical refresh occurs). While the actual flip operation is pending, the back buffer behind the currently visible surface can't be locked or blitted by calling the **IDirectDrawSurface7::Lock**, **IDirectDrawSurface7::Blt**, **IDirectDrawSurface7::BltFast**, or **IDirectDrawSurface7::GetDC** methods. If you attempt to call these methods while a flip operation is pending, they will fail and return DDERR\_WASSTILLDRAWING. However, if you are using a triple buffered scheme, the rearmost buffer is still available.

[Visual Basic]

When working with visible surfaces, such as a primary surface flipping chain or a visible overlay surface flipping chain, the **Flip** method is asynchronous unless you include the DDFLIP\_WAIT flag. On these visible surfaces, the **Flip** method can return before the actual flip operation occurs in the hardware (because the hardware doesn't flip until the next vertical refresh occurs). While the actual flip operation is pending, the back buffer behind the currently visible surface can't be locked or blitted by calling the **DirectDrawSurface7.Lock**, **DirectDrawSurface7.Blt**, **DirectDrawSurface7.BltColorFill**, **DirectDrawSurface7.BltFast**, **DirectDrawSurface7.BltFx**, **DirectDrawSurface7.BltToDC** or **DirectDrawSurface7.GetDC** methods. If you attempt to call these methods while a flip operation is pending, they will fail and raise the DDERR\_WASSTILLDRAWING error. However, if you are using a triple buffered scheme, the rearmost buffer is still available.

### Blitting to Surfaces

This section is a guide to copying pixels from one DirectDraw surface to another, or from one part of a surface to another.

The following topics are covered:

Blitting Basics

Blitting with BltFast

Blitting with Blt

Blit Timing

Transparent Blitting

Color Fills

Blitting to Multiple Windows

#### Blitting Basics

[C++]

Two methods are available for copying images to a DirectDraw surface: **IDirectDrawSurface7::Blt** and **IDirectDrawSurface7::BltFast**. (A third method, **IDirectDrawSurface7::BltBatch**, is not implemented in this version of DirectX.) These methods are called on the destination surface and receive the source surface as a parameter. The destination and source surfaces can be one and the same, and you don't have to worry about overlap—DirectDraw takes care to preserve all source pixels before overwriting them.

Of the two implemented methods, **Blt** is the more flexible and **BltFast** is the faster—but only if there is no hardware blitter. You can determine the blitting capabilities of the hardware from the **DDCAPS** structure obtained in the *lpDDDriverCaps* parameter of the **IDirectDraw7::GetCaps** method. If the **dwCaps** member contains DDCAPS\_BLT, the hardware has at least minimal blitting capabilities.

[Visual Basic]

Five methods are available for copying images to a DirectDraw surface: **DirectDrawSurface7.Blt**, **DirectDrawSurface7.BltColorFill**, **DirectDrawSurface7.BltFast**, **DirectDrawSurface7.BltFx** and **DirectDrawSurface7.BltToDC**. These methods are called on the destination surface and receive the source surface as a parameter. The destination and source surfaces can be one and the same, and you don't have to worry about overlap—DirectDraw takes care to preserve all source pixels before overwriting them.

Of the implemented methods, **Blt** is the more flexible and **BltFast** is the faster—but only if there is no hardware blitter. You can determine the blitting capabilities of the hardware from the **DDCAPS** type obtained in the *hwCaps* parameter of the **DirectDraw7.GetCaps** method. If the **lCaps** member contains DDCAPS\_BLT, the hardware has at least minimal blitting capabilities.

#### Blitting with BltFast

[C++]

When using **IDirectDrawSurface7::BltFast**, you supply a valid rectangle in the source surface from which the pixels are to be copied (or NULL to specify the entire surface), and an x-coordinate and y-coordinate in the destination surface. The source rectangle must be able to fit in the destination surface with its top left corner at that point, or the call will fail with a return value of DDERR\_INVALIDRECT. **BltFast** cannot be used on surfaces that have an attached clipper.

No stretching, mirroring, or other effects can be performed when using **BltFast**.

**BltFast Example**

The following example copies pixels from an off-screen surface, *lpDDSOffOne*, to the primary surface, *lpDDSPrimary*. The flags ensure that the operation will take place as soon as the blitter is free, and that transparent pixels in the source image will not be copied. (For more information on the meaning of these flags, see Blit Timing and Transparent Blitting .)

lpDDSPrimary->BltFast(

100, 200, // Upper left xy of destination

lpDDSOffOne, // Source surface

NULL, // Source rectangle = entire surface

DDBLTFAST\_WAIT | DDBLTFAST\_SRCCOLORKEY );

[Visual Basic]

When using **DirectDrawSurface7.BltFast**, you supply a valid rectangle in the source surface from which the pixels are to be copied (or an empty **RECT** type to specify the entire surface), and an x-coordinate and y-coordinate in the destination surface. The source rectangle must be able to fit in the destination surface with its top left corner at that point, or the call will fail and raise an error value of DDERR\_INVALIDRECT. **BltFast** cannot be used on surfaces that have an attached clipper.

No stretching, mirroring, or other effects can be performed when using **BltFast**.

**BltFast Example**

The following example copies pixels from an off-screen surface, *DDSOffOne*, to the primary surface, *DDSPrimary*. The flags ensure that the operation will take place as soon as the blitter is free, and that transparent pixels in the source image will not be copied. (For more information on the meaning of these flags, see Blit Timing and Transparent Blitting.)

DDSPrimary.BltFast(

100, 200, // Upper left xy of destination

DDSOffOne, // Source surface

SrcRect, // Source rectangle, empty RECT = entire surface

DDBLTFAST\_WAIT Or DDBLTFAST\_SRCCOLORKEY )

#### Blitting with Blt

[C++]

When using the **IDirectDrawSurface7::Blt** method, you supply a valid rectangle in the source surface (or NULL to specify the entire surface), and a rectangle in the destination surface to which the source image will be copied (again, NULL means the rectangle covers the entire surface). If a clipper is attached to the destination surface, the bounds of the destination rectangle can fall outside the surface and clipping will be performed. If there is no clipper, the destination rectangle must fall entirely within the surface or else the method will fail with DDERR\_INVALIDRECT. (For more information on clipping, see Clippers.)

**Scaling**

The **Blt** method automatically re-scales the source image to fit the destination rectangle. If resizing is not your intention, for best performance you should make sure that your source and destination rectangles are exactly the same size, or else use **IDirectDrawSurface7:BltFast**. (See Blitting with BltFast.)

Hardware acceleration for scaling depends on the DDFXCAPS\_BLT\* flags in the **dwFXCaps** member of the **DDCAPS** structure for the device. If, for example, a device has the DDFXCAPS\_BLTSTRETCHXN capability but not DDFXCAPS\_BLTSTRETCHX, it can assist when the x-axis of the source rectangle is being multiplied by a whole number but not when non-integral (arbitrary) scaling is being done.

Devices might also support arithmetic scaling, which is scaling by interpolation rather than simple multiplication or deletion of pixels. For instance, if an axis was being increased by one-third, the pixels would be recolored to provide a closer approximation to the original image than would be produced by the doubling of every third pixel on that axis.

Applications cannot control the type of scaling done by the driver, except by setting the DDBLTFX\_ARITHSTRETCHY flag in the **dwDDFX** member of the **DDBLTFX** structure passed to **Blt**. This flag requests that arithmetic stretching be done on the y-axis. Arithmetic stretching on the x-axis and arithmetic shrinking are not currently supported in the DirectDraw API, but a driver may perform them by default.

**Other Effects**

If you do not require any special effects other than scaling when using **Blt**, you can pass NULL as the *lpDDBltFx* parameter. Otherwise you can choose among a variety of effects specified in a **DDBLTFX** structure. Among these, color fills and mirroring are supported by the HEL, so they are always available. Most other effects depend on hardware support.

For a complete view of the effects capabilities of the HEL, run the DDraw Caps utility supplied with the DirectX SDK and select HEL FX Caps from the HEL menu. For an explanation of the various flags, see **DDCAPS**. You can also check HEL capabilities within your own application by using the **IDirectDraw7::GetCaps** method.

When you specify an effect that requires a value in one of the members of the **DDBLTFX** structure passed to the **IDirectDrawSurface7::Blt** method, you must also include the appropriate flags in the *dwFlags* parameter to show which members of the structure are valid.

Some effects require only the setting of a flag in the **dwFlags** member of **DDBLTFX.** One of these is DDBLTFX\_NOTEARING. You can use this flag when you are blitting animated images directly to the front buffer, so that the blit is timed to coincide with the screen refresh and the possibility of tearing is minimized. Mirroring and rotation are also set by using flags.

Blitting effects include the standard raster operations (ROPs) used by GDI functions such as **BitBlt**. The only ROPs supported by the HEL are SRCCOPY (the default), BLACKNESS, and WHITENESS. Hardware support for other ROPs can be examined in the **DDCAPS** structure for the driver. If you wish to use any of the standard ROPS with the **Blt** method, you flag them in the **dwROP** member of the **DDBLTFX** structure.

The **dwDDROP** member of the **DDBLTFX** structure is for specifying ROPs specific to DirectDraw. However, no such ROPs are currently defined.

**Alpha and Z Values**

Opacity and depth values are not currently supported in DirectDraw blits. If alpha values are stored in the pixel format, they simply overwrite any alpha values in the destination rectangle. Values from alpha buffers and z-buffers are ignored. The members of the **DDBLTFX** structure that have to do with alpha channels and z-buffers (members whose names begin with "dwAlpha" and "dwZ"), and the corresponding flags for **Blt**, are not used. The same applies to the DDBLTFX\_ZBUFFERBASEDEST and DDBLTFX\_ZBUFFERRANGE flags in the **dwDDFX** member of the **DDBLTFX** structure.

Although z-buffers are currently used only in Direct3D applications, you can use **IDirectDrawSurface7::Blt** to set the depth value for a z-buffer surface, by setting the DDBLT\_DEPTHFILL flag. For more information, see Clearing Depth Buffers.

For an overview of the use of alpha channels and z-buffers in Direct3D, see the following topics:

Alpha-blending States

What Are Depth Buffers?

**Blt Example**

The following example, in which it is assumed that *lpDDS* is a valid **IDirectDrawSurface7** pointer, creates a symmetrical image within the surface by mirroring a rectangle from left to right:

RECT rcSource, rcDest;

DDBLTFX ddbltfx;

ZeroMemory(&ddbltfx, sizeof(ddbltfx));

ddbltfx.dwSize = sizeof(ddbltfx);

ddbltfx.dwDDFX = DDBLTFX\_MIRRORLEFTRIGHT;

rcSource.top = 0; rcSource.left = 0;

rcSource.bottom = 100; rcSource.right = 200;

rcDest.top = 0; rcDest.left = 201;

rcDest.bottom = 100; rcDest.right = 401;

HRESULT hr = lpDDS->Blt(&rcDest,

lpDDS,

&rcSource,

DDBLT\_WAIT | DDBLT\_DDFX,

&ddbltfx);

[Visual Basic]

When using the **DirectDrawSurface7.Blt** method, you supply a valid rectangle in the source surface (or an empty **RECT** to specify the entire surface), and a rectangle in the destination surface to which the source image will be copied (again, passing an empty **RECT** means the rectangle covers the entire surface). If a clipper is attached to the destination surface, the bounds of the destination rectangle can fall outside the surface and clipping will be performed. If there is no clipper, the destination rectangle must fall entirely within the surface or else the method will raise the DDERR\_INVALIDRECT error. (For more information on clipping, see Clippers.)

**Scaling**

The **Blt** method automatically re-scales the source image to fit the destination rectangle. If resizing is not your intention, for best performance you should make sure that your source and destination rectangles are exactly the same size, or else use **DirectDrawSurface7.BltFast**. (See Blitting with BltFast.)

Hardware acceleration for scaling depends on the DDFXCAPS\_BLT\* flags in the **lFXCaps** member of the **DDCAPS** type for the device. If, for example, a device has the DDFXCAPS\_BLTSTRETCHXN capability but not DDFXCAPS\_BLTSTRETCHX, it can assist when the x-axis of the source rectangle is being multiplied by a whole number but not when non-integral (arbitrary) scaling is being done.

Devices might also support arithmetic scaling, which is scaling by interpolation rather than simple multiplication or deletion of pixels. For instance, if an axis was being increased by one-third, the pixels would be recolored to provide a closer approximation to the original image than would be produced by the doubling of every third pixel on that axis.

Applications cannot control the type of scaling done by the driver, except by setting the DDBLTFX\_ARITHSTRETCHY flag in the **lDDFX** member of the **DDBLTFX** type passed to **Blt**. This flag requests that arithmetic stretching be done on the y-axis. Arithmetic stretching on the x-axis and arithmetic shrinking are not currently supported in the DirectDraw API, but a driver may perform them by default.

**Other Effects**

If you want to use any special effects other than scaling use the **DirectDrawSurface7.BltFx** method. In this method, you can choose among a variety of effects specified in a **DDBLTFX** type. Among these, color fills and mirroring are supported by the HEL, so they are always available. Most other effects depend on hardware support.

For a complete view of the effects capabilities of the HEL, run the DDraw Caps utility supplied with the DirectX SDK and select HEL FX Caps from the HEL menu. For an explanation of the various flags, see **DDCAPS**. You can also check HEL capabilities within your own application by using the **DirectDraw7.GetCaps** method.

When you specify an effect that requires a value in one of the members of the **DDBLTFX** structure passed to the **DirectDrawSurface7.BltFx** method, you must also include the appropriate flags in the *flags* parameter to show which members of the type are valid.

Some effects require only the setting of a flag in the **lDDFX** member of **DDBLTFX.** One of these is DDBLTFX\_NOTEARING. You can use this flag when you are blitting animated images directly to the front buffer, so that the blit is timed to coincide with the screen refresh and the possibility of tearing is minimized. Mirroring and rotation are also set by using flags.

Blitting effects include the standard raster operations (ROPs) used by GDI functions such as **BitBlt**. The only ROPs supported by the HEL are SRCCOPY (the default), BLACKNESS, and WHITENESS. Hardware support for other ROPs can be examined in the **DDCAPS** type for the driver. If you wish to use any of the standard ROPS with the **BltFx** method, you flag them in the **lROP** member of the **DDBLTFX** type.

The **lDDROP** member of the **DDBLTFX** type is for specifying ROPs specific to DirectDraw. However, no such ROPs are currently defined.

**Alpha and Z Values**

Opacity and depth values are not currently supported in DirectDraw blits. If alpha values are stored in the pixel format, they simply overwrite any alpha values in the destination rectangle. Values from alpha buffers and z-buffers are ignored. The members of the **DDBLTFX** type that have to do with alpha channels and z-buffers (members whose names begin with "lAlpha" and "lZ"), and the corresponding flags for **BltFx**, are not used. The same applies to the DDBLTFX\_ZBUFFERBASEDEST and DDBLTFX\_ZBUFFERRANGE flags in the **lDDFX** member of the **DDBLTFX** structure.

Although z-buffers are currently used only in Direct3D applications, you can use **DirectDrawSurface7.Blt** to set the depth value for a z-buffer surface, by setting the DDBLT\_DEPTHFILL flag. For more information, see Clearing Depth Buffers.

For an overview of the use of alpha channels and z-buffers in Direct3D, see the following topics:

Alpha-blending States

What Are Depth Buffers?

**Blt Example**

The following example, in which it is assumed that *DDS* is a valid **DirectDrawSurface7** object, creates a symmetrical image within the surface by mirroring a rectangle from left to right:

rcSource As RECT

rcDest As RECT

ddbltfx as DDBLTFX

ddbltfx.lDDFX = DDBLTFX\_MIRRORLEFTRIGHT

rcSource.top = 0

rcSource.left = 0

rcSource.bottom = 100

rcSource.right = 200

rcDest.top = 0

rcDest.left = 201

rcDest.bottom = 100

rcDest.right = 401

DDS.BltFx(rcDest,

DDS,

rcSource,

DDBLT\_WAIT Or DDBLT\_DDFX,

ddbltfx);

#### Blit Timing

[C++]

When you copy pixels to a surface using either **IDirectDrawSurface7::Blt** or **IDirectDrawSurface7::BltFast**, the method might fail with DDERR\_WASSTILLDRAWING because the hardware blitter was not ready to accept the command.

If your application has no urgent business to perform while waiting for the blitter to come back into a state of readiness, you can specify the DDBLT\_WAIT flag in the *dwFlags* parameter of **Blt**, or the equivalent DDBLTFAST\_WAIT flag for **BltFast**. The flag causes the method to wait until the blit can be handed off to the blitter (or until an error other than DDERR\_WASSTILLDRAWING occurs).

**Blt** accepts another flag, DDBLT\_ASYNC, that takes advantage of any hardware FIFO (first in, first out) queuing capabilities.

[Visual Basic]

When you copy pixels to a surface using either **DirectDrawSurface7.Blt**, **DirectDrawSurface7.BltColorFill**, **DirectDrawSurface7.BltFast**, **DirectDrawSurface7.BltFx** or **DirectDrawSurface7.BltToDC**, the method might fail and raise a DDERR\_WASSTILLDRAWING error because the hardware blitter was not ready to accept the command.

If your application has no urgent business to perform while waiting for the blitter to come back into a state of readiness, you can specify the DDBLT\_WAIT flag in the *flags* parameter of **Blt**, or the equivalent DDBLTFAST\_WAIT flag for **BltFast**. The flag causes the method to wait until the blit can be handed off to the blitter (or until an error other than DDERR\_WASSTILLDRAWING occurs).

**Blt** accepts another flag, DDBLT\_ASYNC, that takes advantage of any hardware FIFO (first in, first out) queuing capabilities.

#### Transparent Blitting

This section discusses the theory and practice of using transparent blitting to copy parts of a rectangular image selectively, using source and destination color keys.

The concepts are introduced in the following topic:

What Is Transparent Blitting?

Information about the implementation of transparent blitting in DirectDraw is contained in the following topics:

Color Key Format

Setting Color Keys

Blitting with Color Keys

##### What Is Transparent Blitting?

Transparent blitting enables you to create the illusion of nonrectangular blits when animating sprites. A sprite image is usually nonrectangular, but blits are always rectangular, so every pixel within the sprite's bounding rectangle becomes part of the data transfer. With transparent blitting, each pixel that is not part of the sprite image is treated as transparent when the blitter is moving the image to its destination, so that it does not overwrite the color in that pixel on the background image.

The artist creating the sprite chooses an arbitrary color or range of colors to be used as the transparency color key. This is typically a single uncommon color that the artist doesn't use for anything but transparency, and it is used to fill in all parts of the sprite rectangle that are not part of the desired image. At run time you set the color key for the surface containing the sprite. (If you wish, you can automatically set it to the color of the pixel in the upper left corner of the image.) Subsequent blits can take advantage of that color key, ignoring the pixels that match it. This type of color key is known as a source color key.

You can also use a color key on the destination surface, provided the hardware supports destination color keying. This destination color key is used for pixels that can be overwritten by a sprite. For example, the artist might be working on a foreground image that sprites are supposed to pass behind, such as the wall of a room with a window to the outside. The artist chooses an arbitrary color—one that isn't used elsewhere in the image—to represent the sky outside the window. When you set this color key for the destination surface and then blit a sprite to that surface, the sprite's pixels will overwrite only pixels that are using the destination color key. In the example, the sprite appears only in the window, but not on the wall or window frame. As a result, the sprite seems to be outside the room.

Source and destination color keys can be combined. In the example, the sprite could use a source color key so that its entire bounding rectangle does not block out the sky background.

##### Color Key Format

[C++]

A color key is described in a **DDCOLORKEY** structure. If the color key is a single color, both members of this structure should be assigned the same value. Otherwise the color key is a range of colors.

Color keys are specified using the pixel format of a surface. If a surface is in a palettized format, the color key is given as an index or a range of indices. If the surface is in a non-palattized display mode, the color keys are specified in the raw pixel format. For instance, to set a bright purple color key in 16-bit 5:6:5 mode, you would use a value of 0xf81F (All 5 red bits are set, and all 5 blue bits are set).

Some examples of valid color keys follow:

**8-bit palettized mode**

// Palette entry 26 is the color key.

dwColorSpaceLowValue = 26;

dwColorSpaceHighValue = 26;

**16-bit color mode**

// Color is bright purple

dwColorSpaceLowValue = 0xf81F;

dwColorSpaceHighValue = 0xf81F;

Support for a range of colors rather than a single color is hardware-dependent. Check the **dwCKeyCaps** member of the **DDCAPS** structure for the hardware. The HEL does not support color ranges.

[Visual Basic]

A color key is described in a **DDCOLORKEY** type. If the color key is a single color, both members of this structure should be assigned the same value. Otherwise the color key is a range of colors.

Color keys are specified using the pixel format of a surface. If a surface is in a palettized format, the color key is given as an index or a range of indices. If the surface is in a non-palattized display mode, the color keys are specified in the raw pixel format. For instance, to set a bright purple color key in 16-bit 5:6:5 mode, you would use a value of 0xf81F (All 5 red bits are set, and all 5 blue bits are set).

Some examples of valid color keys follow:

**8-bit palettized mode**

// Palette entry 26 is the color key.

low = 26

high = 26

**24-bit true-color mode**

// Color red in hex is the color key.

low = &H000000FF

high = &H000000FF

Support for a range of colors rather than a single color is hardware-dependent. Check the **lCKeyCaps** member of the **DDCAPS** type for the hardware. The HEL does not support color ranges.

##### Setting Color Keys

[C++]

You can set the source or destination color key for a surface either when creating it or afterwards.

To set a color key or keys when creating a surface, you assign the appropriate color values to one or both of the **ddckCKSrcBlt** and **ddckCKDestBlt** members of the **DDSURFACEDESC2** structure that is passed to **IDirectDraw7::CreateSurface**. To enable the color key for blitting, you must also include one or both of DDSD\_CKSRCBLT or DDSD\_CKDESTBLT in the **dwFlags** member.

To set a color key for an existing surface you use the **IDirectDrawSurface7::SetColorKey** method. You specify a key in the *lpDDColorKey* parameter and set either DDCKEY\_SRCBLT or DDCKEY\_DESTBLT in the *dwFlags* parameter to indicated whether you are setting a source or destination key. If the **DDCOLORKEY** structure contains a range of colors, you must also set the DDCKEY\_COLORSPACE flag. If this flag is not set, only the **dwColorSpaceLowValue** member of the structure is used.

[Visual Basic]

You can set the source or destination color key for a surface either when creating it or afterwards.

To set a color key or keys when creating a surface, you assign the appropriate color values to one or both of the **ddckCKSrcBlt** and **ddckCKDestBlt** members of the **DDSURFACEDESC2** type that is passed to **DirectDraw7.CreateSurface**. To enable the color key for blitting, you must also include one or both of DDSD\_CKSRCBLT or DDSD\_CKDESTBLT in the **lFlags** member.

To set a color key for an existing surface you use the **DirectDrawSurface7.SetColorKey** method. You specify a key in the *val* parameter and set either DDCKEY\_SRCBLT or DDCKEY\_DESTBLT in the *flags* parameter to indicated whether you are setting a source or destination key. If the **DDCOLORKEY** type contains a range of colors, you must also set the DDCKEY\_COLORSPACE flag. If this flag is not set, only the **low** member of the type is used.

##### Blitting with Color Keys

[C++]

If you want to use color keys for surfaces when calling the **IDirectDrawSurface7::BltFast** method, you must set one or both of the DDBLTFAST\_SRCCOLORKEY or DDBLTFAST\_DESTCOLORKEY flags in the *dwTrans* parameter.

In order to use colors keys when calling **IDirectDrawSurface7:Blt**, you pass one or both of the DDBLT\_KEYSRC or DDBLT\_KEYDEST flags in the *dwFlags* parameter. Alternatively, you can put the appropriate color values in the **ddckDestColorkey** and **ddckSrcColorkey** members of the **DDBLTFX** structure that is passed to the method through the *lpDDBltFx* parameter. In this case you must also set the DBLT\_KEYSRCOVERRIDE or DDBLT\_KEYDESTOVERRIDE flag, or both, in the *dwFlags* parameter, so that the selected keys are taken from the **DDBLTFX** structure rather than from the surface properties.

[Visual Basic]

If you want to use color keys for surfaces when calling the **DirectDrawSurface7.BltFast** method, you must set one or both of the DDBLTFAST\_SRCCOLORKEY or DDBLTFAST\_DESTCOLORKEY flags in the *trans* parameter.

In order to use colors keys when calling **DirectDrawSurface7:Blt**, you pass one or both of the DDBLT\_KEYSRC or DDBLT\_KEYDEST flags in the *flags* parameter. Alternatively, you can use the **DirectDrawSurface7:BltFx** method and put the appropriate color values in the **ddckDestColorkey\_high, ddckDestColorkey\_low**, **ddckSrcColorkey\_high** and **ddckSrcColorkey\_low** members of the **DDBLTFX** structure that is passed to the method through the *BltFx* parameter. In this case you must also set the DBLT\_KEYSRCOVERRIDE or DDBLT\_KEYDESTOVERRIDE flag, or both, in the *flags* parameter, so that the selected keys are taken from the **DDBLTFX** type rather than from the surface properties.

#### Color Fills

[C++]

In order to fill all or part of a surface with a single color, you can use the **IDirectDrawSurface7::Blt** method with the DDBLT\_COLORFILL flag. This technique allows you to quickly erase an area or draw a solid-colored background.

The following example fills an entire surface with the color blue, after obtaining the numerical value for blue from the pixel format:

/\* It is assumed that lpDDS is a valid pointer to

an IDirectDrawSurface7 interface. \*/

HRESULT ddrval;

DDPIXELFORMAT ddpf;

ddpf.dwSize = sizeof(ddpf);

if (SUCCEEDED(lpDSS->GetPixelFormat(&ddpf))

{

DDBLTFX ddbltfx;

ddbltfx.dwSize = sizeof(ddbltfx);

ddbltfx.dwFillColor = ddpf.dwBBitMask; // Pure blue

ddrval = lpDDS->Blt(

NULL, // Destination is entire surface

NULL, // No source surface

NULL, // No source rectangle

DDBLT\_COLORFILL, &ddbltfx);

switch(ddrval)

{

case DDERR\_WASSTILLDRAWING:

.

.

.

case DDERR\_SURFACELOST:

.

.

.

case DD\_OK:

.

.

.

default:

}

}

[Visual Basic]

In order to fill all or part of a surface with a single color, you can use the **DirectDrawSurface7.BltColorFill** method. This technique allows you to quickly erase an area or draw a solid-colored background.

#### Blitting to Multiple Windows

You can use a DirectDraw object and a DirectDrawClipper object to blit to multiple windows created by an application running at the normal cooperative level. For more information, see Using a Clipper with Multiple Windows.

Creating multiple DirectDraw objects that blit to each other's primary surface is not recommended.

### Losing and Restoring Surfaces

The surface memory associated with a DirectDrawSurface object may be freed, while the DirectDrawSurface objects representing these pieces of surface memory are not necessarily released. When a DirectDrawSurface object loses its surface memory, many methods return DDERR\_SURFACELOST and perform no other action.

[C++]

Surfaces can be lost because the display mode was changed or because another application received exclusive access to the display card and freed all of the surface memory currently allocated on the card. The **IDirectDrawSurface7::Restore** method re-creates these lost surfaces and reconnects them to their DirectDrawSurface object. If your application uses more than one surface, you can call the **IDirectDraw7::RestoreAllSurfaces** method to restore all of your surfaces at once.

[Visual Basic]

Surfaces can be lost because the display mode was changed or because another application received exclusive access to the display card and freed all of the surface memory currently allocated on the card. The **DirectDrawSurface7.Restore** method re-creates these lost surfaces and reconnects them to their DirectDrawSurface object. If your application uses more than one surface, you can call the **DirectDraw7.RestoreAllSurfaces** method to restore all of your surfaces at once.

Restoring a surface doesn't reload any bitmaps that may have existed in the surface prior to being lost. You must completely reconstitute the graphics they once held.

### COM Reference Count Semantics for Surfaces

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Being built upon COM means that DirectDraw follows certain rules that employ reference counts to manage object lifetimes. For a conceptual overview, see the COM documentation; a DirectDraw-centered discussion of the topic is found in Parent and Child Object Lifetimes.

By COM rules, when an interface pointer is copied by setting it to another variable or passing to another object, that copy represents another reference to the object, and therefore the **IUnknown::AddRef** method of the interface must be called to reflect the change. Not only should you follow COM reference counting rules when working with DirectDraw objects, but you should become familiar with the situations in which DirectDraw internally updates reference counts. Some DirectDraw methods—mostly those involving complex surface flipping chains—affect the reference counts of the surfaces involved, while methods involving clippers or palettes affect the reference counts of those objects. Knowing about these situations can make the difference in your application's stability and can prevent memory leaks. This section presents information divided into the following topics:

When Reference Counts Will Change

Reference Counts for Complex Surfaces

Releasing Surfaces

Note:

There are some things to remember about the reference count of the DirectDraw object, in addition to the relationships discussed in this section. For more information, see Parent and Child Object Lifetimes in The DirectDraw Object.

#### When Reference Counts Will Change

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

There are several DirectDraw methods that affect the reference count of a surface, and a few that affect other objects you can associate with a surface. You can think of these situations as "surface-only changes" and "cross-object changes":

**Surface-only changes**

Surface-only changes, as the name states, only affect the reference count of a surface object. For example, you might use the **IDirectDraw7::EnumSurfaces** to enumerate the current surfaces that fit a particular description. When the method invokes the callback function that you provide, it passes a pointer to an **IDirectDrawSurface7** interface, but it increments the reference count for the object before your application receives the pointer. It's your responsibility to release the object when you are finished with it. This will typically be at the end of your callback routine, or later if you choose to keep the object.

Most other surface-only changes affect the reference counts of complex surfaces, such as a flipping chain. Reference counts are a little more tricky for complex surfaces, because (in most cases) DirectDraw treats a complex surface as if it was a single object, even though it is a set of surfaces. In short, the **IDirectDrawSurface7::GetAttachedSurface** and **IDirectDrawSurface7::AddAttachedSurface** methods increment reference counts of surfaces, and **IDirectDrawSurface7::DeleteAttachedSurface** decrements the reference count. These methods don't affect the counts of any surfaces attached to the current surface. See the references for these methods and Reference Counts for Complex Surfaces for a additional details.

**Cross-object changes**

Cross-object reference count changes occur when you create an association between a surface and another object that performs a task for the surface, such as a clipper or a palette.

The **IDirectDrawSurface7::SetClipper** and **IDirectDrawSurface7::SetPalette** methods increment the reference count of the object being attached. After they are attached, the surface manages them; if the surface is released, it automatically releases any objects it is using. (For this reason, some applications release the interface for the object after these calls succeed. This is a perfectly valid practice.)

Once a clipper or palette is attached to a surface, you can call the **IDirectDrawSurface7::GetClipper** and **IDirectDrawSurface7::GetPalette** methods to retrieve them again. Because these methods return a copy of an interface pointer, they implicitly increment the reference count for the object being retrieved. When you're done with the interfaces, don't forget to release them—the objects that the interfaces represent won't disappear so long as the surface they are attached to still holds a reference to them.

#### Reference Counts for Complex Surfaces

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

The methods you use to manipulate a complex surface like a flipping chain all use surface interface pointers, and therefore they all affect the reference counts of the surfaces. Because a complex surface is really a series of single surfaces, the reference count relationships require a little more consideration. As you might expect, the **IDirectDrawSurface7::GetAttachedSurface** method returns the surface interface for a surface attached to the current surface. It does this after incrementing the reference count of the interface being retrieved; it's up to you to release the interface when you no longer need it. The **IDirectDrawSurface7::AddAttachedSurface** method attaches a new surface to the current one. Similarly, **AddAttachedSurface** increments the count for the surface being attached. You would use the **IDirectDrawSurface7::DeleteAttachedSurface** method to remove the surface from the chain and implicitly decrease its reference count.

What isn't immediately clear about these methods is that they don't affect the reference counts of the other objects that make up the complex surface. The **GetAttachedSurface** method simply increments the reference count of the surface it's retrieving, it doesn't affect the counts of the surfaces on which it depends. (The same situation applies to an explicit call to **IUnknown::AddRef**.) This means that the reference count for primary surface in a complex surface can reach zero before its subordinate surfaces reach zero. When the primary surface reference count reaches zero, all other surfaces attached to it are released regardless of their current reference counts. (It's like a tree: if you cut the base, the whole thing falls. In this case, the primary surface is the base.) Attempts to access subordinate surfaces after the primary surface has been deallocated will result in memory faults.

To avoid problems, make sure that your application has released all subordinate surface references before attempting to release the primary surface. It might be helpful to track the references your application holds, only accessing subordinate surface interfaces when you're sure that you also hold a reference the primary surface.

#### Releasing Surfaces

[C++]

Like all COM interfaces, you must release surfaces by calling their **IDirectDrawSurface7::Release** method when you no longer need them.

Each surface you individually create must be explicitly released. However, if you implicitly created multiple surfaces with a single call to **IDirectDraw7::CreateSurface**, such as a flipping chain, you need only release the front buffer. In this case, any pointers you might have to back buffer surfaces are implicitly released and can no longer be used.

Explicitly releasing a back buffer surface doesn't affect the reference count of the other surfaces in the chain.

[Visual Basic]

You must release surfaces by setting the surface to Nothing when you no longer need them.

Each surface you individually create must be explicitly released. However, if you implicitly created multiple surfaces with a single call to **DirectDraw7.CreateSurface**, such as a flipping chain, you need only release the front buffer. In this case, any pointers you might have to back buffer surfaces are implicitly released and can no longer be used.

### Enumerating Surfaces

[C++]

By calling the **IDirectDraw7::EnumSurfaces** method you can request that DirectDraw enumerate surfaces in various ways. The **EnumSurfaces** method enables you to look for surfaces that fit, or don't fit, a provided surface description. DirectDraw calls a **EnumSurfacesCallback** that you include with the call for each enumerated surface.

There are two general ways to search—you can search for surfaces that the DirectDraw object has already created, or for surfaces that the DirectDraw object is capable of creating at the time (given the surface description and available memory). You specify what type of search you want by combining flags in the method's *dwFlags* parameter.

###### Enumerating existing surfaces

This is the most common type of enumeration. You enumerate existing surfaces by calling **EnumSurfaces**, specifying a combination of the DDENUMSURFACES\_DOESEXIST search-type flag and one of the matching flags (DDENUMSURFACES\_MATCH, DDENUMSURFACES\_NOMATCH, or DDENUMSURFACES\_ALL) in the *dwFlags* parameter. If you're enumerating all existing surfaces, you can set the *lpDDSD* parameter to NULL, otherwise set it to the address of an initialized **DDSURFACEDESC2** structure that describes the surface for which you're looking. You can set the third parameter, *lpContext*, to an address that will be passed to the enumeration function you specify in the fourth parameter, *lpEnumSurfacesCallback*.

The following code fragment shows what this call might look like to enumerate all of a DirectDraw object's existing surfaces.

HRESULT ddrval;

ddrval = lpDD->EnumSurfaces(DDENUMSURFACES\_DOESEXIST |

DDENUMSURFACES\_ALL, NULL, NULL,

EnumCallback);

if (FAILED(ddrval))

return FALSE;

When searching for existing surfaces that fit a specific description, DirectDraw determines a match by comparing each member of the provided surface description to those of the existing surfaces. Only exact matches are enumerated. DirectDraw increments the reference counts of the enumerated surfaces, so make sure to release a surface if you don't plan to use it (or when you're done with it).

###### Enumerating possible surfaces

This type of enumeration is less common than enumerating existing surfaces, but it can be helpful to determine if a surface is supported before you attempt to create it. To perform this search, combine the DDENUMSURFACES\_CANBECREATED and DDENUMSURFACES\_MATCH flags when you call **IDirectDraw7::EnumSurfaces** (no other flag combinations are valid). The **DDSURFACEDESC2** structure you use with the call must be initialized to contain information about the surface characteristics that DirectDraw will use.

To enumerate surfaces that use a particular pixel format, include the DDSD\_PIXELFORMAT flag in the **dwFlags** member of the **DDSURFACEDESC2** structure. Additionally, initialize the **DDPIXELFORMAT** structure in the surface description and set its **dwFlags** member to contain the desired pixel format flags—DDPF\_RGB, DDPF\_YUV, or both. You need not set any other pixel format values.

If you include the DDSD\_HEIGHT and DDSD\_WIDTH flags in the **DDSURFACEDESC2** structure, you can specify the desired dimensions in the **dwHeight** and **dwWidth** members. If you exclude these flags, DirectDraw uses the dimensions of the primary surface.

The following code fragment shows what this call could look like to enumerate all valid surface characteristics for 9696 RGB or YUV surfaces:

DDSURFACEDESC2 ddsd;

HRESULT ddrval;

ZeroMemory(&ddsd, sizeof(ddsd));

ddsd.dwSize = sizeof(ddsd);

ddsd.dwFlags = DDSD\_CAPS | DDSD\_PIXELFORMAT |

DDSD\_HEIGHT | DDSD\_WIDTH;

ddsd.ddpfPixelFormat.dwFlags = DDPF\_YUV | DDPF\_RGB;

ddsd.dwHeight = 96;

ddsd.dwWidth = 96;

ddrval = lpDD->EnumSurfaces(

DDENUMSURFACES\_CANBECREATED | DDENUMSURFACES\_MATCH,

&ddsd, NULL, EnumCallback);

if (ddrval != DD\_OK)

return FALSE;

When DirectDraw enumerates possible surfaces, it actually attempts to create a temporary surface that has the desired characteristics. If the attempt succeeds, then DirectDraw calls the provided **EnumSurfacesCallback** function with only the characteristics that worked; it does not provide the callback function with pointer to the temporary surface. Do not assume that a surface isn't supported if it isn't enumerated. The attempt by DirectDraw to create a temporary surface could fail due to memory constraints that exist at the time of the call, resulting in those characteristics not being enumerated, even if the driver actually supports them.

[Visual Basic]

By calling the **DirectDraw7.GetSurfacesEnum** method you can request that DirectDraw enumerate surfaces in various ways. The **GetSurfacesEnum** method enables you to look for surfaces that fit, or don't fit, a provided surface description. This method creates a **DirectDrawEnumSurfaces** object which is then used to query for individual surface descriptions.

There are two general ways to search—you can search for surfaces that the DirectDraw object has already created, or for surfaces that the DirectDraw object is capable of creating at the time (given the surface description and available memory). You specify what type of search you want by combining flags in the method's *flags* parameter.

###### Enumerating existing surfaces

This is the most common type of enumeration. You enumerate existing surfaces by calling **GetSurfacesEnum**, specifying a combination of the DDENUMSURFACES\_DOESEXIST search-type flag and one of the matching flags (DDENUMSURFACES\_MATCH, DDENUMSURFACES\_NOMATCH, or DDENUMSURFACES\_ALL) in the *flags* parameter. If you're enumerating all existing surfaces, you can set the *desc* parameter to Nothing, otherwise set it to an initialized **DDSURFACEDESC2** type that describes the surface for which you're looking.

The following code fragment shows what this call might look like to enumerate all of a DirectDraw object's existing surfaces. This assumes DD is a valid **DirectDraw7** object and DDSurfEnum is a valid **DirectDrawEnumSurfaces** object.

DD.GetSurfacesEnum(DDENUMSURFACES\_DOESEXIST Or

DDENUMSURFACES\_ALL, Nothing)

As DDSurfEnum

When searching for existing surfaces that fit a specific description, DirectDraw determines a match by comparing each member of the provided surface description to those of the existing surfaces. Only exact matches are filled into the **DirectDrawEnumSurfaces** object.

###### Enumerating possible surfaces

This type of enumeration is less common than enumerating existing surfaces, but it can be helpful to determine if a surface is supported before you attempt to create it. To perform this search, combine the DDENUMSURFACES\_CANBECREATED and DDENUMSURFACES\_MATCH flags when you call **DirectDraw7.GetSurfacesEnum** (no other flag combinations are valid). The **DDSURFACEDESC2** type you use with the call must be initialized to contain information about the surface characteristics that DirectDraw will use.

To enumerate surfaces that use a particular pixel format, include the DDSD\_PIXELFORMAT flag in the **lFlags** member of the **DDSURFACEDESC2** type. Additionally, initialize the **DDPIXELFORMAT** type in the surface description and set its **lFlags** member to contain the desired pixel format flags—DDPF\_RGB, DDPF\_YUV, or both. You need not set any other pixel format values.

If you include the DDSD\_HEIGHT and DDSD\_WIDTH flags in the **DDSURFACEDESC2** structure, you can specify the desired dimensions in the **lHeight** and **lWidth** members. If you exclude these flags, DirectDraw uses the dimensions of the primary surface.

The following code fragment shows what this call could look like to enumerate all valid surface characteristics for 9696 RGB or YUV surfaces:

Dim ddsd As DDSURFACEDESC2

ddsd.lFlags = DDSD\_CAPS Or DDSD\_PIXELFORMAT Or

DDSD\_HEIGHT Or DDSD\_WIDTH

ddsd.ddpfPixelFormat.lFlags = DDPF\_YUV Or DDPF\_RGB

ddsd.lHeight = 96

ddsd.lWidth = 96

DD.GetSurfacesEnum(

DDENUMSURFACES\_CANBECREATED Or DDENUMSURFACES\_MATCH,

ddsd) As DDSurfEnum

When DirectDraw enumerates possible surfaces, it actually attempts to create a temporary surface that has the desired characteristics. If the attempt succeeds, then DirectDraw fills the **DirectDrawEnumSurfaces** object with only the characteristics that worked; it does return the temporary surface. Do not assume that a surface isn't supported if it isn't enumerated. The attempt by DirectDraw to create a temporary surface could fail due to memory constraints that exist at the time of the call, resulting in those characteristics not being enumerated, even if the driver actually supports them.

### Updating Surface Characteristics

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

You can update the characteristics of an existing surface by using the **IDirectDrawSurface7::SetSurfaceDesc** method. With this method, you can change the pixel format and location of a DirectDrawSurface object's surface memory to system memory that your application has explicitly allocated. This is useful as it allows a surface to use data from a previously allocated buffer without copying. The new surface memory is allocated by the client application and, as such, the client application must also deallocate it.

When calling the **IDirectDrawSurface7::SetSurfaceDesc** method, the *lpddsd* parameter must be the address of a **DDSURFACEDESC2** structure that describes the new surface memory as well as a pointer to that memory. Within the structure, you can only set the **dwFlags** member to reflect valid members for the location of the surface memory, dimensions, pitch, and pixel format. Therefore, **dwFlags** can only contain combinations of the DDSD\_WIDTH, DDSD\_HEIGHT, DDSD\_PITCH, DDSD\_LPSURFACE, and DDSD\_PIXELFORMAT flags, which you set to indicate valid structure members.

Before you set the values in the structure, you must allocate memory to hold the surface. The size of the memory you allocate is important. Not only do you need to allocate enough memory to accommodate the surface's width and height, but you need to have enough to make room for the surface pitch, which must be a **QWORD** (8 byte) multiple. Remember, pitch is measured in bytes, not pixels.

When setting surface values in the structure, the **lpSurface** member is a pointer to the memory you allocated and the **dwHeight** and **dwWidth** members describe the surface dimensions in pixels. If you specify surface dimensions, you must fill the **lPitch** member to reflect the surface pitch as well. Pitch must be a **QWORD** multiple. Likewise, if you specify pitch, you must also specify a width value. Lastly, the **ddpfPixelFormat** member describes the pixel format for the surface. With the exception of the **lpSurface** member, if you don't specify a value for these members, the method defaults to using the value from the current surface.

There are some restrictions you must be aware of when using **IDirectDrawSurface7::SetSurfaceDesc**, some of which are common sense. For example, the **lpSurface** member of the **DDSURFACEDESC2** structure must be a valid pointer to a system memory (the method doesn't support video memory pointers at this time). Also, the **dwWidth** and **dwHeight** members must be nonzero values. Lastly, you cannot reassign the primary surface or any surfaces within the primary's flipping chain.

You can set the same memory for multiple DirectDrawSurface objects, but you must take care that the memory is not deallocated while it is assigned to any surface object.

Using the **SetSurfaceDesc** method incorrectly will cause unpredictable behavior. The DirectDrawSurface object will not deallocate surface memory that it didn't allocate. Therefore, when the surface memory is no longer needed, it is your responsibility to deallocate it. However, when **SetSurfaceDesc** is called, DirectDraw frees the original surface memory that it implicitly allocated when creating the surface.

### Accessing Surface Memory Directly

[C++]

You can directly access the frame buffer or off-screen surface memory by using the **IDirectDrawSurface7::Lock** method. When you call this method, the *lpDestRect* parameter is a pointer to a **RECT** structure that describes the rectangle on the surface you want to access directly. To request that the entire surface be locked, set *lpDestRect* to NULL. Also, you can specify a **RECT** that covers only a portion of the surface. Providing that no two rectangles overlap, two threads or processes can simultaneously lock multiple rectangles in a surface.

The **Lock** method fills a **DDSURFACEDESC2** structure with all the information you need to properly access the surface memory. The structure includes information about the pitch (or stride) and the pixel format of the surface, if different from the pixel format of the primary surface. When you finish accessing the surface memory, call the **IDirectDrawSurface7::Unlock** method to unlock it.

While you have a surface locked, you can directly manipulate the contents. The following list describes some tips for avoiding common problems with directly rendering surface memory:

Never assume a constant display pitch. Always examine the pitch information returned by the **IDirectDrawSurface7::Lock** method. This pitch can vary for a number of reasons, including the location of the surface memory, the type of display card, or even the version of the DirectDraw driver. For more information, see Width vs. Pitch.

Make certain you blit to unlocked surfaces. DirectDraw blit methods will fail, returning DDERR\_SURFACEBUSY or DDERR\_LOCKEDSURFACES, if called on a locked surface. Similarly, GDI blit functions fail without returning error values if called on a locked surface that exists in display memory.

Limit your application's activity while a surface is locked. While a surface is locked, DirectDraw often holds the Win16Mutex (also known as the Win16Lock) so that gaining access to surface memory can occur safely. The Win16Mutex serializes access to GDI and USER dynamic-link libraries, shutting down Windows for the duration between the **IDirectDrawSurface7::Lock** and **IDirectDrawSurface7::Unlock** calls. The **IDirectDrawSurface7::GetDC** method implicitly calls **Lock**, and the **IDirectDrawSurface7::ReleaseDC** implicitly calls **Unlock**.

Always copy data aligned to display memory. (Windows 95 and Windows 98 use a page fault handler, Vflatd.386, to implement a virtual flat-frame buffer for display cards with bank-switched memory. The handler allows these display devices to present a linear frame buffer to DirectDraw. Copying data unaligned to display memory can cause the system to suspend operations if the copy spans memory banks.)

Unless you include the DDLOCK\_NOSYSLOCK flag when you call the **Lock** method, locking the surface typically causes DirectDraw to take the Win16Mutex. During the Win16Mutex all other applications, including Windows, cease execution. Since the Win16Mutex stops applications from executing, standard debuggers cannot be used while the lock is held. Kernel debuggers can be used during this period. DirectDraw always takes the Win16Mutex when locking the primary surface.

If a blit is in progress when you call **IDirectDrawSurface7::Lock**, the method will return immediately with an error, as a lock cannot be obtained. To prevent the error, use the DDLOCK\_WAIT flag to cause the method to wait until a lock can be successfully obtained.

Locking portions of the primary surface can interfere with the display of a software cursor. If the cursor intersects the locked rectangle, it is hidden for the duration of the lock. If it doesn't intersect the rectangle, it is frozen for the duration of the lock. Neither of these effects occurs if the entire surface is locked.

[Visual Basic]

You can directly access the frame buffer or off-screen surface memory by using the **DirectDrawSurface7.Lock** method. When you call this method, the *r* parameter is a **RECT** type that describes the rectangle on the surface you want to access directly. To request that the entire surface be locked, pass an empty **RECT**. Also, you can specify a **RECT** that covers only a portion of the surface.

The **Lock** method fills a **DDSURFACEDESC2** type with all the information you need to properly access the surface memory. The structure includes information about the pitch (or stride) and the pixel format of the surface, if different from the pixel format of the primary surface. When you finish accessing the surface memory, call the **DirectDrawSurface7.Unlock** method to unlock it.

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### Gamma and Color Controls

This section contains information about the gamma and color control interfaces used with DirectDrawSurface objects. Information is organized into the following topics:

What Are Gamma and Color Controls?

Using Gamma Controls

Using Color Controls

[C++]

Note

You should not attempt to use both the **IDirectDrawGammaControl** and **IDirectDrawColorControl** interfaces on a single surface. Their effects are undefined when used together.

[Visual Basic]

Note

You should not attempt to use both the **DirectDrawGammaControl** and **DirectDrawColorControl** objects on a single surface. Their effects are undefined when used together.

#### What Are Gamma and Color Controls?

[C++]

Through the gamma and color control interfaces, DirectDrawSurface objects enable you to change how the system displays the contents of the surface, without affecting the contents of the surface itself. You can think of these controls as very simple filters that DirectDraw applies to the data as it leaves a surface before being rendered on the screen. Surface objects implement the **IDirectDrawGammaControl** and **IDirectDrawColorControl** interfaces which expose methods to adjust how the surface's contents are filtered. You can retrieve a pointer to either interface by using the **IUnknown::QueryInterface** method of the target surface, specifying the *IID\_IDirectDrawGammaControl* or *IID\_IDirectDrawColorControl* reference identifiers.

Gamma controls, represented by the **IDirectDrawGammaControl** interface, make it possible for you to dynamically change how a surface's individual red, green, and blue levels map to the actual levels that the system displays. By setting gamma levels, you can cause the user's screen to flash colors—red when the user's character is shot, green when they pick up a new item, and so on—without blitting new images to the frame buffer to achieve the effect. Or, you might adjust color levels to apply a color bias to the images in the frame buffer. Although this interface is similar to the color control interface, this one is the easiest to use, making it the best choice for game applications. For details, see Using Gamma Controls.

The **IDirectDrawColorControl** interface allows you to control color in a surface much like the color controls you might find on a television. The similarity between **IDirectDrawColorControl** and the actual controls on a TV is no mistake—this interface is most appropriate for adjusting how broadcast video looks in an overlay surface, so it makes sense that it should provide similar control over colors. You can use color controls to allow a user to change video characteristics such as hue, saturation, contrast, and several others. For more information, see Using Color Controls.

[Visual Basic]

Through the gamma and color control interfaces, DirectDrawSurface objects enable you to change how the system displays the contents of the surface, without affecting the contents of the surface itself. You can think of these controls as very simple filters that DirectDraw applies to the data as it leaves a surface before being rendered on the screen. Surface objects implement the **DirectDrawGammaControl** and **DirectDrawColorControl** interfaces which expose methods to adjust how the surface's contents are filtered. You can retrieve a pointer to either interface by using the **DirectDrawSurface7.GetDirectDrawColorControl** and **DirectDrawSurface7.GetDirectDrawGammaControl** methods of the target surface.

Gamma controls, represented by the **DirectDrawGammaControl** class, make it possible for you to dynamically change how a surface's individual red, green, and blue levels map to the actual levels that the system displays. By setting gamma levels, you can cause the user's screen to flash colors—red when the user's character is shot, green when they pick up a new item, and so on—without blitting new images to the frame buffer to achieve the effect. Or, you might adjust color levels to apply a color bias to the images in the frame buffer. Although this interface is similar to the color control interface, this one is the easiest to use, making it the best choice for game applications. For details, see Using Gamma Controls.

The **DirectDrawColorControl** class allows you to control color in a surface much like the color controls you might find on a television. The similarity between **DirectDrawColorControl** and the actual controls on a TV is no mistake—this interface is most appropriate for adjusting how broadcast video looks in an overlay surface, so it makes sense that it should provide similar control over colors. You can use color controls to allow a user to change video characteristics such as hue, saturation, contrast, and several others. For more information, see Using Color Controls.

#### Using Gamma Controls

[C++]

The **IDirectDrawGammaControl** interface, which you retrieve by querying the surface with the *IID\_IDirectDrawGammaControl* reference identifier, allows you to manipulate ramp levels that affect the red, green, and blue color components of pixels from the surface before they are sent to the digital-to-analog converter (DAC) for display. Although all surface types support the **IDirectDrawGammaControl** interface, you are only allowed to adjust gamma on the primary surface. Attempts to call **IDirectDrawGammaControl::GetGammaRamp** or **IDirectDrawGammaControl::SetGammaRamp** on a surface other than the primary surface will fail.

In the following topics, this section describes the general concept of ramp levels, and provides information about working with those levels through the methods of **IDirectDrawGammaControl**:

[Visual Basic]

The **DirectDrawGammaControl** object, which you retrieve by calling **DirectDrawSurface7.GetDirectDrawGammaControl**, allows you to manipulate ramp levels that affect the red, green, and blue color components of pixels from the surface before they are sent to the digital-to-analog converter (DAC) for display. Although all surface types support the **DirectDrawGammaControl** object, you are only allowed to adjust gamma on the primary surface. Attempts to call **DirectDrawGammaControl.GetGammaRamp** or **DirectDrawGammaControl.SetGammaRamp** on a surface other than the primary surface will fail.

In the following topics, this section describes the general concept of ramp levels, and provides information about working with those levels through the methods of **DirectDrawGammaControl**:

About Gamma Ramp Levels

Detecting Gamma Ramp Support

Setting and Retrieving Gamma Ramp Levels

##### About Gamma Ramp Levels

A *gamma ramp* in DirectDraw is a term used to describe a set of values that map the level of a particular color component (red, green, blue) for all pixels in the frame buffer to new levels that are received by the digital-to-analog converter (DAC) for display on the monitor. The remapping is performed by way of three simple look-up tables, one for each color component.

Here's how it works: DirectDraw takes a pixel from the frame buffer, and looks at it in terms of its individual red, green, and blue color components. Each component is represented by a value from 0 to 65535. DirectDraw takes the original value, and uses it to index into an 256-element array (the ramp), where each element contains a value that replaces the original one. DirectDraw performs this "look-up and replace" process for each color component of each pixel within the frame buffer, thereby changing the final colors for all of the on-screen pixels.

It's handy to visualize the ramp values by graphing them. The left graph of the two following graphs shows a ramp that doesn't modify colors at all, and the right graph shows a ramp that imposes a negative bias to the color component to which it is applied.



The array elements for the graph on the left would contain values identical to their index (0 in the element at index 0, and 65535 at index 255). This type of ramp is the default, as it doesn't change the input values before they're displayed. The right graph is a little more interesting; its ramp contains values that range from 0 in the first element to 32768 in the last element, with values ranging relatively uniformly in between. The effect is that the color component that uses this ramp appears muted on the display. You are not limited to using linear graphs; if your application needs to assign arbitrary mapping, it's free to do so. You can even set the entries to all zeroes to remove a particular color component completely from the display.

##### Detecting Gamma Ramp Support

[C++]

You can determine whether the hardware supports dynamic gamma ramp adjustment by calling the **IDirectDraw7::GetCaps** method. After the call, if the DDCAPS2\_PRIMARYGAMMA flag is present in the **dwCaps2** member of the associate **DDCAPS** structure, the hardware supports dynamic gamma ramps. DirectDraw does not attempt to emulate this feature, so if the hardware doesn't support it, you can't use it.

[Visual Basic]

You can determine whether the hardware supports dynamic gamma ramp adjustment by calling the **DirectDraw7.GetCaps** method. After the call, if the DDCAPS2\_PRIMARYGAMMA flag is present in the **lCaps2** member of the associate **DDCAPS** type, the hardware supports dynamic gamma ramps. DirectDraw does not attempt to emulate this feature, so if the hardware doesn't support it, you can't use it.

##### Setting and Retrieving Gamma Ramp Levels

[C++]

Gamma ramp levels are effectively look-up tables that DirectDraw uses to map the frame buffer color components to new levels that will be displayed. For more information, see About Gamma Ramp Levels. You set and retrieve ramp levels for the primary surface by calling the **IDirectDrawGammaControl::SetGammaRamp** and **IDirectDrawGammaControl::GetGammaRamp** methods. Both methods accept two parameters, but the first parameter is reserved for future use, and should be set to zero. The second parameter, *lpRampData*, is the address of a **DDGAMMARAMP** structure. The **DDGAMMARAMP** structure contains three 256-element arrays of **WORD**s, one array each to contain the red, green, and blue gamma ramps.

You can include the DDSGR\_CALIBRATE value when calling the **IDirectDrawGammaControl::SetGammaRamp** to invoke the calibrator when setting new gamma levels. Calibrating gamma ramps incurs some processing overhead, and should not be used frequently. Setting a calibrated gamma ramp will provide a consistent and absolute gamma value for the viewer, regardless of the display adapter and monitor.

Not all systems support gamma calibration. To determine if gamma calibration is supported, call **IDirectDraw7::GetCaps**, and examine the **dwCaps2** member of the associated **DDCAPS** structure after the method returns. If the DDCAPS2\_CANCALIBRATEGAMMA capability flag is present, then gamma calibration is supported.

When setting new ramp levels, keep in mind that that the levels you set in the arrays are only used when your application is in full-screen, exclusive mode. Whenever your application changes to normal mode, the ramp levels are set aside, taking effect again when the application reinstates full-screen mode. In addition, remember that you cannot set ramp levels for any surface other than the primary.

Note

Those very familiar with the Win32® API might wonder why DirectDraw exposes an interface like **IDirectDrawGammaControl**, when Win32 offers the **GetDeviceGammaRamp** and **SetDeviceGammaRamp** functions for the same surfaces. Although the Win32 API includes these functions, they do not always succeed on all Windows platforms like the methods of the **IDirectDrawGammaControl** interface.

[Visual Basic]

Gamma ramp levels are effectively look-up tables that DirectDraw uses to map the frame buffer color components to new levels that will be displayed. For more information, see About Gamma Ramp Levels. You set and retrieve ramp levels for the primary surface by calling the **DirectDrawGammaControl.SetGammaRamp** and **DirectDrawGammaControl.GetGammaRamp** methods. Both methods accept two parameters, the first parameter is used to specify calibration. The second parameter, *gammaRamp*, is a **DDGAMMARAMP** type. The **DDGAMMARAMP** type contains three 256-element arrays of **Integer**s, one array each to contain the red, green, and blue gamma ramps.

You can include the DDSGR\_CALIBRATE value in the *flags* parameter when calling the **DirectDrawGammaControl.SetGammaRamp** to invoke the calibrator when setting new gamma levels. Calibrating gamma ramps incurs some processing overhead, and should not be used frequently. Setting a calibrated gamma ramp will provide a consistent and absolute gamma value for the viewer, regardless of the display adapter and monitor.

Not all systems support gamma calibration. To determine if gamma calibration is supported, call **DirectDraw7.GetCaps**, and examine the **lCaps2** member of the associated **DDCAPS** type after the method returns. If the DDCAPS2\_CANCALIBRATEGAMMA capability flag is present, then gamma calibration is supported.

When setting new ramp levels, keep in mind that that the levels you set in the arrays are only used when your application is in full-screen, exclusive mode. Whenever your application changes to normal mode, the ramp levels are set aside, taking effect again when the application reinstates full-screen mode. In addition, remember that you cannot set ramp levels for any surface other than the primary.

Note

Those very familiar with the Win32® API might wonder why DirectDraw exposes an interface like **DirectDrawGammaControl**, when Win32 offers the **GetDeviceGammaRamp** and **SetDeviceGammaRamp** functions for the same surfaces. Although the Win32 API includes these functions, they do not always succeed on all Windows platforms like the methods of the **DirectDrawGammaControl** object.

#### Using Color Controls

[C++]

You set and retrieve surface color controls through the **IDirectDrawColorControl** interface, which can be retrieved by querying the DirectDrawSurface object using the *IID\_IDirectDrawColorControl* reference identifier.

Color control information is represented by a **DDCOLORCONTROL** structure, which is used with both methods of the interface, **IDirectDrawColorControl::SetColorControls** and **IDirectDrawColorControl::GetColorControls**. The first structure member, **dwSize**, should be set to the size of the structure, in bytes, before you use it. How you use the next member, **dwFlags**, depends on whether you are setting or retrieving color controls. If you are setting new color controls, set **dwFlags** to a combination of the appropriate flags to indicate which of the other structure members contain valid data that you've set. However, when retrieving color controls, you don't need to set the **dwFlags** before using it—it will contain flags telling you which members are valid after the **IDirectDrawColorControl::GetColorControls** method returns.

The remaining **DDCOLORCONTROL** structure members can contain values that describe the brightness, contrast, hue, saturation, sharpness, gamma, and whether color is used. Note that the structure contains information about gamma correction. This is a single gamma value that affects overall brightness, and it should not be confused with the gamma adjustment features provided through the **IDirectDrawGammaControl** interface.

[Visual Basic]

You set and retrieve surface color controls through the **DirectDrawColorControl** object, which can be retrieved by calling **DirectDrawSurface7.GetDirectDrawColorControl**.

Color control information is represented by a **DDCOLORCONTROL** type, which is used with both methods of the interface, **DirectDrawColorControl.SetColorControls** and **DirectDrawColorControl.GetColorControls**.

The **DDCOLORCONTROL** type members can contain values that describe the brightness, contrast, hue, saturation, sharpness, gamma, and whether color is used. Note that the structure contains information about gamma correction. This is a single gamma value that affects overall brightness, and it should not be confused with the gamma adjustment features provided through the **DirectDrawGammaControl** interface.

### Overlay Surfaces

This section contains information about DirectDraw overlay surface support. The following topics are discussed:

Overlay Surface Overview

Significant DDCAPS Members and Flags

Source and Destination Rectangles

Boundary and Size Alignment

Minimum and Maximum Stretch Factors

Overlay Color Keys

Positioning Overlay Surfaces

Creating Overlay Surfaces

Overlay Z-Orders

Flipping Overlay Surfaces

[C++]

For information about implementing overlay surfaces, see Tutorial 6: Using Overlay Surfaces.

[C++,Visual Basic]

#### Overlay Surface Overview

Overlay surfaces, casually referred to as overlays, are surfaces with special hardware-supported capabilities. Overlay surfaces are frequently used to display live video, recorded video, or still bitmaps over the primary surface without blitting to the primary surface or changing the primary surface's contents in any way. Overlay surface support is provided entirely by the hardware; DirectDraw supports any capabilities as reported by the display device driver. DirectDraw does not emulate overlay surfaces.

An overlay surface is analogous to a clear piece of plastic that you draw on and place in front of the monitor. When the overlay is in front of the monitor, you can see both the overlay and the contents of the primary surface together, but when you remove it, the primary surface's contents are unchanged. In fact, the mechanics of overlays work much like the clear plastic analogy. When you display an overlay surface, you're telling the device driver where and how you want it to be visible. While the display device paints scan lines to the monitor, it checks the location of each pixel in the primary surface to see if an overlay should be visible there instead. If so, the display device substitutes data from the overlay surface for the corresponding pixel, as shown in the following illustration.



By using this method, the display adapter produces a composite of the primary surface and the overlay on the monitor, providing transparency and stretching effects, without modifying the contents of either surface. The composited surfaces are injected into the video stream and sent directly to the monitor. Because this on-the-fly processing and pixel substitution is handled at the hardware level, no noticeable performance loss occurs when displaying overlays. Additionally, this method makes it possible to seamlessly composite primary and overlay surfaces with different pixel formats.

[C++]

You create overlay surfaces by calling the **IDirectDraw7::CreateSurface** method, specifying the DDSCAPS\_OVERLAY flag in the associated **DDSCAPS2** structure. Overlay surfaces can only be created in video memory, so you must also include the DDSCAPS\_VIDEOMEMORY flag. As with other types of surfaces, by including the appropriate flags you can create either a single overlay or a flipping chain made up of multiple overlay surfaces.

[Visual Basic]

You create overlay surfaces by calling the **DirectDraw7.CreateSurface** method, specifying the DDSCAPS\_OVERLAY flag in the associated **DDSCAPS2** type. Overlay surfaces can only be created in video memory, so you must also include the DDSCAPS\_VIDEOMEMORY flag. As with other types of surfaces, by including the appropriate flags you can create either a single overlay or a flipping chain made up of multiple overlay surfaces.

#### Significant DDCAPS Members and Flags

[C++]

You can retrieve information about the supported overlay features by calling the **IDirectDraw7::GetCaps** method. The method fills a **DDCAPS** structure with information describing all features.

When reporting hardware features, the device driver sets flags in the **dwCaps** structure member to indicate when a given type of restriction is enforced by the hardware. After retrieving the driver capabilities, examine the flags in the **dwCaps** member for information about which restrictions apply. The **DDCAPS** structure contains nine members that carry information describing hardware restrictions for overlay surfaces. The following table lists the overlay related members and their corresponding flags:

|  |  |
| --- | --- |
| Member | Flag |
|  | |
| **dwMaxVisibleOverlays** | This member is always valid |
| **dwCurrVisibleOverlays** | This member is always valid |
| **dwAlignBoundarySrc** | DDCAPS\_ALIGNBOUNDARYSRC |
| **dwAlignSizeSrc** | DDCAPS\_ALIGNSIZESRC |
| **dwAlignBoundaryDest** | DDCAPS\_ALIGNBOUNDARYDEST |
| **dwAlignSizeDest** | DDCAPS\_ALIGNSIZEDEST |
| **dwAlignStrideAlign** | DDCAPS\_ALIGNSTRIDE |
| **dwMinOverlayStretch** | DDCAPS\_OVERLAYSTRETCH |
| **dwMaxOverlayStretch** | DDCAPS\_OVERLAYSTRETCH |

The **dwMaxVisibleOverlays** and **dwCurrVisibleOverlays** members carry information about the maximum number of overlays the hardware can display, and how many of them are currently visible.

Additionally, the hardware reports rectangle position and size alignment restrictions in the **dwAlignBoundarySrc**, **dwAlignSizeSrc**, **dwAlignBoundaryDest**, **dwAlignSizeDest**, and **dwAlignStrideAlign** members. The values in these members dictate how you must size and position source and destination rectangles when displaying overlay surfaces. For more information, see Source and Destination Rectangles and Boundary and Size Alignment.

Also, the hardware reports information about stretch factors in the **dwMinOverlayStretch** and **dwMaxOverlayStretch** members. For more information, see Minimum and Maximum Stretch Factors.

[Visual Basic]

You can retrieve information about the supported overlay features by calling the **DirectDraw7.GetCaps** method. The method fills a **DDCAPS** type with information describing all features.

When reporting hardware features, the device driver sets flags in the **lCaps** type member to indicate when a given type of restriction is enforced by the hardware. After retrieving the driver capabilities, examine the flags in the **lCaps** member for information about which restrictions apply. The **DDCAPS** type contains nine members that carry information describing hardware restrictions for overlay surfaces. The following table lists the overlay related members and their corresponding flags:

|  |  |
| --- | --- |
| Member | Flag |
|  | |
| **lMaxVisibleOverlays** | This member is always valid |
| **lCurrVisibleOverlays** | This member is always valid |
| **lAlignBoundarySrc** | DDCAPS\_ALIGNBOUNDARYSRC |
| **lAlignSizeSrc** | DDCAPS\_ALIGNSIZESRC |
| **lAlignBoundaryDest** | DDCAPS\_ALIGNBOUNDARYDEST |
| **lAlignSizeDest** | DDCAPS\_ALIGNSIZEDEST |
| **lAlignStrideAlign** | DDCAPS\_ALIGNSTRIDE |
| **lMinOverlayStretch** | DDCAPS\_OVERLAYSTRETCH |
| **lMaxOverlayStretch** | DDCAPS\_OVERLAYSTRETCH |

The **lMaxVisibleOverlays** and **lCurrVisibleOverlays** members carry information about the maximum number of overlays the hardware can display, and how many of them are currently visible.

Additionally, the hardware reports rectangle position and size alignment restrictions in the **lAlignBoundarySrc**, **lAlignSizeSrc**, **lAlignBoundaryDest**, **lAlignSizeDest**, and **lAlignStrideAlign** members. The values in these members dictate how you must size and position source and destination rectangles when displaying overlay surfaces. For more information, see Source and Destination Rectangles and Boundary and Size Alignment.

Also, the hardware reports information about stretch factors in the **lMinOverlayStretch** and **lMaxOverlayStretch** members. For more information, see Minimum and Maximum Stretch Factors.

#### Source and Destination Rectangles

[C++]

To display an overlay surface, you call the overlay surface's **IDirectDrawSurface7::UpdateOverlay** method, specifying the DDOVER\_SHOW flag in the *dwFlags* parameter. The method requires you to specify a source and destination rectangle in the *lpSrcRect* and *lpDestRect* parameters. The source rectangle describes a rectangle on the overlay surface that will be visible on the primary surface. To request that the method use the entire surface, set the *lpSrcRect* parameter to NULL. The destination rectangle describes a portion of the primary surface on which the overlay surface will be displayed.

[Visual Basic]

To display an overlay surface, you call the overlay surface's **DirectDrawSurface7.UpdateOverlay** method, specifying the DDOVER\_SHOW flag in the *flags* parameter. The method requires you to specify a source and destination rectangle in the *RECT* and *rectD* parameters. The source rectangle describes a rectangle on the overlay surface that will be visible on the primary surface. To request that the method use the entire surface, pass an empty **RECT** for the *RECT* parameter. The destination rectangle describes a portion of the primary surface on which the overlay surface will be displayed.

In addition, you can display an overlay with additional effects by calling **DirectDrawSurface7.UpdateOverlayFx** method. Note you must set the DDOVER\_DDFX flag in the *flags* parameter to use overlay effects set in the *ddoverfx* parameter.

Source and destination rectangles do not need to be the same size. You can often specify a destination rectangle smaller or larger than the source rectangle, and the hardware will shrink or stretch the overlay appropriately when it is displayed.

To successfully display an overlay surface, you might need to adjust the size and position of both rectangles. Whether this is necessary depends on the restrictions imposed by the device driver. For more information, see Boundary and Size Alignment and Minimum and Maximum Stretch Factors.

#### Boundary and Size Alignment

[C++]

Due to various hardware limitations, some device drivers impose restrictions on the position and size of the source and destination rectangles used to display overlay surfaces. To find out which restrictions apply for a device, call the **IDirectDraw7::GetCaps** method and then examine the overlay-related flags in the **dwCaps** member of the **DDCAPS** structure. The following table shows the members and flags specific to boundary and size alignment restrictions:

|  |  |  |
| --- | --- | --- |
| Category | Flag | Member |
|  | | |
| Boundary (position) restrictions | DDCAPS\_ALIGNBOUNDARYSRC | **dwAlignBoundarySrc** |
|  | DDCAPS\_ALIGNBOUNDARYDEST | **dwAlignBoundaryDest** |
| Size restrictions | DDCAPS\_ALIGNSIZESRC | **dwAlignSizeSrc** |
|  | DDCAPS\_ALIGNSIZEDEST | **dwAlignSizeDest** |

There are two types of restrictions, boundary restrictions and size restrictions. Both types of restrictions are expressed in terms of pixels (not bytes) and can apply to the source and destination rectangles. Also, these restrictions can vary depending on the pixel formats of the overlay and primary surface.

Boundary restrictions affect where you can position a source or destination rectangle. The values in the **dwAlignBoundarySrc** and **dwAlignBoundaryDest** members tell you how to align the top left corner of the corresponding rectangle. The x-coordinate of the top left corner of the rectangle (the **left** member of the **RECT** structure), must be a multiple of the reported value.

Size restrictions affect the valid widths for source and destination rectangles. The values in the **dwAlignSizeSrc** and **dwAlignSizeDest** members tell you how to align the width, in pixels, of the corresponding rectangle. Your rectangles must have a pixel width that is a multiple of the reported value. If you stretch the rectangle to comply with a minimum required stretch factor, be sure that the stretched rectangle is still size aligned. After stretching the rectangle, align its width by rounding up, not down, so you preserve the minimum stretch factor. For more information, see Minimum and Maximum Stretch Factors.

[Visual Basic]

Due to various hardware limitations, some device drivers impose restrictions on the position and size of the source and destination rectangles used to display overlay surfaces. To find out which restrictions apply for a device, call the **DirectDraw7.GetCaps** method and then examine the overlay-related flags in the **lCaps** member of the **DDCAPS** type. The following table shows the members and flags specific to boundary and size alignment restrictions:

|  |  |  |
| --- | --- | --- |
| Category | Flag | Member |
|  | | |
| Boundary (position) restrictions | DDCAPS\_ALIGNBOUNDARYSRC | **lAlignBoundarySrc** |
|  | DDCAPS\_ALIGNBOUNDARYDEST | **lAlignBoundaryDest** |
| Size restrictions | DDCAPS\_ALIGNSIZESRC | **lAlignSizeSrc** |
|  | DDCAPS\_ALIGNSIZEDEST | **lAlignSizeDest** |

There are two types of restrictions, boundary restrictions and size restrictions. Both types of restrictions are expressed in terms of pixels (not bytes) and can apply to the source and destination rectangles. Also, these restrictions can vary depending on the pixel formats of the overlay and primary surface.

Boundary restrictions affect where you can position a source or destination rectangle. The values in the **lAlignBoundarySrc** and **lAlignBoundaryDest** members tell you how to align the top left corner of the corresponding rectangle. The x-coordinate of the top left corner of the rectangle (the **left** member of the **RECT** type), must be a multiple of the reported value.

Size restrictions affect the valid widths for source and destination rectangles. The values in the **lAlignSizeSrc** and **lAlignSizeDest** members tell you how to align the width, in pixels, of the corresponding rectangle. Your rectangles must have a pixel width that is a multiple of the reported value. If you stretch the rectangle to comply with a minimum required stretch factor, be sure that the stretched rectangle is still size aligned. After stretching the rectangle, align its width by rounding up, not down, so you preserve the minimum stretch factor. For more information, see Minimum and Maximum Stretch Factors.

#### Minimum and Maximum Stretch Factors

[C++]

Due to hardware limitations, some devices restrict how wide a destination rectangle can be compared with the corresponding source rectangle. DirectDraw communicates these restrictions as stretch factors. A stretch factor is the ratio between the widths of the source and destination rectangles. If the driver provides information about stretch factors, it sets the DDCAPS\_OVERLAYSTRETCH flag in the **DDCAPS** structure after you call the **IDirectDraw7::GetCaps** method. Note that stretch factors are reported multiplied by 1000, so a value of 1300 actually means 1.3 (and 750 would be 0.75).

[Visual Basic]

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Devices that do not impose limits on stretching or shrinking an overlay destination rectangle often report a minimum and maximum stretch factor of 0.

The minimum stretch factor tells you how much wider or narrower than the source rectangle the destination rectangle needs to be. If the minimum stretch factor is greater than 1000, then you must increase the destination rectangle's width by that ratio. For instance, if the driver reports 1300, you must make sure that the destination rectangle's width is at least 1.3 times the width of the source rectangle. Similarly, a minimum stretch factor less than 1000 indicates that the destination rectangle can be smaller than the source rectangle by that ratio.

The maximum stretch factor tells the maximum amount you can stretch the width of the destination rectangle. For example, if the maximum stretch factor is 2000, you can specify destination rectangles that are up to, but not wider than, twice the width of the source rectangle. If the maximum stretch factor is less than 1000, then you must shrink the width of the destination rectangle by that ratio to be able to display the overlay.

After stretching, the destination rectangle must conform to any size alignment restrictions the device might require. Therefore, it's a good idea to stretch the destination rectangle before adjusting it to be size aligned. For more information, see Boundary and Size Alignment.

Hardware does not require that you adjust the height of destination rectangles. You can increase a destination rectangle's height to preserve aspect ratio without negative effects.

#### Overlay Color Keys

[C++]

Like other types of surfaces, overlay surfaces use source and destination color keys for controlling transparent blit operations between surfaces. Because overlay surfaces are not displayed by blitting, there needs to be a different way to control how an overlay surface is displayed over the primary surface when you call the **IDirectDrawSurface7::UpdateOverlay** method. This need is filled by overlay color keys. Overlay color keys, like their blit-related counterparts, have a source version and a destination version that you set by calling the **IDirectDrawSurface7::SetColorKey** method. (For more information, see Setting Color Keys.) You use the DDCKEY\_SRCOVERLAY or DDCKEY\_DESTOVERLAY flags to set a source or destination overlay color key. Overlay surfaces can employ blit and overlay color keys together to control blit operations and overlay display operations appropriately; the two types of color keys do not conflict with one another.

The **IDirectDrawSurface7::UpdateOverlay** method uses the source overlay color key to determine which pixels in the overlay surface should be considered transparent, allowing the contents of the primary surface to show through. Likewise, the method uses the destination overlay color key to determine the parts of the primary surface that will be covered up by the overlay surface when it is displayed. The resulting visual effect is the same as that created by blit-related color keys.

[Visual Basic]

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#### Positioning Overlay Surfaces

[C++]

After initially displaying an overlay by calling the **IDirectDrawSurface7::UpdateOverlay** method, you can update the destination rectangle's by calling the **IDirectDrawSurface7::SetOverlayPosition** method.

Make sure that the positions you specify comply with any boundary alignment restrictions enforced by the hardware. For more information, see Boundary and Size Alignment. Also remember that **SetOverlayPosition** doesn't perform clipping for you; using coordinates that would potentially make the overlay run off the edge of the target surface will cause the method to fail, returning DDERR\_INVALIDPOSITION.

[Visual Basic]

After initially displaying an overlay by calling the **DirectDrawSurface7.UpdateOverlay** method, you can update the destination rectangle's by calling the **DirectDrawSurface7.SetOverlayPosition** method.

Make sure that the positions you specify comply with any boundary alignment restrictions enforced by the hardware. For more information, see Boundary and Size Alignment. Also remember that **SetOverlayPosition** doesn't perform clipping for you; using coordinates that would potentially make the overlay run off the edge of the target surface will cause the method to fail, raising DDERR\_INVALIDPOSITION.

#### Creating Overlay Surfaces

[C++]

Like creating all surfaces, you create an overlay surface by calling the **IDirectDraw7::CreateSurface** method. To create an overlay, include the DDSCAPS\_OVERLAY flag in the associated **DDSCAPS2** structure.

Overlay support varies widely across display devices. As a result, you cannot be sure that a given pixel format will be supported by most drivers and must therefore be prepared to work with a variety of pixel formats. You can request information about the non-RGB formats that a driver supports by calling the **IDirectDraw7::GetFourCCCodes** method.

[Visual Basic]

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When you attempt to create an overlay surface, it is advantageous to try creating a surface with the most desirable pixel format, falling back on other pixel formats if a given pixel format isn't supported.

You can create overlay surface flipping chains. For more information, see Creating Complex Surfaces and Flipping Chains.

#### Overlay Z-Orders

[C++]

Overlay surfaces are assumed to be on top of all other screen components, but when you display multiple overlay surfaces, you need some way to visually organize them. DirectDraw supports *overlay z-ordering* to manage the order in which overlays clip each other. Z-order values represent conceptual distances from the primary surface toward the viewer. They range from 0, which is just on top of the primary surface, to 4 billion, which is as close to the viewer as possible, and no two overlays can share the same z-order. You set z-order values by calling the **IDirectDrawSurface7::UpdateOverlayZOrder** method.

Destination color keys are affected only by the bits on the primary surface, not by overlays occluded by other overlays. Source color keys work on an overlay whether or not a z-order was specified for the overlay.

Overlays without a specified z-order are assumed to have a z-order of 0. Overlays that do not have a specified z-order behave in unpredictable ways when overlaying the same area on the primary surface.

A DirectDraw object does not track the z-orders of overlays displayed by other applications.

Note

You can ensure proper clipping of multiple overlay surfaces by calling **UpdateOverlayZOrder** in response to WM\_KILLFOCUS messages. When you receive this message, set your overlay surface to the rearmost z-order position by calling the **UpdateOverlayZOrder** method with the *dwFlags* parameter set to DDOVERZ\_SENDTOBACK.

[Visual Basic]

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#### Flipping Overlay Surfaces

[C++]

Like other types of surfaces, you can create overlay flipping chains. After creating a flipping chain of overlays, call the **IDirectDrawSurface7::Flip** method to flip between them. For more information, see Flipping Surfaces.

Software decoders displaying video with overlay surfaces can use the DDFLIP\_ODD and DDFLIP\_EVEN flags when calling the **Flip** method to use features that reduce motion artifacts. If the driver supports odd-even flipping, the DDCAPS2\_CANFLIPODDEVEN flag will be set in the **DDCAPS** structure after retrieving driver capabilities. If DDCAPS2\_CANFLIPODDEVEN is set, you can include the DDOVER\_BOB flag when calling the **IDirectDrawSurface7::UpdateOverlay** method to inform the driver that you want it to use the "Bob" algorithm to minimize motion artifacts. Later, when you call **Flip** with the DDFLIP\_ODD or DDFLIP\_EVEN flag, the driver will automatically adjust the overlay source rectangle to compensate for jittering artifacts.

[Visual Basic]

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If the driver doesn't set the DDCAPS2\_CANFLIPODDEVEN flag when you retrieve hardware capabilities, **UpdateOverlay** will fail if you specify the DDOVER\_BOB flag.

For more information about the Bob algorithm, see Solutions to Common Video Artifacts.

### Compressed Texture Surfaces

[C++]

A surface can contain a bitmap to be used for texturing 3-D objects. When creating the surface you must specify the DDSCAPS\_TEXTURE flag in the **dwFlags** member of the **DDSCAPS** structure.

[Visual Basic]

A surface can contain a bitmap to be used for texturing 3-D objects. When creating the surface you must specify the DDSCAPS\_TEXTURE flag in the **lCaps** member of the **DDSCAPS2** type.

For more information on the use of textures in Direct3D Immediate Mode, see Textures.

In order to reduce the amount of memory consumed by textures, DirectDraw supports the compression of texture surfaces.

Some Direct3D devices support compressed texture surfaces natively. On such devices, once you have created a compressed surface and loaded the data into it, the surface can be used in Direct3D just like any other texture surface. Direct3D handles decompression when the texture is mapped to a 3-D object.

Other devices do not support compressed texture surfaces natively. When using such devices, you may still find it useful to use compressed surfaces to represent textures on disk or for textures that are loaded into memory but not currently being used. You can use DirectDraw to convert the compressed textures to an uncompressed format before giving the texture to Direct3D.

For more information on texture compression in DirectDraw, see the following topics:

Creating Compressed Textures

Decompressing Compressed Textures

Transparency in Blits to Compressed Textures

Compressed Texture Formats

For information on using compressed textures in Direct3D Immediate Mode, see Texture Compression.

#### Creating Compressed Textures

[C++]

To describe a compressed texture surface in the **DDSURFACEDESC2** structure when creating the surface, you must include the following steps:

Specify the DDSCAPS\_TEXTURE flag in the **dwFlags** member of the **DDSCAPS** structure, just as you would for any texture.

Set the **dwFourCC** member of the **DDPIXELFORMAT** structure to one of the DXT codes described later.

Include DDPF\_FOURCC in the **dwFlags** member of **DDPIXELFORMAT**. Do not set the DDPF\_RGB flag.

Specify a width and height that are a multiple of 4 pixels.

There are two ways to load image data into a compressed texture surface:

Create a regular RGB or ARGB surface and load a normal bitmap into it, then use **IDirectDrawSurface7::Blt** or **IDirectDrawSurface7::BltFast** to blit from the uncompressed surface to the compressed surface. DirectDraw does the compression for you.

Load the compressed data from a file and copy it directly into the surface memory. (See Accessing Surface Memory Directly.) You can create and convert compressed texture (DDS) files using the DirectX Texture Tool (Dxtex.exe) supplied with the SDK. You can also create your own DDS files and either copy the data from compressed surfaces or else use your own routines to convert regular bitmap data to one of the compressed formats.

Note

When you call **IDirectDrawSurface7::Lock** or **IDirectDrawSurface7::GetSurfaceDesc** on a compressed surface, the DDSD\_LINEARSIZE flag is set in the **dwFlags** member of the **DDSURFACEDESC** structure, and the **dwLinearSize** member contains the number of bytes allocated to contain the compressed surface data. The **dwLinearSize** parameter resides in a union with the **lPitch** parameter, so these parameters are mutually exclusive, as are the flags DDSD\_LINEARSIZE and DDSD\_PITCH.

[Visual Basic]

To describe a compressed texture surface in the **DDSURFACEDESC2** type when creating the surface, you must include the following steps:

Specify the DDSCAPS\_TEXTURE flag in the **lCaps** member of the **DDSCAPS2** type, just as you would for any texture.

Set the **lFourCC** member of the **DDPIXELFORMAT** type to one of the DXT codes described later.

Include DDPF\_FOURCC in the **lFlags** member of **DDPIXELFORMAT**. Do not set the DDPF\_RGB flag.

Specify a width and height that are a multiple of 4 pixels.

There are two ways to load image data into a compressed texture surface:

Create a regular RGB or ARGB surface and load a normal bitmap into it, then use **DirectDrawSurface7.Blt** or **DirectDrawSurface7.BltFast** to blit from the uncompressed surface to the compressed surface. DirectDraw does the compression for you.

Load the compressed data from a file and copy it directly into the surface memory. (See Accessing Surface Memory Directly.) You can create and convert compressed texture (DDS) files using the DirectX Texture Tool (Dxtex.exe) supplied with the SDK. You can also create your own DDS files and either copy the data from compressed surfaces or else use your own routines to convert regular bitmap data to one of the compressed formats.

Note

When you call **DirectDrawSurface7.Lock** or **DirectDrawSurface7.GetSurfaceDesc** on a compressed surface, the DDSD\_LINEARSIZE flag is set in the **lFlags** member of the **DDSURFACEDESC2** type, and the **lLinearSize** member contains the number of bytes allocated to contain the compressed surface data. The **lLinearSize** parameter resides in a union with the **lPitch** parameter, so these parameters are mutually exclusive, as are the flags DDSD\_LINEARSIZE and DDSD\_PITCH.

The advantage of this behavior is that an application can copy the contents of a compressed surface to a file without having to calculate for itself how much storage is required for a surface of a particular width and height in the specific format.

The following table shows the five types of compressed textures. For more information on how the data is stored (you need to know this only if you are writing your own compression routines) see Compressed Texture Formats.

|  |  |  |
| --- | --- | --- |
| FOURCC | Description | Alpha premultiplied? |
|  | | |
| DXT1 | Opaque / one-bit alpha | n/a |
| DXT2 | Explicit alpha | Yes |
| DXT3 | Explicit alpha | No |
| DXT4 | Interpolated alpha | Yes |
| DXT5 | Interpolated alpha | No |

Note

When you blit from a non-premultiplied format to a premultiplied format, DirectDraw scales the colors based on the alpha values. Blitting from a premultiplied format to a non-premultiplied format is not supported. If you try to blit from a premultiplied-alpha source to a non-premultiplied-alpha destination, the method will return DDERR\_INVALIDPARAMS. If you blit from a premultiplied-alpha source to a destination that has no alpha, the source color components, which have been scaled by alpha, will be copied as is.

#### Decompressing Compressed Textures

As with compressing a texture surface, decompressing a compressed texture is performed through DirectDraw blitting services. The HEL performs decompressing blits between system memory surfaces, so these always supported. Likewise, the HEL always performs blits for compressed managed textures (the DDSCAPS2\_TEXTUREMANAGE capability). For other situations, the restrictions discussed in the following paragraphs apply.

If the driver supports the creation of compressed video-memory surfaces, then the driver can also perform decompressing blits from a compressed video-memory surface to an uncompressed video or system memory surface, so long as the destination surface has the DDSCAPS\_OFFSCREENPLAIN capability.

Blits from compressed system-memory surfaces to uncompressed video-memory surfaces are largely unsupported and should not be attempted, even when the driver supports compressed textures. This does not mean that it is impossible to decompress a compressed system-memory surface and move its contents into a video memory surface; it merely requires an additional step:

To decompress a system memory surface into video memory:

1. Create an uncompressed, off-screen plain surface in system memory of the desired dimensions and pixel format.

2. Blit from the compressed system-memory surface to the uncompressed system-memory surface. (The DirectDraw HEL performs decompression in this case.)

3. Blit the uncompressed surface to the uncompressed video-memory surface.

#### Transparency in Blits to Compressed Textures

DirectDraw provides a special trick for creating compressed textures with alpha from plain RGB surfaces. If a source color key is provided on the source RGB surface, DirectDraw assigns an alpha value of 0 to all pixels of that color in the destination. This technique is especially useful for creating DXT1 textures, since they effectively have only 1 bit of alpha information per pixel.

Note

There are no flags that control this behavior. If you do not want any transparency in your compressed texture, do not set a source color key on the source surface.

#### Compressed Texture Formats

This section contains information on the internal organization of compressed texture formats. You don't need these details in order to use compressed textures, because DirectDraw handles conversion to and from compressed formats. However, you might find this information useful if you want to operate on compressed surface data directly.

DirectDraw uses a compression format that divides texture maps into 4x4 texel blocks. If the texture contains no transparency (is opaque), or if the transparency is specified by a one-bit alpha, an 8-byte block represents the texture map block. If the texture map does contain transparent texels, using an alpha channel, a 16-byte block represents it.

These two types of format are discussed in the following sections:

Opaque and One-bit Alpha Textures

Textures with Alpha Channels

Note

Any single texture must specify that its data is stored as 64 or 128 bits per group of 16 texels. If 64-bit blocks—that is, format DXT1—are used for the texture, it is possible to mix the opaque and one-bit alpha formats on a per-block basis within the same texture. In other words, the comparison of the unsigned integer magnitude of color\_0 and color\_1 is performed uniquely for each block of 16 texels.

When 128-bit blocks are used, then the alpha channel must be specified in either explicit (format DXT2 or DXT3) or interpolated mode (format DXT4 or DXT5) for the entire texture. Note that as with color, once interpolated mode is selected then either 8 interpolated alphas or 6 interpolated alphas mode can be used on a block-by-block basis. Again the magnitude comparison of alpha\_0 and alpha\_1 is done uniquely on a block-by-block basis.

##### Opaque and One-bit Alpha Textures

Texture format DXT1 is for textures that are opaque or have a single transparent color.

For each opaque or one-bit alpha block, two 16-bit values (RGB 5:6:5 format) and a 4x4 bitmap with 2-bits-per-pixel are stored. This totals 64 bits for 16 texels, or 4-bits-per-texel. In the block bitmap, there are two bits per texel to select between the four colors, two of which are stored in the encoded data. The other two colors are derived from these stored colors by linear interpolation.

The one-bit alpha format is distinguished from the opaque format by comparing the two 16-bit color values stored in the block. They are treated as unsigned integers. If the first color is greater than the second, it implies that only opaque texels are defined. This means four colors will be used to represent the texels. In four-color encoding, there are two derived colors and all four colors are equally distributed in RGB color space. This format is analogous to RGB 5:6:5 format. Otherwise, for one-bit alpha transparency, three colors are used and the fourth is reserved to represent transparent texels.

In three-color encoding, there is one derived color and the fourth two-bit code is reserved to indicate a transparent texel (alpha information). This format is analogous to RGBA 5:5:5:1, where the final bit is used for encoding the alpha mask.

[C++]

The following piece of pseudocode illustrates the algorithm for deciding whether three- or four-color encoding is selected:

if (color\_0 > color\_1)

{

// Four-color block: derive the other two colors.

// 00 = color\_0, 01 = color\_1, 10 = color\_2, 11 = color\_3

// These two bit codes correspond to the 2-bit fields

// stored in the 64-bit block.

color\_2 = (2 \* color\_0 + color\_1) / 3;

color\_3 = (color 0 + 2 \* color\_1) / 3;

}

else

{

// Three-color block: derive the other color.

// 00 = color\_0, 01 = color\_1, 10 = color\_2,

// 11 = transparent.

// These two bit codes correspond to the 2-bit fields

// stored in the 64-bit block.

color\_2 = (color\_0 + color\_1) / 2;

color\_3 = transparent;

}

The following tables show the memory layout for the 8-byte block. It is assumed that the first index corresponds to the y-coordinate and the second corresponds to the x-coordinate. For example, Texel[1][2] refers to the texture map pixel at (x,y) = (2,1).

Here is the memory layout for the 8-byte (64-bit) block:

|  |  |
| --- | --- |
| Word address | 16-bit word |
|  | |
| 0 | Color\_0 |
| 1 | Color\_1 |
| 2 | Bitmap Word\_0 |
| 3 | Bitmap Word\_1 |

Color\_0 and Color\_1 (colors at the two extremes) are laid out as follows:

|  |  |
| --- | --- |
| Bits | Color |
|  | |
| 4:0 (LSB) | Blue color component |
| 10:5 | Green color component |
| 15:11 | Red color component |

Bitmap Word\_0 is laid out as follows:

|  |  |
| --- | --- |
| Bits | Texel |
|  | |
| 1:0 (LSB) | Texel[0][0] |
| 3:2 | Texel[0][1] |
| 5:4 | Texel[0][2] |
| 7:6 | Texel[0][3] |
| 9:8 | Texel[1][0] |
| 11:10 | Texel[1][1] |
| 13:12 | Texel[1][2] |
| 15:14 (MSB) | Texel[1][3] |

Bitmap Word\_1 is laid out as follows:

|  |  |
| --- | --- |
| Bits | Texel |
|  | |
| 1:0 (LSB) | Texel[2][0] |
| 3:2 | Texel[2][1] |
| 5:4 | Texel[2][2] |
| 7:6 | Texel[2][3] |
| 9:8 | Texel[3][0] |
| 11:10 | Texel[3][1] |
| 13:12 | Texel[3][2] |
| 15:14 (MSB) | Texel[3][3] |

**Example of Opaque Color Encoding**

As an example of opaque encoding, we will assume that the colors red and black are at the extremes. We will call red color\_0 and black color\_1. There will be four interpolated colors that form the uniformly distributed gradient between them. To determine the values for the 4x4 bitmap, the following calculations are used:

00 ? color\_0

01 ? color\_1

10 ? 2/3 color\_0 + 1/3 color\_1

11 ? 1/3 color\_0 + 2/3 color\_1

**Example of One-bit Alpha Encoding**

This format is selected when the unsigned 16-bit integer, color\_0, is less than the unsigned 16-bit integer, color\_1. An example of where this format could be used is leaves on a tree to be shown against a blue sky. Some texels could be marked as transparent while three shades of green are still available for the leaves. Two of these colors fix the extremes, and the third color is an interpolated color.

The bitmap encoding for the colors and the transparency is determined using the following calculations:

00 ? color\_0

01 ? color\_1

10 ? 1/2 color\_0 + 1/2 color\_1

11 ? Transparent

[C++,Visual Basic]

##### Textures with Alpha Channels

There are two ways to encode texture maps that exhibit more complex transparency. In each case, a block that describes the transparency precedes the 64-bit block already described. The transparency is either represented as a 4x4 bitmap with four bits per pixel (explicit encoding), or with fewer bits and linear interpolation analogous to what is used for color encoding.

The transparency block and the color block are laid out as follows:

|  |  |
| --- | --- |
| Word Address | 64-bit Block |
|  | |
| 3:0 | Transparency block |
| 7:4 | Previously described 64-bit block |

**Explicit Texture Encoding**

For explicit texture encoding (DXT2 and DXT3 formats), the alpha components of the texels that describe transparency are encoded in a 4x4 bitmap with 4 bits per texel. These 4 bits can be achieved through a variety of means such as dithering or by simply using the 4 most significant bits of the alpha data. However they are produced, they are used just as they are, without any form of interpolation.

Note

The compression method of DirectDraw uses the 4 most significant bits.

The following tables illustrate how the alpha information is laid out in memory, for each 16-bit word.

This is the layout for Word 0:

|  |  |
| --- | --- |
| Bits | Alpha |
|  | |
| 3:0 (LSB) | [0][0] |
| 7:4 | [0][1] |
| 11:8 | [0][2] |
| 15:12 (MSB) | [0][3] |

This is the layout for Word 1:

|  |  |
| --- | --- |
| Bits | Alpha |
|  | |
| 3:0 (LSB) | [1][0] |
| 7:4 | [1][1] |
| 11:8 | [1][2] |
| 15:12 (MSB) | [1][3] |

This is the layout for Word 2:

|  |  |
| --- | --- |
| Bits | Alpha |
|  | |
| 3:0 (LSB) | [2][0] |
| 7:4 | [2][1] |
| 11:8 | [2][2] |
| 15:12 (MSB) | [2][3] |

This is the layout for Word 3:

|  |  |
| --- | --- |
| Bits | Alpha |
|  | |
| 3:0 (LSB) | [3][0] |
| 7:4 | [3][1] |
| 11:8 | [3][2] |
| 15:12 (MSB) | [3][3] |

**Three-Bit Linear Alpha Interpolation**

The encoding of transparency for the DXT4 and DXT5 formats is based on a concept similar to the linear encoding used for color. Two 8-bit alpha values and a 4x4 bitmap with three bits per pixel are stored in the first eight bytes of the block. The representative alpha values are used to interpolate intermediate alpha values. Additional information is available in the way the two alpha values are stored. If alpha\_0 is greater than alpha\_1, then six intermediate alpha values are created by the interpolation. Otherwise, four intermediate alpha values are interpolated between the specified alpha extremes. The two additional implicit alpha values are 0 (fully transparent) and 255 (fully opaque).

[C++]

The following pseudo-code illustrates this algorithm:

// 8-alpha or 6-alpha block?

if (alpha\_0 > alpha\_1) {

// 8-alpha block: derive the other 6 alphas.

// 000 = alpha\_0, 001 = alpha\_1, others are interpolated

alpha\_2 = (6 \* alpha\_0 + alpha\_1) / 7; // bit code 010

alpha\_3 = (5 \* alpha\_0 + 2 \* alpha\_1) / 7; // Bit code 011

alpha\_4 = (4 \* alpha\_0 + 3 \* alpha\_1) / 7; // Bit code 100

alpha\_5 = (3 \* alpha\_0 + 4 \* alpha\_1) / 7; // Bit code 101

alpha\_6 = (2 \* alpha\_0 + 5 \* alpha\_1) / 7; // Bit code 110

alpha\_7 = (alpha\_0 + 6 \* alpha\_1) / 7; // Bit code 111

}

else { // 6-alpha block: derive the other alphas.

// 000 = alpha\_0, 001 = alpha\_1, others are interpolated

alpha\_2 = (4 \* alpha\_0 + alpha\_1) / 5; // Bit code 010

alpha\_3 = (3 \* alpha\_0 + 2 \* alpha\_1) / 5; // Bit code 011

alpha\_4 = (2 \* alpha\_0 + 3 \* alpha\_1) / 5; // Bit code 100

alpha\_5 = (alpha\_0 + 4 \* alpha\_1) / 5; // Bit code 101

alpha\_6 = 0; // Bit code 110

alpha\_7 = 255; // Bit code 111

}

The memory layout of the alpha block is as follows:

|  |  |
| --- | --- |
| Byte | Alpha |
|  | |
| 0 | Alpha\_0 |
| 1 | Alpha\_1 |
| 2 | [0][2] (2 LSBs), [0][1], [0][0] |
| 3 | [1][1] (1 LSB), [1][0], [0][3], [0][2] (1 MSB) |
| 4 | [1][3], [1][2], [1][1] (2 MSBs) |
| 5 | [2][2] (2 LSBs), [2][1], [2][0] |
| 6 | [3][1] (1 LSB), [3][0], [2][3], [2][2] (1 MSB) |
| 7 | [3][3], [3][2], [3][1] (2 MSBs) |

[C++,Visual Basic]

### Private Surface Data

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

You can store any kind of application-specific data with a surface. For example, a surface representing a map in a game might contain information about terrain.

A surface can have more than one private data buffer. Each buffer is identified by a GUID which you supply when attaching the data to the surface.

To store private surface data, you use the **IDirectDrawSurface7::SetPrivateData** method, passing in a pointer to the source buffer, the size of the data, and an application-defined GUID for the data. Optionally, the source data can exist in the form of a COM object; in this case, you pass a pointer to the object's **IUnknown** interface pointer and you set the DDSPD\_IUNKNOWNPOINTER flag. Another flag, DDSPD\_VOLATILE, indicates that the data being attached to the surface is valid only as long as the contents of the surface do not change. (See Surface Uniqueness Values.)

**SetPrivateData** allocates an internal buffer for the data and copies it. You can then safely free the source buffer or object. The internal buffer or interface reference is released when **IDirectDrawSurface7::FreePrivateData** is called. This happens automatically when the surface is freed.

To retrieve private data for a surface, you must allocate a buffer of the correct size and then call the **IDirectDrawSurface7::GetPrivateData** method, passing the GUID that was assigned to the data by **SetPrivateData**. You are responsible for freeing any dynamic memory you use for this buffer. If the data is a COM object, this method retrieves the **IUnknown** pointer.

If you don't know how big a buffer to allocate, first call **GetPrivateData** with zero in \**lpcbBufferSize.* If the method fails with DDERR\_MOREDATA, it returns the necessary number of bytes in *\*lpcbBufferSize*.

### Surface Uniqueness Values

[C++]

The uniqueness value of a surface allows you to determine whether the surface has changed. When DirectDraw creates a surface, it assigns a uniqueness value, which you can retrieve and store by using the **IDirectDrawSurface7::GetUniquenessValue** method. Then, whenever you need to determine whether the surface has changed, you call the method again and compare the new value against the old one. If it's different, the surface has changed.

The actual value returned by **GetUniquenessValue** is irrelevant, unless it is 0. DirectDraw assigns this value to a surface when it knows that the surface might be changed by some process beyond its control. When **GetUniquenessValue** returns 0, you know only that the state of the surface is indeterminate.

To force the uniqueness value for a surface to change, an application can use the **IDirectDrawSurface7::ChangeUniquenessValue** method. This method could be called, for example, by an application or component that changed the private data for a surface without changing the surface itself, and wished to notify some other process of the change. Most applications, however, never need to change the uniqueness value.

[Visual Basic]

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### Using Non-local Video Memory Surfaces

DirectDraw supports the Accelerated Graphics Port (AGP) architecture for creating surfaces in non-local video memory. On AGP-equipped systems, DirectDraw will use non-local video memory if local video memory is exhausted or if non-local video memory is explicitly requested, depending on the type of AGP implementation that is in place.

[C++]

Currently, there are two implementations of the AGP architecture, known as the "execute model" and the "DMA model." In the execute model implementation, the display device supports the same features for non-local video memory surfaces and local video memory surfaces. As a result, when you retrieve hardware capabilities by calling the **IDirectDraw7::GetCaps** method, the blit-related flags in the **dwNLVBCaps**, **dwNLVBCaps2**, **dwNLVBCKeyCaps**, **dwNLVBFXCaps**, and **dwNLVBRops** members of the **DDCAPS** structure will be identical to those for local video memory. Under the execute model, if local video memory is exhausted, DirectDraw will automatically fall back on non-local video memory unless the caller specifically requests otherwise.

In the DMA model implementation, support for blitting and texturing from non-local video memory surfaces is limited. When the display device uses the DMA model, the DDCAPS2\_NONLOCALVIDMEMCAPS flag will be set in the **dwCaps2** member when you retrieve device capabilities. In the DMA model, the blit-related flags included in the **dwNLVBCaps**, **dwNLVBCaps2**, **dwNLVBCKeyCaps**, **dwNLVBFXCaps**, and **dwNLVBRops** members of the **DDCAPS** structure describe the features that are supported; these features will often be a smaller subset of those supported for local video memory surfaces. Under the DMA model, when local video memory is exhausted, DirectDraw will automatically fall back on non-local video memory for texture surfaces only, unless the caller had explicitly requested local video memory. Texture surfaces are the only types of surfaces that will be treated this way; all other types of surfaces cannot be created in non-local video memory unless the caller explicitly requests it.

DMA model implementations vary in support for texturing from non-local video memory surfaces. If the driver supports texturing from non-local video memory surfaces, the D3DDEVCAPS\_TEXTURENONLOCALVIDMEM flag will be set when you retrieve the 3-D device's capabilities by calling the **IDirect3DDevice7::GetCaps** method.

[Visual Basic]

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In the DMA model implementation, support for blitting and texturing from non-local video memory surfaces is limited. When the display device uses the DMA model, the DDCAPS2\_NONLOCALVIDMEMCAPS flag will be set in the **lCaps2** member when you retrieve device capabilities. In the DMA model, the blit-related flags included in the **lNLVBCaps**, **lNLVBCaps2**, **lNLVBCKeyCaps**, **lNLVBFXCaps**, and **lNLVBRops** members of the **DDCAPS** type describe the features that are supported; these features will often be a smaller subset of those supported for local video memory surfaces. Under the DMA model, when local video memory is exhausted, DirectDraw will automatically fall back on non-local video memory for texture surfaces only, unless the caller had explicitly requested local video memory. Texture surfaces are the only types of surfaces that will be treated this way; all other types of surfaces cannot be created in non-local video memory unless the caller explicitly requests it.

DMA model implementations vary in support for texturing from non-local video memory surfaces. If the driver supports texturing from non-local video memory surfaces, the D3DDEVCAPS\_TEXTURENONLOCALVIDMEM flag will be set when you retrieve the 3-D device's capabilities by calling the **Direct3DDevice7.GetCaps** method.

### Surfaces and Device Contexts

It is often convenient to mix-and-match DirectDraw and GDI services to manipulate the contents of DirectDraw surfaces. DirectDraw offers methods to enable GDI to access DirectDraw surfaces through device contexts, and to retrieve a surface given the surface's device context. This section contains the follows topics that describe these features in detail:

Retrieving the Device Context for a Surface

Finding a Surface with a Device Context

#### Retrieving the Device Context for a Surface

[C++]

If you want to modify the contents of a DirectDraw surface object by using GDI functions, you must retrieve a GDI-compatible device context handle. This could be useful if you wanted to display text in a DirectDraw surface by calling the **DrawText** Win32 function, which accepts a handle to a device context as a parameter. It is possible to retrieve a GDI-compatible device context for a surface by calling the **IDirectDrawSurface7::GetDC** method for that surface. The following example shows how this might be done:

// For this example the lpDDS7 variable is a valid pointer

// to an IDirectDrawSurface7 interface.

HDC hdc;

HRESULT HR;

hr = lpDDS7->GetDC(&hdc);

if(FAILED(hr))

return hr;

// Call DrawText, or some other GDI

// function here.

lpDDS7->ReleaseDC(hdc);

Note that the code calls the **IDirectDrawSurface7::ReleaseDC** method when the surface's device context is no longer needed. This step is required, because the **IDirectDrawSurface7::GetDC** method uses an internal version of the **IDirectDrawSurface7::Lock** method to lock the surface. The surface remains locked until the **IDirectDrawSurface7::ReleaseDC** method is called.

[Visual Basic]

If you want to modify the contents of a DirectDraw surface object by using GDI functions, you must retrieve a GDI-compatible device context handle. It is possible to retrieve a GDI-compatible device context for a surface by calling the **DirectDrawSurface7.GetDC** method for that surface.

Note that the code calls the **DirectDrawSurface7.ReleaseDC** method when the surface's device context is no longer needed. This step is required, because the **DirectDrawSurface7.GetDC** method uses an internal version of the **DirectDrawSurface7.Lock** method to lock the surface. The surface remains locked until the **DirectDrawSurface7.ReleaseDC** method is called.

#### Finding a Surface with a Device Context

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

You can retrieve a pointer to a surface's **IDirectDrawSurface7** interface from the device context for the surface by calling the **IDirectDraw7::GetSurfaceFromDC** method. This feature might be very useful for component applications or ActiveX® controls, that are commonly given a device context to draw into at run time, but could benefit by exploiting the features exposed by the **IDirectDrawSurface7** interface.

A device context might identify memory that isn't associated with a DirectDraw object, or the device context might identify a surface for another DirectDraw object entirely. The latter case is most likely to occur on a system with multiple monitors. If the device context doesn't identify a surface that wasn't created by that DirectDraw object, the method fails, returning DDERR\_NOTFOUND.

The following sample code shows what a very simple scenario might look like:

// For this example, the hdc variable is a valid

// handle to a video memory device context, and the

// lpDD variable is a valid IDirectDraw7 interface pointer.

LPDIRECTDRAWSURFACE7 lpDDS;

HRESULT hr;

hr = lpDD->GetSurfaceFromDC(hdc, &lpDDS);

if(SUCCEEDED(hr)) {

// Use the surface interface.

}

else if(DDERR\_NOTFOUND == hr) {

OutputDebugString("HDC not from this DirectDraw surface\n");

}

## Palettes

This section contains information about DirectDrawPalette objects. The following topics are discussed:

What Are Palettes?

Palette Types

Setting Palettes on Nonprimary Surfaces

Sharing Palettes

Palette Animation

### What Are Palettes?

Palettized surfaces need palettes to be meaningfully displayed. A palettized surface, also known as a color-indexed surface, is simply a collection of numbers where each number represents a pixel. The value of the number is an index into a color table that tells DirectDraw what color to use when displaying that pixel. DirectDrawPalette objects, casually referred to as *palettes*, provide you with an easy way to manage a color table. Surfaces that use a 16-bit or greater pixel format do not use palettes.

A DirectDrawPalette object represents an indexed color table that has 2, 4, 16 or 256 entries to be used with a color indexed surface. Each entry in the palette is an RGB triplet that describes the color to be used when displaying pixels within the surface. The color table can contain 16- or 24-bit RGB triplets representing the colors to be used. For 16-color palettes, the table can also contain indexes to another 256-color palette. Palettes are supported for textures, off-screen surfaces, and overlay surfaces, none of which is required to have the same palette as the primary surface.

[C++]

You can create a palette by calling the **IDirectDraw7::CreatePalette** method. This method retrieves a pointer to the palette object's **IDirectDrawPalette** interface. You can use the methods of this interface to manipulate palette entries, retrieve information about the object's capabilities, or initialize the object (if you used the **CoCreateInstance** COM function to create it).

You apply a palette to a surface by calling the surface's **IDirectDrawSurface7::SetPalette** method. A single palette can be applied to multiple surfaces.

DirectDrawPalette objects reserve entry 0 and entry 255 for 8-bit palettes, unless you specify the DDPCAPS\_ALLOW256 flag to request that these entries be made available to you.

You can retrieve palette entries by using the **IDirectDrawPalette::GetEntries** method, and you can change entries by using the **IDirectDrawPalette::SetEntries** method.

The Ddutil.cpp source file included with the SDK contains some handy application-defined functions for working with palettes. For more information, see the DDLoadPalette functions in that source file.

[Visual Basic]

You can create a palette by calling the **DirectDraw7.CreatePalette** method. This method returns a **DirectDrawPalette** object. You can use the methods of this object to manipulate palette entries and retrieve information about the object's capabilities.

You apply a palette to a surface by calling the surface's **DirectDrawSurface7.SetPalette** method. A single palette can be applied to multiple surfaces.

DirectDrawPalette objects reserve entry 0 and entry 255 for 8-bit palettes, unless you specify the DDPCAPS\_ALLOW256 flag to request that these entries be made available to you.

You can retrieve palette entries by using the **DirectDrawPalette.GetEntries** method, and you can change entries by using the **DirectDrawPalette.SetEntries** method.

### Palette Types

DirectDraw supports 1-bit (2 entry), 2-bit (4 entry), 4-bit (16 entry), and 8-bit (256 entry) palettes. A palette can only be attached to a surface that has a matching pixel format. For example, a 2-entry palette created with the DDPCAPS\_1BIT flag can be attached only to a 1-bit surface created with the DDPF\_PALETTEINDEXED1 flag.

Additionally, you can create palettes that don't contain a color table at all, known as *index* *palettes*. Instead of a color table, an index palette contains index values that represent locations in another palette's color table.

[C++]

To create an indexed palette, specify the DDPCAPS\_8BITENTRIES flag when calling the **IDirectDraw7::CreatePalette** method. For example, to create a 4-bit indexed palette, specify both the DDPCAPS\_4BIT and DDPCAPS\_8BITENTRIES flags. When you create an indexed palette, you pass a pointer to an array of bytes rather than a pointer to an array of **PALETTEENTRY** structures. You must cast the pointer to the array of bytes to an **LPPALETTEENTRY** type when you use the **IDirectDraw7::CreatePalette** method.

Note that DirectDraw does not dereference index palette entries during blit operations.

[Visual Basic]

To create an indexed palette, specify the DDPCAPS\_8BITENTRIES flag when calling the **DirectDraw7.CreatePalette** method. For example, to create a 4-bit indexed palette, specify both the DDPCAPS\_4BIT and DDPCAPS\_8BITENTRIES flags. When you create an indexed palette, you pass an array of bytes rather than an array of **PALETTEENTRY** types.

### Setting Palettes on Nonprimary Surfaces

Palettes can be attached to any palettized surface (primary, back buffer, off-screen plain, or texture map). Only those palettes attached to primary surfaces will have any effect on the system palette. It is important to note that DirectDraw blits never perform color conversion; any palettes attached to the source or destination surface of a blit are ignored.

Nonprimary surface palettes are intended for use by Direct3D applications.

### Sharing Palettes

[C++]

Palettes can be shared among multiple surfaces. The same palette can be set on the front buffer and the back buffer of a flipping chain or shared among multiple texture surfaces. When an application attaches a palette to a surface by using the **IDirectDrawSurface7::SetPalette** method, the surface increments the reference count of that palette. When the reference count of the surface reaches 0, the surface will decrement the reference count of the attached palette. In addition, if a palette is detached from a surface by using **IDirectDrawSurface7::SetPalette** with a NULL palette interface pointer, the reference count of the surface's palette will be decremented.

Note

If **IDirectDrawSurface7::SetPalette** is called several times consecutively on the same surface with the same palette, the reference count for the palette is incremented only once. Subsequent calls do not affect the palette's reference count.

[Visual Basic]

Palettes can be shared among multiple surfaces. The same palette can be set on the front buffer and the back buffer of a flipping chain or shared among multiple texture surfaces.

### Palette Animation

Palette animation refers to the process of modifying a surface's palette to change how the surface itself looks when displayed. By repeatedly changing the palette, the surface appears to change without actually modifying the contents of the surface. To this end, palette animation gives you a way to modify the appearance of a surface without changing its contents and with very little overhead.

There are two methods for providing straightforward palette animation:

Modifying palette entries within a single palette

Switching between multiple palettes

[C++]

Using the first method, you change individual palette entries that correspond to the colors you want to animate, then reset the entries with a single call to the **IDirectDrawPalette::SetEntries** method.

The second method requires two or more DirectDrawPalette objects. When using this method, you perform the animation by attaching one palette object after another to the surface object by calling the **IDirectDrawSurface7::SetPalette** method.

Neither method is hardware intensive, so use whichever technique works best for your application.

For specific information and an example of how to implement palette animation, see Tutorial 5: Dynamically Modifying Palettes.

[Visual Basic]

Using the first method, you change individual palette entries that correspond to the colors you want to animate, then reset the entries with a single call to the **DirectDrawPalette.SetEntries** method.

The second method requires two or more DirectDrawPalette objects. When using this method, you perform the animation by attaching one palette object after another to the surface object by calling the **DirectDrawSurface7.SetPalette** method.

Neither method is hardware intensive, so use whichever technique works best for your application.

## Clippers

This section contains information about DirectDrawClipper objects. The following topics are discussed:

What Are Clippers?

Clip Lists

Sharing DirectDrawClipper Objects

Independent DirectDrawClipper Objects

Creating DirectDrawClipper Objects with CoCreateInstance

Using a Clipper with the System Cursor

Using a Clipper with Multiple Windows

### What Are Clippers?

*Clippers*, or DirectDrawClipper objects, allow you to blit to selected parts of a surface represented by a bounding rectangle or a list of several bounding rectangles. (See Clip Lists.)

One common use for a clipper is to define the boundaries of the screen or window. For example, imagine that you want to display a sprite as it enters the screen from an edge. You don't want to make the sprite pop suddenly onto the screen; you want it to appear as though it is smoothly moving into view. Without a clipper object, DirectDraw does not allow you to blit the entire sprite, because part of it would fall outside the destination surface. A straight copy of the pixel values in the sprite to the destination surface buffer would result in an incorrect display and even memory access violations. With a clipper that has the screen rectangle as its clip list, DirectDraw knows how to trim the sprite as it performs the blit so that only the visible portion is copied.

The following illustration shows this type of clipping.



You can also use clipper objects to designate certain areas within a destination surface as writable. DirectDraw clips blit operations in these areas, protecting the pixels outside the specified clipping rectangle.

The following illustration shows this use of a clipper.



### Clip Lists

[C++]

A clip list consists of one or more **RECT** structures, in pixel coordinates. DirectDraw manages clip lists by using a DirectDrawClipper object, which can be attached to any surface.

The **IDirectDrawSurface7::Blt** method copies data only to rectangles in the clip list. For instance, if the upper-right quarter of a surface was excluded by the rectangles in the clip list, and an application blitted to the entire area of the clipped surface, DirectDraw would effectively perform two blits, the first being to the upper-left corner of the surface, and the second being to the bottom half of the surface, as shown in the following diagram.

[Visual Basic]

A clip list consists of one or more **RECT** types, in pixel coordinates. DirectDraw manages clip lists by using a DirectDrawClipper object, which can be attached to any surface.

The **DirectDrawSurface7.Blt** method copies data only to rectangles in the clip list. For instance, if the upper-right quarter of a surface was excluded by the rectangles in the clip list, and an application blitted to the entire area of the clipped surface, DirectDraw would effectively perform two blits, the first being to the upper-left corner of the surface, and the second being to the bottom half of the surface, as shown in the following diagram.



You can manage a surface's clip list manually or, for a primary surface, have it done automatically by DirectDraw.

[C++]

To manage the clip list yourself, create a list of rectangles in the form of a **RGNDATA** structure and pass this to the **IDirectDrawClipper::SetClipList** method.

To have DirectDraw manage the clip list for a primary surface, you attach the clipper to a window (even a full-screen window) by calling the **IDirectDrawClipper::SetHWnd** method, specifying the target window's handle. This has the effect of setting the clipping region to the client area of the window and ensuring that the clip list is automatically updated as the window is resized, covered, or uncovered.

[Visual Basic]

To manage the clip list yourself, create a list of rectangles in the form of an array of **RECT** types and pass this to the **DirectDrawClipper.SetClipList** method.

To have DirectDraw manage the clip list for a primary surface, you attach the clipper to a window (even a full-screen window) by calling the **DirectDrawClipper.SetHWnd** method, specifying the target window's handle. This has the effect of setting the clipping region to the client area of the window and ensuring that the clip list is automatically updated as the window is resized, covered, or uncovered.

If you set a clipper using a window handle, you cannot set additional rectangles.

Clipping for overlay surfaces is supported only if the overlay hardware can support clipping and if destination color keying is not active.

### Sharing DirectDrawClipper Objects

[C++]

DirectDrawClipper objects can be shared between multiple surfaces. For example, the same DirectDrawClipper object can be set on both the front buffer and the back buffer of a flipping chain. When an application attaches a DirectDrawClipper object to a surface by using the **IDirectDrawSurface7::SetClipper** method, the surface increments the reference count of that object. When the reference count of the surface reaches 0, the surface will decrement the reference count of the attached DirectDrawClipper object. In addition, if a DirectDrawClipper object is detached from a surface by calling **IDirectDrawSurface7::SetClipper** with a NULL clipper interface pointer, the reference count of the surface's DirectDrawClipper object will be decremented.

Note

If **IDirectDrawSurface7::SetClipper** is called several times consecutively on the same surface for the same DirectDrawClipper object, the reference count for the object is incremented only once. Subsequent calls do not affect the object's reference count.

[Visual Basic]

DirectDrawClipper objects can be shared between multiple surfaces. For example, the same DirectDrawClipper object can be set on both the front buffer and the back buffer of a flipping chain. When an application attaches a DirectDrawClipper object to a surface by using the **DirectDrawSurface7.SetClipper** method.

### Independent DirectDrawClipper Objects

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

You can create DirectDrawClipper objects that are not directly owned by any particular DirectDraw object. These DirectDrawClipper objects can be shared across multiple DirectDraw objects. Driver-independent DirectDrawClipper objects are created by using the new **DirectDrawCreateClipper** DirectDraw function. An application can call this function before any DirectDraw objects are created.

Because DirectDraw objects do not own these DirectDrawClipper objects, they are not automatically released when your application's objects are released. If the application does not explicitly release these DirectDrawClipper objects, DirectDraw will release them when the application closes.

You can still create DirectDrawClipper objects by using the **IDirectDraw7::CreateClipper** method. These DirectDrawClipper objects are automatically released when the DirectDraw object from which they were created is released.

### Creating DirectDrawClipper Objects with CoCreateInstance

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

DirectDrawClipper objects have full class-factory support for COM compliance. In addition to using the standard **DirectDrawCreateClipper** function and **IDirectDraw7::CreateClipper** method, you can also create a DirectDrawClipper object either by using the **CoGetClassObject** function to obtain a class factory and then calling the **CoCreateInstance** function, or by calling **CoCreateInstance** directly. The following example shows how to create a DirectDrawClipper object by using **CoCreateInstance** and the **IDirectDrawClipper::Initialize** method.

ddrval = CoCreateInstance(&CLSID\_DirectDrawClipper,

NULL, CLSCTX\_ALL, &IID\_IDirectDrawClipper, &lpClipper);

if (!FAILED(ddrval))

ddrval = IDirectDrawClipper\_Initialize(lpClipper,

lpDD, 0UL);

In this call to **CoCreateInstance**, the first parameter, *CLSID\_DirectDrawClipper*, is the class identifier of the DirectDrawClipper object class, the *IID\_IDirectDrawClipper* parameter identifies the currently supported interface, and the *lpClipper* parameter points to the DirectDrawClipper object that is retrieved.

An application must use the **IDirectDrawClipper::Initialize** method to initialize DirectDrawClipper objects that were created by the class-factory mechanism before it can use the object. The value 0UL is the *dwFlags* parameter, which in this case has a value of 0 because no flags are currently supported. In the example shown here, *lpDD* is the DirectDraw object that owns the DirectDrawClipper object. However, you could supply a NULL value instead, which would create an independent DirectDrawClipper object. (This is equivalent to creating a DirectDrawClipper object by using the **DirectDrawCreateClipper** function.)

Before you close the application, close the COM library by using the **CoUninitialize** function.

### Using a Clipper with the System Cursor

DirectDraw applications often need to provide a way for users to navigate using the mouse. For full-screen exclusive mode applications that use page-flipping, the only option is to implement a mouse cursor manually with a sprite, moving the sprite based on data retrieved from the device by DirectInput® or by responding to Windows mouse messages. However, any application that doesn't use page-flipping can still use the system's mouse cursor support.

When you use the system mouse cursor, you will sometimes fall victim to graphic artifacts that occur when you blit to parts of the primary surface. These artifacts appear as portions of the mouse cursor seemingly left behind by the system.

[C++]

A DirectDrawClipper object can prevent these artifacts from appearing by preventing the mouse cursor image from "being in the way" during a blit operation. It's a relatively simple matter to implement, as well. To do so, create a DirectDrawClipper object by calling the **IDirectDraw7::CreateClipper** method. Then, assign your application's window handle to the clipper with the **IDirectDrawClipper::SetHWnd** method. Once a clipper is attached, any subsequent blits you perform on the primary surface with the **IDirectDrawSurface7::Blt** method will not exhibit the artifact.

Note that the **IDirectDrawSurface7::BltFast** method, and its counterparts in the **IDirectDrawSurface**, **IDirectDrawSurface2**, and **IDirectDrawSurface3** interfaces, will not work on surfaces with attached clippers.

[Visual Basic]

A DirectDrawClipper object can prevent these artifacts from appearing by preventing the mouse cursor image from "being in the way" during a blit operation. It's a relatively simple matter to implement, as well. To do so, create a DirectDrawClipper object by calling the **DirectDraw7.CreateClipper** method. Then, assign your application's window handle to the clipper with the **DirectDrawClipper.SetHWnd** method. Once a clipper is attached, any subsequent blits you perform on the primary surface with the **DirectDrawSurface7.Blt** method will not exhibit the artifact.

### Using a Clipper with Multiple Windows

You can use a DirectDrawClipper object to blit to multiple windows created by an application running at the normal cooperative level.

[C++]

To do this, create a single DirectDraw object with a primary surface. Then, create a DirectDrawClipper object and assign it to your primary surface by calling the **IDirectDrawSurface7::SetClipper** method. To blit only to the client area of a window, set the clipper to that window's client area by calling the **IDirectDrawClipper::SetHWnd** method before blitting to the primary surface. Whenever you need to blit to another window's client area, call the **IDirectDrawClipper::SetHWnd** method again with the new target window handle.

[Visual Basic]

To do this, create a single DirectDraw object with a primary surface. Then, create a DirectDrawClipper object and assign it to your primary surface by calling the **DirectDrawSurface7.SetClipper** method. To blit only to the client area of a window, set the clipper to that window's client area by calling the **DirectDrawClipper.SetHWnd** method before blitting to the primary surface. Whenever you need to blit to another window's client area, call the **DirectDrawClipper.SetHWnd** method again with the new target window handle.

Creating multiple DirectDraw objects that blit to each others' primary surface is not recommended. The technique just described provides an efficient and reliable way to blit to multiple client areas with a single DirectDraw object.

## Multiple-Monitor Systems

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Windows 98 and Windows 2000 support multiple display devices and monitors on a single system. The multiple-monitor architecture (sometimes referred to as MultiMon) enables the operating system to use the display area from two or more display devices and monitors to create a single logical desktop. For example, in a MultiMon system with two monitors, the user could display applications on either monitor, or even drag windows from one monitor to another. DirectDraw supports this architecture, allowing applications to directly access hardware on multiple display devices in a MultiMon system.

Note

As long as it is created on the null device and is not rendering directly to the primary surface, a non-full-screen DirectDraw application will work automatically with MultiMon, and the user will be able to drag the window from one monitor to another. However, DirectDraw will take advantage of hardware acceleration only when the window is entirely within the primary display. It is recommended that windowed DirectDraw applications be specifically designed for MultiMon by maintaining separate DirectDraw objects and surfaces for each monitor. For more information, see Devices and Acceleration in MultiMon Systems.

This section contains information about using DirectDraw on systems with multiple-monitor support. The following topics are discussed:

Enumerating Devices on MultiMon Systems

DirectDraw Objects on Multiple Monitors

Focus and Device Windows

Devices and Acceleration in MultiMon Systems

Debugging Full-Screen DirectDraw Applications with MultiMon

The Multimon.h header file included with the DirectX SDK makes it possible for code written around Windows 98 multiple-monitor functions to compile and run successfully on operating systems that do not support MultiMon.

The following sample application demonstrates the implementation of MultiMon in DirectDraw:

Multimon Sample

### Enumerating Devices on MultiMon Systems

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Use the **DirectDrawEnumerateEx** function to enumerate devices on systems with multiple monitors, specifying flags to determine what types of DirectDraw devices should be enumerated. The function calls an application-defined **DDEnumCallbackEx** function for each enumerated device.

The **DirectDrawEnumerateEx** function is supported on Windows 98 and Windows 2000 operating systems. It is available in Ddraw.lib for applications compiled under DirectX 6.0 and later versions. Applications that statically link to the function will always run under DirectX 6.0 and later, and will always run under any version of DirectX on Windows 98 and Windows 2000. Such applications will fail if run on previous versions of DirectX under Windows 95.

If your application needs to run on versions of DirectX older than DirectX 5.0, it should use **GetProcAddress** to see if **DirectDrawEnumerateEx** is available. The following example shows one way you can do this:

HINSTANCE h = LoadLibrary("ddraw.dll");

// If ddraw.dll doesn't exist in the search path,

// then DirectX probably isn't installed, so fail.

if (!h)

return FALSE;

// Note that you must know which version of the

// function to retrieve (see the following text).

// For this example, we use the ANSI version.

LPDIRECTDRAWENUMERATEEX lpDDEnumEx;

lpDDEnumEx = (LPDIRECTDRAWENUMERATEEX) GetProcAddress(h,"DirectDrawEnumerateExA");

// If the function is there, call it to enumerate all display

// devices attached to the desktop, and any non-display DirectDraw

// devices.

if (lpDDEnumEx)

lpDDEnumEx(Callback, NULL,

DDENUM\_ATTACHEDSECONDARYDEVICES |

DDENUM\_NONDISPLAYDEVICES

);

else

{

/\*

\* We must be running on an old version of DirectDraw.

\* Therefore MultiMon isn't supported. Fall back on

\* DirectDrawEnumerate to enumerate standard devices on a

\* single-monitor system.

\*/

DirectDrawEnumerate(OldCallback,NULL);

/\* Note that it could be handy to let the OldCallback function

\* be a wrapper for a DDEnumCallbackEx.

\*

\* Such a function would look like:

\* BOOL FAR PASCAL OldCallback(GUID FAR \*lpGUID,

\* LPSTR pDesc,

\* LPSTR pName,

\* LPVOID pContext)

\* {

\* return Callback(lpGUID,pDesc,pName,pContext,NULL);

\* }

\*/

}

// If the library was loaded by calling LoadLibrary(),

// then you must use FreeLibrary() to let go of it.

FreeLibrary(h);

The previous example will work for applications that link to Ddraw.dll at run time or load time.

Note that you must retrieve the address of either the ANSI or Unicode version of the **DirectDrawEnumerateEx** function, depending of the type of strings your application uses. When declaring the corresponding callback function, use the **LPTSTR** data type for the string parameters. The **LPTSTR** data type compiles to use Unicode strings if you declare the **\_**UNICODE symbol, and ANSI strings otherwise. By using the **LPTSTR** data type, the function should compile properly regardless of the string type you use in your application.

### DirectDraw Objects on Multiple Monitors

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Windowed DirectDraw applications written for the null or default display driver will work on MultiMon systems, but in applications optimized for MultiMon you will want to create a separate DirectDraw object for each device, using the GUID returned in the enumeration callback. (See Enumerating Devices on MultiMon Systems.)

There are some MultiMon behaviors that will vary depending on whether the application specfies a GUID or NULL during DirectDraw object creation. The most noteable one being that if the application specifies NULL, DirectDraw always clips the cursor to the primary monitor.

Avoid setting the cooperative level multiple times on a MultiMon system. If you need to switch from full-screen to normal mode, it is best to create a new DirectDraw object.

To make an application respond to a user pressing the ALT + TAB keys, the application should not use the default window procedure. To enable this functionality, the device window must change the focus to the parent window each time a SETFOCUS message is recieved.

It is good practice to release all DirectDraw objects at the same time. If you release only the secondary device or devices, the primary device goes back to its original desktop mode, but only the task bar is redrawn and the DirectDraw primary surface is still present. You cannot draw to this surface without first releasing the DirectDraw object and then re-creating it.

### Focus and Device Windows

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Each DirectDraw application that uses one or more monitors in full-screen exclusive mode must have a single focus window, which is the window that receives keyboard input.

Each device that is to hold a full-screen DirectDraw surface must be represented by a DirectDraw object and a device window. The device window is the one that is sized to fit the window and is put on top of all other windows.

For single-monitor applications, there is no distinction between the device and focus window. They are one and the same. For multiple-monitor applications, however, you need to set a device window for each monitor, and you have to let each DirectDraw object know about the application's focus window. The focus window can also serve as the device window for one of the monitors. Other device windows should be children of the focus window so that the application does not minimize when the user clicks on one of them.

Note: make sure your input focus window is specified as the devices parent window when creating multiple exclusive windows for a multimon application or your application will fail to get proper input.

See also:

Setting the Focus Window

Setting Device Windows

#### Setting the Focus Window

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

To set the focus window, you call the **IDirectDraw7::SetCooperativeLevel** method for each of the DirectDraw objects. You pass in a window handle (normally the application window handle) and set the DDSCL\_SETFOCUSWINDOW flag, as in the following example:

/\* It is presumed that lpDD is a valid IDirectDraw interface pointer,

and that hWnd is a valid window handle. \*/

HRESULT ddrval = lpDD->SetCooperativeLevel( hWnd,

DDSCL\_SETFOCUSWINDOW );

The focus window must be the same for all devices.

#### Setting Device Windows

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

There are two ways to set a device window:

Create a window yourself and pass its handle to the **IDirectDraw7::SetCooperativeLevel** method of the DirectDraw object representing the monitor, setting the DDSCL\_SETDEVICEWINDOW, DDSCL\_FULLSCREEN, and DDSCL\_EXCLUSIVE flags. This creates a full-screen window and sets it as the device window for the monitor. Your application will receive mouse messages for the window, and you are responsible for destroying the window at the appropriate time. The window you pass to **SetCooperativeLevel** should be either the focus window (possible only if it is on the same device) or a child of the focus window.

Let DirectDraw create the window. You pass the focus window handle to **SetCooperativeLevel** and set the DDSCL\_CREATEDEVICEWINDOW, DDSCL\_FULLSCREEN, and DDSCL\_EXCLUSIVE flags. DirectDraw creates a default device window that is a child of the focus window. It manages this window and will destroy it at the appropriate time. Your application will not receive any mouse messages for the window.

The following example sets an existing device window for the DirectDraw object represented by *lpDD*.

/\* It is presumed that lpDD is a valid IDirectDraw interface pointer,

and that hWnd is the handle to an appropriate device window. \*/

HRESULT hr = lpDD->SetCooperativeLevel( hWnd,

DDSCL\_SETDEVICEWINDOW | DDSCL\_EXCLUSIVE | DDSCL\_FULLSCREEN );

The following example sets a default device window created by DirectDraw. In this case, *hWnd* is the handle to the existing focus window.

HRESULT hr = lpDD->SetCooperativeLevel( hWnd,

DDSCL\_CREATEDEVICEWINDOW | DDSCL\_EXCLUSIVE | DDSCL\_FULLSCREEN );

Although a focus window can be a device window, you cannot set a window as both the focus window and a device window with a single call to **SetCooperativeLevel**. You must first set it as the focus window and then set it as a device window. However, it is possible to set a focus window and a default device window on the same device with a single call to **SetCooperativeLevel**. The following example shows how this can be done:

HRESULT hr = lpDD->SetCooperativeLevel(

hwndFocus,

DDSCL\_SETFOCUSWINDOW | DDSCL\_FULLSCREEN |

DDSCL\_EXCLUSIVE | DDSCL\_CREATEDEVICEWINDOW);

In this example, an existing window (probably the application window) is set as the focus window, and DirectDraw creates a default device window.

### Devices and Acceleration in MultiMon Systems

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Full-screen exclusive mode DirectDraw objects will take advantage of hardware acceleration regardless of whether they are running on the primary device or on a secondary device. However, they cannot use built-in support for spanning graphics operations across display devices. It is the application's responsibility to perform operations on the appropriate device.

When the normal cooperative level is set, DirectDraw uses hardware acceleration only when the window is wholly within the display area of the primary device. When a window straddles two or more monitors, all blits are done in emulation and performance can be significantly slower. This is necessarily the case, because hardware buffers cannot blit to a display surface controlled by another piece of hardware.

As long as you create the DirectDraw object for the null device—that is, pass NULL to **DirectDrawCreate** as the *lpGUID* parameter—DirectDraw will blit to the entire window regardless of where it is located. However, if the device is created by its actual GUID, this is not the case, and blit operations that cross an edge of the primary surface will be clipped (if you are using a clipper) or will fail, returning DDERR\_INVALIDRECT.

Note

When you are blitting to a window in a MultiMon application, negative coordinates are valid when the logical location of the secondary monitor is to the left of the primary monitor.

To get the best performance in a windowed MultiMon application, you need to create a DirectDraw object for each device, maintain off-screen surfaces in parallel on each device, keep track of which part of the window resides on each device, and perform separate blits to each device.

### Debugging Full-Screen DirectDraw Applications with MultiMon

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

It is possible to use a multimonitor system rather than remote debugging in order to step through code while debugging a full-screen DirectDraw application.

You should use the primary monitor for your development environment and the secondary monitor for the DirectDraw output. Also, you need to change a registry setting through the DirectX property sheet in Control Panel. On the **DirectDraw** page, click **Advanced Settings** and select the **Enable Multi-Monitor Debugging** checkbox. This setting will prevent DirectDraw from minimizing your application when it loses focus.

Under Windows 98, you cannot step through code when a surface is locked. For more information, see Accessing Surface Memory Directly.

## Advanced DirectDraw Topics

This section supplements the DirectDraw overview, providing information about advanced DirectDraw issues. The following topics are discussed:

Mode 13 Support

Taking Advantage of DMA Support

Using DirectDraw Palettes in Windowed Mode

Video Ports

Getting the Flip and Blit Status

Determining the Capabilities of the Display Hardware

Storing Bitmaps in Display Memory

Triple Buffering

DirectDraw Applications and Window Styles

Matching True RGB Colors to the Frame Buffer's Color Space

Displaying a Window in Full-Screen Mode

### Mode 13 Support

This section contains information about DirectDraw Mode 13 graphics mode support. The following topics are discussed:

About Mode 13

Setting Mode 13

Mode 13 and Surface Capabilities

Using Mode 13

#### About Mode 13

DirectDraw supports access to the linear unflippable 320x200 8 bits per pixel palettized mode known widely by the name Mode 13, its hexadecimal BIOS mode number. DirectDraw treats this mode like a Mode X mode, but with some important differences imposed by the physical nature of Mode 13.

#### Setting Mode 13

[C++]

Mode 13 has similar enumeration and mode-setting behavior as Mode X. DirectDraw will only enumerate Mode 13 if the DDSCL\_ALLOWMODEX flag was passed to the **IDirectDraw7::SetCooperativeLevel** method.

You enumerate the Mode 13 display mode like all other modes, but you make a surface capabilities check before calling **IDirectDraw7::EnumDisplayModes**. To do this, call **IDirectDraw7::GetCaps** and check for the DDSCAPS\_STANDARDVGAMODE flag in the **DDSCAPS2** structure after the method returns. If this flag is not present, then Mode 13 is not supported, and attempts to enumerate with the DDEDM\_STANDARDVGAMODES flag will fail, returning DDERR\_INVALIDPARAMS.

The **EnumDisplayModes** method now supports a new enumeration flag, DDEDM\_STANDARDVGAMODES, which causes DirectDraw to enumerate Mode 13 in addition to the 320x200x8 Mode X mode. There is also a new **IDirectDraw7::SetDisplayMode** flag, DDSDM\_STANDARDVGAMODE, which you must pass in order to distinguish Mode 13 from 320x200x8 Mode X.

[Visual Basic]

Mode 13 has similar enumeration and mode-setting behavior as Mode X. DirectDraw will only enumerate Mode 13 if the DDSCL\_ALLOWMODEX flag was passed to the **DirectDraw7.SetCooperativeLevel** method.

You enumerate the Mode 13 display mode like all other modes, but you make a surface capabilities check before calling **DirectDraw7.GetDisplayModesEnum**. To do this, call **DirectDraw7.GetCaps** and check for the DDSCAPS\_STANDARDVGAMODE flag in the **DDSCAPS2** type after the method returns. If this flag is not present, then Mode 13 is not supported, and attempts to enumerate with the DDEDM\_STANDARDVGAMODES flag will fail, generating DDERR\_INVALIDPARAMS.

The **GetDisplayModesEnum** method now supports an enumeration flag, DDEDM\_STANDARDVGAMODES, which causes DirectDraw to enumerate Mode 13 in addition to the 320x200x8 Mode X mode. There is also a new **DirectDraw7.SetDisplayMode** flag, DDSDM\_STANDARDVGAMODE, which you must pass in order to distinguish Mode 13 from 320x200x8 Mode X.

Note that some video cards offer linear accelerated 320x200x8 modes. On such cards DirectDraw will not enumerate Mode 13, enumerating the linear mode instead. In this case, if you attempt to set Mode 13 by passing the DDSDM\_STANDARDVGAMODE flag to **SetDisplayMode**, the method will succeed, but the linear mode will be used. This is analogous to the way that linear low resolution modes override Mode X modes.

#### Mode 13 and Surface Capabilities

[C++]

When DirectDraw calls an application's **EnumModesCallback** callback function, the **ddsCaps** member of the associated **DDSURFACEDESC** or **DDSURFACEDESC2** structure contains flags that reflect the mode being enumerated. You can expect DDSCAPS\_MODEX for a Mode X mode or DDSCAPS\_STANDARDVGAMODE for Mode 13. These flags are mutually exclusive. If neither of these bits is set, then the mode is a linear accelerated mode. This behavior also applies to the flags retrieved by the **IDirectDraw7::GetDisplayMode** method.

[Visual Basic]

When DirectDraw calls an application's **DirectDraw7.GetDisplayModesEnum** method, the **ddsCaps** member of the associated **DDSURFACEDESC2** type contains flags that reflect the mode being enumerated. You can expect DDSCAPS\_MODEX for a Mode X mode or DDSCAPS\_STANDARDVGAMODE for Mode 13. These flags are mutually exclusive. If neither of these bits is set, then the mode is a linear accelerated mode. This behavior also applies to the flags retrieved by the **DirectDraw7.GetDisplayMode** method.

#### Using Mode 13

[C++]

Because Mode 13 is a linear mode, unlike the Mode X modes, DirectDraw can give an application direct access to the frame buffer.You can call the **IDirectDrawSurface7::Lock**, **IDirectDrawSurface7::Blt**, and **IDirectDrawSurface7::BltFast** methods to gain direct access to the primary surface.

When using Mode 13, DirectDraw supports an emulated **IDirectDrawSurface7::Flip** that is implemented as a straight copy of the contents of a back buffer to the primary surface. You can emulate this yourself by copying all or part of the back-buffer's contents to the primary surface using **Blt** or **BltFast**.

[Visual Basic]

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There is one warning concerning **Lock** and Mode 13. Although DirectDraw allows direct linear access to the Mode 13 VGA frame buffer, do not assume that the buffer is always located at address 0xA0000, since DirectDraw can return an aliased virtual-memory pointer to the frame buffer which will not be 0xA0000. Similarly, do not assume that the pitch of a Mode 13 surface is 320, because display cards that support an accelerated 320x200x8 mode will very likely use a different pitch.

### Taking Advantage of DMA Support

This section contains information about how you can take advantage of device support for Direct Memory Access (DMA) to increase performance in completing certain tasks. The following topics are discussed:

About DMA Device Support

Testing for DMA Support

Typical Scenarios for DMA

Using DMA

#### About DMA Device Support

Some display devices can perform blit operations (or other operations) on system memory surfaces. These operations are commonly referred to as Direct Memory Access (DMA) operations. You can exploit DMA support to accelerate certain combinations of operations. For example, on such a device, you could perform a blit from system memory to video memory while using the processor to prepare the next frame. In order to use such facilities, you must assume certain responsibilities. This section details these tasks.

#### Testing for DMA Support

[C++]

Before using DMA operations, you must test the device for DMA support and, if it does support DMA, how much support it provides. Begin by retrieving the driver capabilities by calling the **IDirectDraw7::GetCaps** method, then look for the DDCAPS\_CANBLTSYSMEM flag in the **dwCaps** member of the associated **DDCAPS** structure. If the flag is set, the device supports DMA.

If you know that DMA is generally supported, you also need to find out how well the driver supports it. You do so by looking at some other structure members that provide information about system-to-video, video-to-system, and system-to-system blit operations. These capabilities are provided in 12 **DDCAPS** structure members that are named according to blit and capability type. The following table shows these new members.

|  |  |  |
| --- | --- | --- |
| System-to-video | Video-to-system | System-to-system |
|  | | |
| **dwSVBCaps** | **dwVSBCaps** | **dwSSBCaps** |
| **dwSVBCKeyCaps** | **dwVSBCKeyCaps** | **dwSSBCKeyCaps** |
| **dwSVBFXCaps** | **dwVSBFXCaps** | **dwSSBFXCaps** |
| **dwSVBRops** | **dwVSBRops** | **dwSSBRops** |

For example, the system-to-video blit capability flags are provided in the **dwSVBCaps**, **dwSVBCKeyCaps**, **dwSVBFXCaps** and **dwSVBRops** members. Similarly, video-to-system blit capabilities are in the members whose names begin with "**dwVSB**," and system-to system capabilities are in the "**dwSSB**" members. Examine the flags present in these members to determine the level of hardware support for that blit category.

The flags in these members are parallel with the blit-related flags included in the **dwCaps**, **dwCKeyCaps**, and **dwFXCaps** members, with respect to that member's blit type. For example, the **dwSVBCaps** member contains general blit capabilities as specified by the same flags you might find in the **dwCaps** member. Likewise, the raster operation values in the **dwSVBRops**, **dwVSBRops**, and **dwSSBRops** members provide information about the raster operations supported for a given type of blit operation.

One of the key features to look for in these members is support for asynchronous DMA blit operations. If the driver supports asynchronous DMA blits between surfaces, the DDCAPS\_BLTQUEUE flag will be set in the **dwSVBCaps**, **dwVSBCaps**, or **dwSSBCaps** member. (Generally, you'll see the best support for system-memory-to-video-memory surfaces.) If the flag isn't present, the driver isn't reporting support for asynchronous DMA blit operations.

[Visual Basic]

Before using DMA operations, you must test the device for DMA support and, if it does support DMA, how much support it provides. Begin by retrieving the driver capabilities by calling the **DirectDraw7.GetCaps** method, then look for the DDCAPS\_CANBLTSYSMEM flag in the **lCaps** member of the associated **DDCAPS** type. If the flag is set, the device supports DMA.

If you know that DMA is generally supported, you also need to find out how well the driver supports it. You do so by looking at some other structure members that provide information about system-to-video, video-to-system, and system-to-system blit operations. These capabilities are provided in 12 **DDCAPS** structure members that are named according to blit and capability type. The following table shows these new members.

|  |  |  |
| --- | --- | --- |
| System-to-video | Video-to-system | System-to-system |
|  | | |
| **lSVBCaps** | **lVSBCaps** | **lSSBCaps** |
| **lSVBCKeyCaps** | **lVSBCKeyCaps** | **lSSBCKeyCaps** |
| **lSVBFXCaps** | **lVSBFXCaps** | **lSSBFXCaps** |
| **lSVBRops** | **lVSBRops** | **lSSBRops** |

For example, the system-to-video blit capability flags are provided in the **lSVBCaps**, **lSVBCKeyCaps**, **lSVBFXCaps** and **lSVBRops** members. Similarly, video-to-system blit capabilities are in the members whose names begin with "**lVSB**," and system-to system capabilities are in the "**lSSB**" members. Examine the flags present in these members to determine the level of hardware support for that blit category.

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#### Typical Scenarios for DMA

System memory to video memory transfers that use the SRCCOPY raster operation are the most common type of hardware-supported blit operation. (The SRCCOPY raster operation, which is documented in the Platform SDK, causes the data within the source rectangle to be copied directly to the destination rectangle.) The most typical use for such an operation is to move textures from a large collection of system memory surfaces to a surface in video memory in preparation for subsequent operations. System-to-video DMA transfers are about as fast as processor-controlled transfers (for example, HEL blits), but are of great utility since they can operate in parallel with the host processor.

#### Using DMA

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Hardware transfers use physical memory addresses, not the virtual addresses which are home to applications. Some device drivers require that you provide the surface's physical memory address. This mechanism is implemented by the **IDirectDrawSurface7::PageLock** method. If the device driver does not require page locking, the DDCAPS2\_NOPAGELOCKREQUIRED flag will be set when you retrieve the hardware capabilities by calling the **IDirectDraw7::GetCaps** method.

Page locking a surface prevents the system from committing a surface's physical memory to other uses, and guarantees that the surface's physical address will remain constant until a corresponding **IDirectDrawSurface7::PageUnlock** call is made. If the device driver requires page locking, DirectDraw will allow asynchronous DMA operations only on system memory surfaces that the application has page locked. If you do not call **IDirectDrawSurface7::PageLock** in such a situation, DirectDraw will perform the transfers by using software emulation. Note that locking a large amount of system memory will make Windows run poorly. Therefore, it is highly recommended that only full-screen exclusive mode applications use **IDirectDrawSurface7::PageLock** for large amounts of system memory, and that such applications take care to unlock these surfaces when the application is minimized. Of course, when the application is restored, you should page lock the system memory surface again.

Responsibility for managing page locking is entirely in the hands of the application developer. DirectDraw will never page lock or page unlock a surface. Additionally, it is up to you to determine how much memory you can safely page lock without adversely affecting system performance.

### Using DirectDraw Palettes in Windowed Mode

[C++]

**IDirectDrawPalette** interface methods write directly to the hardware when the display is in exclusive (full-screen) mode. However, when the display is in nonexclusive (windowed) mode, the **IDirectDrawPalette** interface methods call the GDIs palette handling functions to work cooperatively with other windowed applications.

[Visual Basic]

**DirectDrawPalette** class methods write directly to the hardware when the display is in exclusive (full-screen) mode. However, when the display is in nonexclusive (windowed) mode, the **DirectDrawPalette** class methods call the GDIs palette handling functions to work cooperatively with other windowed applications.

The discussion in the following topics assumes that the desktop is in an 8-bit palettized mode and that you have created a primary surface and a typical window.

Types of Palette Entries in Windowed Mode

Creating a Palette in Windowed Mode

Setting Palette Entries in Windowed Mode

#### Types of Palette Entries in Windowed Mode

[C++]

Unlike full-screen exclusive mode applications, windowed applications must share the desktop palette with other applications. This imposes several restrictions on which palette entries you can safely modify and how you can modify them. The **PALETTEENTRY** structure you use when working with DirectDrawPalette objects and GDI contains a **peFlags** member to carry information that describes how the system should interpret the **PALETTEENTRY** structure.

The **peFlags** member describes three types of palette entries, discussed in this topic:

[Visual Basic]

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The **flags** member describes three types of palette entries, discussed in this topic:

Windows static entries

Animated entries

Nonanimated entries

**Windows static entries**

In normal mode, Windows reserves palette entries 0 through 9 and 246 through 255 for system colors that it uses to display menu bars, menu text, window borders, and so on. In order to maintain a consistent look for your application and avoid damaging the appearance of other applications, you need to protect these entries in the palette you set to the primary surface. Often, developers retrieve the system palette entries by calling the **GetSystemPaletteEntries** Win32® function, then explicitly set the identical entries in a custom palette to match before assigning it to the primary surface. Duplicating the system palette entries in a custom palette will work initially, but it becomes invalid if the user changes the desktop color scheme.

To avoid having your palette look bad when the user changes color schemes, you can protect the appropriate entries by providing a reference into the system palette instead specifying a color value. This way, no matter what color the system is using for a given entry, your palette will always match and you won't need to do any updating. The PC\_EXPLICIT flag, used in the **peFlags** member, makes it possible for you to directly refer to a system palette entry. When you use this flag, the system no longer assumes that the other structure members include color information. Rather, when you use PC\_EXPLICIT, you set the value in the **peRed** member to the desired system palette index and set the other colors to zero.

[C++]

For instance, if you want to ensure that the proper entries in your palette always match the system's color scheme, you could use the following code:

// Set the first and last 10 entries to match the system palette.

PALETTEENTRY pe[256];

ZeroMemory(pe, sizeof(pe));

for(int i=0;i<10;i++){

pe[i].peFlags = pe[i+246].peFlags = PC\_EXPLICIT;

pe[i].peRed = i;

pe[i+246].peRed = i+246;

}

You can force Windows to use only the first and last palette entry (0 and 255) by calling the **SetSystemPaletteUse** Win32 function. In this case, you should set only entries 0 and 255 of your **PALETTEENTRY** structure to PC\_EXPLICIT.

**Animated entries**

You specify palette entries that you will be animating by using the PC\_RESERVED flag in the corresponding **PALETTEENTRY** structure. Windows will not allow any other application to map its logical palette entry to that physical entry, thereby preventing other applications from cycling their colors when your application animates the palette.

**Nonanimated entries**

You specify normal, nonanimated palette entries by using the PC\_NOCOLLAPSE flag in the corresponding **PALETTEENTRY** structure. The PC\_NOCOLLAPSE flag informs Windows not to substitute some other already-allocated physical palette entry for that entry.

[Visual Basic]

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#### Creating a Palette in Windowed Mode

[C++]

The following example illustrates how to create a DirectDraw palette in nonexclusive (windowed) mode. In order for your palette to work correctly, it is vital that you set up every one of the 256 entries in the **PALETTEENTRY** structure that you submit to the **IDirectDraw7::CreatePalette** method.

LPDIRECTDRAW7 lpDD; // Assumed to be initialized previously

PALETTEENTRY pPaletteEntry[256];

int index;

HRESULT ddrval;

LPDIRECTDRAWPALETTE2 lpDDPal;

// First set up the Windows static entries.

for (index = 0; index < 10 ; index++)

{

// The first 10 static entries:

pPaletteEntry[index].peFlags = PC\_EXPLICIT;

pPaletteEntry[index].peRed = index;

pPaletteEntry[index].peGreen = 0;

pPaletteEntry[index].peBlue = 0;

// The last 10 static entries:

pPaletteEntry[index+246].peFlags = PC\_EXPLICIT;

pPaletteEntry[index+246].peRed = index+246;

pPaletteEntry[index+246].peGreen = 0;

pPaletteEntry[index+246].peBlue = 0;

}

// Now set up private entries. In this example, the first 16

// available entries are animated.

for (index = 10; index < 26; index ++)

{

pPaletteEntry[index].peFlags = PC\_NOCOLLAPSE|PC\_RESERVED;

pPaletteEntry[index].peRed = 255;

pPaletteEntry[index].peGreen = 64;

pPaletteEntry[index].peBlue = 32;

}

// Now set up the rest, the nonanimated entries.

for (; index < 246; index ++) // Index is set up by previous for loop

{

pPaletteEntry[index].peFlags = PC\_NOCOLLAPSE;

pPaletteEntry[index].peRed = 25;

pPaletteEntry[index].peGreen = 6;

pPaletteEntry[index].peBlue = 63;

}

// All 256 entries are filled. Create the palette.

ddrval = lpDD->CreatePalette(DDPCAPS\_8BIT, pPaletteEntry,

&lpDDPal,NULL);

[Visual Basic]

The following example illustrates how to create a DirectDraw palette in nonexclusive (windowed) mode. In order for your palette to work correctly, it is vital that you set up every one of the 256 entries in the **PALETTEENTRY** type that you submit to the **DirectDraw7.CreatePalette** method.

Private Sub Form\_Load()

Dim pPaletteEntry(255) As PALETTEENTRY

Dim index As Long

Dim ddpal As DirectDrawPalette

'First set up the windows static entries.

For index = 0 To 9

'The first 10 static entries.

pPaletteEntry(index).flags = PC\_EXPLICIT

pPaletteEntry(index).red = index

pPaletteEntry(index).green = 0

pPaletteEntry(index).blue = 0

'The last 10 static entries

pPaletteEntry(index + 246).flags = PC\_EXPLICIT

pPaletteEntry(index + 246).red = index + 246

pPaletteEntry(index + 246).green = 0

pPaletteEntry(index + 246).blue = 0

Next

'Now set up private entries. In this example, the first

'16 available entried are animated.

For index = 10 To 25

pPaletteEntry(index).flags = PC\_NOCOLLAPSE Or PC\_RESERVED

pPaletteEntry(index).red = 255

pPaletteEntry(index).green = 64

pPaletteEntry(index).blue = 32

Next

'Now set up the rest, the non-animated entries.

For index = 26 To 246

pPaletteEntry(index).flags = PC\_NOCOLLAPSE

pPaletteEntry(index).red = 25

pPaletteEntry(index).green = 6

pPaletteEntry(index).blue = 63

Next

'All 256 entries are filled. Create the palette.

Set ddpal = dd.CreatePalette(DDPCAPS\_8BIT, pPaletteEntry())

#### Setting Palette Entries in Windowed Mode

[C++]

The rules that apply to the **PALETTEENTRY** structure used with the **IDirectDraw7::CreatePalette** method also apply to the **IDirectDrawPalette::SetEntries** method. Typically, you maintain your own array of **PALETTEENTRY** structures, so you do not need to rebuild it. When necessary, you can modify the array, and then call **IDirectDrawPalette::SetEntries** when it is time to update the palette.

In most circumstances, you should not attempt to set any of the Windows static entries when in nonexclusive (windowed) mode or you will get unpredictable results. The only exception is when you reset the 256 entries.

For palette animation, you typically change only a small subset of entries in your **PALETTEENTRY** array. You submit only those entries to **IDirectDrawPalette::SetEntries**. If you are resetting such a small subset, you must reset only those entries marked with the PC\_NOCOLLAPSE and PC\_RESERVED flags. Attempting to animate other entries can have unpredictable results.

The following example illustrates palette animation in nonexclusive mode:

LPDIRECTDRAW lpDD; // Already initialized

PALETTEENTRY pPaletteEntry[256]; // Already initialized

LPDIRECTDRAWPALETTE lpDDPal; // Already initialized

int index;

HRESULT ddrval;

PALETTEENTRY temp;

// Animate some entries. Cycle the first 16 available entries.

// They were already animated.

temp = pPaletteEntry[10];

for (index = 10; index < 25; index ++)

{

pPaletteEntry[index] = pPaletteEntry[index+1];

}

pPaletteEntry[25] = temp;

// Set the values. Do not pass a pointer to the entire palette entry

// structure, but only to the changed entries.

ddrval = lpDDPal->SetEntries(

0, // Flags must be zero

10, // First entry

16, // Number of entries

& (pPaletteEntry[10])); // Where to get the data

[Visual Basic]

The rules that apply to the **PALETTEENTRY** type used with the **DirectDraw7.CreatePalette** method also apply to the **DirectDrawPalette.SetEntries** method. Typically, you maintain your own array of **PALETTEENTRY** types, so you do not need to rebuild it. When necessary, you can modify the array, and then call **DirectDrawPalette.SetEntries** when it is time to update the palette.

In most circumstances, you should not attempt to set any of the Windows static entries when in nonexclusive (windowed) mode or you will get unpredictable results. The only exception is when you reset the 256 entries.

For palette animation, you typically change only a small subset of entries in your **PALETTEENTRY** array. You submit only those entries to **DirectDrawPalette.SetEntries**. If you are resetting such a small subset, you must reset only those entries marked with the PC\_NOCOLLAPSE and PC\_RESERVED flags. Attempting to animate other entries can have unpredictable results.

### Video Ports

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support video ports.

[C++]

DirectDraw video-port extensions are a low-level programming interface, not intended for mainstream multimedia programmers. The target customer is the video-streaming software industry, which creates products like DirectShow®. Developers who want to include video playback in their software can make use of video-port extensions. However, for most software, a high-level programming interface like the one provided by DirectShow is recommended for greater ease of use.

This section contains information about DirectDrawVideoPort objects. The following topics are discussed:

What Are Video Ports?

Video-Port Technology Overview

About DirectDraw Video-Port Extensions

Video Frames and Fields

HREF, VREF, and Connections

Vertical Blanking Interval Data

Autoflipping

Solutions to Common Video Artifacts

Solving Problems Caused by Half-Lines

Exploiting Hardware Features

#### What Are Video Ports?

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

A DirectDrawVideoPort object represents the video-port hardware found on some display adapters. Generally, a video-port object controls how the video-port hardware applies a video signal it receives from a video decoder directly to the frame buffer.

More than one channel of video can be controlled by creating as many DirectDrawVideoPort objects as is required. Because each channel can be separately enumerated and configured, the video hardware for each channel does not need to be identical.

For more information, see Video-Port Technology Overview.

#### Video-Port Technology Overview

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

A *video* *port* is hardware on a display device that enables direct access to a surface within the frame buffer, bypassing the CPU and PCI bus. Direct frame buffer access makes it possible to efficiently play live or recorded video without creating noticeable load on the CPU. Once in a surface, an image can be displayed on the screen as an overlay, used as a Direct3D texture, or accessed by the CPU for capture or other processing. The following paragraphs provide general information about the components that make up the technology and how they work.

**Data Flow**

In a machine equipped with a video port, data in a video stream can flow directly from a video source through a video decoder and the video port to the frame buffer. These components often exist together on a display adapter, but can be on separate hardware components that are physically connected to one another. An example of this data flow is provided in the following illustration.



**Video source**

In the scope of video-port technology, a video source is strictly a hardware video input device, such as a Zoom Video port, MPEG codec, or other hardware source. These sources broadcast signals in a variety of formats, including NTSC, PAL, and SECAM through a physical connection to a video decoder.

Video Decoder

A video decoder is also a hardware component. The video decoder's job is to decipher the information provided by the video source and send it to the video port in an agreed upon connection format. The decoder possesses a physical connection to the video port, and exposes its services through a stream class minidriver. The decoder is responsible for sending video data and clock and sync information to the video port.

Video port

Like the other components in the data flow path, the video port is a piece of hardware. The video port exists on the display adapter's VGA chip and has direct access to the frame buffer. It receives information sent from the decoder, processes it, and places it in the frame buffer to be displayed. During processing, the video port can manipulate image data to provide scaling, shrinking, color control, or cropping services.

Frame Buffer

The frame buffer accepts video data as provided by the video port. Once received, applications can programmatically manipulate the image data, blit it to other locations, or show it on the display using an overlay (the most common use).

#### About DirectDraw Video-Port Extensions

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

DirectDraw has been extended to include the DirectDrawVideoPort object, which takes advantage of video-port technology and provides its services through the **IDDVideoPortContainer** and **IDirectDrawVideoPort** interfaces.

DirectDrawVideoPort objects do not control the video decoder, because it provides services of its own, nor does DirectDraw control the video source; it is beyond the scope of the video port. Rather, a DirectDrawVideoPort object represents the video port itself. It monitors the incoming signal and passes image data to the frame buffer, using parameters set though its interface methods to modify the image, perform flipping, or carry out other services.

The **IDDVideoPortContainer** interface, which you can retrieve by calling the **IDirectDraw7::QueryInterface** method, provides methods to query the hardware for its capabilities and create video-port objects. You create a video-port object by calling the **IDDVideoPortContainer::CreateVideoPort** method. Video-port objects expose their functionality through the **IDirectDrawVideoPort** interface, enabling you to manipulate the video-port hardware itself. Using these interfaces, you can examine the video-port's capabilities, assign an overlay surface to receive image data, start and stop video playback, and set hardware parameters to manipulate image data for cropping, color control, scaling, or shrinking effects.

DirectDraw video-port extensions provide for multiple video ports on the same machine by allowing you to create multiple DirectDrawVideoPort objects. There is no requirement that multiple video ports on a machine be identical—each port is separately enumerated and configured separately, regardless of any hardware differences that might exist.

In keeping with the general philosophy of DirectX, this technology gives programmers low-level access to hardware features while insulating them from specific hardware implementation details. It is not a high-level API.

#### Video Frames and Fields

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

Video can be interlaced or non-interlaced. When a video signal is interlaced, each video frame is made of two fields of image data. Each field is a collection of every other scan line in an image, starting with the first or second scan line. The first field, referred to as the odd field (or field 1), contains the data for the first scan line and skips every other scan line to the end of the image. Similarly, the even field (or field 2), carries every other scan line starting with the second. The "even-ness" or "odd-ness" of a field is referred to as its field polarity.

When video is not interlaced, each field contains all of a frame's scan lines. Typically, video signals are sent at a rate of 30 frames per second; in the case of interleaved video, this means the rate is 60 fields per second.

The fields that make up a frame do not always reflect the same moment in time. For example, if the frames are separated by 1/30 of a second then the two fields of a frame may be separated by 1/60 of a second. Because a television displays each field individually, no two fields are simultaneously visible, and the difference between fields adds to the illusion of movement.

#### HREF, VREF, and Connections

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

When a monitor or other display device is displaying an image, it typically scans down the screen, creating an image from left to right, top to bottom. (Sometimes, the device makes two passes down the screen to create a single image; this type of display is called an interlaced display.) The video stream contains signals that instruct the display device when a new line or new screen is to be drawn.

The terms HREF and VREF, also known as hsync and vsync, are the signals within the video stream that tell a display device what to do and when to do it. The HREF signals that a new line is to be drawn and the VREF signals a new screen.

For instance, imagine you're working with a video signal intended for the world's smallest monitor. The monitor only has 4 scan lines. (This is not at all realistic, of course, but it's simple.) On an oscilloscope, the HREF and VREF signals would look somewhat like the following illustration.



In the preceding illustration, both HREF and VREF signals are "active high," meaning that they are considered active when in a heightened state (when the waves go up). There is no standard for these signals. In some cases, places where the waves go down ("low" states) might signal an active HREF or VREF, or sometimes one will be active high and the other active low. Although the preceding illustration is only an imaginary example, note that there are lots of HREF signals for each VREF. This is because for each new screen, there are several scan lines. Of course, in a real video signal for a real broadcast, you would see hundreds of HREFs for a single VREF.

HREF signals, VREF signals, and video data are carried across physical data lines from the decoder to the video port. In many cases, a number of lines are reserved for video data, and others are dedicated to carrying HREF and VREF signals. However, there is no standard for how these data lines are used.

A connection is a protocol that a video port or decoder uses to define how it uses these data lines. Video ports and video decoders will support a variety of connections. DirectDraw video-port extensions use globally-unique identifiers (GUIDs) to identify each type of connection. You can query for the connections that the video port supports by calling the **IDDVideoPortContainer::GetVideoPortConnectInfo** method. You create a DirectDrawVideoPort object that supports a given connection by calling the **IDDVideoPortContainer::CreateVideoPort** method.

Keep in mind that the video decoder is outside the scope of DirectDraw video-port extensions, and exposes its supported connections through an interface of its own. By enumerating the connections that the video-port supports and comparing the results with the connections supported by the decoder, you can negotiate a common connection (or "language") that both components understand.

#### Vertical Blanking Interval Data

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

In broadcast video, a small period of time elapses between video frames, during which a display device refreshes its display for the next frame. This period of time is called the Vertical Blanking Interval (VBI). Instead of sitting idle during the VBI, broadcast video encodes data in the first twenty-one scan lines of a video frame and sends these lines during the VBI. This data is often used for closed captioning or time-stamping, but can be used for other purposes.

DirectDraw video-port extensions enable you to divert data contained with the VBI to a surface, bypass scaling of VBI data, and automatically flip between VBI surfaces in a flipping chain. Once data is in a surface, you can directly access the surface's memory as needed.

For more information, see Autoflipping.

#### Autoflipping

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

To avoid tearing images when refreshing the screen between frames, DirectDrawVideoPort objects can automatically flip their target overlay surfaces in response to VREF signals. To use this service, the target surface you set to the video-port object with the **IDirectDrawVideoPort::SetTargetSurface** method must be the first surface in a flipping chain of overlay surfaces. Then, to begin playing the video sequence, call the **IDirectDrawVideoPort::StartVideo** method, specifying the DDVP\_AUTOFLIP flag in the **dwVPFlags** member of the associated **DDVIDEOPORTINFO** structure. The video-port object will flip to the next surface in the flipping chain for each VREF signal it receives. If the video port is interleaving fields, it will flip once for every two VREF signals it receives.

If you are using autoflipping and want to direct VBI data to separate auto-flipped surfaces, you must have the same number of VBI surfaces as you do standard video surfaces.

#### Solutions to Common Video Artifacts

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

Several problems are inherent in displaying broadcast video on display devices other than televisions. This section briefly discusses some common problems, then describes how DirectDraw video-port extensions tries to solve them.

**NTSC Interlaced Display and Interleaved Memory**

An NTSC signal broadcasts video at an approximate rate of 30 frames, or 60 fields, per second. Like a frame, a field in an NTSC signal is independent of the other field in a frame and can contain different image data. For more information on this behavior, see Video Frames and Fields.

The problems caused by the independence of fields within a frame become apparent when two fields are interleaved for display. In video with a lot of movement, the two fields of a single frame will contain images that don't match each other, resulting in motion artifacts.

One way that developers have tried to work around this behavior is by discarding one of the fields. This solution causes a loss in image quality by roughly one-half, but provides acceptable results for some purposes. Another method frequently used is to display fields individually, stretching each vertically by a factor of two when it is displayed. This provides better image quality, but because fields are offset by one pixel in the y-direction, the result is an animation that "jitters" up and down as it plays.

DirectDraw video-port extensions can employ two, more advanced, techniques for improving image quality, known as "Bob" and "Weave." Both are supported by the DirectDraw overlay surfaces that are used with video-port extensions.

The first algorithm, Bob, is very similar to the method of displaying each field in a frame individually. However, for each field, the overlay's source rectangle is adjusted to accommodate for any jittering effects. Effectively, the source rectangle bounces up and down in time with the fields, negating the jittering on the screen. The following illustration depicts this process.



The Weave algorithm provides the best image quality for material that originates from film by exploiting a common technique used in the video industry for converting motion pictures to television. Unlike Bob, a video-port object does not Weave by itself; you must combine the default overlay behavior of displaying both fields simultaneously with kernel mode video transport (provided with Windows 2000 and Windows 98) to implement the algorithm.

Here is a synopsis of the algorithm, provided for completeness. Motion pictures capture video at a rate of 24 frames per second. When converting a motion picture for television, technicians use a technique called *3:2 pulldown* to convert the frame rate to the 30 frames per second required for television broadcasts. This technique involves inserting a redundant field for every four true fields in the video stream to come up with the required number of fields.

When you weave, you are reversing this process. You detect when 3:2 pulldown is being used, removing any redundant fields to restore the original motion-picture frames. The fields that make up the restored frames can then be interleaved in memory without risk of motion artifacts. Occasionally, the pattern of redundant frames will change due to edits within the original film or reel breaks. You must monitor when these changes occur and update the behavior to adjust for the new pattern.

By default, an overlay surface displays both fields simultaneously. This works well if you're implementing the Weave algorithm, but prevents the video port from using the Bob algorithm. You can programmatically change how the overlay treats video data by calling the **IDirectDrawSurface7::UpdateOverlay** method. The flags you include in the **dwFlags** parameter determine the overlay's behavior: if you include the DDOVER\_BOB flag, the video port will use the Bob algorithm; if you don't, it displays both fields. Note that by simply displaying both fields simultaneously, the resulting video will show motion artifacts.

#### Solving Problems Caused by Half-Lines

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

Some video decoders output a half line of meaningless data at the beginning of the even field. If this extra line is written to the frame buffer, the resulting image will appear garbled. In some cases, the video-port hardware is capable of sensing and discarding this data before writing it to the frame buffer.

You can determine if a video port is capable of discarding this data when retrieving connection information with the **IDDVideoPortContainer::GetVideoPortConnectInfo** method. If the video port cannot discard half-lines, the DDVPCONNECT\_HALFLINE flag will be specified in the **dwFlags** member of the associated **DDVIDEOPORTCONNECT** structure for each supported connection.

If the video port is unable to discard half-lines, you have two options: you can discard one of the fields, or you can work around the hardware's limitations by making some adjustments in how you create the video-port object and display images with the target overlay surface

Here's how to work around the problem. When creating the video-port object by calling the **IDDVideoPortContainer::CreateVideoPort** method, include the DDVPCONNECT\_INVERTPOLARITY flag in the **dwFlags** member of the associated **DDVIDEOPORTCONNECT** structure. This causes the video port to invert the polarity of the fields in the video stream, treating even fields like odd fields and vice versa. Once reversed, the half-line preceding even fields will be written to the frame buffer as the first scan line of each frame. To remove the unwanted data, adjust the source rectangle of the overlay surface used to display the image down one pixel by calling the **IDirectDrawVideoPort::StartVideo** method with the necessary coordinates. Note that this technique requires that you allocate one extra line in the surface containing the even field.

#### Exploiting Hardware Features

[Visual Basic]

The information in this topic pertains only to applications written in C++. Visual Basic for DirectX 7.0 does not support Video Ports.

[C++]

Video-port hardware often supports special features for adjusting color, shrinking or zooming images, handling VBI data, or skipping fields. The HAL provides information about these features by using flags in the **DDVIDEOPORTCAPS** structure. You retrieve the capabilities of a machine's video-port hardware by calling the **IDDVideoPortContainer::EnumVideoPorts** method.

To exploit these features for playback, you use the **IDirectDrawVideoPort::StartVideo** method, which uses a **DDVIDEOPORTINFO** structure to request that hardware features be used to modify image data before placing it in the frame buffer or for display. By setting values and flags in this structure, you can specify the source rectangle used with the overlay surface, indicate cropping regions, request hardware scaling, and set pixel formats.

DirectDrawVideoPort objects do not emulate video-port hardware services.

### Getting the Flip and Blit Status

[C++]

When the **IDirectDrawSurface7::Flip** method is called, the primary surface and back buffer are exchanged. However, the exchange may not occur immediately. For example, if a previous flip has not finished, or if it did not succeed, this method returns DDERR\_WASSTILLDRAWING. In the samples included with the SDK, the **IDirectDrawSurface7::Flip** call continues to loop until it returns DD\_OK. Also, a **IDirectDrawSurface7::Flip** call does not complete immediately. It schedules a flip for the next time a vertical blank occurs on the system.

An application that waits until the DDERR\_WASSTILLDRAWING value is not returned is very inefficient. Instead, you could create a function in your application that calls the **IDirectDrawSurface7::GetFlipStatus** method on the back buffer to determine if the previous flip has finished.

If the previous flip has not finished and the call returns DDERR\_WASSTILLDRAWING, your application can use the time to perform another task before it checks the status again. Otherwise, you can perform the next flip. The following example demonstrates this concept:

while(lpDDSBack->GetFlipStatus(DDGFS\_ISFLIPDONE) ==

DDERR\_WASSTILLDRAWING);

// Waiting for the previous flip to finish. The application can

// perform another task here.

ddrval = lpDDSPrimary->Flip(NULL, 0);

You can use the **IDirectDrawSurface7::GetBltStatus** method in much the same way to determine whether a blit has finished. Because **IDirectDrawSurface7::GetFlipStatus** and **IDirectDrawSurface7::GetBltStatus** return immediately, you can use them periodically in your application with little loss in speed.

[Visual Basic]

When the **DirectDrawSurface7.Flip** method is called, the primary surface and back buffer are exchanged. However, the exchange may not occur immediately. For example, if a previous flip has not finished, or if it did not succeed, this method raises a DDERR\_WASSTILLDRAWING error.

An application that waits until the DDERR\_WASSTILLDRAWING error value is not raised is very inefficient. Instead, you could create a function in your application that calls the **DirectDrawSurface7.GetFlipStatus** method on the back buffer to determine if the previous flip has finished.

If the previous flip has not finished and the call returns DDERR\_WASSTILLDRAWING, your application can use the time to perform another task before it checks the status again. Otherwise, you can perform the next flip. The following example demonstrates this concept:

while(DDSBack.GetFlipStatus(DDGFS\_ISFLIPDONE) =

DDERR\_WASSTILLDRAWING)

' Waiting for the previous flip to finish. The application can

' perform another task here.

DDSPrimary->Flip(NOTHING, 0)

You can use the **DirectDrawSurface7.GetBltStatus** method in much the same way to determine whether a blit has finished. Because **DirectDrawSurface7.GetFlipStatus** and **DirectDrawSurface7.GetBltStatus** return immediately, you can use them periodically in your application with little loss in speed.

### Determining the Capabilities of the Display Hardware

DirectDraw uses software emulation to perform the DirectDraw functions not supported by the user's hardware. To accelerate performance of your DirectDraw applications, you should determine the capabilities of the user's display hardware after you have created a DirectDraw object, then structure your program to take advantage of these capabilities when possible.

[C++]

You can determine these capabilities by using the **IDirectDraw7::GetCaps** method. Not all hardware features are supported in emulation. If you want to use a feature only supported by some hardware, you must also be prepared to supply some alternative for systems with hardware that lacks that feature.

[Visual Basic]

You can determine these capabilities by using the **DirectDraw7.GetCaps** method. Not all hardware features are supported in emulation. If you want to use a feature only supported by some hardware, you must also be prepared to supply some alternative for systems with hardware that lacks that feature.

### Storing Bitmaps in Display Memory

Blitting from display memory to display memory is usually much more efficient than blitting from system memory to display memory. As a result, you should store as many of the sprites your application uses as possible in display memory.

[C++]

Most display adapter hardware contains enough extra memory to store more than the primary surface and the back buffer. Call the **IDirectDraw7::GetAvailableVidMem** method to determine the amount of total and available memory for storing bitmaps in the display adapter's memory. After the call, the *lpdwTotal* parameter contains the total amount of display memory, minus the primary surface and any private caches held by driver, and *lpdwFree* contains the amount of display memory currently free that can be allocated for a surface that matches the capabilities specified by the structure at *lpDDSCaps2*.

[Visual Basic]

Most display adapter hardware contains enough extra memory to store more than the primary surface and the back buffer. Call the **DirectDraw7.GetAvailableTotalMem** method to determine the amount of total and available memory for storing bitmaps in the display adapter's memory. This method returns the total amount of display memory, minus the primary surface and any private caches held by driver, for a surface that matches the capabilities specified by the **DDSCAPS2** type.

### Triple Buffering

[C++]

In some cases, that is, when the display adapter has enough memory, it may be possible to speed up the process of displaying your application by using triple buffering. Triple buffering uses one primary surface and two back buffers. The following example shows how to initialize a triple-buffering scheme:

// The lpDDSPrimary and lpDDSBack variables are globally

// declared, uninitialized LPDIRECTDRAWSURFACE7 variables.

//

// The lpDD variable is a pointer to an IDirectDraw7 interface

DDSURFACEDESC2 ddsd;

ZeroMemory (&ddsd, sizeof(ddsd));

// Create the primary surface with two back buffers.

ddsd.dwSize = sizeof(ddsd);

ddsd.dwFlags = DDSD\_CAPS | DDSD\_BACKBUFFERCOUNT;

ddsd.ddsCaps.dwCaps = DDSCAPS\_PRIMARYSURFACE |

DDSCAPS\_FLIP | DDSCAPS\_COMPLEX;

ddsd.dwBackBufferCount = 2;

ddrval = lpDD->CreateSurface(&ddsd, &lpDDSPrimary, NULL);

// If we successfully created the flipping chain,

// retrieve pointers to the surfaces we need for

// flipping and blitting.

if(ddrval == DD\_OK)

{

// Get the surface directly attached to the primary (the back buffer).

ddsd.ddsCaps.dwCaps = DDSCAPS\_BACKBUFFER;

ddrval = lpDDSPrimary->GetAttachedSurface(&ddsd.ddsCaps,

&lpDDSBack);

if(ddrval != DD\_OK) ;

// Display an error message here.

}

You do not need to keep track of all surfaces in a triple buffered flipping chain. The only surfaces you must keep pointers to are the primary surface and the back-buffer surface. You need a pointer to the primary surface in order to flip the surfaces in the flipping chain, and you need a pointer to the back buffer for blitting. For more information, see Flipping Surfaces.

Triple buffering allows your application to continue blitting to the back buffer even if a flip has not completed and the back buffer's blit has already finished. Performing a flip is not a synchronous event; one flip can take longer than another. Therefore, if your application uses only one back buffer, it may spend some time idling while waiting for the **IDirectDrawSurface7::Flip** method to return with DD\_OK.

[Visual Basic]

In some cases, that is, when the display adapter has enough memory, it may be possible to speed up the process of displaying your application by using triple buffering. Triple buffering uses one primary surface and two back buffers. The following example shows how to initialize a triple-buffering scheme:

' The DDSPrimary and DDSBack variables are globally

' declared DIRECTDRAWSURFACE7 variables.

'

' The DD variable is a DirectDraw7 object

Dim ddsd As DDSURFACEDESC2

' Create the primary surface with two back buffers.

ddsd.lFlags = DDSD\_CAPS Or DDSD\_BACKBUFFERCOUNT

ddsd.ddsCaps.lCaps = DDSCAPS\_PRIMARYSURFACE Or

DDSCAPS\_FLIP Or DDSCAPS\_COMPLEX

ddsd.lBackBufferCount = 2

DDSPrimary = DD.CreateSurface(ddsd)

' If we successfully created the flipping chain,

' retrieve the surfaces we need for flipping and blitting.

' Get the surface directly attached to the primary (the back buffer).

ddsd.ddsCaps.lCaps = DDSCAPS\_BACKBUFFER

DDSBack = DDSPrimary.GetAttachedSurface(ddsd.ddsCaps)

You do not need to keep track of all surfaces in a triple buffered flipping chain. The only surfaces you must keep pointers to are the primary surface and the back-buffer surface. You need a pointer to the primary surface in order to flip the surfaces in the flipping chain, and you need a pointer to the back buffer for blitting. For more information, see Flipping Surfaces.

Triple buffering allows your application to continue blitting to the back buffer even if a flip has not completed and the back buffer's blit has already finished. Performing a flip is not a synchronous event; one flip can take longer than another. Therefore, if your application uses only one back buffer, it may spend some time idling while waiting for the **DirectDrawSurface7.Flip** method to succeed.

### DirectDraw Applications and Window Styles

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

If your application uses DirectDraw in windowed mode, you can create windows with any window style. However, full-screen exclusive mode applications cannot be created with the WS\_EX\_TOOLWINDOW style without risk of unpredictable behavior. The WS\_EX\_TOOLWINDOW style prevents a window from being the top most window, which is required for a DirectDraw full-screen, exclusive mode application.

Full-screen exclusive mode applications should use the WS\_EX\_TOPMOST extended window style and the WS\_VISIBLE window style to display properly. These styles keep the application at the front of the window z-order and prevent GDI from drawing on the primary surface.

The following example shows one way to safely prepare a window to be used in a full-screen, exclusive mode application.

////////////////////////////////////////////////////////

// Register the window class and display the window.

////////////////////////////////////////////////////////

BOOL WINAPI InitApp(INT nWinMode)

{

WNDCLASSEX wcex;

wcex.cbSize = sizeof(WNDCLASSEX);

wcex.hInstance = g\_hinst;

wcex.lpszClassName = g\_szWinName;

wcex.lpfnWndProc = WndProc;

wcex.style = CS\_VREDRAW|CS\_HREDRAW|CS\_DBLCLKS;

wcex.hIcon = LoadIcon (NULL, IDI\_APPLICATION);

wcex.hIconSm = LoadIcon (NULL, IDI\_WINLOGO);

wcex.hCursor = LoadCursor (NULL, IDC\_ARROW);

wcex.lpszMenuName = MAKEINTRESOURCE(IDR\_APPMENU);

wcex.cbClsExtra = 0 ;

wcex.cbWndExtra = 0 ;

wcex.hbrBackground = GetStockObject (NULL\_BRUSH);

RegisterClassEx(&wcex);

g\_hwndMain = CreateWindowEx(

WS\_EX\_TOPMOST,

g\_szWinName,

g\_szWinCaption,

WS\_VISIBLE|WS\_POPUP,

0,0,0,0,

NULL,

NULL,

g\_hinst,

NULL);

if(!g\_hwndMain)

return(FALSE);

SetFocus(g\_hwndMain);

ShowWindow(g\_hwndMain, nWinMode);

UpdateWindow(g\_hwndMain);

return TRUE;

}

### Matching True RGB Colors to the Frame Buffer's Color Space

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

Applications often need to find out how a true RGB color (RGB 888) will be mapped into a frame buffer's color space when the display device is not in RGB 888 mode. For example, imagine you're working on an application that will run in 16- and 24-bit RGB display modes. You know that when the art was created, a color was reserved for use as a transparent blitting color key; for the sake of argument, it is a 24-bit color such as RGB(128,64,255). Because your application will also run in a 16-bit RGB mode, you need a way to find out how this 24-bit color key maps into the color space that the frame buffer uses when it's running in a 16-bit RGB mode.

Although DirectDraw does not perform color matching services for you, there are ways to calculate how your color key will be mapped in the frame buffer. These methods can be pretty complicated. For most purposes, you can use the GDI built-in color matching services, combined with the DirectDraw direct frame buffer access, to determine how a color value maps into a different color space. In fact, the Ddutil.cpp source file included in the DirectX examples of the Platform SDK includes a sample function called DDColorMatch that performs this task. The DDColorMatch sample function performs the following main tasks:

1. Retrieves the color value of a pixel in a surface at 0,0.

2. Calls the Win32 **SetPixel** function, using a **COLORREF** structure that describes your 24-bit RGB color.

3. Uses DirectDraw to lock the surface, getting a pointer to the frame buffer memory.

4. Retrieves the actual color value from the frame buffer (set by GDI in Step 2) and unlocks the surface

5. Resets the pixel at 0,0 to its original color using **SetPixel**.

The process used by the DDColorMatch sample function is not fast; it isn't intended to be. However, it provides a reliable way to determine how a color will be mapped across different RGB color spaces. For more information, see the source code for DDColorMatch in the Ddutil.cpp source file.

Note

Because the **SetPixel** GDI function only accepts a **COLORREF** structure on input, this technique only works for matching RGB 888 colors to the frame buffer's pixel format. If your application needs to match colors of another pixel format, you should translate them to RGB 888 before using this technique or query the primary surface for its pixel format and match colors manually.

### Displaying a Window in Full-Screen Mode

[Visual Basic]

The information in this topic pertains only to applications written in C++.

[C++]

In full-screen mode, DirectDraw has exclusive control over the display. As a result, dialog boxes and other windows created through GDI are not normally visible. However, by using special techniques you can incorporate a Windows dialog box, HTML Help, or any other kind of window in your application.

The FSWindow Sample illustrates how a dialog box can be displayed and updated in a full-screen application, and how mouse clicks and keystrokes work just as if the dialog box were being displayed by GDI.

In FSWindow, the dialog box is created and "shown" as an ordinary dialog window:

hWndDlg = CreateDialog(g\_hInstance,

MAKEINTRESOURCE(IDD\_DIALOG\_SAMPLE),

hWnd, (DLGPROC) SampleDlgProc);

ShowWindow(hWndDlg, SW\_SHOWNORMAL);

Of course, at this point the dialog box is shown only on the hidden GDI surface. It does not appear on the primary surface, which is controlled by DirectDraw.

If the hardware capabilities include DDCAPS2\_CANRENDERWINDOWED (see DDCAPS), displaying and updating the dialog box is easy. The application simply calls the **IDirectDraw7::FlipToGDISurface** method, which makes the GDI surface the primary surface. From now on, all updates to the dialog box will be displayed automatically, because GDI is now rendering directly to the front buffer. The application continues rendering to the back buffer, and on each pass through the rendering loop the contents of the back buffer are blitted to the front buffer by DirectDraw. The dialog box is not overwritten because the front buffer is clipped to the application window, and the dialog box is obscuring part of that window.

The following code, from the FSWindow\_Init function, creates the clipper, associates it with the application window, and brings the GDI surface to the front:

if (ddObject->CreateClipper(0, &ddClipper, NULL) == DD\_OK)

ddClipper->SetHWnd(0, hwndAppWindow);

ddObject->FlipToGDISurface();

Then, in the FSWindow\_Update function, the following code blits the rendered contents of the back buffer to the clipping region:

ddFrontBuffer->SetClipper(ddClipper);

ddFrontBuffer->Blt(NULL, ddBackBuffer, NULL, DDBLT\_WAIT, NULL);

Note that because the GDI surface is the primary surface, Windows continues displaying the mouse cursor. (This would not be the case, however, if the application were using DirectInput with the mouse device at the exclusive cooperative level.)

For hardware that does not have the DDCAPS2\_CANRENDERWINDOWED capability, the process of displaying and updating a window in full-screen mode is somewhat more complicated. In this case, the application is responsible for obtaining the image of the window created by GDI and blitting it to the back buffer after the full-screen rendering has been done. The entire back buffer is then flipped to the front in the usual way.

The FSWindow sample provides two different methods for accessing the display memory of the window, depending on whether the content is static or dynamic. The method for static content is faster because it involves blitting from a memory device context rather than a screen device context. This method should be used for windows that do not change, such as informational dialog boxes. (Remember, though, that unless you manually update the bitmap in response to events, even basic animation such as a button press will not be visible to the user.)

If the content is static, FSWindow calls the CreateBMPFromWindow function when the window is initialized. This function creates a bitmap and blits the contents of the window into it. The bitmap handle is stored in the global variable *hwndFSWindowBMP*. Whenever the primary surface is about to be updated, this bitmap is blitted to the back buffer, as follows:

if (FSWindow\_IsStatic)

{

hdcMemory = CreateCompatibleDC(NULL);

SelectObject(hdcMemory, hwndFSWindowBMP);

BitBlt(hdcBackBuffer, x, y, cx, cy, hdcMemory, 0, 0, SRCCOPY);

DeleteDC(hdcMemory);

}

If, on the other hand, the content of the window is dynamic, the following code is executed. It blits the image directly from the GDI surface (represented by the *hdcScreen* device context) to the back buffer.

BitBlt(hdcBackBuffer, x, y, cx, cy, hdcScreen, x, y, SRCCOPY);

The coordinates represent the position and dimensions of the window on the GDI surface, as retrieved through a call to **GetWindowRect**.

When the FSWindow application is running on hardware that does not have the DDCAPS2\_CANRENDERWINDOWED capability, it does not use the GDI surface, so Windows cannot display the mouse cursor. The application takes over this task by obtaining information about the cursor and displaying it on the back buffer just before the flip.

# DirectDraw Tutorials

This section contains a series of tutorials, each providing step-by-step instructions for implementing the basics of DirectDraw in a C/C++ or Visual Basic application. The tutorials are written parallel to a set of sample files that are provided with this SDK in the \Samples\Multimedia\DDraw\Tutorials directory, following their code path and providing explanations along the way. Readers are encouraged to follow along in the sample code as they move through these tutorials.

DirectDraw C/C++ Tutorials

DirectDraw Visual Basic Tutorials

## DirectDraw C/C++ Tutorials

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

This section contains a series of tutorials, each of which provides step-by-step instructions for implementing a simple DirectDraw application. These tutorials use many of the DirectDraw sample files that are provided with this SDK. These samples demonstrate how to set up DirectDraw, and how to use the DirectDraw methods to perform common tasks:

Tutorial 1: The Basics of DirectDraw

Tutorial 2: Loading Bitmaps on the Back Buffer

Tutorial 3: Blitting from an Off-Screen Surface

Tutorial 4: Color Keys and Bitmap Animation

Tutorial 5: Dynamically Modifying Palettes

Tutorial 6: Using Overlay Surfaces

Note

The sample files in these tutorials are written in C++. If you are using a C compiler, you must make the appropriate changes to the files for them to successfully compile. At the very least, you need to add the *vtable* and *this* pointers to the interface methods.

### Tutorial 1: The Basics of DirectDraw

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

To use DirectDraw, you first create an instance of the DirectDraw object, which represents the display adapter on the computer. You then use the interface methods to manipulate the object. In addition, you need to create one or more instances of a DirectDrawSurface object to be able to display your application on a graphics surface.

To demonstrate this, the DDEx1 sample included with this SDK performs the following steps:

Step 1: Create a DirectDraw Object

Step 2: Determine the Application's Behavior

Step 3: Change the Display Mode

Step 4: Create Flipping Surfaces

Step 5: Render to the Surfaces

Step 6: Write to the Surface

Step 7: Flip the Surfaces

Step 8: Deallocate the DirectDraw Objects

Note

To use GUIDs successfully in your applications, you must either define INITGUID prior to all other include and define statements, or you must link to the Dxguid.lib library. You should define INITGUID in only one of your source modules.

#### Step 1: Create a DirectDraw Object

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

To create an instance of a DirectDraw object, your application should use the **DirectDrawCreateEx** function as shown in the doInit sample function of the DDEx1 program. **DirectDrawCreateEx** contains four parameters. The first parameter takes a globally unique identifier (GUID) that represents the display device. The GUID, in most cases, is set to NULL, which means DirectDraw uses the default display driver for the system. The second parameter contains the address of a pointer that identifies the location of the DirectDraw object if it is created. The third parameter is the reference identification for the **IDirectDraw7** interface, this parameter must be set to IID\_IDirectDraw7. The fourth parameter is always set to NULL and is included for future expansion.

The following example shows how to create the DirectDraw object and how to determine if the creation was successful or not:

ddrval = DirectDrawCreateEx(NULL, &lpDD, IID\_IDirectDraw7, NULL);

if(ddrval == DD\_OK)

{

// lpDD is a valid DirectDraw object.

}

else

{

// The DirectDraw object could not be created.

}

Next: Step 2: Determine the Application's Behavior

#### Step 2: Determine the Application's Behavior

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

Before you can change the resolution of the display, you must at a minimum specify the DDSCL\_EXCLUSIVE and DDSCL\_FULLSCREEN flags in the *dwFlags* parameter of the **IDirectDraw7::SetCooperativeLevel** method. This gives your application complete control over the display device, and no other application will be able to share it. In addition, the DDSCL\_FULLSCREEN flag sets the application in exclusive (full-screen) mode. Your application covers the entire desktop, and only your application can write to the screen. The desktop is still available, however. (To see the desktop in an application running in exclusive mode, start DDEx1 and press ALT + TAB.)

The following example demonstrates the use of the **SetCooperativeLevel** method:

HRESULT ddrval;

LPDIRECTDRAW7 lpDD; // Already created by DirectDrawCreateEx

ddrval = lpDD->SetCooperativeLevel(hwnd, DDSCL\_EXCLUSIVE |

DDSCL\_FULLSCREEN);

if(ddrval == DD\_OK)

{

// Exclusive mode was successful.

}

else

{

// Exclusive mode was not successful.

// The application can still run, however.

}

If **SetCooperativeLevel** does not return DD\_OK, you can still run your application. The application will not be in exclusive mode, however, and it might not be capable of the performance your application requires. In this case, you might want to display a message that allows the user to decide whether or not to continue.

If you are setting the full-screen, exclusive cooperative level, you must pass your application's window handle to **SetCooperativeLevel** to allow Windows to determine if your application terminates abnormally. For example, if a general protection (GP) fault occurs and GDI is flipped to the back buffer, the user will not be able to return to the Windows screen. To prevent this from occurring, DirectDraw provides a process running in the background that traps messages that are sent to that window. DirectDraw uses these messages to determine when the application terminates. This feature imposes some restrictions, however. You have to specify the window handle that is retrieving messages for your application—that is, if you create another window, you must ensure that you specify the window that is active. Otherwise, you might experience problems, including unpredictable behavior from GDI, or no response when you press ALT + TAB.

Next: Step 3: Change the Display Mode

#### Step 3: Change the Display Mode

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After you have set the application's behavior, you can use the **IDirectDraw7::SetDisplayMode** method to change the resolution of the display. The following example shows how to set the display mode to 6404808 bpp:

HRESULT ddrval;

LPDIRECTDRAW7 lpDD; // Already created

ddrval = lpDD->SetDisplayMode(640, 480, 8);

if(ddrval == DD\_OK)

{

// The display mode changed successfully.

}

else

{

// The display mode cannot be changed.

// The mode is either not supported or

// another application has exclusive mode.

}

When you set the display mode, you should ensure that if the user's hardware cannot support higher resolutions, your application reverts to a standard mode that is supported by a majority of display adapters. For example, your application could be designed to run on all systems that support 6404808 as a standard backup resolution.

Note

**IDirectDraw7::SetDisplayMode** returns a DDERR\_INVALIDMODE error value if the display adapter could not be set to the desired resolution. Therefore, you should use the **IDirectDraw7::EnumDisplayModes** method to determine the capabilities of the user's display adapter before trying to set the display mode.

Next: Step 4: Create Flipping Surfaces

#### Step 4: Create Flipping Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After you have set the display mode, you must create the surfaces on which to place your application. Because the DDEx1 example is using the **IDirectDraw7::SetCooperativeLevel** method to set the mode to exclusive (full-screen) mode, you can create surfaces that flip between the surfaces. If you were using **SetCooperativeLevel** to set the mode to DDSCL\_NORMAL, you could create only surfaces that blit between the surfaces. Creating flipping surfaces requires the following steps, also discussed in this topic:

Step 4.1: Define the Surface Requirements

Step 4.2: Create the Surfaces

##### Step 4.1: Define the Surface Requirements

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The first step in creating flipping surfaces is to define the surface requirements in a **DDSURFACEDESC2** structure. The following example shows the structure definitions and flags needed to create a flipping surface.

// Create the primary surface with one back buffer.

ddsd.dwSize = sizeof(ddsd);

ddsd.dwFlags = DDSD\_CAPS | DDSD\_BACKBUFFERCOUNT;

ddsd.ddsCaps.dwCaps = DDSCAPS\_PRIMARYSURFACE |

DDSCAPS\_FLIP | DDSCAPS\_COMPLEX;

ddsd.dwBackBufferCount = 1;

In this example, the **dwSize** member is set to the size of the **DDSURFACEDESC2** structure. This is to prevent any DirectDraw method call you use from returning with an invalid member error. (The **dwSize** member was provided for future expansion of the **DDSURFACEDESC2** structure.)

The **dwFlags** member determines which members in the **DDSURFACEDESC2** structure will be filled with valid information. For the DDEx1 example, **dwFlags** is set to specify that you want to use the **DDSCAPS** structure (DDSD\_CAPS) and that you want to create a back buffer (DDSD\_BACKBUFFERCOUNT).

The **dwCaps** member in the example indicates the flags that will be used in the **DDSCAPS** structure. In this case, it specifies a primary surface (DDSCAPS\_PRIMARYSURFACE), a flipping surface (DDSCAPS\_FLIP), and a complex surface (DDSCAPS\_COMPLEX).

Finally, the example specifies one back buffer. The back buffer is where the backgrounds and sprites will actually be written. The back buffer is then flipped to the primary surface. In the DDEx1 example, the number of back buffers is set to 1. You can, however, create as many back buffers as the amount of display memory allows. For more information on creating more than one back buffer, see Triple Buffering.

Surface memory can be either display memory or system memory. DirectDraw uses system memory if the application runs out of display memory (for example, if you specify more than one back buffer on a display adapter with only 1 MB of RAM). You can also specify whether to use only system memory or only display memory by setting the **dwCaps** member in the **DDSCAPS** structure to DDSCAPS\_SYSTEMMEMORY or DDSCAPS\_VIDEOMEMORY. (If you specify DDSCAPS\_VIDEOMEMORY, but not enough memory is available to create the surface, **IDirectDraw7::CreateSurface** returns with a DDERR\_OUTOFVIDEOMEMORY error.)

Next: Step 4.2: Create the Surfaces

##### Step 4.2: Create the Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After the **DDSURFACEDESC2** structure is filled, you can use it and *lpDD*, the pointer to the DirectDraw object that was created by the **DirectDrawCreateEx** function, to call the **IDirectDraw7::CreateSurface** method, as shown in the following example:

ddrval = lpDD->CreateSurface(&ddsd, &lpDDSPrimary, NULL);

if(ddrval == DD\_OK)

{

// lpDDSPrimary points to the new surface.

}

else

{

// The surface was not created.

return FALSE;

}

The *lpDDSPrimary* parameter will point to the primary surface returned by **CreateSurface** if the call succeeds.

After the pointer to the primary surface is available, you can use the **IDirectDrawSurface7::GetAttachedSurface** method to retrieve a pointer to the back buffer, as shown in the following example:

ddscaps.dwCaps = DDSCAPS\_BACKBUFFER;

ddrval = lpDDSPrimary->GetAttachedSurface(&ddcaps, &lpDDSBack);

if(ddrval == DD\_OK)

{

// lpDDSBack points to the back buffer.

}

else

{

return FALSE;

}

By supplying the address of the surface's primary surface and by setting the capabilities value with the DDSCAPS\_BACKBUFFER flag, the *lpDDSBack* parameter will point to the back buffer if the **IDirectDrawSurface7::GetAttachedSurface** call succeeds.

Next: Step 5: Render to the Surfaces

#### Step 5: Render to the Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After the primary surface and a back buffer have been created, the DDEx1 example renders some text on the primary surface and back buffer surface by using standard Windows GDI functions, as shown in the following example:

if (lpDDSPrimary->GetDC(&hdc) == DD\_OK)

{

SetBkColor(hdc, RGB(0, 0, 255));

SetTextColor(hdc, RGB(255, 255, 0));

TextOut(hdc, 0, 0, szFrontMsg, lstrlen(szFrontMsg));

lpDDSPrimary->ReleaseDC(hdc);

}

if (lpDDSBack->GetDC(&hdc) == DD\_OK)

{

SetBkColor(hdc, RGB(0, 0, 255));

SetTextColor(hdc, RGB(255, 255, 0));

TextOut(hdc, 0, 0, szBackMsg, lstrlen(szBackMsg));

lpDDSBack->ReleaseDC(hdc);

}

The example uses the **IDirectDrawSurface7::GetDC** method to retrieve the handle of the device context, and it internally locks the surface. If you are not going to use Windows functions that require a handle of a device context, you could use the **IDirectDrawSurface7::Lock** and **IDirectDrawSurface7::Unlock** methods to lock and unlock the back buffer.

Locking the surface memory (whether the whole surface or part of a surface) ensures that your application and the system blitter cannot obtain access to the surface memory at the same time. This prevents errors from occurring while your application is writing to surface memory. In addition, your application cannot page flip until the surface memory is unlocked.

After the surface is locked, the example uses standard Windows GDI functions: **SetBkColor** to set the background color, **SetTextColor** to select the color of the text to be placed on the background, and **TextOut** to print the text and background color on the surfaces.

After the text has been written to the buffer, the example uses the **IDirectDrawSurface7::ReleaseDC** method to unlock the surface and release the handle. Whenever your application finishes writing to the back buffer, you must call either **IDirectDrawSurface7::ReleaseDC** or **IDirectDrawSurface7::Unlock**, depending on your application. Your application cannot flip the surface until the surface is unlocked.

Typically, you write to a back buffer, which you then flip to the primary surface to be displayed. In the case of DDEx1, there is a significant delay before the first flip, so DDEx1 writes to the primary buffer in the initialization function to prevent a delay before displaying the surface. As you will see in a subsequent step of this tutorial, the DDEx1 example writes only to the back buffer during WM\_TIMER. An initialization function or title page may be the only place where you might want to write to the primary surface.

Note

After the surface is unlocked by using **IDirectDrawSurface7::Unlock**, the pointer to the surface memory is invalid. You must use **IDirectDrawSurface7::Lock** again to obtain a valid pointer to the surface memory.

Next: Step 6: Write to the Surface

#### Step 6: Write to the Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The first half of the WM\_TIMER message in DDEx1 is devoted to writing to the back buffer, as shown in the following example:

case WM\_TIMER:

// Flip surfaces.

if(bActive)

{

if (lpDDSBack->GetDC(&hdc) == DD\_OK)

{

SetBkColor(hdc, RGB(0, 0, 255));

SetTextColor(hdc, RGB(255, 255, 0));

if(phase)

{

TextOut(hdc, 0, 0, szFrontMsg, lstrlen(szFrontMsg));

phase = 0;

}

else

{

TextOut(hdc, 0, 0, szBackMsg, lstrlen(szBackMsg));

phase = 1;

}

lpDDSBack->ReleaseDC(hdc);

}

The line of code that calls the **IDirectDrawSurface7::GetDC** method locks the back buffer in preparation for writing. The **SetBkColor** and **SetTextColor** functions set the colors of the background and text.

Next, the *phase* variable determines whether the primary buffer message or the back buffer message should be written. If *phase* equals 1, the primary surface message is written, and *phase* is set to 0. If *phase* equals 0, the back buffer message is written, and *phase* is set to 1. Note, however, that in both cases the messages are written to the back buffer.

After the message is written to the back buffer, the back buffer is unlocked by using the **IDirectDrawSurface7::ReleaseDC** method.

Next: Step 7: Flip the Surfaces

#### Step 7: Flip the Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After the surface memory is unlocked, you can use the **IDirectDrawSurface7::Flip** method to flip the back buffer to the primary surface, as shown in the following example:

while(1)

{

HRESULT ddrval;

ddrval = lpDDSPrimary->Flip(NULL, 0);

if(ddrval == DD\_OK)

{

break;

}

if(ddrval == DDERR\_SURFACELOST)

{

ddrval = lpDDSPrimary->Restore();

if(ddrval != DD\_OK)

{

break;

}

}

if(ddrval != DDERR\_WASSTILLDRAWING)

{

break;

}

}

In the example, *lpDDSPrimary* parameter designates the primary surface and its associated back buffer. When **IDirectDrawSurface7::Flip** is called, the front and back surfaces are exchanged (only the pointers to the surfaces are changed; no data is actually moved). If the flip is successful and returns DD\_OK, the application breaks from the while loop.

If the flip returns with a DDERR\_SURFACELOST value, an attempt is made to restore the surface by using the **IDirectDrawSurface7::Restore** method. If the restore is successful, the application loops back to the **IDirectDrawSurface7::Flip** call and tries again. If the restore is unsuccessful, the application breaks from the while loop, and returns with an error.

Note

When you call **IDirectDrawSurface7::Flip**, the flip does not complete immediately. Rather, a flip is scheduled for the next time a vertical blank occurs on the system. If, for example, the previous flip has not occurred, **IDirectDrawSurface7::Flip** returns DDERR\_WASSTILLDRAWING. In the example, the **IDirectDrawSurface7::Flip** call continues to loop until it returns DD\_OK.

Next: Step 8: Deallocate the DirectDraw Objects

#### Step 8: Deallocate the DirectDraw Objects

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

When you press the F12 key, the DDEx1 application processes the WM\_DESTROY message before exiting the application. This message calls the finiObjects sample function, which contains all of the **IUnknown::Release** calls, as shown in the following example:

static void finiObjects(void)

{

if(lpDD != NULL)

{

if(lpDDSPrimary != NULL)

{

lpDDSPrimary->Release();

lpDDSPrimary = NULL;

}

lpDD->Release();

lpDD = NULL;

}

} // finiObjects

The application checks if the pointers to the DirectDraw object (*lpDD*) and the DirectDrawSurface object (*lpDDSPrimary*) are not equal to NULL. Then DDEx1 calls the **IDirectDrawSurface7::Release** method to decrease the reference count of the DirectDrawSurface object by 1. Because this brings the reference count to 0, the DirectDrawSurface object is deallocated. The DirectDrawSurface pointer is then destroyed by setting its value to NULL. Next, the application calls **IDirectDraw7::Release** to decrease the reference count of the DirectDraw object to 0, deallocating the DirectDraw object. This pointer is then also destroyed by setting its value to NULL.

### Tutorial 2: Loading Bitmaps on the Back Buffer

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The sample discussed in this tutorial (DDEx2) expands on the DDEx1 sample that was discussed in Tutorial 1. DDEx2 includes functionality to load a bitmap file on the back buffer. This new functionality is demonstrated in the following steps:

Step 1: Create the Palette

Step 2: Set the Palette

Step 3: Load a Bitmap on the Back Buffer

Step 4: Flip the Surfaces

As in DDEx1, doInit is the initialization function for the DDEx2 application. Although the code for the DirectDraw initialization does not look quite the same in DDEx2 as it did in DDEx1, it is essentially the same, except for the following section:

lpDDPal = DDLoadPalette(lpDD, szBackground);

if (lpDDPal == NULL)

goto error;

ddrval = lpDDSPrimary->SetPalette(lpDDPal);

if(ddrval != DD\_OK)

goto error;

// Load a bitmap into the back buffer.

ddrval = DDReLoadBitmap(lpDDSBack, szBackground);

if(ddrval != DD\_OK)

goto error;

#### Step 1: Create the Palette

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The DDEx2 sample first loads the palette into a structure by using the following code:

lpDDPal = DDLoadPalette(lpDD, szBackground);

if (lpDDPal == NULL)

goto error;

The sample function DDLoadPalette is part of the common DirectDraw functions found in the Ddutil.cpp file located in the \Dxsdk\Sdk\Samples\Misc directory. Most of the DirectDraw sample files in this SDK use this file. Essentially, it contains the functions for loading bitmaps and palettes from either files or resources. To avoid having to repeat code in the example files, these functions were placed in a file that could be reused. Make sure you include Ddutil.cpp in the list of files to be compiled with the rest of the DDEx*n* samples.

For DDEx2, the DDLoadPalette sample function creates a DirectDrawPalette object from the Back.bmp file. The DDLoadPalette sample function determines if a file or resource for creating a palette exists. If one does not, it creates a default palette. For DDEx2, it extracts the palette information from the bitmap file and stores it in a structure pointed to by *ape*.

DDEx2 then creates the DirectDrawPalette object, as shown in the following example:

pdd->CreatePalette(DDPCAPS\_8BIT, ape, &ddpal, NULL);

return ddpal;

When the **IDirectDraw7::CreatePalette** method returns, the *ddpal* parameter points to the DirectDrawPalette object, which is then returned from the DDLoadPalette call.

The *ape* parameter is a pointer to a structure that can contain either 2, 4, 16, or 256 entries, organized linearly. The number of entries depends on the *dwFlags* parameter in the **CreatePalette** method. In this case, the *dwFlags* parameter is set to DDPCAPS\_8BIT, which indicates that there are 256 entries in this structure. Each entry contains 4 bytes (a red channel, a green channel, a blue channel, and a flags byte).

Next: Step 2: Set the Palette

#### Step 2: Set the Palette

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After you create the palette, you pass the pointer to the DirectDrawPalette object (*ddpal*) to the primary surface by calling the **IDirectDrawSurface7::SetPalette** method, as shown in the following example:

ddrval = lpDDSPrimary->SetPalette(lpDDPal);

if(ddrval != DD\_OK)

// SetPalette failed.

After you have called **IDirectDrawSurface7::SetPalette**, the DirectDrawPalette object is associated with the DirectDrawSurface object. Any time you need to change the palette, you simply create a new palette and set the palette again. (Although this tutorial uses these steps, there are other ways of changing the palette, as will be shown in later examples.)

Next: Step 3: Load a Bitmap on the Back Buffer

#### Step 3: Load a Bitmap on the Back Buffer

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After the DirectDrawPalette object is associated with the DirectDrawSurface object, DDEx2 loads the Back.bmp bitmap on the back buffer by using the following code:

// Load a bitmap into the back buffer.

ddrval = DDReLoadBitmap(lpDDSBack, szBackground);

if(ddrval != DD\_OK)

// Load failed.

DDReLoadBitmap is another sample function found in Ddutil.cpp. It loads a bitmap from a file or resource into an already existing DirectDraw surface. (You could also use DDLoadBitmap to create a surface and load the bitmap into that surface. For more information, see Tutorial 5: Dynamically Modifying Palettes.) For DDEx2, it loads the Back.bmp file pointed to by *szBackground* onto the back buffer pointed to by *lpDDSBack*. The DDReLoadBitmap function calls the DDCopyBitmap function to copy the file onto the back buffer and stretch it to the proper size.

The DDCopyBitmap function copies the bitmap into memory, and it uses the GetObject function to retrieve the size of the bitmap. It then uses the following code to retrieve the size of the back buffer onto which it will place the bitmap:

// Get the size of the surface.

ddsd.dwSize = sizeof(ddsd);

ddsd.dwFlags = DDSD\_HEIGHT | DDSD\_WIDTH;

pdds->GetSurfaceDesc(&ddsd);

The *ddsd* value is a pointer to the **DDSURFACEDESC2** structure. This structure stores the current description of the DirectDraw surface. In this case, the **DDSURFACEDESC2** members describe the height and width of the surface, which are indicated by DDSD\_HEIGHT and DDSD\_WIDTH. The call to the **IDirectDrawSurface7::GetSurfaceDesc** method then loads the structure with the proper values. For DDEx2, the values will be 480 for the height and 640 for the width.

The DDCopyBitmap sample function locks the surface and copies the bitmap to the back buffer, stretching or compressing it as applicable by using the StretchBlt function, as shown in the following example:

if ((hr = pdds->GetDC(&hdc)) == DD\_OK)

{

StretchBlt(hdc, 0, 0, ddsd.dwWidth, ddsd.dwHeight, hdcImage, x, y,

dx, dy, SRCCOPY);

pdds->ReleaseDC(hdc);

}

Next: Step 4: Flip the Surfaces

#### Step 4: Flip the Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

Flipping surfaces in the DDEx2 sample is essentially the same process as that in the DDEx1 tutorial (see Tutorial 1: The Basics of DirectDraw) except that if the surface is lost (**DDERR\_SURFACELOST**), the bitmap must be reloaded on the back buffer by using the DDReLoadBitmap function after the surface is restored.

### Tutorial 3: Blitting from an Off-Screen Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The sample in Tutorial 2 (DDEx2) takes a bitmap and puts it in the back buffer, and then it flips between the back buffer and the primary buffer. This is not a very realistic approach to displaying bitmaps. The sample in this tutorial (DDEx3) expands on the capabilities of DDEx2 by including two off-screen buffers in which the two bitmaps—one for the even screen and one for the odd screen—are stored. It uses the **IDirectDrawSurface7::BltFast** method to copy the contents of an off-screen surface to the back buffer, and then it flips the buffers and copies the next off-screen surface to the back buffer.

The new functionality demonstrated in DDEx3 is shown in the following steps:

Step 1: Create the Off-Screen Surfaces

Step 2: Load the Bitmaps to the Off-Screen Surfaces

Step 3: Blit the Off-Screen Surfaces to the Back Buffer

#### Step 1: Create the Off-Screen Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The following code is added to the doInit sample function in DDEx3 to create the two off-screen buffers:

// Create an offscreen bitmap.

ddsd.dwFlags = DDSD\_CAPS | DDSD\_HEIGHT | DDSD\_WIDTH;

ddsd.ddsCaps.dwCaps = DDSCAPS\_OFFSCREENPLAIN;

ddsd.dwHeight = 480;

ddsd.dwWidth = 640;

ddrval = lpDD->CreateSurface(&ddsd, &lpDDSOne, NULL);

if(ddrval != DD\_OK)

{

return initFail(hwnd);

}

// Create another offscreen bitmap.

ddrval = lpDD->CreateSurface(&ddsd, &lpDDSTwo, NULL);

if(ddrval != DD\_OK)

{

return initFail(hwnd);

}

The **dwFlags** member specifies that the application will use the **DDSCAPS** structure, and it will set the height and width of the buffer. The surface will be an off-screen plain buffer, as indicated by the DDSCAPS\_OFFSCREEN flag set in the **DDSCAPS** structure. The height and the width are set as 480 and 640, respectively, in the **DDSURFACEDESC2** structure. The surface is then created by using the **IDirectDraw7::CreateSurface** method.

Because both of the off-screen plain buffers are the same size, the only requirement for creating the second buffer is to call **IDirectDraw7::CreateSurface** again with a different pointer name.

You can also specifically request that the off-screen buffer be placed in system memory or display memory by setting either the DDSCAPS\_SYSTEMMEMORY or DDSCAPS\_VIDEOMEMORY capability in the **DDSCAPS** structure. By saving the bitmaps in display memory, you can increase the speed of the transfers between the off-screen surfaces and the back buffer. This will become more important when using bitmap animation. However, if you specify DDSCAPS\_VIDEOMEMORY for the off-screen buffer and not enough display memory is available to hold the entire bitmap, a DDERR\_OUTOFVIDEOMEMORY error value will be returned when you attempt to create the surface.

Next: Step 2: Load the Bitmaps to the Off-Screen Surfaces

#### Step 2: Load the Bitmaps to the Off-Screen Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After the two off-screen surfaces are created, DDEx3 uses the InitSurfaces sample function to load the bitmaps from the Frntback.bmp file onto the surfaces. The InitSurfaces function uses the DDCopyBitmap sample function located in Ddutil.cpp to load both of the bitmaps, as shown in the following example:

// Load the bitmap resource.

hbm = (HBITMAP)LoadImage(GetModuleHandle(NULL), szBitmap,

IMAGE\_BITMAP, 0, 0, LR\_CREATEDIBSECTION);

if (hbm == NULL)

return FALSE;

DDCopyBitmap(lpDDSOne, hbm, 0, 0, 640, 480);

DDCopyBitmap(lpDDSTwo, hbm, 0, 480, 640, 480);

DeleteObject(hbm);

return TRUE;

If you look at the Frntback.bmp file in Microsoft® Paint or another drawing application, you can see that the bitmap consists of two screens, one on top of the other. The DDCopyBitmap function breaks the bitmap in two at the point where the screens meet. In addition, it loads the first bitmap into the first off-screen surface (*lpDDSOne*) and the second bitmap into the second off-screen surface (*lpDDSTwo*).

Next: Step 3: Blit the Off-Screen Surfaces to the Back Buffer

#### Step 3: Blit the Off-Screen Surfaces to the Back Buffer

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The WM\_TIMER message contains the code for writing to surfaces and flipping surfaces. In the case of DDEx3, it contains the following code to select the proper off-screen surface and to blit it to the back buffer:

rcRect.left = 0;

rcRect.top = 0;

rcRect.right = 640;

rcRect.bottom = 480;

if(phase)

{

pdds = lpDDSTwo;

phase = 0;

}

else

{

pdds = lpDDSOne;

phase = 1;

}

while(1)

{

ddrval = lpDDSBack->BltFast(0, 0, pdds, &rcRect, FALSE);

if(ddrval == DD\_OK)

{

break;

}

}

The phase variable determines which off-screen surface will be blitted to the back buffer. The **IDirectDrawSurface7::BltFast** method is then called to blit the selected off-screen surface onto the back buffer, starting at position (0, 0), the upper-left corner. The *rcRect* parameter points to the **RECT** structure that defines the upper-left and lower-right corners of the off-screen surface that will be blitted from. The last parameter is set to FALSE (or 0), indicating that no specific transfer flags are used.

Depending on the requirements of your application, you could use either the **IDirectDrawSurface7::Blt** method or the **IDirectDrawSurface7::BltFast** method to blit from the off-screen buffer. If you are performing a blit from an off-screen plain buffer that is in display memory, you should use **IDirectDrawSurface7::BltFast**. Although you will not gain speed on systems that use hardware blitter on their display adapters, the blit will take about 10 percent less time on systems that use hardware emulation to perform the blit. Because of this, you should use **IDirectDrawSurface7::BltFast** for all display operations that blit from display memory to display memory. If you are blitting from system memory or require special hardware flags, however, you have to use **IDirectDrawSurface7::Blt**.

After the off-screen surface is loaded in the back buffer, the back buffer and the primary surface are flipped in much the same way as shown in the previous tutorials.

### Tutorial 4: Color Keys and Bitmap Animation

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The sample in Tutorial 3 (DDEx3) shows one simple method of placing bitmaps into an off-screen buffer before they are blitted to the back buffer. The sample in this tutorial (DDEx4) uses the techniques described in the previous tutorials to load a background and a series of sprites into an off-screen surface. Then it uses the **IDirectDrawSurface7::BltFast** method to copy portions of the off-screen surface to the back buffer, thereby generating a simple bitmap animation.

The bitmap file that DDEx4 uses, All.bmp, contains the background and 60 iterations of a rotating red donut with a black background. The DDEx4 sample contains new functions that set the color key for the rotating donut sprites. Then, the sample copies the appropriate sprite to the back buffer from the off-screen surface.

The new functionality demonstrated in DDEx4 is shown in the following steps:

Step 1: Set the Color Key

Step 2: Create a Simple Animation

#### Step 1: Set the Color Key

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

In addition to the other functions found in the doInit sample function of some of the other DirectDraw samples, the DDEx4 sample contains the code to set the color key for the sprites. Color keys are used for setting a color value that will be used for transparency. When the system contains a hardware blitter, all the pixels of a rectangle are blitted except the value that was set as the color key, thereby creating nonrectangular sprites on a surface. The following code shows how to set the color key in DDEx4:

// Set the color key for this bitmap (black).

DDSetColorKey(lpDDSOne, RGB(0,0,0));

return TRUE;

You can select the color key by setting the RGB values for the color you want in the call to the DDSetColorKey sample function. The RGB value for black is (0, 0, 0). The DDSetColorKey function calls the DDColorMatch function. (Both functions are in Ddutil.cpp.) The DDColorMatch function stores the current color value of the pixel at location (0, 0) on the bitmap located in the *lpDDSOne* surface. Then it takes the RGB values you supplied and sets the pixel at location (0, 0) to that color. Finally, it masks the value of the color with the number of bits per pixel that are available. After that is done, the original color is put back in location (0, 0), and the call returns to DDSetColorKey with the actual color key value. After it is returned, the color key value is placed in the **dwColorSpaceLowValue** member of the **DDCOLORKEY** structure. It is also copied to the **dwColorSpaceHighValue** member. The call to **IDirectDrawSurface7::SetColorKey** then sets the color key.

You may have noticed the reference to CLR\_INVALID in DDSetColorKey and DDColorMatch. If you pass CLR\_INVALID as the color key in the DDSetColorKey call in DDEx4, the pixel in the upper-left corner (0, 0) of the bitmap will be used as the color key. As the DDEx4 bitmap is delivered, that does not mean much because the color of the pixel at (0, 0) is a shade of gray. If, however, you would like to see how to use the pixel at (0, 0) as the color key for the DDEx4 sample, open the All.bmp bitmap file in a drawing application and then change the single pixel at (0, 0) to black. Be sure to save the change (it's hard to see). Then change the DDEx4 line that calls DDSetColorKey to the following:

DDSetColorKey(lpDDSOne, CLR\_INVALID);

Recompile the DDEx4 sample, and ensure that the resource definition file is also recompiled so that the new bitmap is included. (To do this, you can simply add and then delete a space in the Ddex4.rc file.) The DDEx4 sample will then use the pixel at (0, 0), which is now set to black, as the color key.

Next: Step 2: Create a Simple Animation

#### Step 2: Create a Simple Animation

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The DDEx4 sample uses the updateFrame sample function to create a simple animation using the red donuts included in the All.bmp file. The animation consists of three red donuts positioned in a triangle and rotating at various speeds. This sample compares the Win32 **GetTickCount** function with the number of milliseconds since the last call to **GetTickCount** to determine whether to redraw any of the sprites. It subsequently uses the **IDirectDrawSurface7::BltFast** method first to blit the background from the off-screen surface (*lpDDSOne*) to the back buffer, and then to blit the sprites to the back buffer using the color key that you set earlier to determine which pixels are transparent. After the sprites are blitted to the back buffer, DDEx4 calls the **IDirectDrawSurface7::Flip** method to flip the back buffer and the primary surface.

Note that when you use **IDirectDrawSurface7::BltFast** to blit the background from the off-screen surface, the *dwTrans* parameter that specifies the type of transfer is set to DDBLTFAST\_NOCOLORKEY. This indicates that a normal blit will occur with no transparency bits. Later, when the red donuts are blitted to the back buffer, the *dwTrans* parameter is set to DDBLTFAST\_SRCCOLORKEY. This indicates that a blit will occur with the color key for transparency as it is defined, in this case, in the *lpDDSOne* buffer.

In this sample, the entire background is redrawn each time through the updateFrame function. One way of optimizing this sample would be to redraw only that portion of the background that changes while rotating the red donuts. Because the location and size of the rectangles that make up the donut sprites never change, you should be able to easily modify the DDEx4 sample with this optimization.

### Tutorial 5: Dynamically Modifying Palettes

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The sample described in this tutorial (DDEx5) is a modification of the sample described in Tutorial 4 (DDEx4) example. DDEx5 demonstrates how to dynamically change the palette entries while an application is running. The new functionality demonstrated in DDEx5 is shown in the following steps:

Step 1: Load the Palette Entries

Step 2: Rotate the Palettes

#### Step 1: Load the Palette Entries

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The following code in DDEx5 loads the palette entries with the values in the lower half of the All.bmp file (the part of the bitmap that contains the red donuts):

// First, set all colors as unused.

for(i=0; i<256; i++)

{

torusColors[i] = 0;

}

// Lock the surface and scan the lower part (the torus area),

// and keep track of all the indexes found.

ddsd.dwSize = sizeof(ddsd);

while (lpDDSOne->Lock(NULL, &ddsd, 0, NULL) == DDERR\_WASSTILLDRAWING)

;

// Search through the torus frames and mark used colors.

for(y=480; y<480+384; y++)

{

for(x=0; x<640; x++)

{

torusColors[((BYTE \*)ddsd.lpSurface)[y\*ddsd.lPitch+x]] = 1;

}

}

lpDDSOne->Unlock(NULL);

The *torusColors* array is used as an indicator of the color index of the palette used in the lower half of the All.bmp file. Before it is used, all of the values in the *torusColors* array are reset to 0. The off-screen buffer is then locked in preparation for determining if a color index value is used.

The *torusColors* array is set to start at row 480 and column 0 of the bitmap. The color index value in the array is determined by the byte of data at the location in memory where the bitmap surface is located. This location is determined by the **lpSurface** member of the **DDSURFACEDESC2** structure, which is pointing to the memory location corresponding to row 480 and column 0 of the bitmap (y  **lPitch** + x). The location of the specific color index value is then set to 1. The y-value (row) is multiplied by the **lPitch** value (found in the **DDSURFACEDESC2** structure) to get the actual location of the pixel in linear memory.

The color index values that are set in *torusColors* will be used later to determine which colors in the palette are rotated. Because there are no common colors between the background and the red donuts, only those colors associated with the red donuts are rotated. If you want to check whether this is true or not, just remove the "\*ddsd.lPitch" from the array and see what happens when you recompile and run the program. (Without multiplying y  **lPitch**, the red donuts are never reached and only the colors found in the background are indexed and later rotated.) For more information about width and pitch, see Width vs. Pitch.

Next: Step 2: Rotate the Palettes

#### Step 2: Rotate the Palettes

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

The updateFrame sample function in DDEx5 works in much the same way as it did in Tutorial 4 (DDEx4). It first blits the background into the back buffer, and then it blits the three donuts in the foreground. However, before it flips the surfaces, updateFrame changes the palette of the primary surface from the palette index that was created in the doInit function, as shown in the following code:

// Change the palette.

if(lpDDPal->GetEntries(0, 0, 256, pe) != DD\_OK)

{

return;

}

for(i=1; i<256; i++)

{

if(!torusColors[i])

{

continue;

}

pe[i].peRed = (pe[i].peRed+2) % 256;

pe[i].peGreen = (pe[i].peGreen+1) % 256;

pe[i].peBlue = (pe[i].peBlue+3) % 256;

}

if(lpDDPal->SetEntries(0, 0, 256, pe) != DD\_OK)

{

return;

}

The **IDirectDrawPalette::GetEntries** method in the first line queries palette values from a DirectDrawPalette object. Because the palette entry values pointed to by *pe* should be valid, the method will return DD\_OK and continue. The loop that follows checks *torusColors* to determine if the color index was set to 1 during its initialization. If so, the red, green, and blue values in the palette entry pointed to by *pe* are rotated.

After all of the marked palette entries are rotated, the **IDirectDrawPalette::SetEntries** method is called to change the entries in the DirectDrawPalette object. This change takes place immediately if you are working with a palette set to the primary surface.

With this done, the surfaces are subsequently flipped.

### Tutorial 6: Using Overlay Surfaces

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

This tutorial shows you, step by step, how to use DirectDraw and hardware supported overlay surfaces in your applications. The tutorial is written around the Mosquito sample application included with the DirectX SDK samples. Mosquito is a simple application that uses a flipping chain of overlay surfaces to display an animated bitmap on the desktop without blitting to the primary surface. The sample adjusts the characteristics of the overlay surface as needed to accommodate for hardware limitations.

The Mosquito sample application performs the following steps (complex tasks are divided into smaller sub-steps):

Step 1: Create a Primary Surface

Step 2: Test for Hardware Overlay Support

Step 3: Create an Overlay Surface

Step 4: Display the Overlay Surface

Step 5: Update the Overlay Display Position

Step 6: Hide the Overlay Surface

#### Step 1: Create a Primary Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

To prepare for using overlay surfaces, you must first initialize DirectDraw and create a primary surface over which the overlay surface will be displayed. Mosquito creates a primary surface with the following code:

// Zero-out the structure and set the dwSize member.

ZeroMemory(&ddsd, sizeof(ddsd));

ddsd.dwSize = sizeof(ddsd);

// Set flags and create a primary surface.

ddsd.dwFlags = DDSD\_CAPS;

ddsd.ddsCaps.dwCaps = DDSCAPS\_PRIMARYSURFACE;

ddrval = g\_lpdd->CreateSurface(&ddsd, &g\_lpddsPrimary, NULL );

The preceding example begins by initializing the **DDSURFACEDESC2** structure it will use. It then sets the flags appropriate to create a primary surface and creates it by calling the **IDirectDraw7::CreateSurface** method. For the call, the first parameter is a pointer to a **DDSURFACEDESC2** structure that describes the surface to be created. The second parameter is a pointer to a variable that will receive an **IDirectDrawSurface7** interface pointer if the call succeeds. The last parameter is set to NULL to indicate that no COM aggregation is taking place.

Next: Step 2: Test for Hardware Overlay Support

#### Step 2: Test for Hardware Overlay Support

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After initializing DirectDraw, you need to verify that the device supports overlay surfaces. Because DirectDraw doesn't emulate overlays, if the hardware device driver doesn't support them, you can't continue. You can test for overlay support by retrieving the device driver capabilities with the **IDirectDraw7::GetCaps** method. After the call, look for the presence of the DDCAPS\_OVERLAY flag in the **dwFlags** member of the associated **DDCAPS** structure. If the flag is present, then the display hardware supports overlays; if not, you can't use overlay surfaces with that device.

The following example, taken from the Mosquito sample application, shows how to test for hardware overlay support:

BOOL AreOverlaysSupported()

{

DDCAPS capsDrv;

HRESULT ddrval;

// Get driver capabilities to determine Overlay support.

ZeroMemory(&capsDrv, sizeof(capsDrv));

capsDrv.dwSize = sizeof(capsDrv);

ddrval = g\_lpdd->GetCaps(&capsDrv, NULL);

if (FAILED(ddrval))

return FALSE;

// Does the driver support overlays in the current mode?

// (Currently the DirectDraw emulation layer does not support overlays.

// Overlay related APIs will fail without hardware support).

if (!(capsDrv.dwCaps & DDCAPS\_OVERLAY))

return FALSE;

return TRUE;

}

The preceding example calls the **IDirectDraw7::GetCaps** method to retrieve device driver capabilities. The first parameter for the call is the address of a **DDCAPS** that will be filled with information describing the device driver's capabilities. Because the application doesn't need information about emulation capabilities, the second parameter is set to NULL.

After retrieving the driver capabilities, the example checks the **dwCaps** member for the presence of the DDCAPS\_OVERLAY flag using a logical **AND** operation. If the flag isn't present, the example returns FALSE to indicate failure. Otherwise, the example returns TRUE to indicate that the device driver supports overlay surfaces.

In your code, this might be a good time for you to check the **dwMaxVisibleOverlays** and **dwCurrVisibleOverlays** members in the **DDCAPS** structure to ensure that no other overlay surfaces are in use by other applications.

Next: Step 3: Create an Overlay Surface

#### Step 3: Create an Overlay Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

Now that you know that the driver supports overlay surfaces, you can try to create one. Because there is no standard dictating how devices must support overlay surfaces, you can't count on being able to create overlays of any particular size or pixel format. Additionally, you can't expect to succeed in creating an overlay surface on the first try. Therefore, be prepared to attempt creation multiple times starting with the most desirable characteristics, falling back on less desirable (but possibly less hardware intensive) configurations until one works.

Note

You can call the **IDirectDraw7::GetFourCCCodes** method to retrieve a list of FOURCC codes that describe non-RGB pixel formats that the driver will likely support for overlay surfaces. However, in you want to try using RGB overlay surfaces, it is recommended that you attempt to create surfaces in various common RGB formats, falling back on another format if you fail.

The Mosquito sample follows a "best case to worst case" philosophy when creating an overlay surface. Mosquito first tries to create a triple-buffered page flipping complex overlay surface. If the creation attempt fails, the sample tries the configuration with other common pixel formats. The following code fragment shows how this can be done:

ZeroMemory(&ddsdOverlay, sizeof(ddsdOverlay));

ddsdOverlay.dwSize = sizeof(ddsdOverlay);

ddsdOverlay.dwFlags= DDSD\_CAPS | DDSD\_HEIGHT | DDSD\_WIDTH |

DDSD\_BACKBUFFERCOUNT| DDSD\_PIXELFORMAT;

ddsdOverlay.ddsCaps.dwCaps = DDSCAPS\_OVERLAY | DDSCAPS\_FLIP |

DDSCAPS\_COMPLEX | DDSCAPS\_VIDEOMEMORY;

ddsdOverlay.dwWidth =320;

ddsdOverlay.dwHeight =240;

ddsdOverlay.dwBackBufferCount=2;

// Try to create an overlay surface using one of the pixel formats in our

// global list.

i=0;

do{

ddsdOverlay.ddpfPixelFormat=g\_ddpfOverlayFormats[i];

// Try to create the overlay surface

ddrval = g\_lpdd->CreateSurface(&ddsdOverlay, &g\_lpddsOverlay, NULL);

} while( FAILED(ddrval) && (++i < NUM\_OVERLAY\_FORMATS) );

The preceding example sets the flags and values within a **DDSURFACEDESC2** structure to reflect a triple-buffered page flipping complex overlay surface. Then, the sample performs a loop during which it attempts to create the requested surface in a variety of common pixel formats, in order of most desirable to least desirable pixel formats. If the attempt succeeds, the loop ends. If all the attempts fail, it's likely that the display hardware doesn't have enough memory to support a triple-buffered scheme or that it doesn't support flipping overlay surfaces. In this case, the sample falls back on a less desirable configuration using a single non-flipping overlay surface, as shown in the following example:

// If we failed to create a triple buffered complex overlay surface, try

// again with a single non-flippable buffer.

if(FAILED(ddrval))

{

ddsdOverlay.dwBackBufferCount=0;

ddsdOverlay.ddsCaps.dwCaps=DDSCAPS\_OVERLAY | DDSCAPS\_VIDEOMEMORY;

ddsdOverlay.dwFlags= DDSD\_CAPS|DDSD\_HEIGHT|DDSD\_WIDTH|DDSD\_PIXELFORMAT;

// Try to create the overlay surface

ddrval = g\_lpdd->CreateSurface(&ddsdOverlay, &g\_lpddsOverlay, NULL);

i=0;

do{

ddsdOverlay.ddpfPixelFormat=g\_ddpfOverlayFormats[i];

ddrval = g\_lpdd->CreateSurface(&ddsdOverlay, &g\_lpddsOverlay, NULL);

} while( FAILED(ddrval) && (++i < NUM\_OVERLAY\_FORMATS) );

// We couldn't create an overlay surface. Exit, returning failure.

if (FAILED(ddrval))

return FALSE;

}

The previous code resets the flags and values in the **DDSURFACEDESC2** structure to reflect a single non-flipping overlay surface. Again, the example loops through pixel formats attempting to create the surfaces, stopping the loop if an attempt succeeded. If the attempts still didn't work, the sample returns FALSE to indicate failure.

After you've successfully created your overlay surface or surfaces, you can load bitmaps onto them in preparation for display.

Next: Step 4: Display the Overlay Surface

#### Step 4: Display the Overlay Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After creating your overlay surface, you can display it. Often, display hardware imposes alignment restrictions on the position and pixel width of the rectangles you use to display the overlay. Additionally, you will often need to account for a minimum required stretch factor by adjusting the width of the destination rectangle in order to successfully display the overlay surface. The Mosquito sample performs the following tasks to prepare and display the overlay surface:

Step 4.1: Determine the Minimum Display Requirements

Step 4.2: Set Up the Source and Destination Rectangles

Step 4.3: Display the Overlay Surface

Next: Step 4.1: Determine the Minimum Display Requirements

##### Step 4.1: Determine the Minimum Display Requirements

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

Most display hardware imposes restrictions on displaying overlay surfaces. You must carefully meet these restrictions in order to successfully display an overlay surface. You can retrieve information about these restrictions by calling the **IDirectDraw7::GetCaps** method. The **DDCAPS** structure that the method fills contains information about overlay capabilities and their usage restrictions. Hardware restrictions vary, so always look at the flags included in the **dwFlags** member to determine which restrictions apply to you.

The Mosquito sample starts by retrieving the hardware capabilities, then takes action based upon the minimum stretch factor, as shown in the following code fragment:

// Get driver capabilities

ddrval = g\_lpdd->GetCaps(&capsDrv, NULL);

if (FAILED(ddrval))

return FALSE;

// Check the minimum stretch and set the local variable accordingly.

if(capsDrv.dwCaps & DDCAPS\_OVERLAYSTRETCH)

uStretchFactor1000 = (capsDrv.dwMinOverlayStretch>1000) ? capsDrv.dwMinOverlayStretch : 1000;

else

uStretchFactor1000 = 1000;

The preceding code calls **GetCaps** to retrieve only the hardware capabilities. For this call, the first parameter is a pointer the **DDCAPS** structure that will be filled with the capability information for the device driver, and the second parameter is NULL to indicate that emulation information is not to be retrieved.

The example retains the minimum stretch factor in a temporary variable for use later. (Keep in mind that stretch factors are reported multiplied by 1000, so 1300 really means 1.3.) If the driver reports a value greater than 1000, it means that the driver requires that all destination rectangles must be stretched along the x-axis by a ratio of the reported value. For example, if the driver reports a stretch factor 1.3 and the source rectangle is 320 pixels wide, the destination rectangle must be at least 416 pixels wide. If the driver reports a stretch factor less than 1000, it means that the driver can display overlays smaller than the source rectangle, but can also stretch the overlay if desired.

Next, the sample examines values describing the driver's size alignment restrictions, as shown in the following example:

// Grab any alignment restrictions and set the local variables acordingly.

uSrcSizeAlign = (capsDrv.dwCaps & DDCAPS\_ALIGNSIZESRC)?capsDrv.dwAlignSizeSrc:0;

uDestSizeAlign= (capsDrv.dwCaps & DDCAPS\_ALIGNSIZESRC)?capsDrv.dwAlignSizeDest:0;

The sample uses more temporary variables to hold the reported size alignment restrictions taken from the **dwAlignSizeSrc** and **dwAlignSizeDest** members. These values provide information about pixel width alignment restrictions and are needed when setting the dimensions of the source and destination rectangles to reflect these restrictions later. Source and destination rectangles must have a pixel width that is a multiple of the values in these members.

Last, the sample examines the value that describes the destination rectangle boundary alignment:

// Set the "destination position alignment" global so we won't have to

// keep calling GetCaps() every time we move the overlay surface.

if (capsDrv.dwCaps & DDCAPS\_ALIGNBOUNDARYDEST)

g\_dwOverlayXPositionAlignment = capsDrv.dwAlignBoundaryDest;

else

g\_dwOverlayXPositionAlignment = 0;

The preceding code uses a global variable to hold the value for the destination rectangle's boundary alignment, as taken from the **dwAlignBoundaryDest** member. This value will be used when the program repositions the overlay later. (For details, see Step 5: Update the Overlay Display Position) You must set the x-coordinate of the destination rectangle's top left corner to be aligned with this value, in pixels. That is, if the value specified is 4, you can only specify destination rectangles whose top-left corner has an x-coordinate at pixels 0, 4, 8, 12, and so on. The Mosquito application initially displays the overlay at 0,0, so alignment compliance is assumed and the sample doesn't need to retrieve the restriction information until after displaying the overlay the first time. Your implementation might vary, so you will probably need to check this information and adjust the destination rectangle before displaying the overlay.

Next: Step 4.2: Set Up the Source and Destination Rectangles

##### Step 4.2: Set Up the Source and Destination Rectangles

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After retrieving the driver's overlay restrictions you should set the values for your source and destination rectangles accordingly, assuring that you will be able to successfully display the overlay. The following sample from the Mosquito sample application starts by setting the characteristics of the source rectangle:

// Set initial values in the source RECT.

rs.left=0; rs.top=0;

rs.right = 320;

rs.bottom = 240;

// Apply size alignment restrictions, if necessary.

if (capsDrv.dwCaps & DDCAPS\_ALIGNSIZESRC && uSrcSizeAlign)

rs.right -= rs.right % uSrcSizeAlign;

The preceding code sets initial values for the surface to include the dimensions of the entire surface. If the device driver requires size alignment for the source rectangle, the example adjusts the source rectangle to conform. The example adjusts the width of the source rectangle to be narrower than the original size because the width cannot be expanded without completely recreating the surface. However, your code could just as easily start with a smaller rectangle and widen the rectangle to meet driver restrictions.

After the dimensions of the source rectangle are set and conform with hardware restrictions, you need to set and adjust the dimensions of the destination rectangle. This process requires a little more work because the rectangle might need to be stretched first, then adjusted to meet size alignment restrictions. The following code performs the task of accounting for the minimum stretch factor:

// Set up the destination RECT, starting with the source RECT values.

// We use the source RECT dimensions instead of the surface dimensions in

// case they differ.

rd.left=0; rd.top=0;

rd.right = (rs.right\*uStretchFactor1000+999)/1000;

// (Adding 999 avoids integer truncation problems.)

// (This isn't required by DDraw, but we'll stretch the

// height, too, to maintain aspect ratio).

rd.bottom = rs.bottom\*uStretchFactor1000/1000;

The preceding code sets the top left corner of the destination rectangle to the top left corner of the screen, then sets the width to account for the minimum stretch factor. While adjusting for the stretch factor, note that the example adds 999 to the product of the width and stretch factor. This is done to prevent integer truncation that could result in a rectangle that isn't as wide as the minimum stretch factor requires. For more information, see Minimum and Maximum Stretch Factors. Also, after the example stretches the width, it stretches the height. Stretching the height isn't required, but was done to preserve the bitmap's aspect ratio and avoid a distorted appearance.

After stretching the destination rectangle, the example continues by adjusting it to conform to size alignment restrictions as follows:

// Adjust the destination RECT's width to comply with any imposed

// alignment restrictions.

if (capsDrv.dwCaps & DDCAPS\_ALIGNSIZEDEST && uDestSizeAlign)

rd.right = (int)((rd.right+uDestSizeAlign-1)/uDestSizeAlign)\*uDestSizeAlign;

The example checks the capabilities flags to see if the driver imposes destination size alignment restrictions. If so, the destination rectangle's width is increased by enough pixels to meet alignment restrictions. Note that the rectangle is adjusted by expanding the width, not by decreasing it. This is done because decreasing the width could cause the destination rectangle to be smaller than is required by the minimum stretch factor, consequently causing attempts to display the overlay surface to fail.

Next: Step 4.3: Display the Overlay Surface

##### Step 4.3: Display the Overlay Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After you've set up the source and destination rectangles, you can display the overlay for the first time. If you've prepared correctly, this will be simple. The Mosquito sample uses the following code to initially display the overlay:

// Set the flags we'll send to UpdateOverlay

dwUpdateFlags = DDOVER\_SHOW | DDOVER\_DDFX;

// Does the overlay hardware support source color keying?

// If so, we can hide the black background around the image.

// This probably won't work with YUV formats

if (capsDrv.dwCKeyCaps & DDCKEYCAPS\_SRCOVERLAY)

dwUpdateFlags |= DDOVER\_KEYSRCOVERRIDE;

// Create an overlay FX structure so we can specify a source color key.

// This information is ignored if the DDOVER\_SRCKEYOVERRIDE flag isn't set.

ZeroMemory(&ovfx, sizeof(ovfx));

ovfx.dwSize = sizeof(ovfx);

ovfx.dckSrcColorkey.dwColorSpaceLowValue=0; // Specify black as the color key

ovfx.dckSrcColorkey.dwColorSpaceHighValue=0;

// Call UpdateOverlay() to displays the overlay on the screen.

ddrval = g\_lpddsOverlay->UpdateOverlay(&rs, g\_lpddsPrimary, &rd, dwUpdateFlags, &ovfx);

if(FAILED(ddrval))

return FALSE;

The preceding example starts by setting the DDOVER\_SHOW and DDOVER\_DDFX flags in the *dwUpdateFlags* temporary variable, indicating that the overlay is to be displayed for the first time, and that the hardware should use the effects information included in an associated **DDOVERLAYFX** structure to do so. Next, the example checks a previously existing **DDCAPS** structure to determine if overlay source color keying is supported. If it is, the DDOVER\_KEYSRCOVERRIDE is included in the *dwUpdateFlags* variable to take advantage of source color keying and the example sets color key values accordingly.

After preparation is complete, the example calls the **IDirectDrawSurface7::UpdateOverlay** method to display the overlay. For the call, the first and third parameters are the addresses of the adjusted source and destination rectangles. The second parameter is the address of the primary surface over which the overlay will be displayed. The fourth parameter consists of the flags placed in the previously prepared *dwUpdateFlags* variable, and the fifth parameter is the address of **DDOVERLAYFX** structure whose members were set to match those flags.

If the hardware only supports one overlay surface and that surface is in use, the **UpdateOverlay** method fails, returning DDERR\_OUTOFCAPS. Additionally, if **UpdateOverlay** fails, you might try increasing the width of the destination rectangle to accommodate for the possibility that the hardware incorrectly reported a minimum stretch factor that was too small. However, this rarely occurs and Mosquito simply fails if **UpdateOverlay** doesn't succeed.

Next: Step 5: Update the Overlay Display Position

#### Step 5: Update the Overlay Display Position

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

After displaying the overlay surface, you might not need to do anything else. However, some software might need to reposition the overlay surface. The Mosquito sample uses the **IDirectDrawSurface7::SetOverlayPosition** method to reposition the overlay, as shown in the following example:

// Set x- and y-coordinates

.

.

.

// We need to check for any alignment restrictions on the x-position

// and align it if necessary.

if (g\_dwOverlayXPositionAlignment)

dwXAligned = g\_nOverlayXPos - g\_nOverlayXPos % g\_dwOverlayXPositionAlignment;

else

dwXAligned = g\_nOverlayXPos;

// Set the overlay to its new position.

ddrval = g\_lpddsOverlay->SetOverlayPosition(dwXAligned, g\_nOverlayYPos);

if (ddrval == DDERR\_SURFACELOST)

{

if (!RestoreAllSurfaces())

return;

}

The preceding example starts by aligning the rectangle to meet any destination rectangle boundary alignment restrictions that might exist. The global variable that it checks, *g\_dwOverlayXPositionAlignment*, was set earlier to equal the value reported in the **dwAlignBoundaryDest** member of the **DDCAPS** structure when the application previously called the **IDirectDraw7::GetCaps** method. (For details, see Step 4.1: Determine the Minimum Display Requirements). If destination alignment restrictions exist, the example adjusts the new x-coordinate to be pixel-aligned accordingly. Failing to meet this requirement will cause the overlay surface not to be displayed.

After making any requisite adjustments to the new x-coordinate, the example calls **IDirectDrawSurface7::SetOverlayPosition** method to reposition the overlay. For the call, the first parameter is the aligned x-coordinate, and the second parameter is the new y-coordinate. These values represent the new location of the overlay's top-left corner. Width and height information are not accepted, nor are they needed because DirectDraw already knows the dimensions of the surface from the **IDirectDrawSurface7::UpdateOverlay** method made to initially display the overlay. If the call fails because one or more surfaces were lost, the example calls an application-defined function to restore them and reload their bitmaps.

Note

Take care not to use coordinates too close to the bottom or right edge of the target surface. The **IDirectDraw7::SetOverlayPosition** method does not perform clipping for you; using coordinates that would potentially make the overlay run off the edge of the target surface will cause the method to fail, returning DDERR\_INVALIDPOSITION.

Next: Step 6: Hide the Overlay Surface

#### Step 6: Hide the Overlay Surface

[Visual Basic]

The information in this section pertains only to applications written in C and C++. See DirectDraw Visual Basic Tutorials.

[C++]

When you do not need the overlay surface anymore, or if you simply want to remove it from view, you can hide the surface by calling the **IDirectDrawSurface7::UpdateOverlay** method with the appropriate flags. Mosquito hides the overlay in preparation for closing the application using the following code:

void DestroyOverlay()

{

if (g\_lpddsOverlay){

// Use UpdateOverlay() with the DDOVER\_HIDE flag to remove an overlay

// from the display.

g\_lpddsOverlay->UpdateOverlay(NULL, g\_lpddsPrimary, NULL, DDOVER\_HIDE, NULL);

g\_lpddsOverlay->Release();

g\_lpddsOverlay=NULL;

}

}

When the preceding example calls **IDirectDrawSurface7::UpdateOverlay**, it specifies NULL for the source and destination rectangles, because they are irrelevant when hiding the overlay. Similarly, the example uses NULL in the fifth parameter because overlay effects aren't being used. The second parameter is a pointer to the target surface. Lastly, the example uses the DDOVER\_HIDE flag in the fourth parameter to indicate that the overlay will be removed from view.

After the example hides the overlay, the example releases its **IDirectDrawSurface7** interface and invalidates its global variable by setting it to NULL. For the purposes of the Mosquito sample application, the overlay surface is no longer needed. If you still need the overlay surface for later, you could simply hide the overlay without releasing it, then redisplay it whenever you require.

## DirectDraw Visual Basic Tutorials

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

This section contains a series of tutorials, each of which provides step-by-step instructions for implementing a simple DirectDraw application. These tutorials use many of the DirectDraw sample files that are provided with this SDK. These samples demonstrate how to set up DirectDraw, and how to use the DirectDraw methods to perform common tasks:

Tutorial 1: Blitting to the Screen

Tutorial 2: Using Transparency

Tutorial 3: Using Full-Screen Features

Tutorial 4: Blitting to Areas of the Screen

Tutorial 5: Enumerating DirectDraw Devices

### Tutorial 1: Blitting to the Screen

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

This first tutorial deals with blitting a bitmap to the display adapter. The term blit is shorthand for "bit block transfer," which is the process of transferring blocks of data from one place in memory to another. Graphics programmers use blitting to transfer graphics from one place in memory to another. Blits are often used to perform sprite animation.

To use DirectDraw, you first create an instance of the DirectDraw object, which represents the display adapter on the computer. You then use methods to manipulate the object. In addition, you need to create one or more instances of a DirectDrawSurface object to be able to display your application on a graphics surface.

To demonstrate this, the Tutorial 1: Blitting to the Screen sample included in this SDK performs the following steps:

Step 1: Create the Form

Step 2: Declare Module Level Variables

Step 2: Initialize Variables

#### Step 1: Create the Form

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The Tutorial 1 blitting sample is a standard .exe project with a picture box control placed on the form. The picture box control is placed with the top left corner of the picture box with the top left corner of the form. This picture box is used to display the bitmap image of the application and is named **Picture1**.

Next: Step 2: Declare Module Level Variables

#### Step 2: Declare Module Level Variables

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The first step of coding DirectX application written in Visual Basic is to create an instance of the **DirectX7** class. This object contains the methods necessary to create the starting objects of all the DirectX components including DirectDraw, DirectSound, Direct3D Immediate Mode, Direct3D Retained Mode, DirectInput, DirectPlay, and DirectMusic. Information on Direct3D Retained Mode can be found in the Appendix node of this documentation.

The **DirectX7** class is the top level class of the DxVBLib type library and an object of this class is created with the statement:

Dim objDX As New DirectX7

Additional module level variables declarations found in the Tutorial 1 blitting sample are for a DirectDraw object, DirectDrawSurface objects, DirectDrawClipper object, DirectDraw surface description types, and a Boolean variable used to hold initialization information.

Next: Step 3: Initialize Variables

#### Step 3: Initialize Variables

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The first procedure called from the Form\_Load event is the init procedure. This procedure creates the DirectDraw object. This is accomplished by invoking the **DirectX7.DirectDrawCreate** method of the **DirectX7** object and setting the returned object to DirectDraw which we declared as an object variable of class **DirectDraw7**. In the Tutorial 1 blitting sample, this is done with the statement:

Set objDD = objDX.DirectDrawCreate("")

This method takes only one string argument and passing an empty string specifies the active display driver.

Next you must specify the behavior of the application by calling the **DirectDraw7.SetCooperativeLevel** method of the DirectDraw object. The Tutorial 1 blitting sample is run as a regular windowed application and this is done with the statement:

Call objDD.SetCooperativeLevel (Me.hwnd, DDSCL\_NORMAL)

You are now ready to start creating surfaces. Before you actually create the surface object, you need to create a surface description by setting the members of the **DDSURFACEDESC2** type. One of the members of this type is **ddscaps**, a nested type, and by setting the **lFlags** member of the **DDSURFACEDESC2** to DDSD\_CAPS, you are stating that the **ddscaps** member is valid in this type. This is done with the statement:

ddsd1.lFlags = DDSD\_CAPS

Next you need to specify that this type description is for a primary surface, which is done with the statement:

ddsd1.ddsCaps.lCaps = DDSCAPS\_PRIMARYSURFACE

After creating the surface description, you actually create the surface object by invoking the **CreateSurface** method from the DirectDraw object with the set surface description as an argument. This is done in the Tutorial 1 blitting sample with the statement:

Set objDDPrimSurf = objDD.CreateSurface(ddsd1)

The surface object creation steps are repeated for a second surface which has the DDSCAPS\_OFFSCREENPLAIN flag set to specify that this surface is any off-screen surface that is not an overlay, texture, z-buffer, front-buffer, back-buffer, or alpha surface. It is used to identify plain surfaces. Then the **CreateSurfaceFromFile** method is invoked from the DirectDraw object. This method creates the surface object and loads a bitmap onto the surface. The location of the bitmap is specified through the FindMediaDir procedure. These steps are shown with the statements:

FindMediaDir "lake.bmp"

ddsd2.lFlags = DDSD\_CAPS

ddsd2.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN

Set objDDSurf = objDD.CreateSurfaceFromFile("lake.bmp", ddsd2)

A **DirectDrawClipper** object is then created by calling the **DirectDraw7.CreateClipper** method. Clippers, or **DirectDrawClipper** objects, allow you to blit to selected parts of a surface represented by a bounding rectangle. In Tutorial 1, we want to contain the blit to the **Picture1** picture box control. This is done with the following statements:

Set ddClipper = objDD.CreateClipper(0)

ddClipper.SetHWnd Picture1.hWnd

objDDPrimSurf.SetClipper ddClipper

After initializing all the variables and objects we set the *bInit* variable to True and call the blt subroutine.

Next: Step 4: Blit the Surface

#### Step 4: Blit the Surface

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

So far in the Tutorial 1: Blitting to the Screen sample you have created a primary surface and a off-screen surface which has a loaded bitmap. To display the bitmap on the screen, you must blit the off-screen surface to the primary surface. The blit method of the DirectDraw surface object takes four arguments and returns a **Long** indicating the success or failure of the blit. Two of the arguments of are type **RECT** which specify the bounding rectangles of the destination surface and the source surface.

The coordinates of the source rectangle are obtained from the **lHeight** and the **lWidth** members of the off-screen surface description. There are a few extra steps in obtaining the destination rectangle. First of all, since Visual Basic uses twips for screen measurement and DirectX uses pixels, the dimensions of the Visual Basic picture box control must be converted to pixels before setting the destination rectangle. This is accomplished by setting the **ScaleMode** property of the form to Pixels and then making the width and height of the picture box equal to the **ScaleWidth** and **ScaleHeight** of the form. Note: the width and height of the form stay in twips after you change the **ScaleMode**, but the **ScaleWidth** and the **ScaleHeight** are now in pixels. In the Tutorial 1 blitting sample, this is done with the statements:

Picture1.Width = Me.ScaleWidth

Picture1.Height = Me.ScaleHeight

These statements are in the Form\_Resize event and are executed when the form is initially displayed and resized.

Furthermore, the destination **RECT** type is filled when the **DirectX7.GetWindowRect** is called.

Lastly the blit is perform with the **blt** method of the primary surface object:

ddrval = objDDPrimSurf.blt(r1, objDDSurf, r2, DDBLT\_WAIT)

The result of the method is a **Long** that is stored in **ddrval**. You can check this variable for success or failure. The last argument of the method is the DDBLT\_WAIT flag which tells DirectDraw to wait if the blitter is busy and blit the surface when it becomes available.

### Tutorial 2: Using Transparency

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

This second tutorial expands on the concepts learned in the first tutorial by introducing transparent blitting. Transparent blitting enables you to create the illusion of nonrectangular blits when animating sprites. A sprite image is usually nonrectangular, but blits are always rectangular, so every pixel within the sprite's bounding rectangle becomes part of the data transfer. With transparent blitting, each pixel that is not part of the sprite image is treated as transparent when the blitter is moving the image to its destination, so that it does not overwrite the color in that pixel on the background image.

The artist creating the sprite chooses an arbitrary color or range of colors to be used as the transparency color key. This tutorial uses a source color key on the sprite image to give the illusion of a nonrectangular blit.

The first steps of this tutorial are identical to the first tutorial to the point of creating the primary surface in Step 3: Initialize Variables. Therefore, to avoid redundancy, the first step in this tutorial will be to create the back buffer surface.

To demonstrate transparent blitting, the Tutorial 2 sample included in this SDK performs the following steps:

Step 1: Create the Back Buffer

Step 2: Initialize the Surfaces

Step 3: Blit to the Primary Surface

#### Step 1: Create the Back Buffer

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The Tutorial 2 sample uses an off-screen surface as a composing surface. An off-screen surface is a conceptually rectangular area in memory that is generally used to store bitmaps to be blitted to the primary surface. This back buffer will be used to store the images of the lake and the sprite before displaying the composited image to the screen. This surface is created with the following statements:

'Create an invisible surface to draw to be used

'as a compositing surface in system memory

'Indicate that we want to specify the height and width

'The format of the surface (bits per pixel) will be the same

'as the primary surface

ddsdBackBuffer.lFlags = DDSD\_CAPS Or DDSD\_HEIGHT Or DDSD\_WIDTH

'Indicate that we want a surface that is not visible and that

'we want it in system memory as opposed to video memory

ddsdBackBuffer.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN Or DDSCAPS\_SYSTEMMEMORY

'Specify the height and width of the surface to be the same

'as the picture box (note unit are in pixels)

ddsdBackBuffer.lWidth = Picture1.Width

ddsdBackBuffer.lHeight = Picture1.Height

'Create the requested surface

Set objDDBackBuffer = objDD.CreateSurface(ddsdBackBuffer)

Next: Step 2: Initialize the Surfaces

#### Step 2: Initialize the Surfaces

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

This step involves creating and initializing two more surfaces, one for the background image and one for the sprite image. Additionally, we will specify the transparent color key to the sprite surface.

Both surfaces are off-screen surfaces created with a call to the **DirectDraw7.CreateSurfaceFromFile** method. The first surface created, objDDLakeSurf, is for the background image and has the same height and width as the **Picture1** picture box control on the form. The second surface, objDDSpriteSurf, contains the sprite image which will eventually be composed with the background image on the back buffer. These surfaces are created with the following statements:

'Load a background image of the lake

'Indicate that we want to create an off-screen surface

'An off-screen surface is one that is available in memory

'(video or system memory) but is not visible to the user

ddsdLake.lFlags = DDSD\_CAPS Or DDSD\_WIDTH Or DDSD\_HEIGHT

ddsdLake.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN

ddsdLake.lWidth = Picture1.Width

ddsdLake.lHeight = Picture1.Height

'Create the surface and load lake.bmp onto the surface

Set objDDLakeSurf = objDD.CreateSurfaceFromFile("lake.bmp", ddsdLake)

'Copy the background to the compositing surface

RepaintEntireBackground

'Load a sprite image of a flying dog

ddsdSprite.lFlags = DDSD\_CAPS Or DDSD\_WIDTH Or DDSD\_HEIGHT

ddsdSprite.lWidth = 64

ddsdSprite.lHeight = 64

ddsdSprite.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN

Set objDDSpriteSurf = objDD.CreateSurfaceFromFile("disk1.bmp", ddsdSprite)

Next we set the transparent color key for the sprite surface. The color key is specified through a **DDCOLORKEY** type variable. This type has two members, low and high, both **Longs**. You can specify a range of values to be used as the color key or a single color by passing the same values to both members. In the Tutorial 2 sample both the high and low values are 0, indicating that we want solid black to be the color key. The color key is set on a surface by calling the **DirectDrawSurface7.SetColorKey** method.

There are two types of color keys you can specify on a surface. A source color key is a color that (in the case of blitting) is not copied to, or (in the case of overlays) not visible on, the destination surface. A destination color key is a color that (in the case of blitting) is replaced or (in the case of overlays) is covered on the destination surface. The Tutorial 2 sample uses a source color key. The steps in setting a color key are as follows:

'Set the transparent color of the sprite

Dim key As DDCOLORKEY

key.low = 0

key.high = 0

'Assign the transparent color to the sprite object

'DDCKEY\_SRCBLT specifies that when a blt is done the

'transparent color is associated with the surface being

'blitted and not the one being blitted to

objDDSpriteSurf.SetColorKey DDCKEY\_SRCBLT, key

Next: Step 3: Blit to the Primary Surface

#### Step 3: Blit to the Primary Surface

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

There are several steps involved before the simple sprite animation is displayed on the screen. Both the sprite surface and the background image are composed to the back buffer and then the back buffer is blitted to the primary surface. The animation is achieved by constantly moving the location of the destination rectangle when blitting the sprite surface to the back buffer. In Tutorial 2, the DoFrame procedure updates the location of the sprite surface and repaints the background image while the application is running. Additionally, there is some code to display the frames per second (fps) of the animation.

First a simple timer loop is implemented to calculate the angle of where to place the sprite:

t2 = Timer

If t1 <> 0 Then

a = a + (t2 - t1) \* 100

If a > 360 Then a = a - 360

End If

t1 = t2

Next we make sure that we still retain control of the created surfaces. Surfaces can be lost and will need to be restored if another application takes control of the display adapter. The Tutorial 2 sample contains a simple function, ExModeActive, that tests the cooperative level of the DirectDraw object to determine whether or not we will have to restore the surfaces. This is shown in the following code:

Dim bRestore As Boolean

bRestore = False

Do Until ExModeActive

DoEvents

bRestore = True

Loop

DoEvents

If bRestore Then

bRestore = False

objDD.RestoreAllSurfaces

End If

Next, a small bit of code is implemented to display the frames per second of the sprite animation. This can be useful to help streamline your application and to find potential bottlenecks in your application.

'calculate FPS

i = i + 1

If i = 30 Then

tNow = Timer

If tNow <> tLast Then

fps = 30 / (Timer - tLast)

tLast = Timer

i = 0

Me.Caption = "DD Transparency Frames per Second =" + Format$(fps, "#.0")

End If

End If

Next we calculate the x and y coordinates of where to place the sprite:

x = Cos((a / 360) \* 2 \* 3.141) \* Picture1.Width / 8

y = Sin((a / 360) \* 2 \* 3.141) \* Picture1.Height / 8

x = x + Picture1.Width / 2

y = y + Picture1.Height / 2

The previous position of the sprite is held in a **RECT** type so we can repaint only the affected portion of the background surface. This increases the performance of the application because we do not have to constantly blit the entire surface. Then we determine the new position of the sprite and blit the sprite surface to the back buffer.

'Clean up background from last frame

'by only repainting the background where it needs to

Dim rClean As RECT

If lastX <> 0 Then

rClean.Left = lastX

rClean.Top = lastY

rClean.Right = lastX + ddsdSprite.lWidth

rClean.Bottom = lastY + ddsdSprite.lHeight

Call objDDBackBuffer.BltFast(lastX, lastY, objDDLakeSurf, rClean, DDBLTFAST\_WAIT)

End If

lastX = x

lastY = y

'Blit the sprite to the backbuffer

'using the color key on the source

'wait for the blt to finish before moving one

Dim rtemp As RECT

rtemp.Left = x

rtemp.Top = y

rtemp.Right = x + ddsdSprite.lWidth

rtemp.Bottom = y + ddsdSprite.lHeight

objDDBackBuffer.Blt rtemp, objDDSpriteSurf, rSprite, DDBLT\_KEYSRC Or DDBLT\_WAIT

Finally, we obtain the rectangle coordinates of the picture box control by calling the **DirectX7.GetWindowRect** method and call the **DirectDrawSurface7.Blt** method to blit the back buffer to the primary surface.

Call objDX.GetWindowRect(Picture1.hWnd, rPrim)

Call objDDScreen.Blt(rPrim, objDDBackBuffer, rBackBuffer, DDBLT\_WAIT)

### Tutorial 3: Using Full-Screen Features

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

This section demonstrates creating a full-screen DirectDraw application. This tutorial is very similar the Tutorial 2: Using Transparency but because it runs in full-screen, the implementation is slightly different. Mainly, instead of re-blitting the back buffer to the primary surface, this tutorial introduces the concept of a complex surface and a flipping chain. The steps to creating a full-screen application are:

Step 1: Set the Cooperative Level and the Display Mode

Step 2: Create a Complex Surface

Step 3: Initialize the Surfaces

Step 4: Update the Display with Page Flipping

#### Step 1: Set the Cooperative Level and the Display Mode

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The first step in creating a full-screen application in DirectDraw is to set the cooperative level and the display mode for the DirectDraw object. Setting the cooperative level determines the top-level behavior of the application. We want this application to have exclusive access to the primary display and run in the full screen. Note: to run in full-screen mode you must also have exclusive access. Additionally, we want the enable the Mode X which is derived from the standard VGA Mode 13. The cooperative level is set through the following calls:

Set dd = dx.DirectDrawCreate("")

Me.Show

Call dd.SetCooperativeLevel(Me.hWnd, DDSCL\_FULLSCREEN Or DDSCL\_ALLOWMODEX Or DDSCL\_EXCLUSIVE)

After setting the cooperative level, we must set the display mode for this application by calling the **DirectDraw7.SetDisplayMode** method:

dd.SetDisplayMode 640, 480, 16, 0, DDSDM\_DEFAULT

The first two parameters are the height and width of the mode. The third is the bits per pixel (bpp). Next is the refresh rate, specifying 0 requests the default refresh rate for the driver. The last parameter is additional options, DDSDM\_DEFAULT sets the mode without substituting Mode 13 for Mode X.

Next: Step 2: Create a Complex Surface

#### Step 2: Create a Complex Surface

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

In Tutorial 2, the off-screen, back buffer surface was used as a composing surface for the background image and the sprite image. This tutorial again uses a back buffer, but it is part of a complex surface. A complex surface is a set of surfaces created with a single call to the Error! Bookmark not defined. method. If the DDSCAPS\_COMPLEX flag is set when you call **CreateSurface** call, DirectDraw implicitly creates one or more surfaces in addition to the surface explicitly specified.

One of the most useful complex surfaces you can create is a **Error! Bookmark not defined.**. Usually, a flipping chain is made of a **Error! Bookmark not defined.** and one or more **Error! Bookmark not defined.**. The DDSCAPS\_FLIP flag indicates that a surface is part of a flipping chain. Creating a flipping chain this way requires that you also include the DDSCAPS\_COMPLEX flag.

The Tutorial 2 sample creates a flipping chain with one back buffer with the statements:

ddsd1.lFlags = DDSD\_CAPS Or DDSD\_BACKBUFFERCOUNT

ddsd1.ddsCaps.lCaps = DDSCAPS\_PRIMARYSURFACE Or DDSCAPS\_FLIP Or DDSCAPS\_COMPLEX

ddsd1.lBackBufferCount = 1

Set primary = dd.CreateSurface(ddsd1)

Next we create a **DDSCAPS2** type variable and set the DDSCAPS\_BACKBUFFER flag to specify this is surface description for a back buffer. Then we obtain the created back buffer by using the **DirectDrawSurface7.GetAttachedSurface** method:

Dim caps As DDSCAPS2

caps.lCaps = DDSCAPS\_BACKBUFFER

Set backbuffer = primary.GetAttachedSurface(caps)

Next: Step 3: Initialize the Surfaces

#### Step 3: Initialize the Surfaces

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

Initializing the off-screen surface buffers for the background image and the sprite image is essentially identical to the Step 2: Initialize the Surfaces topic found in Tutorial 2. The only difference is that we create the background surface with the surface description of the back buffer. This is easily obtained by calling the **DirectDrawSurface7.GetSurfaceDesc** method. This is shown in the statements:

backbuffer.GetSurfaceDesc ddsd4

ddsd2.lFlags = DDSD\_CAPS Or DDSD\_HEIGHT Or DDSD\_WIDTH

ddsd2.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN

ddsd2.lWidth = ddsd4.lWidth

ddsd2.lHeight = ddsd4.lHeight

Set lakesurf = dd.CreateSurfaceFromFile("lake.bmp", ddsd2)

Next: Step 4: Update the Display with Page Flipping

#### Step 4: Update the Display with Page Flipping

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

This step is very similar to the Step 3: Blit to the Primary Surface step in Tutorial 2. In fact, the results are identical, except that this tutorial is done in full-screen. However, since we created the back buffer as part of a flipping chain, instead of constantly re-blitting the entire back buffer to the primary surface we can use page flipping.

**Error! Bookmark not defined.** is key in multimedia, animation, and game software. Software page flipping is analogous to the way animation can be done with a pad of paper. On each page the artist changes the figure slightly, so that when you flip between sheets rapidly the drawing appears animated.

This application writes to the back buffer, then flips the primary surface so that the back buffer appears on screen. While the system is displaying the image, we are again writing to the back buffer. The process continues as long as the application is running, allowing us to animate images quickly and efficiently.

After blitting the background image and the sprite to the back buffer, we can flip the surface by calling the **DirectDrawSurface7.Flip** method as seen in the code:

primary.Flip Nothing, DDFLIP\_WAIT

### Tutorial 4: Blitting to Areas of the Screen

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The Tutorial 4 application in the SDK is very similar to Tutorial 3: Using Full Screen Features with additional sprite animation. In fact, the only difference between the two applications is that this Tutorial uses a bitmap with many frames of animation. If you open donut.bmp file in an image viewer, you will notice that although it is a single bitmap, there are numerous images of the donut shape from slightly different viewpoints. Animation is accomplished by changing the location of the destination rectangle for the sprite on the back buffer. In addition, the different views of the donut are cycled to be blit, making the sprite rotate.

Since this tutorial is so similar to the previous one, only the step showing how to animate the sprite is discussed:

Step 1: Animate the Sprite

#### Step 1: Animate the Sprite

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

Since we know the height and width of each instance of the donut in the donut.bmp image, we can separate the bitmap into columns and rows with each cell being a single image of the donut:

ddsd3.lFlags = DDSD\_CAPS

ddsd3.ddsCaps.lCaps = DDSCAPS\_OFFSCREENPLAIN

Set spritesurf = dd.CreateSurfaceFromFile("donut.bmp ", ddsd3)

spriteWidth = 64

spriteHeight = 64

cols = ddsd3.lWidth / spriteWidth

rows = ddsd3.lHeight / spriteHeight

Taking a closer look at the **DirectDrawSurface7.BltFast** method, we see that *srcRect* parameter is a Error! Bookmark not defined. type that defines the upper-left and lower-right points of the rectangle to blit from on the source surface. Therefore by randomly specifying a portion or cell of the sprite surface we give the sprite animation:

col = currentFrame Mod cols

row = Int(currentFrame / cols)

rSprite.Left = col \* spriteWidth

rSprite.Top = row \* spriteHeight

rSprite.Right = rSprite.Left + spriteWidth

rSprite.Bottom = rSprite.Top + spriteHeight

'blt to the backbuffer our animated sprite

ddrval = backbuffer.BltFast(rSprite2.Left, rSprite2.Top, spritesurf, \_

rSprite, DDBLTFAST\_SRCCOLORKEY Or DDBLTFAST\_WAIT)

### Tutorial 5: Enumerating DirectDraw Devices

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

The Tutorial 5 sample application illustrates using the enumeration objects in DirectX for Visual Basic to obtain DirectDraw device information. This application reports the hardware and software capabilities, 3-D hardware and software capabilities, and the available display modes for each DirectDraw device installed on the system.

This tutorial is divided into the following steps:

Step 1: Obtain Installed DirectDraw Devices

Step 2: Display DirectDraw Device Capabilities

Step 3: Display DirectDraw Device 3-D Capabilities

Step 4: Report Available Display Modes

#### Step 1: Obtain Installed DirectDraw Devices

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

DirectX for Visual Basic enables you to query the display hardware's capabilities at run time, then provide the best performance possible given the host computer's hardware capabilities. This is easily accomplished through the use of the many enumeration objects in the DxVBLib type library.

The first step is to obtain all DirectDraw devices installed on the system. In addition to the primary display adapter, some systems have multiple display cards. A common scenario is a secondary 3-D graphics card. All the installed devices are obtained by calling the **DirectX7.GetDDEnum** method. This method returns a **DirectDrawEnum** object which you then query for information. Through the methods of the **DirectDrawEnum** object, you can retrieve the number of installed devices and the name, description, GUID and monitor handle for each individual device.

In the Tutorial 5 sample application this is done with the following code:

Dim ddEnum As DirectDrawEnum

Dim strGuid As String

Set ddEnum = m\_dx.GetDDEnum()

OutList.AddItem "Display Cards"

For i = 1 To ddEnum.GetCount()

OutList.AddItem " Index " + Str(i)

OutList.AddItem " Description " + ddEnum.GetDescription(i)

OutList.AddItem " Name " + ddEnum.GetName(i)

OutList.AddItem " GUID " + ddEnum.GetGuid(i)

OutList.AddItem ""

strGuid = ddEnum.GetGuid(i)

GetDDCaps strGuid

GetD3DDevices strGuid

GetDisplayModes strGuid

Next

Notice that GetDDCaps, GetD3DDevices and GetDisplayModes procedures are called for each device found installed on the system.

The information is displayed by populating a List box control.

Next: Step 2: Display DirectDraw Device Capabilities

#### Step 2: Display DirectDraw Device Capabilities

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

To obtain the DirectDraw hardware and software capabilities for the device you must first create the DirectDraw object, set the cooperative level of the application and call the **DirectDraw7.GetCaps** method. This method takes two parameters both **DDCAPS** type variables. Calling this method fills the first parameter, *hwCaps*, with the capabilities of the hardware. The second parameter, *helCaps*, is filled with the capabilities of the hardware emulation layer (HEL). For more information on software and hardware capabilities, see the Architectural Overview for DirectDraw topic.

After the **GetCaps** method is called, displaying the capabilities is done by checking the flags returned in the **DDCAPS** variables:

Dim dd As DirectDraw7

Dim hwCaps As DDCAPS 'HARDWARE

Dim helCaps As DDCAPS 'SOFTWARE EMULATION

Set dd = m\_dx.DirectDrawCreate(sGuid)

dd.SetCooperativeLevel Me.hWnd, DDSCL\_NORMAL

'Its always a good idea to figure out if the HW

'supports a feature

'Unsupported features however are emulated via

'software but are much slower

dd.GetCaps hwCaps, helCaps

'how much video memory is available

OutList.AddItem " HW CAPS"

OutList.AddItem " total video memory " + Str(hwCaps.lVidMemTotal)

OutList.AddItem " free video memory " + Str(hwCaps.lVidMemFree)

'Palette Support

'Most apps don't use palettes since

'all cards support 16bpp

'Some apps use 8bpp for speed

lVal = hwCaps.lPalCaps

If (lVal = 0) Then

OutList.AddItem " no hw palette support"

End If

If (lVal And DDPCAPS\_1BIT) Then

OutList.AddItem " palette support 1bpp "

End If

If (lVal And DDPCAPS\_2BIT) Then

OutList.AddItem " palette support 2bit "

End If

'do we support the gamma ramp interface?

lVal = hwCaps.ddsCaps.lCaps2

If lVal And DDCAPS2\_CANCALIBRATEGAMMA Then

OutList.AddItem " supports gamma correction"

Else

OutList.AddItem " no support for gamma correction"

End If

Set dd = Nothing

Next: Step 3: Display DirectDraw Device 3-D Capabilities

#### Step 3: Display DirectDraw Device 3-D Capabilities

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

Retrieving the 3-D capabilities of a DirectDraw device is very similar to the previous step of this tutorial. First a **Direct3D7** object must be created from the **DirectDraw7** object. Next, the **Direct3D7.GetDevicesEnum** method is called to create and fill a **Direct3DEnumDevices** enumeration object. The methods of the enumeration object are then called to retrieve information about the Direct3D devices present on a system.

In the Tutorial 5 sample, the **Direct3DEnumDevices.GetDesc** method is called on each Direct3D device to obtain the capabilities. Then capability flags are checked in the **D3DDEVICEDESC7** type and the results are reported in the List box. This is shown in the following statements:

Set dd = m\_dx.DirectDrawCreate(sGuid)

Set d3d = dd.GetDirect3D()

OutList.AddItem " D3D devices"

Set d3denum = d3d.GetDevicesEnum()

OutList.AddItem ""

For i = 1 To d3denum.GetCount()

d3denum.GetDesc i, hwDesc

OutList.AddItem " Guid " + d3denum.GetGuid(i)

OutList.AddItem " Description " + d3denum.GetDescription(i)

OutList.AddItem " Name " + d3denum.GetName(i)

OutList.AddItem " Device "

With hwDesc

OutList.AddItem " Max Texture Height " + Str(.lMaxTextureHeight)

OutList.AddItem " Max Texture Width " + Str(.lMaxTextureWidth)

If (.lDeviceRenderBitDepth And DDBD\_8) Then

OutList.AddItem " Supports rendering to 8 bit"

End If

If (.lDeviceZBufferBitDepth And DDBD\_8) Then

OutList.AddItem " Supports 8 bit z buffer"

End If

If (.lDevCaps And D3DDEVCAPS\_TEXTURENONLOCALVIDMEM) Then

OutList.AddItem " Supports AGP textures"

End If

End With

Next: Step 4: Report Available Display Modes

#### Step 4: Report Available Display Modes

[C++]

This section pertains only to application development in Visual Basic. See DirectDraw C/C++ Tutorials.

[Visual Basic]

A display mode is a hardware setting that describes the dimensions and bit-depth of graphics that the display hardware sends to the monitor from the primary surface. Display modes are described by their defining characteristics: width, height, and bit-depth. For instance, most display adapters can display graphics 640 pixels wide and 480 pixels tall, where each pixel is 8 bits of data. In shorthand, this display mode is called 640×480×8. As the dimensions of a display mode get larger or as the bit-depth increases, more display memory is required.

Support for display modes varies depending on the display adapter. To ensure a particular display mode is supported on the system, you should enumerate all the valid display modes using the **DirectDraw7.GetDisplayModesEnum** method. This method creates and fills a **DirectDrawEnumModes** enumeration object called DisplayModesEnum which is then used to retrieve the descriptions of individual display modes.

In the Tutorial 5 sample the methods of the DisplayModesEnum object are called for each supported display mode:

Dim DisplayModesEnum As DirectDrawEnumModes

Dim ddsd2 As DDSURFACEDESC2

Dim dd As DirectDraw7

Set dd = m\_dx.DirectDrawCreate(sGuid)

dd.SetCooperativeLevel Me.hWnd, DDSCL\_NORMAL

Set DisplayModesEnum = dd.GetDisplayModesEnum(0, ddsd2)

OutList.AddItem " Display Modes"

For i = 1 To DisplayModesEnum.GetCount()

DisplayModesEnum.GetItem i, ddsd2

OutList.AddItem " Index " + Str(i)

OutList.AddItem " Width " + Str(ddsd2.lWidth)

OutList.AddItem " Height " + Str(ddsd2.lHeight)

OutList.AddItem " Bits Per Pixel" + Str(ddsd2.ddpfPixelFormat.lRGBBitCount)

OutList.AddItem " Refresh Rate " + Str(ddsd2.lRefreshRate)

OutList.AddItem ""

Next

# DirectDraw Reference

This section contains reference information for the application programming interface (API) elements provided by Microsoft® DirectDraw® in C/C++ and Microsoft® Visual Basic®. Reference material is organized by language:

DirectDraw C/C++ Reference

DirectDraw Visual Basic Reference

## DirectDraw C/C++ Reference

This section contains reference information for the API elements that DirectDraw provides. Reference material is divided into the following categories:

Interfaces

Functions

Callback Functions

Structures

Return Values

Pixel Format Masks

Four-Character Codes (FOURCC)

### Interfaces

This section contains reference information about the interfaces used with the DirectDraw component. The following interfaces are covered:

**IDDVideoPortContainer**

**IDirectDraw7**

**IDirectDrawClipper**

**IDirectDrawColorControl**

**IDirectDrawGammaControl**

**IDirectDrawPalette**

**IDirectDrawSurface7**

**IDirectDrawVideoPort**

IDDVideoPortContainer

Applications use the methods of the **IDDVideoPortContainer** interface to create and manipulate DirectDrawVideoPort objects. Retrieve a pointer to this interface by calling the **IUnknown::QueryInterface** method of a DirectDraw object, specifying the IID\_IDDVideoPortContainer reference identifier.

The methods of the **IDDVideoPortContainer** interface can be organized into the following groups:

|  |  |
| --- | --- |
| **Creating objects** | **CreateVideoPort** |
| **Video ports** | **EnumVideoPorts** |
|  | **QueryVideoPortStatus** |
| **Connections** | **GetVideoPortConnectInfo** |

The **IDDVideoPortContainer** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

You can use the **LPDDVIDEOPORTCONTAINER** data type to declare a variable that contains a pointer to an **IDDVideoPortContainer** interface. The Dvp.h header file declares the **LPDDVIDEOPORTCONTAINER** with the following code:

typedef struct IDDVideoPortContainer FAR \*LPDDVIDEOPORTCONTAINER;

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDDVideoPortContainer::CreateVideoPort

The **IDDVideoPortContainer::CreateVideoPort** method creates a DirectDrawVideoPort object.

**HRESULT CreateVideoPort(**

**DWORD** *dwFlags***,**

**LPDDVIDEOPORTDESC** *lpDDVideoPortDesc***,**

**LPDIRECTDRAWVIDEOPORT FAR** *\*lplpDDVideoPort***,**

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*dwFlags*

Flags specifying video-port control options. This parameter can be one of the following flags, or NULL if control options are not needed:

DDVPCREATE\_VBIONLY

The process wants to control only the VBI portion of the video stream.

DDVPCREATE\_VIDEOONLY

The process wants to control only the non-VBI (video) portion of the video stream.

*lpDDVideoPortDesc*

Address of a **DDVIDEOPORTDESC** structure that describes the DirectDrawVideoPort object to be created.

*lplpDDVideoPort*

Address of a variable to be filled with a pointer to the new DirectDrawVideoPort object's **IDirectDrawVideoPort** interface if the call succeeds.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CURRENTLYNOTAVAIL |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_OUTOFCAPS |
| DDERR\_OUTOFMEMORY |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDDVideoPortContainer::EnumVideoPorts

The **IDDVideoPortContainer::EnumVideoPorts** method enumerates all the video ports that the hardware exposes that are compatible with a provided video-port description.

**HRESULT EnumVideoPorts(**

**DWORD** *dwFlags***,**

**LPDDVIDEOPORTCAPS** *lpDDVideoPortCaps***,**

**LPVOID** *lpContext***,**

**LPENUMVIDEOCALLBACK** *lpEnumVideoCallback*

**);**

Parameters

*dwFlags*

Reserved for future use. This parameter must be 0.

*lpDDVideoPortCaps*

Address of a **DDVIDEOPORTCAPS** structure to be checked against the available video ports. If this parameter is NULL, all video ports are enumerated.

*lpContext*

Address of a caller-defined structure to be passed to each enumeration member.

*lpEnumVideoCallback*

Address of the **EnumVideoCallback** function to be called each time that a match is found.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDDVideoPortContainer::GetVideoPortConnectInfo

The **IDDVideoPortContainer::GetVideoPortConnectInfo** method retrieves the connection information supported by all video ports.

**HRESULT GetVideoPortConnectInfo(**

**DWORD** *dwPortId***,**

**LPDWORD** *lpNumEntries***,**

**LPDDVIDEOPORTCONNECT** *lpConnectInfo*

**);**

Parameters

*dwPortId*

Identifier of the video port for which the connection information is to be retrieved.

*lpNumEntries*

Address of a variable that contains the number of entries that the array at *lpConnectInfo* can hold. If this number is less than the total number of connections, the method fills the array with all the entries that fit, sets the value at *lpNumEntries* to indicate the total number of connections, and returns DDERR\_MOREDATA.

*lpConnectInfo*

Address of an array of **DDVIDEOPORTCONNECT** structures to be filled with the connection options supported by the specified video port. If this parameter is NULL, the method sets *lpNumEntries* to indicate the total number of connections that the video port supports, then returns DD\_OK.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_MOREDATA |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDDVideoPortContainer::QueryVideoPortStatus

The **IDDVideoPortContainer::QueryVideoPortStatus** method retrieves the status of a DirectDrawVideoPort object.

**HRESULT QueryVideoPortStatus(**

**DWORD** *dwPortId***,**

**LPDDVIDEOPORTSTATUS** *lpVPStatus*

**);**

Parameters

*dwPortId*

Identifier of the video port for which the status information is to be retrieved.

*lpVPStatus*

Address of a **DDVIDEOPORTSTATUS** structure to be filled with information about the status of the specified video port.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CURRENTLYNOTAVAIL |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDraw7

Applications use the methods of the **IDirectDraw7** interface to create DirectDraw objects and work with system-level variables. This section is a reference to the methods of this interface. For a conceptual overview, see The DirectDraw Object.

The methods of the **IDirectDraw7** interface can be organized into the following groups:

|  |  |
| --- | --- |
| **Allocating memory** | **Compact** |
|  | **Initialize** |
| **Cooperative levels** | **SetCooperativeLevel** |
|  | **TestCooperativeLevel** |
| **Creating objects** | **CreateClipper** |
|  | **CreatePalette** |
|  | **CreateSurface** |
| **Device capabilities** | **GetCaps** |
| **Display modes** | **EnumDisplayModes** |
|  | **GetDisplayMode** |
|  | **GetMonitorFrequency** |
|  | **RestoreDisplayMode** |
|  | **SetDisplayMode** |
|  | **WaitForVerticalBlank** |
| **Display status** | **GetScanLine** |
|  | **GetVerticalBlankStatus** |
| **Miscellaneous** | **EvaluateMode** |
|  | **GetAvailableVidMem** |
|  | **GetDeviceIdentifier** |
|  | **GetFourCCCodes** |
|  | **StartModeTest** |
| **Surface management** | **DuplicateSurface** |
|  | **EnumSurfaces** |
|  | **FlipToGDISurface** |
|  | **GetGDISurface** |
|  | **GetSurfaceFromDC** |
|  | **RestoreAllSurfaces** |

The **IDirectDraw7** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

The **IDirectDraw7** interface extends the features of previous versions of the interface by offering methods enabling more flexible surface management than previous versions. All the surface-related methods in the **IDirectDraw7** interface accept slightly different parameters than their counterparts in the **IDirectDraw2** interface. Wherever an **IDirectDraw2** interface method might accept a **DDSURFACEDESC** structure and retrieve an **IDirectDrawSurface3** interface, the methods in **IDirectDraw7** accept a **DDSURFACEDESC2** structure and retrieve an **IDirectDrawSurface7** interface, instead.

**IDirectDraw7** introduces improved compliance with COM rules dictating the lifetime of child objects. For more information, see Parent and Child Object Lifetimes.

Use the **LPDIRECTDRAW**, **LPDIRECTDRAW2**, **LPDIRECTDRAW4** or **LPDIRECTDRAW7** data types to declare a variable that contains a pointer to an **IDirectDraw**, **IDirectDraw2**, **IDirectDraw4** or **IDirectDraw7** interface. The Ddraw.h header file declares these data types with the following code:

typedef struct IDirectDraw FAR \*LPDIRECTDRAW;

typedef struct IDirectDraw2 FAR \*LPDIRECTDRAW2;

typedef struct IDirectDraw4 FAR \*LPDIRECTDRAW4;

typedef struct IDirectDraw7 FAR \*LPDIRECTDRAW7;

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::Compact

The **IDirectDraw7::Compact** method is not currently implemented.

**HRESULT Compact();**

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_SURFACEBUSY |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::CreateClipper

The **IDirectDraw7::CreateClipper** method creates a DirectDrawClipper object.

**HRESULT CreateClipper(**

**DWORD** *dwFlags***,**

**LPDIRECTDRAWCLIPPER FAR** *\*lplpDDClipper***,**

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

*lplpDDClipper*

Address of a variable to be set to a valid **IDirectDrawClipper** interface pointer if the call succeeds.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_OUTOFMEMORY |

Remarks

The DirectDrawClipper object can be attached to a DirectDrawSurface and used during **IDirectDrawSurface7::Blt**, **IDirectDrawSurface7::BltBatch**, and **IDirectDrawSurface7::UpdateOverlay** operations.

To create a DirectDrawClipper object that is not owned by a specific DirectDraw object, use the **DirectDrawCreateClipper** function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetClipper**, **IDirectDrawSurface7::SetClipper**

IDirectDraw7::CreatePalette

The **IDirectDraw7::CreatePalette** method creates a DirectDrawPalette object for this DirectDraw object.

**HRESULT CreatePalette(**

**DWORD** *dwFlags***,**

**LPPALETTEENTRY** *lpDDColorArray***,**

**LPDIRECTDRAWPALETTE FAR** *\*lplpDDPalette***,**

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*dwFlags*

One or more of the following flags:

DDPCAPS\_1BIT

The index is 1 bit. There are two entries in the color table.

DDPCAPS\_2BIT

The index is 2 bits. There are four entries in the color table.

DDPCAPS\_4BIT

The index is 4 bits. There are 16 entries in the color table.

DDPCAPS\_8BIT

The index is 8 bits. There are 256 entries in the color table.

DDPCAPS\_8BITENTRIES

The index refers to an 8-bit color index. This flag is valid only when used with the DDPCAPS\_1BIT, DDPCAPS\_2BIT, or DDPCAPS\_4BIT flag, and when the target surface is 8 bpp. Each color entry is 1 byte long and is an index to a destination surface's 8-bpp palette.

DDPCAPS\_ALPHA

The **peFlags** member of the associated **PALETTEENTRY** structure is to be interpreted as a single 8-bit alpha value (in addition to the **peRed**, **peGreen**, and **peBlue** members). A palette created with this flag can only be attached to a texture: a surface created with the DDSCAPS\_TEXTURE capability flag.

DDPCAPS\_ALLOW256

This palette can have all 256 entries defined.

DDPCAPS\_INITIALIZE

Obsolete. DirectDraw always initializes this palette with the colors in the color array passed at *lpDDColorArray*.

DDPCAPS\_PRIMARYSURFACE

This palette is attached to the primary surface. Changing this palette's color table immediately affects the display unless DDPSETPAL\_VSYNC is specified and supported.

DDPCAPS\_PRIMARYSURFACELEFT

This palette is the one attached to the left-eye primary surface. Changing this palette's color table immediately affects the left-eye display unless DDPSETPAL\_VSYNC is specified and supported.

DDPCAPS\_VSYNC

This palette can have modifications to it synchronized with the monitor's refresh rate.

*lpDDColorArray*

Address of an array of 2, 4, 16, or 256 **PALETTEENTRY** structures to initialize this DirectDrawPalette object.

*lplpDDPalette*

Address of a variable to be set to a valid **IDirectDrawPalette** interface pointer if the call succeeds.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_OUTOFMEMORY |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::CreateSurface

The **IDirectDraw7::CreateSurface** method creates a DirectDrawSurface object for this DirectDraw object.

**HRESULT CreateSurface(**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc2***,**

**LPDIRECTDRAWSURFACE7 FAR** *\*lplpDDSurface***,**

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*lpDDSurfaceDesc2*

Address of a **DDSURFACEDESC2** structure that describes the requested surface. Set any unused members of the **DDSURFACEDESC2** structure to 0 before calling this method. A **DDSCAPS2** structure is a member of **DDSURFACEDESC2**.

*lplpDDSurface*

Address of a variable to be set to a valid **IDirectDrawSurface7** interface pointer if the call succeeds.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INCOMPATIBLEPRIMARY |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_NOALPHAHW |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_NOEMULATION |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOFLIPHW |
| DDERR\_NOMIPMAPHW |
| DDERR\_NOOVERLAYHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_OUTOFMEMORY |
| DDERR\_OUTOFVIDEOMEMORY |
| DDERR\_PRIMARYSURFACEALREADYEXISTS |
| DDERR\_UNSUPPORTEDMODE |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::DuplicateSurface

The **IDirectDraw7::DuplicateSurface** method duplicates a DirectDrawSurface object.

**HRESULT DuplicateSurface(**

**LPDIRECTDRAWSURFACE7** *lpDDSurface***,**

**LPLPDIRECTDRAWSURFACE7 FAR** *\*lplpDupDDSurface*

**);**

Parameters

*lpDDSurface*

Address of the **IDirectDrawSurface7** interface for the surface to be duplicated.

*lplpDupDDSurface*

Address of a variable to be filled with an **IDirectDrawSurface7** interface pointer for the newly duplicated DirectDrawSurface object.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CANTDUPLICATE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |
| DDERR\_SURFACELOST |

Remarks

This method creates a new DirectDrawSurface object that points to the same surface memory as an existing DirectDrawSurface object. This duplicate can be used just like the original object. The surface memory is released after the last object referring to it is released. A primary surface, 3-D surface, or implicitly created surface cannot be duplicated.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::EnumDisplayModes

The **IDirectDraw7::EnumDisplayModes** method enumerates all the display modes that the hardware exposes through the DirectDraw object that are compatible with a provided surface description.

**HRESULT EnumDisplayModes(**

**DWORD** *dwFlags***,**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc2***,**

**LPVOID** *lpContext***,**

**LPDDENUMMODESCALLBACK2** *lpEnumModesCallback*

**);**

Parameters

*dwFlags*

DDEDM\_REFRESHRATES

Enumerates modes with different refresh rates. **IDirectDraw7::EnumDisplayModes** guarantees that a particular mode is enumerated only once. This flag specifies whether the refresh rate is taken into account when determining whether a mode is unique.

DDEDM\_STANDARDVGAMODES

Enumerates Mode 13 in addition to the 320x200x8 Mode X mode.

*lpDDSurfaceDesc2*

Address of a **DDSURFACEDESC2** structure to be checked against available modes. If the value of this parameter is NULL, all modes are enumerated.

*lpContext*

Address of an application-defined structure to be passed to each enumeration member.

*lpEnumModesCallback*

Address of the **EnumModesCallback2** function that the enumeration procedure calls every time a match is found.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method enumerates the **dwRefreshRate** member of the **DDSURFACEDESC2** structure; the **IDirectDraw::EnumDisplayModes** method does not contain this capability. If you use the **IDirectDraw7::SetDisplayMode** method to set the refresh rate of a new mode, use **IDirectDraw7::EnumDisplayModes** to enumerate the **dwRefreshRate** member.

This method differs from its counterparts in former interfaces in that it accepts the address of an **EnumModesCallback2** function as a parameter, rather than an **EnumModesCallback** function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::GetDisplayMode**, **IDirectDraw7::SetDisplayMode**, **IDirectDraw7::RestoreDisplayMode**

IDirectDraw7::EnumSurfaces

The **IDirectDraw7::EnumSurfaces** method enumerates all the existing or possible surfaces that meet the specified surface description.

**HRESULT EnumSurfaces(**

**DWORD** *dwFlags***,**

**LPDDSURFACEDESC2** *lpDDSD2***,**

**LPVOID** *lpContext***,**

**LPDDENUMSURFACESCALLBACK2** *lpEnumSurfacesCallback*

**);**

Parameters

*dwFlags*

A combination of one search type flag and one matching flag. The search type flag determines how the method searches for matching surfaces; you can search for surfaces that can be created using the description in the *lpDDSD2* parameter or for existing surfaces that already match that description. The matching flag determines whether the method enumerates all surfaces, only those that match, or only those that do not match the description in the *lpDDSD2* parameter.

**Search type flags**

DDENUMSURFACES\_CANBECREATED

Enumerates the first surface that can be created and meets the search criterion. This flag can be used only with the DDENUMSURFACES\_MATCH flag.

DDENUMSURFACES\_DOESEXIST

Enumerates the already existing surfaces that meet the search criterion.

**Matching flags**

DDENUMSURFACES\_ALL

Enumerates all surfaces that meet the search criterion. This flag can be used only with the DDENUMSURFACES\_DOESEXIST search type flag.

DDENUMSURFACES\_MATCH

Searches for any surface that matches the surface description.

DDENUMSURFACES\_NOMATCH

Searches for any surface that does not match the surface description.

*lpDDSD2*

Address of a **DDSURFACEDESC2** structure that defines the surface of interest. This parameter can be NULL if *dwFlags* includes the DDENUMSURFACES\_ALL flag.

*lpContext*

Address of an application-defined structure to be passed to each enumeration member.

*lpEnumSurfacesCallback*

Address of the **EnumSurfacesCallback2** function that the enumeration procedure calls every time a match is found.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

If the DDENUMSURFACES\_CANBECREATED flag is set, this method attempts to temporarily create a surface that meets the search criterion.

When using the DDENUMSURFACES\_DOESEXIST flag, an enumerated surface's reference count is incremented—if you are not going to use the surface, be sure to use **IDirectDrawSurface7::Release** to release it after each enumeration. If you will be using the surface, release it when it is no longer needed.

This method differs from its counterparts in previous interface versions in that it accepts a pointer to an **EnumSurfacesCallback2** function, rather than an **EnumSurfacesCallback** function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

Enumerating Surfaces

IDirectDraw7::EvaluateMode

The **IDirectDraw7::EvaluateMode** method is used after a call to **IDirectDraw7::StartModeTest** to pass or fail each mode presented by the test and to step through the modes until the test is complete.

**HRESULT EvaluateMode(**

**DWORD** *dwFlags,*

**DWORD** \**pSecondsUntilTimeout*

**);**

Parameters

*dwFlags*

Flags indicating the status of the mode being tested.

DDEM\_MODEPASSED

The mode being tested has passed.

DDEM\_MODEFAILED

The mode being tested has failed.

*pSecondsUntilTimeout*

A pointer to the **DWORD** that will receive a value denoting the seconds remaining before the current mode will be failed automatically unless it is explicitly passed or failed.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails or on completion, the method can return one of the following error values:

|  |
| --- |
| DDERR\_TESTFINISHED |
| DDERR\_NEWMODE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |

Remarks

The **IDirectDraw7::EvaluateMode** method can be used in conjunction with the **IDirectDraw7::StartModeTest** method to determine the maximum refresh rate that an EDID monitor and display adapter combination can support for each screen resolution.

Specifically, a call to **IDirectDraw7::StartModeTest** directs DirectDraw to establish a set of testable resolutions and to display a mode based on the first resolution in the set. Subsequent calls to **IDirectDraw7::EvaluateMode** can be used to pass or fail each mode and to advance the test to the next display mode. The method steps through the testable resolutions starting with the highest refresh rate supported for a given resolution. Once a refresh rate for a given resolution passes, testing of lower refresh rates for that resolution is skipped.

When the test is initiated, or whenever a mode is passed or failed, DirectDraw will begin a 15 second timeout. An application can monitor the time remaining without passing or failing the current mode by calling **IDirectDraw7::EvaluateMode** with a value of 0 for the *dwFlags* argument. Note that DirectDraw will only change modes or terminate the test when **IDirectDraw7::EvaluateMode** is called. However, if the method is called after the timeout period has elapsed, the current mode will be failed, regardless of the value provided for the dwFlags argument.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::StartModeTest**

IDirectDraw7::FlipToGDISurface

The **IDirectDraw7::FlipToGDISurface** method makes the surface that the GDI writes to the primary surface.

**HRESULT FlipToGDISurface();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |

Remarks

This method can be called at the end of a page-flipping application to ensure that the display memory that the GDI is writing to is visible.

The method can also be used to make the GDI surface the primary surface so that normal windows such as dialog boxes can be displayed in full-screen mode. The hardware must have the DDCAPS2\_CANRENDERWINDOWED capability. For more information, see Displaying a Window in Full-Screen Mode

This method disables stereo autoflipping.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::GetGDISurface**

IDirectDraw7::GetAvailableVidMem

The **IDirectDraw7::GetAvailableVidMem** method retrieves the total amount of display memory available and the amount of display memory currently free for a given type of surface.

**HRESULT GetAvailableVidMem(**

**LPDDSCAPS2** *lpDDSCaps2***,**

**LPDWORD** *lpdwTotal***,**

**LPDWORD** *lpdwFree*

**);**

Parameters

*lpDDSCaps2*

Address of a **DDSCAPS2** structure that indicates the hardware capabilities of the proposed surface.

*lpdwTotal*

Address of a variable to be filled with the total amount of display memory available, in bytes. The value retrieved reflects the total video memory, minus the video memory required for the primary surface and any private caches that the display driver reserves.

*lpdwFree*

Address of a variable to be filled with the amount of display memory currently free that can be allocated for a surface that matches the capabilities specified by the structure at *lpDDSCaps2*.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NODIRECTDRAWHW |

If NULL is passed to either *lpdwTotal* or *lpdwFree*, the value for that parameter is not returned.

Remarks

The following C++ example demonstrates how to use **IDirectDraw7::GetAvailableVidMem** to determine both the total and free display memory available for texture-map surfaces:

// For this example, the lpDD variable is a valid

// pointer to an IDirectDraw interface.

LPDIRECTDRAW7 lpDD;

DDSCAPS2 ddsCaps2;

DWORD dwTotal;

DWORD dwFree;

HRESULT hr;

hr = lpDD->QueryInterface(IID\_IDirectDraw7, &lpDD);

if (FAILED(hr))

return hr;

// Initialize the structure.

ZeroMemory(&ddsCaps2, sizeof(ddsCaps2));

ddsCaps2.dwCaps = DDSCAPS\_TEXTURE;

hr = lpDD->GetAvailableVidMem(&ddsCaps2, &dwTotal, &dwFree);

if (FAILED(hr))

return hr;

If the surface has the DDSCAPS\_VIDEOMEMORY flag set, this method will return different amounts of video memory depending on whether or not the surface can be used as a 3-D texture. If the surface can be used for 3-D textures, the GetAvailableVidMem method will return the sum of the local video memory and the non-local video memory on AGP systems.

This method provides only a snapshot of the current display-memory state. The amount of free display memory is subject to change as surfaces are created and released. Therefore, you should use the free memory value only as an approximation. In addition, a particular display adapter card might make no distinction between two different memory types. For example, the adapter might use the same portion of display memory to store z-buffers and textures. So, allocating one type of surface (for example, a z-buffer) can affect the amount of display memory available for another type of surface (textures). Therefore, it is best to first allocate an application's fixed resources (such as front and back buffers and z-buffers) before determining how much memory is available for dynamic use (such as texture mapping).

This method was not implemented in the **IDirectDraw** interface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::GetCaps

The **IDirectDraw7::GetCaps** method fills in the capabilities of the device driver for the hardware and the hardware emulation layer (HEL).

**HRESULT GetCaps(**

**LPDDCAPS** *lpDDDriverCaps***,**

**LPDDCAPS** *lpDDHELCaps*

**);**

Parameters

*lpDDDriverCaps*

Address of a **DDCAPS** structure to be filled with the capabilities of the hardware, as reported by the device driver. Set this parameter to NULL if device driver capabilities are not to be retrieved.

*lpDDHELCaps*

Address of a **DDCAPS** structure to be filled with the capabilities of the HEL. Set this parameter to NULL if HEL capabilities are not to be retrieved.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

You can set only one of the two parameters to NULL to exclude it. If you set both to NULL, the method fails, returning DDERR\_INVALIDPARAMS.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::GetDeviceIdentifier

The **IDirectDraw7::GetDeviceIdentifier** method obtains information about the driver. This method can be used, with caution, to recognize specific hardware installations to implement workarounds for poor driver or chipset behavior.

**HRESULT GetDeviceIdentifier(**

**LPDDDEVICEIDENTIFIER2** *lpdddi***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpdddi*

Address of a **DDDEVICEIDENTIFIER2** structure to receive information about the driver.

*dwFlags*

Flags specifying options. The following flag is defined:

DDGDI\_GETHOSTIDENTIFIER

Causes the method to return information about the host (typically 2-D) adapter in a system equipped with a stacked secondary 3-D adapter. Such an adapter appears to the application as if it were part of the host adapter, but is typically located on a separate card. When the *dwFlags* parameter is 0, information on the stacked secondary is returned because this most accurately reflects the qualities of the DirectDraw object involved.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return DDERR\_INVALIDPARAMS.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::GetDisplayMode

The **IDirectDraw7::GetDisplayMode** method retrieves the current display mode.

**HRESULT GetDisplayMode(**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc2*

**);**

Parameters

*lpDDSurfaceDesc2*

Address of a **DDSURFACEDESC2** structure to be filled with a description of the surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTEDMODE |

Remarks

An application should not save the information returned by this method to restore the display mode on clean-up. The application should use the **IDirectDraw7::RestoreDisplayMode** method to restore the mode on clean-up, thus avoiding mode-setting conflicts that could arise in a multiprocess environment.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::SetDisplayMode**, **IDirectDraw7::RestoreDisplayMode**, **IDirectDraw7::EnumDisplayModes**

IDirectDraw7::GetFourCCCodes

The **IDirectDraw7::GetFourCCCodes** method retrieves the FOURCC codes supported by the DirectDraw object. This method can also retrieve the number of codes supported.

**HRESULT GetFourCCCodes(**

**LPDWORD** *lpNumCodes***,**

**LPDWORD** *lpCodes*

**);**

Parameters

*lpNumCodes*

Address of a variable that contains the number of entries that the array pointed to by *lpCodes* can hold. If the number of entries is too small to accommodate all the codes, *lpNumCodes* is set to the required number, and the array pointed to by *lpCodes* is filled with all that fits.

*lpCodes*

Address of an array of variables to be filled with FOURCC codes supported by this DirectDraw object. If you specify NULL, *lpNumCodes* is set to the number of supported FOURCC codes, and the method returns.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::GetGDISurface

The **IDirectDraw7::GetGDISurface** method retrieves the DirectDrawSurface object that currently represents the surface memory that GDI is treating as the primary surface.

**HRESULT GetGDISurface(**

**LPDIRECTDRAWSURFACE7 FAR** *\*lplpGDIDDSSurface*

**);**

Parameters

*lplpGDIDDSSurface*

Address of a variable to be filled with a pointer to the **IDirectDrawSurface7** interface for the surface that currently controls the GDI's primary surface memory.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::FlipToGDISurface**

IDirectDraw7::GetMonitorFrequency

The **IDirectDraw7::GetMonitorFrequency** method retrieves the frequency of the monitor being driven by the DirectDraw object.

**HRESULT GetMonitorFrequency(**

**LPDWORD** *lpdwFrequency*

**);**

Parameters

*lpdwFrequency*

Address of a variable to be filled with the monitor frequency, in Hz.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::GetScanLine

The **IDirectDraw7::GetScanLine** method retrieves the scan line that is currently being drawn on the monitor.

**HRESULT GetScanLine(**

**LPDWORD** *lpdwScanLine*

**);**

Parameters

*lpdwScanLine*

Address of a variable to contain the scan line that the display is currently drawing.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DDERR\_VERTICALBLANKINPROGRESS |

Remarks

Scan lines are reported as zero-based integers. The returned scan line value is in the range from 0 through *n*, where 0 is the first visible scan line on the screen and *n* is the last visible scan line, plus any scan lines that occur during the vertical blank period. So, in a case where an application is running at a resolution of 640×480 and there are 12 scan lines during vblank, the values returned by this method range from 0 through 491.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::GetVerticalBlankStatus**, **IDirectDraw7::WaitForVerticalBlank**

IDirectDraw7::GetSurfaceFromDC

The **IDirectDraw7::GetSurfaceFromDC** method retrieves the **IDirectDrawSurface7** interface for a surface, based on its GDI device context handle.

**HRESULT GetSurfaceFromDC(**

**HDC** *hdc*,

**LPDIRECTDRAWSURFACE7** \**lpDDS*

**);**

Parameters

*hdc*

Handle of a display device context.

*lpDDS*

Address of a variable to be filled with a valid **IDirectDrawSurface7** interface pointer if the call succeeds.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |
| DDERR\_NOTFOUND |

Remarks

This method succeeds only for device context handles that identify surfaces already associated with the DirectDraw object.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

Surfaces and Device Contexts

IDirectDraw7::GetVerticalBlankStatus

The **IDirectDraw7::GetVerticalBlankStatus** method retrieves the status of the vertical blank.

**HRESULT GetVerticalBlankStatus(**

**LPBOOL** *lpbIsInVB*

**);**

Parameters

*lpbIsInVB*

Address of a variable to be filled with the status of the vertical blank. This parameter is TRUE if a vertical blank is occurring, and FALSE otherwise.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

To synchronize with the vertical blank, use the **IDirectDraw7::WaitForVerticalBlank** method.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::GetScanLine**, **IDirectDraw7::WaitForVerticalBlank**

IDirectDraw7::Initialize

The **IDirectDraw7::Initialize** method initializes a DirectDraw object that was created by using the **CoCreateInstance** COM function.

**HRESULT Initialize(**

**GUID FAR** *\*lpGUID*

**);**

Parameters

*lpGUID*

Address of the globally unique identifier (GUID) used as the interface identifier.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_ALREADYINITIALIZED |
| DDERR\_DIRECTDRAWALREADYCREATED |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_NODIRECTDRAWSUPPORT |
| DDERR\_OUTOFMEMORY |

This method is provided for compliance with the Component Object Model (COM). If the **DirectDrawCreate** function was used to create a DirectDraw object, this method returns DDERR\_ALREADYINITIALIZED. If **IDirectDraw7::Initialize** is not called when using **CoCreateInstance** to create a DirectDraw object, any method that is called afterward returns DDERR\_NOTINITIALIZED.

Remarks

For more information about using **IDirectDraw7::Initialize** with **CoCreateInstance**, see Creating DirectDraw Objects by Using CoCreateInstance.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::RestoreAllSurfaces

The **IDirectDraw7::RestoreAllSurfaces** method restores all the surfaces created for the DirectDraw object, in the order that they were created.

**HRESULT RestoreAllSurfaces();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method is provided for convenience. Effectively, this method calls the **IDirectDrawSurface7::Restore** method for each surface created by this DirectDraw object.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Restore**, Losing and Restoring Surfaces

IDirectDraw7::RestoreDisplayMode

The **IDirectDraw7::RestoreDisplayMode** method resets the mode of the display device hardware for the primary surface to what it was before the **IDirectDraw7::SetDisplayMode** method was called. Exclusive-level access is required to use this method.

**HRESULT RestoreDisplayMode();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_LOCKEDSURFACES |
| DDERR\_NOEXCLUSIVEMODE |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::SetDisplayMode**, **IDirectDraw7::EnumDisplayModes**, **IDirectDraw7::SetCooperativeLevel**

IDirectDraw7::SetCooperativeLevel

The **IDirectDraw7::SetCooperativeLevel** method determines the top-level behavior of the application.

**HRESULT SetCooperativeLevel(**

**HWND** *hWnd***,**

**DWORD** *dwFlags*

**);**

Parameters

*hWnd*

Window handle used for the application. Set to the calling application's top-level window handle (not a handle for any child windows created by the top-level window). This parameter can be NULL when the DDSCL\_NORMAL flag is specified in the *dwFlags* parameter.

*dwFlags*

One or more of the following flags:

DDSCL\_ALLOWMODEX

Allows the use of Mode X display modes. This flag can only be used if the DDSCL\_EXCLUSIVE and DDSCL\_FULLSCREEN flags are present.

DDSCL\_ALLOWREBOOT

Allows CTRL+ALT+DEL to function while in exclusive (full-screen) mode.

DDSCL\_CREATEDEVICEWINDOW

This flag is supported in Microsoft® Windows® 98 and Microsoft® Windows® 2000 only. Indicates that DirectDraw is to create and manage a default device window for this DirectDraw object. For more information, see Focus and Device Windows.

DDSCL\_EXCLUSIVE

Requests the exclusive level. This flag must be used with the DDSCL\_FULLSCREEN flag.

DDSCL\_FPUPRESERVE

The calling application cares about the FPU state and does not want Direct3D to modify it in ways visible to the application. In this mode, Direct3D saves and restores the FPU state every time that it needs to modify the FPU state. For more information, see DirectDraw Cooperative Levels and FPU Precision.

DDSCL\_FPUSETUP

The calling application is likely to keep the FPU set up for optimal Direct3D performance (single precision and exceptions disabled), so Direct3D does not need to explicitly set the FPU each time. This is the default state. For more information, see DirectDraw Cooperative Levels and FPU Precision.

DDSCL\_FULLSCREEN

The exclusive-mode owner is responsible for the entire primary surface. The GDI can be ignored. This flag must be used with the DDSCL\_EXCLUSIVE flag.

DDSCL\_MULTITHREADED

Requests multithread-safe DirectDraw behavior. This causes Direct3D to take the global critical section more frequently.

DDSCL\_NORMAL

The application functions as a regular Microsoft® Windows® application. This flag cannot be used with the DDSCL\_ALLOWMODEX, DDSCL\_EXCLUSIVE, or DDSCL\_FULLSCREEN flags.

DDSCL\_NOWINDOWCHANGES

DirectDraw is not allowed to minimize or restore the application window on activation.

DDSCL\_SETDEVICEWINDOW

This flag is supported in Windows 98 and Windows 2000 only. Indicates that the *hWnd* parameter is the window handle of the device window for this DirectDraw object. This flag cannot be used with the DDSCL\_SETFOCUSWINDOW flag.

DDSCL\_SETFOCUSWINDOW

This flag is supported in Windows 98 and Windows 2000 only. Indicates that the *hWnd* parameter is the window handle of the focus window for this DirectDraw object. This flag cannot be used with the DDSCL\_SETDEVICEWINDOW flag.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_EXCLUSIVEMODEALREADYSET |
| DDERR\_HWNDALREADYSET |
| DDERR\_HWNDSUBCLASSED |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

This method must be called by the same thread that created the application window.

An application must set either the DDSCL\_EXCLUSIVE or the DDSCL\_NORMAL flag.

The DDSCL\_EXCLUSIVE flag must be set to call functions that can have drastic performance consequences for other applications. For more information, see Cooperative Levels.

Interaction between this method and the **IDirectDraw7::SetDisplayMode** method differs from their **IDirectDraw** counterparts. For more information, see Restoring Display Modes.

If you use Microsoft Foundation Classes (MFC), the window handle passed to this method should identify the application's top-level window, not a derived child window. To retrieve your MFC application's top-level window handle, you could use the following code:

HWND hwndTop = AfxGetMainWnd()->GetSafeHwnd();

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::SetDisplayMode**, **IDirectDraw7::Compact**, **IDirectDraw7::EnumDisplayModes**, Mode X and Mode 13 Display Modes, Focus and Device Windows

IDirectDraw7::SetDisplayMode

The **IDirectDraw7::SetDisplayMode** method sets the mode of the display-device hardware.

**HRESULT SetDisplayMode(**

**DWORD** *dwWidth***,**

**DWORD** *dwHeight***,**

**DWORD** *dwBPP***,**

**DWORD** *dwRefreshRate***,**

**DWORD** *dwFlags*

**);**

Parameters

*dwWidth* and *dwHeight*

Width and height of the new mode.

*dwBPP*

Bits per pixel (bpp) of the new mode.

*dwRefreshRate*

Refresh rate of the new mode. Set this value to 0 to request the default refresh rate for the driver.

*dwFlags*

Flags describing additional options. Currently, the only valid flag is DDSDM\_STANDARDVGAMODE, which causes the method to set Mode 13, instead of Mode X 320x200x8 mode. If you are setting another resolution, bit depth, or a Mode X mode, do not use this flag; instead, set the parameter to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDMODE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_LOCKEDSURFACES |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_SURFACEBUSY |
| DDERR\_UNSUPPORTED |
| DDERR\_UNSUPPORTEDMODE |
| DDERR\_WASSTILLDRAWING |

Remarks

This method must be called by the same thread that created the application window.

If another application changes the display mode, the primary surface is lost, and the method returns DDERR\_SURFACELOST until the primary surface is recreated to match the new display mode.

As part of the **IDirectDraw** interface, this method did not include the *dwRefreshRate* and *dwFlags* parameters.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::RestoreDisplayMode**, **IDirectDraw7::GetDisplayMode**, **IDirectDraw7::EnumDisplayModes**, **IDirectDraw7::SetCooperativeLevel**, Setting Display Modes, Restoring Display Modes

IDirectDraw7::StartModeTest

The **IDirectDraw7::StartModeTest** method initiates a test to update the system registry with refresh rate information for the current display adapter and monitor combination. A call to this method is typically followed by calls to **IDirectDraw7::EvaluateMode** to pass or fail modes displayed by the test.

**HRESULT StartModeTest(**

**LPSIZE** *lpModesToTest,*

**DWORD** *dwNumEntries,*

**DWORD** *dwFlags*

**);**

Parameters

*lpModesToTest*

A pointer to an array of SIZE elements describing, in terms of screen resolutions, the modes that should be tested.

*dwNumEntries*

The number of elements in the array pointed to by *lpModesToTest*.

*dwFlags*

The only flag value that is valid at present is DDSMT\_ISTESTREQUIRED. When this flag is specified, **IDirectDraw7::StartModeTest** will not initiate a test, but will instead return a value indicating whether it is possible or necessary to test the resolutions identified by *lpModesToTest* and *dwNumEntries*.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CURRENTLYNOTAVAIL |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOTFOUND |
| DDERR\_TESTFINISHED |

When the method is called with the DDSMT\_ISTESTREQUIRED flag, it can return one of the following values:

|  |
| --- |
| DDERR\_NEWMODE |
| DDERR\_NODRIVERSUPPORT |
| DDERR\_NOMONITORINFORMATION |
| DDERR\_TESTFINISHED |

Remarks

The **IDirectDraw7::StartModeTest** method can be used in conjunction with the **IDirectDraw7::EvaluateMode** method to determine the maximum refresh rate that an EDID monitor and display adapter combination can support for each screen resolution. The results of the testing are stored in the system registry and affect the operation of **IDirectDraw7::EnumDisplayModes** when that method is called with the DDEDM\_REFRESHRATES flag set.

Specifically, a call to **IDirectDraw7::StartModeTest** directs DirectDraw to establish a set of testable resolutions and to display a mode based on the first resolution in the set. Subsequent calls to **IDirectDraw7::EvaluateMode** can be used to pass or fail each mode and to advance the test to the next display mode.

This method will only succeed with monitors that contain EDID data. If the monitor is not EDID-compliant, then the method will return DDERR\_TESTFINISHED without testing any modes. If the EDID table does not contain values higher than 60 Hz, no modes will be tested. Refresh rates higher than 100 Hz will only be tested if the EDID table contains values higher than 85 Hz.

Calling the method with an argument list of (NULL, 0, 0) will clear existing refresh rate information from the registry.

The test will not guarantee to display only the resolutions in the array described by the *lpModesToTest* and *dwNumEntries* parameters. For example, the 640×480 resolution is used to obtain a maximum viewable refresh rate for the 320×200 resolution.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::EvaluateMode**

IDirectDraw7::TestCooperativeLevel

The **IDirectDraw7::TestCooperativeLevel** method reports the current cooperative-level status of the DirectDraw device for a windowed or full-screen application.

**HRESULT TestCooperativeLevel(void);**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK, indicating that the calling application can continue.

If it fails, the method can return one of the following error values (see Remarks):

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_EXCLUSIVEMODEALREADYSET |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_WRONGMODE |

Remarks

This method is particularly useful to applications that use the WM\_ACTIVATEAPP and WM\_DISPLAYCHANGE system messages as a notification to restore surfaces or recreate DirectDraw objects. The DD\_OK return value always indicates that the application can continue, but the error codes are interpreted differently, depending on the cooperative level that the application uses. For more information, see Testing Cooperative Levels.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDraw7::WaitForVerticalBlank

The **IDirectDraw7::WaitForVerticalBlank** method helps the application synchronize itself with the vertical-blank interval.

**HRESULT WaitForVerticalBlank(**

**DWORD** *dwFlags***,**

**HANDLE** *hEvent*

**);**

Parameters

*dwFlags*

Determines how long to wait for the vertical blank. One of the following flags:

DDWAITVB\_BLOCKBEGIN

Returns when the vertical-blank interval begins.

DDWAITVB\_BLOCKBEGINEVENT

Triggers an event when the vertical blank begins. This value is not currently supported.

DDWAITVB\_BLOCKEND

Returns when the vertical-blank interval ends and the display begins.

*hEvent*

Handle of the event to be triggered when the vertical blank begins. This parameter is not currently used.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDraw7::GetVerticalBlankStatus**, **IDirectDraw7::GetScanLine**

IDirectDrawClipper

Applications use the methods of the **IDirectDrawClipper** interface to manage clip lists. This section is a reference to the methods of this interface. For a conceptual overview, see Clippers.

The methods of the **IDirectDrawClipper** interface can be organized into the following groups:

|  |  |
| --- | --- |
| **Allocating memory** | **Initialize** |
| **Clip list** | **GetClipList** |
|  | **IsClipListChanged** |
|  | **SetClipList** |
|  | **SetHWnd** |
| **Handles** | **GetHWnd** |

The **IDirectDrawClipper** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

You can use the **LPDIRECTDRAWCLIPPER** data type to declare a variable that contains a pointer to an **IDirectDrawClipper** interface. The Ddraw.h header file declares these data types with the following code:

typedef struct IDirectDrawClipper FAR \*LPDIRECTDRAWCLIPPER;

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawClipper::GetClipList

The **IDirectDrawClipper::GetClipList** method retrieves a copy of the clip list associated with a DirectDrawClipper object. A subset of the clip list can be selected by passing a rectangle that clips the clip list.

**HRESULT GetClipList(**

**LPRECT** *lpRect***,**

**LPRGNDATA** *lpClipList***,**

**LPDWORD** *lpdwSize*

**);**

Parameters

*lpRect*

Address of a rectangle to be used to clip the clip list. This parameter can be NULL to retrieve the entire clip list.

*lpClipList*

Address of an **RGNDATA** structure to receive the resulting copy of the clip list. If this parameter is NULL, the method fills the variable at *lpdwSize* to the number of bytes necessary to hold the entire clip list.

*lpdwSize*

Address of a variable to receive the size of the resulting clip list. When retrieving the clip list, this parameter is the size of the buffer at *lpClipList*. When *lpClipList* is NULL, the variable at *lpdwSize* receives the required size of the buffer, in bytes.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCLIPLIST |
| DDERR\_REGIONTOOSMALL |

Remarks

The **RGNDATA** structure used with this method has the following syntax:

typedef struct \_RGNDATA {

RGNDATAHEADER rdh;

char Buffer[1];

} RGNDATA;

The **rdh** member of the **RGNDATA** structure is an **RGNDATAHEADER** structure that has the following syntax:

typedef struct \_RGNDATAHEADER {

DWORD dwSize;

DWORD iType;

DWORD nCount;

DWORD nRgnSize;

RECT rcBound;

} RGNDATAHEADER;

For more information about these structures, see the Platform SDK.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawClipper::SetClipList**

IDirectDrawClipper::GetHWnd

The **IDirectDrawClipper::GetHWnd** method retrieves the window handle previously associated with this DirectDrawClipper object by the **IDirectDrawClipper::SetHWnd** method.

**HRESULT GetHWnd(**

**HWND FAR** *\*lphWnd*

**);**

Parameters

*lphWnd*

Address of the window handle previously associated with this DirectDrawClipper object by the **IDirectDrawClipper::SetHWnd** method.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawClipper::SetHWnd**

IDirectDrawClipper::Initialize

The **IDirectDrawClipper::Initialize** method initializes a DirectDrawClipper object that was created by using the **CoCreateInstance** COM function.

**HRESULT Initialize(**

**LPDIRECTDRAW** *lpDD***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpDD*

Address of the DirectDraw structure that represents the DirectDraw object. If this parameter is set to NULL, an independent DirectDrawClipper object is created (the equivalent of using the **DirectDrawCreateClipper** function).

*dwFlags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_ALREADYINITIALIZED |
| DDERR\_INVALIDPARAMS |

This method is provided for compliance with the Component Object Model (COM). If **DirectDrawCreateClipper** or the **IDirectDraw7::CreateClipper** method was used to create the DirectDrawClipper object, this method returns DDERR\_ALREADYINITIALIZED.

Remarks

For more information about using **IDirectDrawClipper::Initialize** with **CoCreateInstance**, see Creating DirectDrawClipper Objects with CoCreateInstance.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IUnknown::AddRef**, **IUnknown::QueryInterface**, **IUnknown::Release**, **IDirectDraw7::CreateClipper**

IDirectDrawClipper::IsClipListChanged

The **IDirectDrawClipper::IsClipListChanged** method monitors the status of the clip list if a window handle is associated with a DirectDrawClipper object.

**HRESULT IsClipListChanged(**

**BOOL FAR** *\*lpbChanged*

**);**

Parameters

*lpbChanged*

Address of a variable that is set to TRUE if the clip list has changed.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawClipper::SetClipList

The **IDirectDrawClipper::SetClipList** method sets or deletes the clip list used by the **IDirectDrawSurface7::Blt**, **IDirectDrawSurface7::BltBatch**, and **IDirectDrawSurface7::UpdateOverlay** methods on surfaces to which the parent DirectDrawClipper object is attached.

**HRESULT SetClipList(**

**LPRGNDATA** *lpClipList***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpClipList*

Address of a valid **RGNDATA** structure or NULL. If there is an existing clip list associated with the DirectDrawClipper object and this value is NULL, the clip list is deleted.

*dwFlags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CLIPPERISUSINGHWND |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

The clip list cannot be set if a window handle is already associated with the DirectDrawClipper object. The **BltFast** method cannot clip.

The **RGNDATA** structure used with this method has the following syntax:

typedef struct \_RGNDATA {

RGNDATAHEADER rdh;

char Buffer[1];

} RGNDATA;

The **rdh** member of the **RGNDATA** structure is an **RGNDATAHEADER** structure that has the following syntax:

typedef struct \_RGNDATAHEADER {

DWORD dwSize;

DWORD iType;

DWORD nCount;

DWORD nRgnSize;

RECT rcBound;

} RGNDATAHEADER;

For more information about these structures, see the Platform SDK.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawClipper::GetClipList**, **IDirectDrawSurface7::Blt**, **IDirectDrawSurface7::BltFast**, **IDirectDrawSurface7::BltBatch**, **IDirectDrawSurface7::UpdateOverlay**

IDirectDrawClipper::SetHWnd

The **IDirectDrawClipper::SetHWnd** method sets the window handle that the clipper object uses to obtain clipping information.

**HRESULT SetHWnd(**

**DWORD** *dwFlags***,**

**HWND** *hWnd*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

*hWnd*

Window handle that obtains the clipping information.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawClipper::GetHWnd**

IDirectDrawColorControl

The **IDirectDrawColorControl** interface allows you to get and set color controls. It has the following methods:

|  |  |
| --- | --- |
| **Color controls** | **GetColorControls** |
|  | **SetColorControls** |

The **IDirectDrawColorControl** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

You can use the **LPDIRECTDRAWCOLORCONTROL** data type to declare a variable that contains a pointer to an **IDirectDrawColorControl** interface. The Ddraw.h header file declares these data types with the following code:

typedef struct IDirectDrawColorControl FAR \*LPDIRECTDRAWCOLORCONTROL;

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawColorControl::GetColorControls

The **IDirectDrawColorControl::GetColorControls** method returns the current color-control settings associated with the specified overlay or primary surface. The **dwFlags** member of the **DDCOLORCONTROL** structure indicates which of the color-control options are supported.

**HRESULT GetColorControls(**

**LPDDCOLORCONTROL** *lpColorControl*

**);**

Parameters

*lpColorControl*

Address of the **DDCOLORCONTROL** structure to receive the current control settings of the specified surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawColorControl::SetColorControls**, Using Color Controls, Gamma and Color Controls

IDirectDrawColorControl::SetColorControls

The **IDirectDrawColorControl::SetColorControls** method sets the color-control settings associated with the specified overlay or primary surface.

**HRESULT SetColorControls(**

**LPDDCOLORCONTROL** *lpColorControl*

**);**

Parameters

*lpColorControl*

Address of the **DDCOLORCONTROL** structure that contains the new values to be applied to the specified surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawColorControl::GetColorControls**, Using Color Controls, Gamma and Color Controls

IDirectDrawGammaControl

Applications use the methods of the **IDirectDrawGammaControl** interface to adjust the red, green, and blue gamma ramp levels of the primary surface. This section is a reference to the methods of this interface. This interface is supported by DirectDrawSurface objects; you can retrieve a pointer to this interface by calling the **IUnknown::QueryInterface** method of a DirectDrawSurface object, specifying the IID\_IDirectDrawGammaControl reference identifier.

For a conceptual overview, see Gamma and Color Controls.

The interface has the following methods:

|  |  |
| --- | --- |
| **Gamma ramps** | **GetGammaRamp** |
|  | **SetGammaRamp** |

The **IDirectDrawGammaControl** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

You can use the **LPDIRECTDRAWGAMMACONTROL** data type to declare a variable that contains a pointer to an **IDirectDrawGammaControl** interface. The Ddraw.h header file declares the data type with the following code:

typedef struct IDirectDrawGammaControl FAR \*LPDIRECTDRAWGAMMACONTROL;

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawGammaControl::GetGammaRamp

The **IDirectDrawGammaControl::GetGammaRamp** method retrieves the red, green, and blue gamma ramps for the primary surface.

**HRESULT GetGammaRamp(**

**DWORD** *dwFlags*,

**LPGAMMARAMP** *lpRampData*

**);**

Parameters

*dwFlags*

Not currently used; set to 0.

*lpRampData*

Address of a **DDGAMMARAMP** structure to be filled with the current red, green, and blue gamma ramps. Each array maps color values in the frame buffer to the color values to be passed to the digital-to-analog converter (DAC).

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawGammaControl::SetGammaRamp**, Gamma and Color Controls

IDirectDrawGammaControl::SetGammaRamp

The **IDirectDrawGammaControl::SetGammaRamp** method retrieves the red, green, and blue gamma ramps for the primary surface.

**HRESULT SetGammaRamp(**

**DWORD** *dwFlags*,

**LPGAMMARAMP** *lpRampData*

**);**

Parameters

*dwFlags*

Flag indicating whether gamma calibration is desired. Set this parameter to DDSGR\_CALIBRATE to request that the calibrator adjust the gamma ramp according to the physical properties of the display, making the result identical on all systems. If calibration is not needed, set this parameter to 0.

*lpRampData*

Address of a **DDGAMMARAMP** structure that contains the new red, green, and blue gamma ramp entries. Each array maps color values in the frame buffer to the color values to be passed to the digital-to-analog converter (DAC).

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

Not all systems support gamma calibration. To determine whether gamma calibration is supported, call **IDirectDraw7::GetCaps**, and examine the **dwCaps2** member of the associated **DDCAPS** structure after the method returns. If the DDCAPS2\_CANCALIBRATEGAMMA capability flag is present, gamma calibration is supported.

Calibrating gamma ramps incurs some processing overhead and should not be used frequently.

Including the DDSGR\_CALIBRATE flag in the *dwFlags* parameter when running on systems that do not support gamma calibration does not cause this method to fail. The method succeeds, setting new gamma ramp values without calibration.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawGammaControl::GetGammaRamp**, Gamma and Color Controls

IDirectDrawPalette

Applications use the methods of the **IDirectDrawPalette** interface to create DirectDrawPalette objects and work with system-level variables. This section is a reference to the methods of this interface. For a conceptual overview, see Palettes.

The methods of the **IDirectDrawPalette** interface can be organized into the following groups:

|  |  |
| --- | --- |
| **Allocating memory** | **Initialize** |
| **Palette capabilities** | **GetCaps** |
| **Palette entries** | **GetEntries** |
|  | **SetEntries** |

The **IDirectDrawPalette** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

You can use the **LPDIRECTDRAWPALETTE** data type to declare a variable that contains a pointer to an **IDirectDrawPalette** interface. The Ddraw.h header file declares the data type with the following code:

typedef struct IDirectDrawPalette FAR \*LPDIRECTDRAWPALETTE;

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawPalette::GetCaps

The **IDirectDrawPalette::GetCaps** method retrieves the capabilities of this palette object.

**HRESULT GetCaps(**

**LPDWORD** *lpdwCaps*

**);**

Parameters

*lpdwCaps*

One of the following flags from the **dwPalCaps** member of the **DDCAPS** structure that defines palette capabilities:

|  |
| --- |
| DDPCAPS\_1BIT |
| DDPCAPS\_2BIT |
| DDPCAPS\_4BIT |
| DDPCAPS\_8BIT |
| DDPCAPS\_8BITENTRIES |
| DDPCAPS\_ALPHA |
| DDPCAPS\_ALLOW256 |
| DDPCAPS\_PRIMARYSURFACE |
| DDPCAPS\_PRIMARYSURFACELEFT |
| DDPCAPS\_VSYNC |

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawPalette::GetEntries

The **IDirectDrawPalette::GetEntries** method queries palette values from a DirectDrawPalette object.

**HRESULT GetEntries(**

**DWORD** *dwFlags***,**

**DWORD** *dwBase***,**

**DWORD** *dwNumEntries***,**

**LPPALETTEENTRY** *lpEntries*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

*dwBase*

Start of the entries to be retrieved sequentially.

*dwNumEntries*

Number of palette entries that can fit in the address specified in *lpEntries*. The colors of the palette entry are returned in sequence, from the value of the *dwStartingEntry* parameter through the value of the *dwCount* parameter minus 1. (These parameters are set by **IDirectDrawPalette::SetEntries**.)

*lpEntries*

Address of the palette entries. The palette entries are 1 byte each if the DDPCAPS\_8BITENTRIES flag is set, and 4 bytes otherwise. Each field is a color description.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTPALETTIZED |

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawPalette::SetEntries**

IDirectDrawPalette::Initialize

The **IDirectDrawPalette::Initialize** method initializes the DirectDrawPalette object.

**HRESULT Initialize(**

**LPDIRECTDRAW** *lpDD***,**

**DWORD** *dwFlags***,**

**LPPALETTEENTRY** *lpDDColorTable*

**);**

Parameters

*lpDD*

Address of the DirectDraw structure that represents the DirectDraw object.

*dwFlags* and *lpDDColorTable*

Currently not used and must be set to 0.

Return Values

This method returns DDERR\_ALREADYINITIALIZED.

This method is provided for compliance with the Component Object Model (COM). Because the DirectDrawPalette object is initialized when it is created, this method always returns DDERR\_ALREADYINITIALIZED.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IUnknown::AddRef**, **IUnknown::QueryInterface**, **IUnknown::Release**

IDirectDrawPalette::SetEntries

The **IDirectDrawPalette::SetEntries** method changes entries in a DirectDrawPalette object immediately.

**HRESULT SetEntries(**

**DWORD** *dwFlags***,**

**DWORD** *dwStartingEntry***,**

**DWORD** *dwCount***,**

**LPPALETTEENTRY** *lpEntries*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

*dwStartingEntry*

First entry to be set.

*dwCount*

Number of palette entries to be changed.

*lpEntries*

Address of the palette entries. The palette entries are 1 byte each if the DDPCAPS\_8BITENTRIES flag is set, and 4 bytes otherwise. Each field is a color description.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOPALETTEATTACHED |
| DDERR\_NOTPALETTIZED |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawPalette::GetEntries**, **IDirectDrawSurface7::SetPalette**

IDirectDrawSurface7

Applications use the methods of the **IDirectDrawSurface7** interface to create DirectDrawSurface objects and work with system-level variables. This section is a reference to the methods of this interface. For a conceptual overview, see Surfaces.

The methods of the **IDirectDrawSurface7** interface can be organized into the following groups:

|  |  |
| --- | --- |
| **Allocating memory** | **Initialize** |
|  | **IsLost** |
|  | **Restore** |
| **Attaching surfaces** | **AddAttachedSurface** |
|  | **DeleteAttachedSurface** |
|  | **EnumAttachedSurfaces** |
|  | **GetAttachedSurface** |
| **Blitting** | **Blt** |
|  | **BltBatch** |
|  | **BltFast** |
|  | **GetBltStatus** |
| **Color keying** | **GetColorKey** |
|  | **SetColorKey** |
| **Device contexts** | **GetDC** |
|  | **ReleaseDC** |
| **Flipping** | **Flip** |
|  | **GetFlipStatus** |
| **Locking surfaces** | **Lock** |
|  | **PageLock** |
|  | **PageUnlock** |
|  | **Unlock** |
| **Miscellaneous** | **GetDDInterface** |
| **Overlays** | **AddOverlayDirtyRect** |
|  | **EnumOverlayZOrders** |
|  | **GetOverlayPosition** |
|  | **SetOverlayPosition** |
|  | **UpdateOverlay** |
|  | **UpdateOverlayDisplay** |
|  | **UpdateOverlayZOrder** |
| **Private surface data** | **FreePrivateData** |
|  | **GetPrivateData** |
|  | **SetPrivateData** |
| **Surface capabilities** | **GetCaps** |
| **Surface clipper** | **GetClipper** |
|  | **SetClipper** |
| **Surface characteristics** | **ChangeUniquenessValue** |
|  | **GetPixelFormat** |
|  | **GetSurfaceDesc** |
|  | **GetUniquenessValue** |
|  | **SetSurfaceDesc** |
| **Surface palettes** | **GetPalette** |
|  | **SetPalette** |
| **Textures** | **GetLOD** |
|  | **GetPriority** |
|  | **SetLOD** |
|  | **SetPriority** |

The **IDirectDrawSurface7** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

The **IDirectDrawSurface7** interface extends the features of previous versions of the interface by offering methods that offer better surface management and ease of use. Many methods in this interface accept slightly different parameters than their counterparts in former versions of the interface. Wherever an **IDirectDrawSurface3** interface method might accept a **DDSURFACEDESC** structure or an **IDirectDrawSurface3** interface, the methods in **IDirectDrawSurface7** accept a **DDSURFACEDESC2** structure or an **IDirectDrawSurface7** interface, instead.

You can use the **LPDIRECTDRAWSURFACE**, **LPDIRECTDRAWSURFACE2**, **LPDIRECTDRAWSURFACE3**, **LPDIRECTDRAWSURFACE4**, or **LPDIRECTDRAWSURFACE7** data types to declare variables that point to various DirectDrawSurface object interfaces. The Ddraw.h header file declares these data types with the following code:

typedef struct IDirectDrawSurface FAR \*LPDIRECTDRAWSURFACE;

typedef struct IDirectDrawSurface2 FAR \*LPDIRECTDRAWSURFACE2;

typedef struct IDirectDrawSurface3 FAR \*LPDIRECTDRAWSURFACE3;

typedef struct IDirectDrawSurface4 FAR \*LPDIRECTDRAWSURFACE4;

typedef struct IDirectDrawSurface7 FAR \*LPDIRECTDRAWSURFACE7;

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::AddAttachedSurface

The **IDirectDrawSurface7::AddAttachedSurface** method attaches the specified z-buffer surface to this surface.

**HRESULT AddAttachedSurface(**

**LPDIRECTDRAWSURFACE7** *lpDDSAttachedSurface*

**);**

Parameters

*lpDDSAttachedSurface*

Address of an **IDirectDrawSurface7** interface that the surface is to be attached to.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CANNOTATTACHSURFACE |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACEALREADYATTACHED |
| DDERR\_SURFACELOST |
| DDERR\_WASSTILLDRAWING |

Remarks

This method increments the reference count of the surface being attached. You can explicitly unattach the surface and decrement its reference count by using the **IDirectDrawSurface7::DeleteAttachedSurface** method. Unlike complex surfaces that you create with a single call to **IDirectDraw7::CreateSurface**, surfaces attached with this method are not automatically released. It is the application's responsibility to release such surfaces.

You can attach only z-buffer surfaces with this method.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::DeleteAttachedSurface**, **IDirectDrawSurface7::EnumAttachedSurfaces**

IDirectDrawSurface7::AddOverlayDirtyRect

The **IDirectDrawSurface7::AddOverlayDirtyRect** method is not currently implemented.

**HRESULT AddOverlayDirtyRect(**

**LPRECT** *lpRect*

**);**

Parameters

*lpRect*

Address of the **RECT** structure that needs to be updated.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::UpdateOverlayDisplay**

IDirectDrawSurface7::Blt

The **IDirectDrawSurface7::Blt** method performs a bit block transfer (blit). This method does not support z-buffering or alpha blending (see alpha channel) during blit operations.

**HRESULT Blt(**

**LPRECT** *lpDestRect***,**

**LPDIRECTDRAWSURFACE7** *lpDDSrcSurface***,**

**LPRECT** *lpSrcRect***,**

**DWORD** *dwFlags***,**

**LPDDBLTFX** *lpDDBltFx*

**);**

Parameters

*lpDestRect*

Address of a **RECT** structure that defines the upper-left and lower-right points of the rectangle to blit to on the destination surface. If this parameter is NULL, the entire destination surface is used.

*lpDDSrcSurface*

Address of an **IDirectDrawSurface7** interface for the DirectDrawSurface object that is the source of the blit.

*lpSrcRect*

Address of a **RECT** structure that defines the upper-left and lower-right points of the rectangle to blit from on the source surface. If this parameter is NULL, the entire source surface is used.

*dwFlags*

A combination of flags that determine the valid members of the associated **DDBLTFX** structure, specify color-key information, or request special behavior from the method. The following flags are defined:

**Validation flags**

DDBLT\_COLORFILL

Uses the **dwFillColor** member of the **DDBLTFX** structure as the RGB color that fills the destination rectangle on the destination surface.

DDBLT\_DDFX

Uses the **dwDDFX** member of the **DDBLTFX** structure to specify the effects to use for this blit.

DDBLT\_DDROPS

Uses the **dwDDROP** member of the **DDBLTFX** structure to specify the raster operations (ROPS) that are not part of the Microsoft® Win32® API.

DDBLT\_DEPTHFILL

Uses the **dwFillDepth** member of the **DDBLTFX** structure as the depth value with which to fill the destination rectangle on the destination z-buffer surface.

DDBLT\_KEYDESTOVERRIDE

Uses the **ddckDestColorkey** member of the **DDBLTFX** structure as the color key for the destination surface.

DDBLT\_KEYSRCOVERRIDE

Uses the **ddckSrcColorkey** member of the **DDBLTFX** structure as the color key for the source surface.

DDBLT\_ROP

Uses the **dwROP** member of the **DDBLTFX** structure for the ROP for this blit. These ROPs are the same as those defined in the Win32 API.

DDBLT\_ROTATIONANGLE

Uses the **dwRotationAngle** member of the **DDBLTFX** structure as the rotation angle (specified in 1/100s of a degree) for the surface.

**Color key flags**

DDBLT\_KEYDEST

Uses the color key associated with the destination surface.

DDBLT\_KEYSRC

Uses the color key associated with the source surface.

**Behavior flags**

DDBLT\_ASYNC

Performs this blit asynchronously through the first in, first out (FIFO) hardware in the order received. If no room is available in the FIFO hardware, the call fails.

DDBLT\_DONOTWAIT

New for DirectX 7.0. Returns without blitting and also returns DDERR\_WASSTILLDRAWING if the blitter is busy.

DDBLT\_WAIT

Postpones the DDERR\_WASSTILLDRAWING return value if the blitter is busy, and returns as soon as the blit can be set up or another error occurs.

**Obsolete and unsupported flags**

All DDBLT\_ALPHA flag values.

Not currently implemented.

All DDBLT\_ZBUFFER flag values

This method does not currently support z-aware blit operations. None of the flags beginning with "DDBLT\_ZBUFFER" are supported in this release of DirectX.

*lpDDBltFx*

Address of the **DDBLTFX** structure.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOALPHAHW |
| DDERR\_NOBLTHW |
| DDERR\_NOCLIPLIST |
| DDERR\_NODDROPSHW |
| DDERR\_NOMIRRORHW |
| DDERR\_NORASTEROPHW |
| DDERR\_NOROTATIONHW |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method is capable of synchronous or asynchronous blits (the latter is the default behavior), either display memory to display memory, display memory to system memory, system memory to display memory, or system memory to system memory. The blits can be performed by using source color keys and destination color keys. Arbitrary stretching or shrinking is performed if the source and destination rectangles are not the same size.

Typically, **IDirectDrawSurface7::Blt** returns immediately with an error if the blitter is busy and the blit could not be set up. Specify the DDBLT\_WAIT flag to request a synchronous blit. When you include the DDBLT\_WAIT flag, the method waits until the blit can be set up or another error occurs before it returns.

**RECT** structures are defined so that the **right** and **bottom** members are exclusive—therefore, **right** minus **left** equals the width of the rectangle, not 1 less than the width.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::BltBatch

The **IDirectDrawSurface7::BltBatch** method is not currently implemented.

**HRESULT BltBatch(**

**LPDDBLTBATCH** *lpDDBltBatch***,**

**DWORD** *dwCount***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpDDBltBatch*

Address of the first **DDBLTBATCH** structure that defines the parameters for the blit operations.

*dwCount*

Number of blit operations to be performed.

*dwFlags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOALPHAHW |
| DDERR\_NOBLTHW |
| DDERR\_NOCLIPLIST |
| DDERR\_NODDROPSHW |
| DDERR\_NOMIRRORHW |
| DDERR\_NORASTEROPHW |
| DDERR\_NOROTATIONHW |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::BltFast

The **IDirectDrawSurface7::BltFast** method performs a source copy blit or transparent blit by using a source color key or destination color key.

**HRESULT BltFast(**

**DWORD** *dwX***,**

**DWORD** *dwY***,**

**LPDIRECTDRAWSURFACE7** *lpDDSrcSurface***,**

**LPRECT** *lpSrcRect***,**

**DWORD** *dwTrans*

**);**

Parameters

*dwX* and *dwY*

The x- and y-coordinates to blit to on the destination surface.

*lpDDSrcSurface*

Address of an **IDirectDrawSurface7** interface for the DirectDrawSurface object that is the source of the blit.

*lpSrcRect*

Address of a **RECT** structure that defines the upper-left and lower-right corners of the rectangle to blit from on the source surface.

*dwTrans*

Type of transfer. The following transfers are defined:

DDBLTFAST\_DESTCOLORKEY

A transparent blit that uses the destination color key.

DDBLTFAST\_NOCOLORKEY

A normal copy blit with no transparency.

DDBLTFAST\_SRCCOLORKEY

A transparent blit that uses the source color key.

DDBLTFAST\_WAIT

Postpones the DDERR\_WASSTILLDRAWING message if the blitter is busy, and returns as soon as the blit can be set up or another error occurs.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOBLTHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method always attempts an asynchronous blit if it is supported by the hardware.

This method works only on display memory surfaces and cannot clip when blitting. If you use this method on a surface with an attached clipper, the call fails, and the method returns DDERR\_UNSUPPORTED.

The software implementation of **IDirectDrawSurface7::BltFast** is 10 percent faster than the **IDirectDrawSurface7::Blt** method. However, there is no speed difference between the two if display hardware is used.

Typically, **IDirectDrawSurface7::BltFast** returns immediately with an error if the blitter is busy and the blit cannot be set up. You can use the DDBLTFAST\_WAIT flag, however, if you want this method not to return until either the blit can be set up or another error occurs.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::ChangeUniquenessValue

The **IDirectDrawSurface7::ChangeUniquenessValue** method manually updates the uniqueness value for this surface.

**HRESULT ChangeUniquenessValue();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

DirectDraw automatically updates uniqueness values whenever the contents of a surface change.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetUniquenessValue**, Surface Uniqueness Values

IDirectDrawSurface7::DeleteAttachedSurface

The **IDirectDrawSurface7::DeleteAttachedSurface** method detaches two attached surfaces.

**HRESULT DeleteAttachedSurface(**

**DWORD** *dwFlags***,**

**LPDIRECTDRAWSURFACE7** *lpDDSAttachedSurface*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

*lpDDSAttachedSurface*

Address of the **IDirectDrawSurface7** interface for the DirectDrawSurface object to be detached. If this parameter is NULL, all attached surfaces are detached.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CANNOTDETACHSURFACE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |
| DDERR\_SURFACENOTATTACHED |

Remarks

This method decrements the reference count of the surface to be detached. If the reference count of the surface to be detached reaches 0, it is lost and removed from memory.

Implicit attachments, those formed by DirectDraw rather than the **IDirectDrawSurface7::AddAttachedSurface** method, cannot be detached. Detaching surfaces from a flipping chain can alter other surfaces in the chain. If a front buffer is detached from a flipping chain, the next surface in the chain becomes the front buffer, and the following surface becomes the back buffer. If a back buffer is detached from a chain, the following surface becomes a back buffer. If a plain surface is detached from a chain, the chain simply becomes shorter. If a flipping chain has only two surfaces and they are detached, the chain is destroyed, and both surfaces return to their previous designations.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Flip**

IDirectDrawSurface7::EnumAttachedSurfaces

The **IDirectDrawSurface7::EnumAttachedSurfaces** method enumerates all the surfaces attached to a given surface.

**HRESULT EnumAttachedSurfaces(**

**LPVOID** *lpContext***,**

**LPDDENUMSURFACESCALLBACK2** *lpEnumSurfacesCallback*

**);**

Parameters

*lpContext*

Address of the application-defined structure that is passed to the enumeration member every time that it is called.

*lpEnumSurfacesCallback*

Address of the **EnumSurfacesCallback2** function to be called for each surface that is attached to this surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |

Remarks

This method enumerates only those surfaces that are directly attached to this surface. For example, in a flipping chain of three or more surfaces, only one surface is enumerated because each surface is attached only to the next surface in the flipping chain. In such a configuration, you can call **EnumAttachedSurfaces** on each successive surface to walk the entire flipping chain.

This method differs from its counterparts in previous interface versions in that it accepts a pointer to an **EnumSurfacesCallback2** function, rather than an **EnumSurfacesCallback** function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::EnumOverlayZOrders

The **IDirectDrawSurface7::EnumOverlayZOrders** method enumerates the overlay surfaces on the specified destination. The overlays can be enumerated in front-to-back or back-to-front order.

**HRESULT EnumOverlayZOrders(**

**DWORD** *dwFlags***,**

**LPVOID** *lpContext***,**

**LPDDENUMSURFACESCALLBACK2** *lpfnCallback*

**);**

Parameters

*dwFlags*

One of the following flags:

DDENUMOVERLAYZ\_BACKTOFRONT

Enumerates overlays back to front.

DDENUMOVERLAYZ\_FRONTTOBACK

Enumerates overlays front to back.

*lpContext*

Address of the user-defined context to be passed to the callback function for each overlay surface.

*lpfnCallback*

Address of the **EnumSurfacesCallback2** callback function to be called for each surface to be overlaid on this surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method differs from its counterparts in previous interface versions in that it accepts a pointer to an **EnumSurfacesCallback2** function, rather than an **EnumSurfacesCallback** function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::Flip

The **IDirectDrawSurface7::Flip** method makes the surface memory associated with the DDSCAPS\_BACKBUFFER surface become associated with the front-buffer surface.

**HRESULT Flip(**

**LPDIRECTDRAWSURFACE7** *lpDDSurfaceTargetOverride***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpDDSurfaceTargetOverride*

Address of the **IDirectDrawSurface7** interface for an arbitrary surface in the flipping chain. The default for this parameter is NULL, in which case DirectDraw cycles through the buffers in the order that they are attached to each other. If this parameter is not NULL, DirectDraw flips to the specified surface, instead of the next surface in the flipping chain. The method fails if the specified surface is not a member of the flipping chain.

*dwFlags*

Flags specifying flip options.

DDFLIP\_DONOTWAIT

On **IDirectDrawSurface7** interfaces, the default is DDFLIP\_WAIT. If you want to override the default and use time when the accelerator is busy (as denoted by the DDERR\_WASSTILLDRAWING return value), use DDFLIP\_DONOTWAIT.

DDFLIP\_EVEN

For use only when displaying video in an overlay surface. The new surface contains data from the even field of a video signal. This flag cannot be used with the DDFLIP\_ODD flag.

DDFLIP\_STEREO

DirectDraw flips and displays a main stereo surface. When this flag is set, stereo autoflipping is enabled. The hardware automatically flips between the left and right buffers during each screen refresh.

DDFLIP\_INTERVAL2

DDFLIP\_INTERVAL3

DDFLIP\_INTERVAL4

These flags indicate how many vertical retraces to wait between each flip. The default is 1. DirectDraw returns DERR\_WASSTILLDRAWING for each surface involved in the flip until the specified number of vertical retraces has occurred. If DDFLIP\_INTERVAL2 is set, DirectDraw flips on every second vertical sync; if DDFLIP\_INTERVAL3, on every third sync; and if DDFLIP\_INTERVAL4, on every fourth sync.

These flags are effective only if DDCAPS2\_FLIPINTERVAL is set in the **DDCAPS** structure returned for the device.

DDFLIP\_NOVSYNC

Causes DirectDraw to perform the physical flip as close as possible to the next scan line. Subsequent operations involving the two flipped surfaces do not check whether the physical flip has finished—that is, they do not return DDERR\_WASSTILLDRAWING for that reason (but might for other reasons). This allows an application to perform flips at a higher frequency than the monitor refresh rate, but might introduce visible artifacts.

If DDCAPS2\_FLIPNOVSYNC is not set in the **DDCAPS** structure returned for the device, DDFLIP\_NOVSYNC has no effect.

DDFLIP\_ODD

For use only when displaying video in an overlay surface. The new surface contains data from the odd field of a video signal. This flag cannot be used with the DDFLIP\_EVEN flag.

DDFLIP\_WAIT

Typically, if the flip cannot be set up because the state of the display hardware is not appropriate, the DDERR\_WASSTILLDRAWING error returns immediately, and no flip occurs. Setting this flag causes the method to continue trying to flip if it receives the DDERR\_WASSTILLDRAWING error from the hardware abstraction layer (HAL). The method does not return until the flipping operation has been successfully set up or another error, such as DDERR\_SURFACEBUSY, is returned.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOFLIPHW |
| DDERR\_NOTFLIPPABLE |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

With **IDirectDrawSurface7**, the default behavior of this method is to wait for the accelator to finish. Therefore, under default conditions, this method never returns DDERR\_WASSTILLDRAWING. If you want to see the error codes and not wait until the flip operation succeeds, use the DDFLIP\_DONOTWAIT flag.

This method can be called only for a surface that has the DDSCAPS\_FLIP and DDSCAPS\_FRONTBUFFER capabilities. The display memory previously associated with the front buffer is associated with the back buffer.

The *lpDDSurfaceTargetOverride* parameter is used in rare cases in which the back buffer is not the buffer that should become the front buffer. Typically, this parameter is NULL.

The **IDirectDrawSurface7::Flip** method is always synchronized with the vertical blank. If the surface has been assigned to a video port, this method updates the visible overlay surface and the target surface of the video port.

For more information, see Flipping Surfaces.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetFlipStatus**

IDirectDrawSurface7::FreePrivateData

The **IDirectDrawSurface7::FreePrivateData** method frees the specified private data associated with this surface.

**HRESULT FreePrivateData(**

**REFGUID** *guidTag*

**);**

Parameters

*guidTag*

Reference to (C++) or address of (C) the globally unique identifier that identifies the private data to be freed.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |

Remarks

DirectDraw calls this method automatically when a surface is released.

If the private data was set by using the DDSPD\_IUNKNOWNPOINTER flag, this method calls the **IUnknown::Release** method on the associated interface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetPrivateData**, **IDirectDrawSurface7::SetPrivateData**

IDirectDrawSurface7::GetAttachedSurface

The **IDirectDrawSurface7::GetAttachedSurface** method obtains the attached surface that has the specified capabilities and increments the reference count of the retrieved interface.

**HRESULT GetAttachedSurface(**

**LPDDSCAPS2** *lpDDSCaps***,**

**LPDIRECTDRAWSURFACE7 FAR** *\*lplpDDAttachedSurface*

**);**

Parameters

*lpDDSCaps*

Address of a **DDSCAPS2** structure that contains the hardware capabilities of the surface.

*lplpDDAttachedSurface*

Address of a variable to receive a pointer to the retrieved surface's **IDirectDrawSurface7** interface. The retrieved surface is the one that matches the description, according to the *lpDDSCaps* parameter.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |
| DDERR\_SURFACELOST |

Remarks

Attachments are used to connect multiple DirectDrawSurface objects into complex structures, like the ones needed to support 3-D page flipping with z-buffers. This method fails if more than one surface is attached that matches the capabilities requested. In this case, the application must use the **IDirectDrawSurface7::EnumAttachedSurfaces** method to obtain the attached surfaces.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::GetBltStatus

The **IDirectDrawSurface7::GetBltStatus** method obtains the blitter status.

**HRESULT GetBltStatus(**

**DWORD** *dwFlags*

**);**

Parameters

*dwFlags*

One of the following flags:

DDGBS\_CANBLT

Inquires whether a blit involving this surface can occur immediately, and returns DD\_OK if the blit can be completed.

DDGBS\_ISBLTDONE

Inquires whether the blit is done, and returns DD\_OK if the last blit on this surface has completed.

Return Values

If the method succeeds, a blitter is present, and the return value is DD\_OK.

If it fails, the method returns DDERR\_WASSTILLDRAWING if the blitter is busy, DDERR\_NOBLTHW if there is no blitter, or one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOBLTHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::GetCaps

The **IDirectDrawSurface7::GetCaps** method retrieves the capabilities of the surface. These capabilities are not necessarily related to the capabilities of the display device.

**HRESULT GetCaps(**

**LPDDSCAPS2** *lpDDSCaps*

**);**

Parameters

*lpDDSCaps*

Address of a **DDSCAPS2** structure to be filled with the hardware capabilities of the surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method differs from its counterpart in the **IDirectDrawSurface3** interface in that it accepts a pointer to a **DDSCAPS2** structure, rather than the legacy **DDSCAPS** structure.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::GetClipper

The **IDirectDrawSurface7::GetClipper** method retrieves the DirectDrawClipper object associated with this surface and increments the reference count of the returned clipper.

**HRESULT GetClipper(**

**LPDIRECTDRAWCLIPPER FAR** *\*lplpDDClipper*

**);**

Parameters

*lplpDDClipper*

Address of a pointer to the DirectDrawClipper object associated with the surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCLIPPERATTACHED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetClipper**

IDirectDrawSurface7::GetColorKey

The **IDirectDrawSurface7::GetColorKey** method retrieves the color key value for the DirectDrawSurface object.

**HRESULT GetColorKey(**

**DWORD** *dwFlags***,**

**LPDDCOLORKEY** *lpDDColorKey*

**);**

Parameters

*dwFlags*

One of the following flags determines which color key is requested:

DDCKEY\_DESTBLT

A color key or color space to be used as a destination color key for blit operations.

DDCKEY\_DESTOVERLAY

A color key or color space to be used as a destination color key for overlay operations.

DDCKEY\_SRCBLT

A color key or color space to be used as a source color key for blit operations.

DDCKEY\_SRCOVERLAY

A color key or color space to be used as a source color key for overlay operations.

*lpDDColorKey*

Address of the **DDCOLORKEY** structure to be filled with the current values for the specified color key of the DirectDrawSurface object.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOLORKEY |
| DDERR\_NOCOLORKEYHW |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetColorKey**

IDirectDrawSurface7::GetDC

The **IDirectDrawSurface7::GetDC** method creates a GDI-compatible handle of a device context for the surface.

**HRESULT GetDC(**

**HDC FAR** *\*lphDC*

**);**

Parameters

*lphDC*

Address for the returned handle of a device context.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_DCALREADYCREATED |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method uses an internal version of the **IDirectDrawSurface7::Lock** method to lock the surface. The surface remains locked until the **IDirectDrawSurface7::ReleaseDC** method is called.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Lock**

IDirectDrawSurface7::GetDDInterface

The **IDirectDrawSurface7::GetDDInterface** method retrieves an interface to the DirectDraw object that was used to create the surface.

**HRESULT GetDDInterface(**

**LPVOID FAR** *\*lplpDD*

**);**

Parameters

*lplpDD*

Address of a variable to be filled with a valid interface pointer if the call succeeds. Cast this pointer to an **IUnknown** interface pointer; then query for the desired DirectDraw interface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method was not implemented in the **IDirectDraw** interface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::GetFlipStatus

The **IDirectDrawSurface7::GetFlipStatus** method indicates whether the surface has finished its flipping process.

**HRESULT GetFlipStatus(**

**DWORD** *dwFlags*

**);**

Parameters

*dwFlags*

One of the following flags:

DDGFS\_CANFLIP

Inquires whether this surface can be flipped immediately, and returns DD\_OK if the flip can be completed.

DDGFS\_ISFLIPDONE

Inquires whether the flip has finished, and returns DD\_OK if the last flip on this surface has completed.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return DDERR\_WASSTILLDRAWING if the surface has not finished its flipping process, or one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Flip**

IDirectDrawSurface7::GetLOD

The **IDirectDrawSurface7::GetLOD** method retrieves the maximum level of detail currently set for a managed mipmap surface. This method succeeds only on managed textures (see Remarks).

**HRESULT GetLOD(**

**LPDWORD** *lpdwMaxLOD*

**);**

Parameters

*lpdwMaxLOD*

Address of a variable to contain the maximum level-of-detail value if the call succeeds.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

Applications can call this method only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT.

This method communicates to the Direct3D texture manager the most detailed mipmap in this chain that it should load into local video memory. For example, in a five-level mipmap chain, a value of 2 in the variable at *lpdwMaxLOD* indicates that the texture manager loads only mipmap levels 2 through 4 into local video memory at any given time. Likewise, if the most detailed mipmap in the chain has the dimensions 256×256, a value of 2 in *lpdwMaxLOD* means that the largest mipmap ever present in video memory has dimensions 64×64.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetLOD**, Texture Filtering With Mipmaps, Automatic Texture Management, Textures

IDirectDrawSurface7::GetOverlayPosition

Given a visible, active overlay surface (DDSCAPS\_OVERLAY flag set), the **IDirectDrawSurface7::GetOverlayPosition** method returns the display coordinates of the surface.

**HRESULT GetOverlayPosition(**

**LPLONG** *lplX***,**

**LPLONG** *lplY*

**);**

Parameters

*lplX* and *lplY*

Addresses of the x- and y-display coordinates.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPOSITION |
| DDERR\_NOOVERLAYDEST |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OVERLAYNOTVISIBLE |
| DDERR\_SURFACELOST |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetOverlayPosition**, **IDirectDrawSurface7::UpdateOverlay**

IDirectDrawSurface7::GetPalette

The **IDirectDrawSurface7::GetPalette** method retrieves the DirectDrawPalette object associated with this surface and increments the reference count of the returned palette.

**HRESULT GetPalette(**

**LPDIRECTDRAWPALETTE FAR** *\*lplpDDPalette*

**);**

Parameters

*lplpDDPalette*

Address of a variable to be filled with a pointer to the palette object's **IDirectDrawPalette** interface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOPALETTEATTACHED |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetPalette**

IDirectDrawSurface7::GetPixelFormat

The **IDirectDrawSurface7::GetPixelFormat** method retrieves the color and pixel format of the surface.

**HRESULT GetPixelFormat(**

**LPDDPIXELFORMAT** *lpDDPixelFormat*

**);**

Parameters

*lpDDPixelFormat*

Address of the **DDPIXELFORMAT** structure to be filled with a detailed description of the current pixel and color space format of the surface.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::GetPriority

The **IDirectDrawSurface7::GetPriority** method retrieves the texture-management priority for this texture. This method succeeds only on managed textures (see Remarks).

**HRESULT GetPriority(**

**LPDWORD** *lpdwPriority*

**);**

Parameters

*lpdwPriority*

Address of a variable to be filled with the texture priority if the call succeeds.

Return Values

If the method succeeds, the return value is D3D\_OK.

If it fails, the return value is an error. The method returns DDERR\_INVALIDOBJECT if the parameter is invalid or if the texture is not managed by Direct3D.

Remarks

Priorities are used to determine when managed textures are to be removed from memory. A texture assigned a low priority is removed before a texture with a high priority. If two textures have the same priority, the texture that was used more recently is kept in memory; the other texture is removed.

Applications can set and retrieve priorities only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT.

This method was introduced with the **IDirectDrawSurface7** interface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetPriority**, Automatic Texture Management, Textures

IDirectDrawSurface7::GetPrivateData

The **IDirectDrawSurface7::GetPrivateData** method copies the private data associated with the surface to a provided buffer.

**HRESULT GetPrivateData(**

**REFGUID** *guidTag*,

**LPVOID** *lpBuffer*,

**LPDWORD** *lpcbBufferSize*

**);**

Parameters

*guidTag*

Reference to (C++) or address of (C) the globally unique identifier that identifies the private data to be retrieved.

*lpBuffer*

Address of a previously allocated buffer to be filled with the requested private data if the call succeeds. The application calling this method is responsible for allocating and releasing this buffer.

*lpcbBufferSize*

Size of the buffer at *lpBuffer*, in bytes. If this value is less than the actual size of the private data (such as 0), the method sets this parameter to the required buffer size, and the method returns DDERR\_MOREDATA.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_EXPIRED |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_MOREDATA |
| DDERR\_NOTFOUND |
| DDERR\_OUTOFMEMORY |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::SetPrivateData**, **IDirectDrawSurface7::FreePrivateData**

IDirectDrawSurface7::GetSurfaceDesc

The **IDirectDrawSurface7::GetSurfaceDesc** method retrieves a description of the surface in its current condition.

**HRESULT GetSurfaceDesc(**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc*

**);**

Parameters

*lpDDSurfaceDesc*

Address of a **DDSURFACEDESC2** structure to be filled with the current description of this surface. You need only initialize this structure's **dwSize** member to the size, in bytes, of the structure prior to the call; no other preparation is required.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**DDSURFACEDESC**, **DDSURFACEDESC2**

IDirectDrawSurface7::GetUniquenessValue

The **IDirectDrawSurface7::GetUniquenessValue** method retrieves the current uniqueness value for this surface.

**HRESULT GetUniquenessValue(**

**LPDWORD** *lpValue*

**);**

Parameters

*lpValue*

Address of a variable to be filled with the surface's current uniqueness value if the call succeeds.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

The only defined uniqueness value is 0, indicating that the surface is likely to be changing beyond the control of DirectDraw. Other uniqueness values are only significant if they differ from a previously cached uniqueness value. If the current value is different from a cached value, the contents of the surface have changed.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::ChangeUniquenessValue**, Surface Uniqueness Values

IDirectDrawSurface7::Initialize

The **IDirectDrawSurface7::Initialize** method initializes a DirectDrawSurface object.

**HRESULT Initialize(**

**LPDIRECTDRAW** *lpDD***,**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc*

**);**

Parameters

*lpDD*

Address of the DirectDraw structure that represents the DirectDraw object.

*lpDDSurfaceDesc*

Address of a **DDSURFACEDESC2** structure to be filled with the relevant details about the surface.

Return Values

The method returns DDERR\_ALREADYINITIALIZED.

Remarks

This method is provided for compliance with the Component Object Model (COM). Because the DirectDrawSurface object is initialized when it is created, this method always returns DDERR\_ALREADYINITIALIZED.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IUnknown::AddRef**, **IUnknown::QueryInterface**, **IUnknown::Release**

IDirectDrawSurface7::IsLost

The **IDirectDrawSurface7::IsLost** method determines whether the surface memory associated with a DirectDrawSurface object has been freed.

**HRESULT IsLost();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK because the memory has not been freed.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |

You can use this method to determine when you need to reallocate surface memory. When a DirectDrawSurface object loses its surface memory, most methods return DDERR\_SURFACELOST and perform no other action.

Remarks

Surfaces can lose their memory when the mode of the display card is changed or when an application receives exclusive access to the display card and frees all surface memory currently allocated on the display card.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Restore**, Losing and Restoring Surfaces

IDirectDrawSurface7::Lock

The **IDirectDrawSurface7::Lock** method obtains a pointer to the surface memory.

**HRESULT Lock(**

**LPRECT** *lpDestRect***,**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc***,**

**DWORD** *dwFlags***,**

**HANDLE** *hEvent*

**);**

Parameters

*lpDestRect*

Address of a **RECT** structure that identifies the region of the surface that is being locked. If NULL, the entire surface is locked.

*lpDDSurfaceDesc*

Address of a **DDSURFACEDESC2** structure to be filled with the relevant details about the surface.

*dwFlags*

The following flags are defined:

DDLOCK\_DONOTWAIT

On **IDirectDrawSurface7** interfaces, the default is DDLOCK\_WAIT. If you want to override the default and use time when the accelerator is busy (as denoted by the DDERR\_WASSTILLDRAWING return value). use DDLOCK\_DONOTWAIT.

DDLOCK\_EVENT

Not currently implemented.

DDLOCK\_NOOVERWRITE

New for DirectX 7.0. Used only with Direct3D vertex-buffer locks. Indicates that no vertices that were referred to in Draw\*PrimitiveVB calls since the start of the frame (or the last lock without this flag) are modified during the lock. This can be useful when you want only to append data to the vertex buffer.

DDLOCK\_NOSYSLOCK

Do not take the Win16Mutex (also known as Win16Lock). This flag is ignored when locking the primary surface.

DDLOCK\_DISCARDCONTENTS

New for DirectX 7.0. Used only with Direct3D vertex-buffer locks. Indicates that no assumptions are made about the contents of the vertex buffer during this lock. This enables Direct3D or the driver to provide an alternative memory area as the vertex buffer. This is useful when you plan to clear the contents of the vertex buffer and fill in new data.

DDLOCK\_OKTOSWAP

This flag is obsolete and was replaced by the DDLOCK\_DISCARDCONTENTS flag.

DDLOCK\_READONLY

Indicates that the surface being locked can only be read.

DDLOCK\_SURFACEMEMORYPTR

Indicates that a valid memory pointer to the top of the specified rectangle should be returned. If no rectangle is specified, a pointer to the top of the surface is returned. This is the default.

DDLOCK\_WAIT

If a lock cannot be obtained because a blit operation is in progress, the method retries until a lock is obtained or another error occurs, such as DDERR\_SURFACEBUSY.

DDLOCK\_WRITEONLY

Indicates that the surface being locked is write-enabled.

*hEvent*

Not used and must be set to NULL.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_WASSTILLDRAWING |

Remarks

For more information on using this method, see Accessing Surface Memory Directly.

In **IDirectDrawSurface7**, the default behavior of this method is to wait for the accelator to finish. Therefore, under default conditions, this method never returns DDERR\_WASSTILLDRAWING. If you want to see the error codes and not wait until the blit operation succeeds, use the DDLOCK\_DONOTWAIT flag.

After retrieving a surface memory pointer, you can access the surface memory until a corresponding **IDirectDrawSurface7::Unlock** method is called. When the surface is unlocked, the pointer to the surface memory is invalid.

Do not call DirectDraw blit functions to blit from a locked region of a surface. If you do, the blit returns either DDERR\_SURFACEBUSY or DDERR\_LOCKEDSURFACES. GDI blit functions also silently fail when used on a locked video memory surface.

Unless you include the DDLOCK\_NOSYSLOCK flag, this method causes DirectDraw to hold the Win16Mutex (also known as Win16Lock) until you call the **IDirectDrawSurface7::Unlock** method. GUI debuggers cannot operate while the Win16Mutex is held.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Unlock**, **IDirectDrawSurface7::GetDC**, **IDirectDrawSurface7::ReleaseDC**

IDirectDrawSurface7::PageLock

The **IDirectDrawSurface7::PageLock** method prevents a system-memory surface from being paged out while a blit operation that uses direct memory access (DMA) transfers to or from system memory is in progress.

**HRESULT PageLock(**

**DWORD** *dwFlags*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CANTPAGELOCK |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |

Remarks

You must call this method to make use of DMA support. If you do not, the blit occurs using software emulation. For more information, see Using DMA.

The performance of the operating system can be negatively affected if too much memory is locked.

A lock count is maintained for each surface and is incremented each time that **IDirectDrawSurface7::PageLock** is called for that surface. The count is decremented when **IDirectDrawSurface7::PageUnlock** is called. When the count reaches 0, the memory is unlocked, and can then be paged by the operating system.

This method works only on system-memory surfaces; it does not page-lock a display-memory surface or an emulated primary surface. If an application calls this method on a display memory surface, the method does nothing except return DD\_OK.

This method was not implemented in the **IDirectDraw** interface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::PageUnlock**

IDirectDrawSurface7::PageUnlock

The **IDirectDrawSurface7::PageUnlock** method unlocks a system-memory surface, allowing it to be paged out.

**HRESULT PageUnlock(**

**DWORD** *dwFlags*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_CANTPAGEUNLOCK |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTPAGELOCKED |
| DDERR\_SURFACELOST |

Remarks

A lock count is maintained for each surface and is incremented each time that **IDirectDrawSurface7::PageLock** is called for that surface. The count is decremented when **IDirectDrawSurface7::PageUnlock** is called. When the count reaches 0, the memory is unlocked, and can then be paged by the operating system.

This method works only on system-memory surfaces; it does not page-unlock a display-memory surface or an emulated primary surface. If an application calls this method on a display-memory surface, this method does nothing except return DD\_OK.

This method was not implemented in the **IDirectDraw** interface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::PageLock**

IDirectDrawSurface7::ReleaseDC

The **IDirectDrawSurface7::ReleaseDC** method releases the handle of a device context previously obtained by using the **IDirectDrawSurface7::GetDC** method.

**HRESULT ReleaseDC(**

**HDC** *hDC*

**);**

Parameters

*hDC*

Handle of a device context previously obtained by **IDirectDrawSurface7::GetDC**.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

This method also unlocks the surface previously locked when the **IDirectDrawSurface7::GetDC** method was called.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetDC**

IDirectDrawSurface7::Restore

The **IDirectDrawSurface7::Restore** method restores a surface that has been lost. This occurs when the surface memory associated with the DirectDrawSurface object has been freed.

**HRESULT Restore();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_IMPLICITLYCREATED |
| DDERR\_INCOMPATIBLEPRIMARY |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_OUTOFMEMORY |
| DDERR\_UNSUPPORTED |
| DDERR\_WRONGMODE |

Remarks

This method restores the memory allocated for a surface, but does not reload any bitmaps that might have existed in the surface before it was lost. For more information, see Losing and Restoring Surfaces.

Surfaces can be lost because the mode of the display card was changed or because an application received exclusive access to the display card and freed all surface memory currently allocated on the card. When a DirectDrawSurface object loses its surface memory, many methods return DDERR\_SURFACELOST and perform no other function. The **IDirectDrawSurface7::Restore** method reallocates surface memory and reattaches it to the DirectDrawSurface object.

A single call to this method restores a DirectDrawSurface object's associated implicit surfaces (back buffers, and so on). An attempt to restore an implicitly created surface results in an error. **IDirectDrawSurface7::Restore** does not work across explicit attachments created by using the **IDirectDrawSurface7::AddAttachedSurface** method—each of these surfaces must be restored individually.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::IsLost**

IDirectDrawSurface7::SetClipper

The **IDirectDrawSurface7::SetClipper** method attaches a clipper object to, or deletes one from, a surface.

**HRESULT SetClipper(**

**LPDIRECTDRAWCLIPPER** *lpDDClipper*

**);**

Parameters

*lpDDClipper*

Address of the **IDirectDrawClipper** interface for the DirectDrawClipper object to be attached to the DirectDrawSurface object. If NULL, the current DirectDrawClipper object is detached.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOCLIPPERATTACHED |

Remarks

When setting a clipper to a surface for the first time, this method increments the clipper's reference count; subsequent calls do not affect the clipper's reference count. If you pass NULL as the *lpDDClipper* parameter, the clipper is removed from the surface, and the clipper's reference count is decremented. If you do not delete the clipper, the surface automatically releases its reference to the clipper when the surface itself is released. According to COM rules, your application is responsible for releasing any references that it holds to the clipper when the object is no longer needed.

This method is primarily used by surfaces that are being overlaid on, or blitted to, the primary surface. However, it can be used on any surface. After a DirectDrawClipper object has been attached and a clip list is associated with it, the DirectDrawClipper object is used for the **IDirectDrawSurface7::Blt**, **IDirectDrawSurface7::BltBatch**, and **IDirectDrawSurface7::UpdateOverlay** operations involving the parent DirectDrawSurface object. This method can also detach the current DirectDrawClipper object of a DirectDrawSurface object.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetClipper**

IDirectDrawSurface7::SetColorKey

The **IDirectDrawSurface7::SetColorKey** method sets the color key value for the DirectDrawSurface object if the hardware supports color keys on a per-surface basis.

**HRESULT SetColorKey(**

**DWORD** *dwFlags***,**

**LPDDCOLORKEY** *lpDDColorKey*

**);**

Parameters

*dwFlags*

Determines which color key is requested. The following flags are defined:

DDCKEY\_COLORSPACE

The structure contains a color space. Not set if the structure contains a single color key.

DDCKEY\_DESTBLT

A color key or color space to be used as a destination color key for blit operations.

DDCKEY\_DESTOVERLAY

A color key or color space to be used as a destination color key for overlay operations.

DDCKEY\_SRCBLT

A color key or color space to be used as a source color key for blit operations.

DDCKEY\_SRCOVERLAY

A color key or color space to be used as a source color key for overlay operations.

*lpDDColorKey*

Address of the **DDCOLORKEY** structure that contains the new color key values for the DirectDrawSurface object. This value can be NULL to remove a previously set color key.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOOVERLAYHW |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

For transparent blits and overlays, set destination color on the destination surface and source color on the source surface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetColorKey**

IDirectDrawSurface7::SetLOD

The **IDirectDrawSurface7::SetLOD** method sets the maximum level of detail for a managed mipmap surface. This method succeeds only on managed textures (see Remarks).

**HRESULT SetLOD(**

**DWORD** *dwMaxLOD*

**);**

*dwMaxLOD*

Maximum level-of-detail value to be set for the mipmap chain if the call succeeds.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

Applications can call this method only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT.

This method communicates to the Direct3D texture manager the most detailed mipmap in this chain that it should load into local video memory. For example, in a five-level mipmap chain, setting *dwMaxLOD* to 2 indicates that the texture manager should load only mipmap levels 2 through 4 into local video memory at any given time. Likewise, if the most detailed mipmap in the chain has the dimensions 256×256, setting the maximum level to 2 means that the largest mipmap ever present in video memory has dimensions 64×64.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetLOD**, Texture Filtering With Mipmaps, Automatic Texture Management, Textures

IDirectDrawSurface7::SetOverlayPosition

The **IDirectDrawSurface7::SetOverlayPosition** method changes the display coordinates of an overlay surface.

**HRESULT SetOverlayPosition(**

**LONG** *lX***,**

**LONG** *lY*

**);**

Parameters

*lX* and *lY*

New x- and y-display coordinates.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPOSITION |
| DDERR\_NOOVERLAYDEST |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OVERLAYNOTVISIBLE |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetOverlayPosition**, **IDirectDrawSurface7::UpdateOverlay**

IDirectDrawSurface7::SetPalette

The **IDirectDrawSurface7::SetPalette** method attaches a palette object to (or detaches one from) a surface. The surface uses this palette for all subsequent operations. The palette change takes place immediately, without regard to refresh timing.

**HRESULT SetPalette(**

**LPDIRECTDRAWPALETTE** *lpDDPalette*

**);**

Parameters

*lpDDPalette*

Address of the **IDirectDrawPalette** interface for the palette object to be used with this surface. If NULL, the current palette is detached.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOPALETTEATTACHED |
| DDERR\_NOPALETTEHW |
| DDERR\_NOT8BITCOLOR |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

When setting a palette to a surface for the first time, this method increments the palette's reference count; subsequent calls do not affect the palette's reference count. If you pass NULL as the *lpDDPalette* parameter, the palette is removed from the surface, and the palette's reference count is decremented. If you do not delete the palette, the surface automatically releases its reference to the palette when the surface itself is released. According to COM rules, your application is responsible for releasing any references that it holds to the palette when the object is no longer needed.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetPalette**, **IDirectDraw7::CreatePalette**

IDirectDrawSurface7::SetPriority

The **IDirectDrawSurface7::GetPriority** method assigns the texture-management priority for this texture. This method succeeds only on managed textures (see Remarks).

**HRESULT SetPriority(**

**DWORD** *dwPriority*

**);**

Parameters

*dwPriority*

Value specifying the new texture-management priority for the texture.

Return Values

If the method succeeds, the return value is D3D\_OK.

If it fails, the method returns an error. It returns DDERR\_INVALIDOBJECT if the parameter is invalid or if the texture is not managed by Direct3D.

Remarks

This method was introduced with the **IDirectDrawSurface7** interface.

Priorities are used to determine when managed textures are to be removed from memory. A texture with a low priority is removed before a texture with a high priority. If two textures have the same priority, the texture that was used more recently is kept in memory; the other texture is removed.

Applications can set and retrieve priorities only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetPriority**, Automatic Texture Management, Textures

IDirectDrawSurface7::SetPrivateData

The **IDirectDrawSurface7::SetPrivateData** method associates data with the surface that is intended for use by the application, not by DirectDraw. Data is passed by value, and multiple sets of data can be associated with a single surface.

**HRESULT SetPrivateData(**

**REFGUID** *guidTag*,

**LPVOID** *lpData*,

**DWORD** *cbSize*,

**DWORD** *dwFlags*

**);**

Parameters

*guidTag*

Reference to (C++) or address of (C) the globally unique identifier that identifies the private data to be set.

*lpData*

Address of a buffer that contains the data to be associated with the surface.

*cbSize*

Size of the buffer at *lpData*, in bytes.

*dwFlags*

Flags describing the type of data being passed or requesting that the data be invalidated when the surface changes. The following flags are defined:

(none)

If no flags are specified, DirectDraw allocates memory to hold the data within the buffer and copies the data into the new buffer. The buffer allocated by DirectDraw is automatically freed, as appropriate.

DDSPD\_IUNKNOWNPOINTER

The data at *lpData* is a pointer to an **IUnknown** interface. DirectDraw automatically calls the **IUnknown::AddRef** method of this interface. When this data is no longer needed, DirectDraw automatically calls the **IUnknown::Release** method of this interface.

DDSPD\_VOLATILE

The buffer at *lpData* is only valid while the surface remains unchanged. If the surface's contents change, subsequent calls to the **IDirectDrawSurface7::GetPrivateData** method return DDERR\_EXPIRED.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

DirectDraw does not manage the memory at *lpData*. If this buffer was dynamically allocated, it is the caller's responsibility to free the memory.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::GetPrivateData**, **IDirectDrawSurface7::FreePrivateData**

IDirectDrawSurface7::SetSurfaceDesc

The **IDirectDrawSurface7::SetSurfaceDesc** method sets the characteristics of an existing surface.

**HRESULT SetSurfaceDesc(**

**LPDDSURFACEDESC2** *lpddsd2***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpddsd2*

Address of a **DDSURFACEDESC2** structure that contains the new surface characteristics.

*dwFlags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDOBJECT |
| DDERR\_SURFACELOST |
| DDERR\_SURFACEBUSY |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_INVALIDCAPS |
| DDERR\_UNSUPPORTED |
| DDERR\_GENERIC |

Remarks

Currently, this method can be used only to set the surface data and pixel format used by an explicit system-memory surface. This is useful because it allows a surface to use data from a previously allocated buffer without copying. The new surface memory is allocated by the client application, and therefore the client application must also deallocate it. For more information, see Updating Surface Characteristics.

Using this method incorrectly causes unpredictable behavior. The DirectDrawSurface object does not deallocate surface memory that it did not allocate. Therefore, when the surface memory is no longer needed, it is your responsibility to deallocate it. However, when this method is called, DirectDraw frees the original surface memory that it implicitly allocated when creating the surface.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::Unlock

The **IDirectDrawSurface7::Unlock** method notifies DirectDraw that the direct surface manipulations are complete.

**HRESULT Unlock(**

**LPRECT** *lpRect*

**);**

Parameters

*lpRect*

Address of the **RECT** structure that was used to lock the surface in the corresponding call to the **IDirectDrawSurface7::Lock** method. This parameter can be NULL only if the entire surface was locked by passing NULL in the *lpDestRect* parameter of the corresponding call to the **IDirectDrawSurface7::Lock** method.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOTLOCKED |
| DDERR\_SURFACELOST |

Remarks

Because it is possible to call **IDirectDrawSurface7::Lock** multiple times for the same surface with different destination rectangles, the pointer in *lpRect* links the calls to the **IDirectDrawSurface7::Lock** and **IDirectDrawSurface7::Unlock** methods.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::Lock**

IDirectDrawSurface7::UpdateOverlay

The **IDirectDrawSurface7::UpdateOverlay** method repositions or modifies the visual attributes of an overlay surface. These surfaces must have the DDSCAPS\_OVERLAY flag set.

**HRESULT UpdateOverlay(**

**LPRECT** *lpSrcRect***,**

**LPDIRECTDRAWSURFACE7** *lpDDDestSurface***,**

**LPRECT** *lpDestRect***,**

**DWORD** *dwFlags***,**

**LPDDOVERLAYFX** *lpDDOverlayFx*

**);**

Parameters

*lpSrcRect*

Address of a **RECT** structure that defines the x, y, width, and height of the region on the source surface being used as the overlay. This parameter can be NULL when hiding an overlay or to indicate that the entire overlay surface is to be used and that the overlay surface conforms to any boundary and size-alignment restrictions imposed by the device driver.

*lpDDDestSurface*

Address of the **IDirectDrawSurface7** interface for the surface that is being overlaid.

*lpDestRect*

Address of a **RECT** structure that defines the x, y, width, and height of the region on the destination surface that the overlay should be moved to. This parameter can be NULL when hiding the overlay.

*dwFlags*

The following flags are defined:

DDOVER\_ADDDIRTYRECT

Adds a dirty rectangle to an emulated overlay surface.

DDOVER\_ALPHADEST

Obsolete.

DDOVER\_ALPHADESTCONSTOVERRIDE

Uses the **dwAlphaDestConst** member of the **DDOVERLAYFX** structure as the destination alpha channel for this overlay.

DDOVER\_ALPHADESTNEG

Indicates that the destination surface becomes more transparent as the alpha value increases (0 is opaque).

DDOVER\_ALPHADESTSURFACEOVERRIDE

Uses the **lpDDSAlphaDest** member of the **DDOVERLAYFX** structure as the alpha channel destination for this overlay.

DDOVER\_ALPHAEDGEBLEND

Uses the **dwAlphaEdgeBlend** member of the **DDOVERLAYFX** structure as the alpha channel for the edges of the image that border the color key colors.

DDOVER\_ALPHASRC

Uses either the alpha information in pixel format or the alpha channel surface attached to the source surface as the source alpha channel for this overlay.

DDOVER\_ALPHASRCCONSTOVERRIDE

Uses the **dwAlphaSrcConst** member of the **DDOVERLAYFX** structure as the source alpha channel for this overlay.

DDOVER\_ALPHASRCNEG

Indicates that the source surface becomes more transparent as the alpha value increases (0 is opaque).

DDOVER\_ALPHASRCSURFACEOVERRIDE

Uses the **lpDDSAlphaSrc** member of the **DDOVERLAYFX** structure as the alpha channel source for this overlay.

DDOVER\_ARGBSCALEFACTORS

New for DirectX 7.0. Indicates that the **DDOVERLAYFX** structure contains valid ARGB scaling factors.

DDOVER\_AUTOFLIP

Automatically flips to the next surface in the flipping chain each time that a video port VSYNC occurs.

DDOVER\_BOB

Displays each field of the interlaced video stream individually without causing any artifacts.

DDOVER\_BOBHARDWARE

Bob operations are performed using hardware, rather than software or emulated. This flag must be used with the DDOVER\_BOB flag.

DDOVER\_DDFX

Uses the overlay FX flags in the *lpDDOverlayFx* parameter to define special overlay effects.

DDOVER\_DEGRADEARGBSCALING

New for DirectX 7.0. ARGB scaling factors can be degraded to fit driver capabilities.

DDOVER\_HIDE

Turns off this overlay.

DDOVER\_INTERLEAVED

The surface memory is composed of interleaved fields.

DDOVER\_KEYDEST

Uses the color key associated with the destination surface.

DDOVER\_KEYDESTOVERRIDE

Uses the **dckDestColorkey** member of the **DDOVERLAYFX** structure as the color key for the destination surface.

DDOVER\_KEYSRC

Uses the color key associated with the source surface.

DDOVER\_KEYSRCOVERRIDE

Uses the **dckSrcColorkey** member of the **DDOVERLAYFX** structure as the color key for the source surface.

DDOVER\_OVERRIDEBOBWEAVE

Bob and weave decisions should not be overridden by other interfaces.

DDOVER\_REFRESHALL

Redraws the entire surface on an emulated overlayed surface.

DDOVER\_REFRESHDIRTYRECTS

Redraws all dirty rectangles on an emulated overlayed surface.

DDOVER\_SHOW

Turns on this overlay.

*lpDDOverlayFx*

Address of a **DDOVERLAYFX** structure that describes the effects to be used. Can be NULL if the DDOVER\_DDFX flag is not specified.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_DEVICEDOESNTOWNSURFACE |
| DDERR\_GENERIC |
| DDERR\_HEIGHTALIGN |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OUTOFCAPS |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_XALIGN |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

IDirectDrawSurface7::UpdateOverlayDisplay

The **IDirectDrawSurface7::UpdateOverlayDisplay** method is not currently implemented.

**HRESULT UpdateOverlayDisplay(**

**DWORD** *dwFlags*

**);**

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::AddOverlayDirtyRect**

IDirectDrawSurface7::UpdateOverlayZOrder

The **IDirectDrawSurface7::UpdateOverlayZOrder** method sets the z-order of an overlay.

**HRESULT UpdateOverlayZOrder(**

**DWORD** *dwFlags***,**

**LPDIRECTDRAWSURFACE7** *lpDDSReference*

**);**

Parameters

*dwFlags*

One of the following flags:

DDOVERZ\_INSERTINBACKOF

Inserts this overlay in the overlay chain behind the reference overlay.

DDOVERZ\_INSERTINFRONTOF

Inserts this overlay in the overlay chain in front of the reference overlay.

DDOVERZ\_MOVEBACKWARD

Moves this overlay one position backward in the overlay chain.

DDOVERZ\_MOVEFORWARD

Moves this overlay one position forward in the overlay chain.

DDOVERZ\_SENDTOBACK

Moves this overlay to the back of the overlay chain.

DDOVERZ\_SENDTOFRONT

Moves this overlay to the front of the overlay chain.

*lpDDSReference*

Address of the **IDirectDrawSurface7** interface for the DirectDraw surface to be used as a relative position in the overlay chain. This parameter is needed only for DDOVERZ\_INSERTINBACKOF and DDOVERZ\_INSERTINFRONTOF.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTAOVERLAYSURFACE |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.

See Also

**IDirectDrawSurface7::EnumOverlayZOrders**

IDirectDrawVideoPort

Applications use the methods of the **IDirectDrawVideoPort** interface to channel live video data from a hardware video port to a DirectDraw surface. This section is a reference to the methods of this interface. For a conceptual overview, see Video Ports.

The methods of the **IDirectDrawVideoPort** interface can be organized into the following groups:

|  |  |
| --- | --- |
| **Color controls** | **GetColorControls** |
|  | **SetColorControls** |
| **Fields and signals** | **GetFieldPolarity** |
|  | **GetVideoSignalStatus** |
| **Flipping** | **Flip** |
|  | **SetTargetSurface** |
| **Formats** | **GetInputFormats** |
|  | **GetOutputFormats** |
| **Timing and synchronization** | **GetVideoLine** |
|  | **WaitForSync** |
| **Video control** | **StartVideo** |
|  | **StopVideo** |
|  | **UpdateVideo** |
| **Zoom factors** | **GetBandwidthInfo** |

The **IDirectDrawVideoPort** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

|  |  |
| --- | --- |
| **IUnknown** | **AddRef** |
|  | **QueryInterface** |
|  | **Release** |

You can use the **LPDIRECTDRAWVIDEOPORT** data type to declare a variable that contains a pointer to an **IDirectDrawVideoPort** interface. The Dvp.h header file declares the **LPDIRECTDRAWVIDEOPORT** with the following code:

typedef struct IDirectDrawVideoPort FAR \*LPDIRECTDRAWVIDEOPORT;

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::Flip

The **IDirectDrawVideoPort::Flip** method instructs the DirectDrawVideoPort object to write the next frame of video to a new surface.

**HRESULT Flip(**

**LPDIRECTDRAWSURFACE** *lpDDSurface***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpDDSurface*

Address of the **IDirectDrawSurface** interface for the surface to receive the next frame of video. Setting this parameter to NULL causes DirectDraw to cycle through surfaces in the flipping chain in the order that they were attached.

*dwFlags*

Flip options flags. Can be one of the following values:

DDVPFLIP\_VIDEO

The specified surface is to receive the normal video data.

DDVPFLIP\_VBI

The specified surface is to receive only the data within the vertical blanking interval.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method can be used to prevent tearing. Calls to **IDirectDrawVideoPort::Flip** are asynchronous—the flip operation is always synchronized with the vertical blank of the video signal.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetBandwidthInfo

The **IDirectDrawVideoPort::GetBandwidthInfo** method retrieves the minimum required overlay zoom factors and device limitations of a video port that uses the provided output pixel format.

**HRESULT GetBandwidthInfo(**

**LPDDPIXELFORMAT** *lpddpfFormat***,**

**DWORD** *dwWidth***,**

**DWORD** *dwHeight***,**

**DWORD** *dwFlags***,**

**LPDDVIDEOPORTBANDWIDTH** *lpBandwidth*

**);**

Parameters

*lpddpfFormat*

Address of a **DDPIXELFORMAT** structure that describes the output pixel format for which bandwidth information is retrieved.

*dwWidth* and *dwHeight*

Dimensions of an overlay or video data. These parameters depend on the value specified in the *dwFlags* parameter.

*dwFlags*

Flags indicating how the method is to interpret the *dwWidth* and *dwHeight* parameters. Can be one of the following values:

DDVPB\_OVERLAY

The *dwWidth* and *dwHeight* parameters indicate the size of the source overlay surface. Use this flag when the video port is dependent on the overlay source size.

DDVPB\_TYPE

The *dwWidth* and *dwHeight* parameters are not set. The method retrieves the device's dependency type in the **dwCaps** member of the associated **DDVIDEOPORTBANDWIDTH** structure. Use this flag when you call this method the first time.

DDVPB\_VIDEOPORT

The *dwWidth* and *dwHeight* parameters indicate the prescale size of the video data that the video port writes to the frame buffer. Use this flag when the video port is dependent on the overlay zoom factor.

*lpBandwidth*

Address of a **DDVIDEOPORTBANDWIDTH** structure to be filled with the retrieved bandwidth and device dependency information.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method is usually called twice. When you make the first call, specify the DDVPB\_TYPE flag in the *dwFlags* parameter to retrieve information about the device's overlay dependency type. Subsequent calls using the DDVPB\_VIDEOPORT or DDVPB\_OVERLAY flags must be interpreted considering the device's dependency type.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetColorControls

The **IDirectDrawVideoPort::GetColorControls** method returns the current color control settings associated with the video port.

**HRESULT GetColorControls(**

**LPDDCOLORCONTROL** *lpColorControl*

**);**

Parameters

*lpColorControl*

Address of a **DDCOLORCONTROL** structure to be filled with the current settings of the video port's color control.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Remarks

The **dwFlags** member of the **DDCOLORCONTROL** structure indicates which of the color control options are supported.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetFieldPolarity

The **IDirectDrawVideoPort::GetFieldPolarity** method retrieves the polarity of a video field.

**HRESULT GetFieldPolarity(**

**LPBOOL** *lpbFieldPolarity*

**);**

Parameters

*lpbFieldPolarity*

Address of a variable to be set to indicate the current field polarity. This value is set to TRUE if the current video field is the even field of an interlaced video signal, and FALSE otherwise.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DDERR\_VIDEONOTACTIVE |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetInputFormats

The **IDirectDrawVideoPort::GetInputFormats** method retrieves the input formats supported by the DirectDrawVideoPort object.

**HRESULT GetInputFormats(**

**LPDWORD** *lpNumFormats***,**

**LPDDPIXELFORMAT** *lpFormats***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpNumFormats*

Address of a variable that contains the number of entries that the array at *lpFormats* can hold. If this number is less than the total number of codes, the method fills the array with all the codes that fit, sets the value at *lpNumFormats* to indicate the total number of codes, and returns DDERR\_MOREDATA.

*lpFormats*

Address of an array of **DDPIXELFORMAT** structures to be filled in with the input formats supported by this DirectDrawVideoPort object. If NULL, the method sets *lpNumFormats* to the number of supported formats, and then returns DD\_OK.

*dwFlags*

Flags specifying the part of the video signal for which formats are enumerated. One of the following values:

DDVPFORMAT\_VIDEO

Returns formats for the video data.

DDVPFORMAT\_VBI

Returns formats for the VBI data.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_MOREDATA |

Remarks

This method can also be used to return the number of formats supported. To do this, set the *lpFormats* parameter to NULL. When the method returns, the variable at *lpNumFormats* contains the total number of supported input formats.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetOutputFormats

The **IDirectDrawVideoPort::GetOutputFormats** method retrieves a list of output formats that the DirectDrawVideoPort object supports for a specified input format.

**HRESULT GetOutputFormats(**

**LPDDPIXELFORMAT** *lpInputFormat***,**

**LPDWORD** *lpNumFormats***,**

**LPDDPIXELFORMAT** *lpFormats***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpInputFormat*

Address of a **DDPIXELFORMAT** structure that describes the input format for which conversion information is requested.

*lpNumFormats*

Address of a variable that contains the number of entries that the array at *lpFromats* can hold. If this number is less than the total number of codes, the method fills the array with all the codes that fit, sets the value at *lpNumFormats* to indicate the total number of codes, and returns DDERR\_MOREDATA.

*lpFormats*

Address of an array of **DDPIXELFORMAT** structures to be filled in with the output formats supported by this DirectDrawVideoPort object. If NULL, the method sets *lpNumFormats* to the number of supported formats, and then returns DD\_OK.

*dwFlags*

Flags specifying the part of the video signal for which formats are enumerated. One of the following values:

DDVPFORMAT\_VIDEO

Returns formats for the video data.

DDVPFORMAT\_VBI

Returns formats for the VBI data.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_MOREDATA |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetVideoLine

The **IDirectDrawVideoPort::GetVideoLine** method retrieves the line of video currently being written to the frame buffer.

**HRESULT GetVideoLine(**

**LPDWORD** *lpdwLine*

**);**

Parameters

*lpdwLine*

Address of a variable to be filled with a value indicating the video line currently being written to the frame buffer.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DDERR\_VERTICALBLANKINPROGRESS |
| DDERR\_VIDEONOTACTIVE |

Remarks

The value that this method retrieves reflects the true video line being written, relative to the field height, before any prescaling occurs.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::GetVideoSignalStatus

The **IDirectDrawVideoPort::GetVideoSignalStatus** method retrieves the status of the video signal currently being presented to the video port.

**HRESULT GetVideoSignalStatus(**

**LPDWORD** *lpdwStatus*

**);**

Parameters

*lpdwStatus*

Address of a variable to contain a return value indicating the quality of the video signal at the video port. The value is set to one of the following codes:

DDVPSQ\_NOSIGNAL

No video signal is present at the video port.

DDVPSQ\_SIGNALOK

A valid video signal is present at the video port.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::SetColorControls

The **IDirectDrawVideoPort::SetColorControls** method sets the color control settings associated with the video port.

**HRESULT SetColorControls(**

**LPDDCOLORCONTROL** *lpColorControl*

**);**

Parameters

*lpColorControl*

Address of a **DDCOLORCONTROL** structure that contains the new color control settings to be applied to the video port.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

IDirectDrawVideoPort::SetTargetSurface

The **IDirectDrawVideoPort::SetTargetSurface** method sets the DirectDraw surface object to receive the stream of live video data and/or the vertical blank interval data.

**HRESULT SetTargetSurface(**

**LPDIRECTDRAWSURFACE** *lpDDSurface***,**

**DWORD** *dwFlags*

**);**

Parameters

*lpDDSurface*

Address of the DirectDrawSurface object to receive the video data.

*dwFlags*

Value specifying the type of the target surface. One of the following flags:

DDVPTARGET\_VIDEO

The specified surface should receive the normal video data and vertical interval data unless a separate surface was attached for this purpose.

DDVPTARGET\_VBI

The specified surface should receive the data within the vertical blanking interval.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawVideoPort::StartVideo**, **IDirectDrawVideoPort::StopVideo**, **IDirectDrawVideoPort::UpdateVideo**

IDirectDrawVideoPort::StartVideo

The **IDirectDrawVideoPort::StartVideo** method enables the hardware video port and starts the flow of video data into the currently specified surface.

**HRESULT StartVideo(**

**LPDDVIDEOPORTINFO** *lpVideoInfo*

**);**

Parameters

*lpVideoInfo*

Address of a pointer to a **DDVIDEOPORTINFO** structure.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawVideoPort::SetTargetSurface**, **IDirectDrawVideoPort::StopVideo**, **IDirectDrawVideoPort::UpdateVideo**

IDirectDrawVideoPort::StopVideo

The **IDirectDrawVideoPort::StopVideo** method stops the flow of video-port data into the frame buffer.

**HRESULT StopVideo();**

Parameters

None.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method returns DDERR\_INVALIDOBJECT.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawVideoPort::SetTargetSurface**, I**IDirectDrawVideoPort::StartVideo**, **IDirectDrawVideoPort::UpdateVideo**

IDirectDrawVideoPort::UpdateVideo

The **IDirectDrawVideoPort::UpdateVideo** method updates parameters that govern the flow of video data from the video port to the DirectDrawSurface object.

**HRESULT UpdateVideo(**

**LPDDVIDEOPORTINFO** *lpVideoInfo*

**);**

Parameters

*lpVideoInfo*

Address of a **DDVIDEOPORTINFO** structure that describes the video transfer parameters.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDrawVideoPort::SetTargetSurface**, **IDirectDrawVideoPort::StartVideo**, **IDirectDrawVideoPort::StopVideo**

IDirectDrawVideoPort::WaitForSync

The **IDirectDrawVideoPort::WaitForSync** method waits for VSYNC or until a given scan line is being drawn.

**HRESULT WaitForSync(**

**DWORD** *dwFlags***,**

**DWORD** *dwLine***,**

**DWORD** *dwTimeout*

**);**

Parameters

*dwFlags*

Flag specifying how the method waits for the video VSYNC or the specified line number. One of the following values:

DDVPWAIT\_BEGIN

Return at the start of the vertical blanking interval.

DDVPWAIT\_END

Return at the end of the vertical blanking interval.

DDVPWAIT\_LINE

Return when the video counter either reaches or passes the line specified by the *dwLine* parameter.

*dwLine*

Video line determining when the method returns, relative to the field height, before prescaling. This parameter is ignored if the *dwFlags* parameter is set to DDVPWAIT\_BEGIN or DDVPWAIT\_END.

*dwTimeout*

Amount of time, in milliseconds, that the method waits for the next video vertical blank before timing out. If this parameter is 0, the method waits 3 times the value specified in the **dwMicrosecondsPerField** member of the **DDVIDEOPORTDESC**.

Return Values

If the method succeeds, the return value is DD\_OK.

If it fails, the method can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DDERR\_VIDEONOTACTIVE |
| DDERR\_WASSTILLDRAWING |

Remarks

This method helps the caller synchronize with the video vertical blank interval or with an arbitrary line of video data. The method blocks the calling thread until either the video VSYNC occurs or the video line counter matches the specified line number.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.  
**Import Library:** Use ddraw.lib.

### Functions

This section contains information about the following DirectDraw global functions:

**DirectDrawCreate**

**DirectDrawCreateEx**

**DirectDrawCreateClipper**

**DirectDrawEnumerate**

**DirectDrawEnumerateEx**

DirectDrawCreate

The **DirectDrawCreate** function creates an instance of a DirectDraw object. A DirectDraw object created with this function does not support the newest set of Direct3D interfaces. To create a DirectDraw object capable of exposing the new features of Direct3D, use the **DirectDrawCreateEx** function.

**HRESULT WINAPI DirectDrawCreate(**

**GUID FAR** *\*lpGUID***,**

**LPDIRECTDRAW FAR** *\*lplpDD***,**

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*lpGUID*

Address of the globally unique identifier (GUID) that represents the driver to be created. This can be NULL to indicate the active display driver, or you can pass one of the following flags to restrict the active display driver's behavior for debugging purposes:

DDCREATE\_EMULATIONONLY

The DirectDraw object uses emulation for all features; it does not take advantage of any hardware-supported features.

DDCREATE\_HARDWAREONLY

The DirectDraw object never emulates features not supported by the hardware. Attempts to call methods that require unsupported features fail, returning DDERR\_UNSUPPORTED.

*lplpDD*

Address of a variable to be set to a valid **IDirectDraw** interface pointer if the call succeeds.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the function succeeds, the return value is DD\_OK.

If it fails, the function can return one of the following error values:

|  |
| --- |
| DDERR\_DIRECTDRAWALREADYCREATED |
| DDERR\_GENERIC |
| DDERR\_INVALIDDIRECTDRAWGUID |
| DDERR\_INVALIDPARAMS |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_OUTOFMEMORY |

Remarks

This function attempts to initialize a DirectDraw object, and then sets a pointer to the object if the call succeeds.

On systems with multiple monitors, specifying NULL for *lpGUID* causes the DirectDraw object to run in emulation mode when the normal cooperative level is set. To make use of hardware acceleration on these systems, specify the device's GUID. For more information, see Devices and Acceleration in MultiMon Systems.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

DirectDrawCreateEx

The **DirectDrawCreateEx** function creates an instance of a DirectDraw object that supports the newest set of Direct3D interfaces. To use the new features of Direct3D in DirectX 7.0, create a DirectDraw object with this function. For more information about the relationship between DirectDraw and Direct3D see The DirectDraw Object and Direct3D and Accessing Direct3D topics.

**HRESULT WINAPI DirectDrawCreateEx(**

**GUID FAR** *\*lpGUID***,**

**LPVOID** *\*lplpDD,*

**REFIID** *iid,*

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*lpGUID*

Address of the globally unique identifier (GUID) that represents the driver to be created. This can be NULL to indicate the active display driver, or you can pass one of the following flags to restrict the behavior of the active display driver for debugging purposes:

DDCREATE\_EMULATIONONLY

The DirectDraw object uses emulation for all features; it does not take advantage of any hardware-supported features.

DDCREATE\_HARDWAREONLY

The DirectDraw object never emulates features not supported by the hardware. Attempts to call methods that require unsupported features fail, returning DDERR\_UNSUPPORTED.

*lplpDD*

Address of a variable to be set to a valid **IDirectDraw7** interface pointer if the call succeeds.

*iid*

This parameter must be set to IID\_IDirectDraw7. This function fails and returns DDERR\_INVALIDPARAMS if any other interface is specified.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the function succeeds, the return value is DD\_OK.

If it fails, the function can return one of the following error values:

|  |
| --- |
| DDERR\_DIRECTDRAWALREADYCREATED |
| DDERR\_GENERIC |
| DDERR\_INVALIDDIRECTDRAWGUID |
| DDERR\_INVALIDPARAMS |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_OUTOFMEMORY |

Remarks

This function attempts to initialize a DirectDraw object, and then sets a pointer to the object if the call succeeds.

On systems with multiple monitors, specifying NULL for *lpGUID* causes the DirectDraw object to run in emulation mode when the normal cooperative level is set. To make use of hardware acceleration on these systems, specify the device's GUID. For more information, see Devices and Acceleration in MultiMon Systems.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

DirectDrawCreateClipper

The **DirectDrawCreateClipper** function creates an instance of a DirectDrawClipper object not associated with a DirectDraw object.

**HRESULT WINAPI DirectDrawCreateClipper(**

**DWORD** *dwFlags***,**

**LPDIRECTDRAWCLIPPER FAR** *\*lplpDDClipper***,**

**IUnknown FAR** *\*pUnkOuter*

**);**

Parameters

*dwFlags*

Currently not used and must be set to 0.

*lplpDDClipper*

Address of a pointer to be filled with the address of the new DirectDrawClipper object.

*pUnkOuter*

Allows for future compatibility with COM aggregation features. Presently, however, this method returns an error if this parameter is anything but NULL.

Return Values

If the function succeeds, the return value is DD\_OK.

If it fails, the function can return one of the following error values:

|  |
| --- |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

This function can be called before any DirectDraw objects are created. Because these DirectDrawClipper objects are not owned by any DirectDraw object, they are not automatically released when an application's objects are released. If the application does not explicitly release the DirectDrawClipper objects, DirectDraw releases them when the application terminates.

To create a DirectDrawClipper object owned by a specific DirectDraw object, use the **IDirectDraw7::CreateClipper** method.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**IDirectDraw7::CreateClipper**

DirectDrawEnumerate

This function is superseded by the **DirectDrawEnumerateEx** function.

The **DirectDrawEnumerate** function enumerates the primary DirectDraw display device and a nondisplay device (such as a 3-D accelerator that has no 2-D capabilities), if one is installed. The NULL entry always identifies the primary display device shared with the GDI.

**HRESULT WINAPI DirectDrawEnumerate(**

**LPDDENUMCALLBACK** *lpCallback***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpCallback*

Address of a **DDEnumCallback** function to be called with a description of each enumerated DirectDraw-enabled hardware abstraction layer (HAL).

*lpContext*

Address of an application-defined context to be passed to the enumeration callback function each time that it is called.

Return Values

If the function succeeds, the return value is DD\_OK.

If it fails, the function returns DDERR\_INVALIDPARAMS.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.

See Also

**DirectDrawEnumerateEx**

DirectDrawEnumerateEx

The **DirectDrawEnumerateEx** function enumerates all DirectDraw devices installed on the system. The NULL entry always identifies the primary display device shared with GDI.

**HRESULT WINAPI DirectDrawEnumerateEx(**

**LPDDENUMCALLBACKEX** *lpCallback***,**

**LPVOID** *lpContext,*

**DWORD** *dwFlags*

**);**

Parameters

*lpCallback*

Address of a **DDEnumCallbackEx** function to be called with a description of each enumerated DirectDraw-enabled hardware abstraction layer (HAL).

*lpContext*

Address of an application-defined value to be passed to the enumeration callback function each time that it is called.

*dwFlags*

Flags specifying the enumeration scope. This parameter can be 0 or a combination of the following flags. If the value is 0, the function enumerates only the primary display device.

DDENUM\_ATTACHEDSECONDARYDEVICES

The function enumerates the primary device and any display devices that are attached to the desktop.

DDENUM\_DETACHEDSECONDARYDEVICES

The function enumerates the primary device and any display devices that are not attached to the desktop.

DDENUM\_NONDISPLAYDEVICES

The function enumerates the primary device and any nondisplay devices, such as 3-D accelerators that have no 2-D capabilities.

Return Values

If the function succeeds, the return value is DD\_OK.

If it fails, the function returns DDERR\_INVALIDPARAMS.

Remarks

On systems with multiple monitors, this method enumerates multiple display devices. For more information, see Multiple-Monitor Systems.

For Windows 98, this function is supported in DirectX 5.0 and later; for all other operating systems, DirectX 6.0 is required. Retrieve the address of the **DirectDrawEnumerateEx** function from the Ddraw.dll dynamic-link library by calling the **GetProcAddress** Win32 function with the "DirectDrawEnumerateExA" (ANSI) or "DirectDrawEnumerateExW" (Unicode) process name strings. If **GetProcAddress** fails, the installed version of the operating system does not support multiple monitors. For more information, see Enumerating Devices on MultiMon Systems.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.  
**Import Library:** Use ddraw.lib.  
**Unicode:** Implemented as Unicode and ANSI versions on Windows NT/2000.

### Callback Functions

This section contains information about the following callback functions used with DirectDraw:

**DDEnumCallback**

**DDEnumCallbackEx**

**EnumModesCallback**

**EnumModesCallback2**

**EnumSurfacesCallback**

**EnumSurfacesCallback2**

**EnumSurfacesCallback7**

**EnumVideoCallback**

DDEnumCallback

The **DDEnumCallback** function is an application-defined callback function for the **DirectDrawEnumerate** function.

**BOOL WINAPI DDEnumCallback(**

**GUID FAR** *\*lpGUID***,**

**LPSTR** *lpDriverDescription***,**

**LPSTR** *lpDriverName***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpGUID*

Address of the unique identifier of the DirectDraw object.

*lpDriverDescription*

Address of a string that contains the driver description.

*lpDriverName*

Address of a string that contains the driver name.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

Return Values

The callback function returns nonzero to continue the enumeration.

It returns zero to stop the enumeration.

Remarks

You can use the **LPDDENUMCALLBACK** data type to declare a variable that can contain a pointer to this callback function.

If UNICODE is defined, the string values are returned as type **LPWSTR**, rather than **LPSTR**.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

DDEnumCallbackEx

The **DDEnumCallbackEx** function is an application-defined callback function for the **DirectDrawEnumerateEx** function.

**BOOL WINAPI DDEnumCallbackEx(**

**GUID FAR** \**lpGUID*,

**LPSTR** *lpDriverDescription***,**

**LPSTR** *lpDriverName***,**

**LPVOID** *lpContext,*

**HMONITOR** *hm*

**);**

Parameters

*lpGUID*

Address of the unique identifier of the DirectDraw object.

*lpDriverDescription*

Address of a string that contains the driver description.

*lpDriverName*

Address of a string that contains the driver name.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

*hm*

Handle of the monitor associated with the enumerated DirectDraw object. This parameter is NULL when the enumerated DirectDraw object is for the primary device, a nondisplay device (such as a 3-D accelerator with no 2-D capabilities), or devices not attached to the desktop.

Return Values

The callback function returns nonzero to continue the enumeration.

It returns 0 to stop the enumeration.

Remarks

After the **DirectDrawEnumerateEx** function completes, the pointer to the GUID is no longer valid. You must save a copy of the GUID structure itself, not the pointer, or the DirectDrawCreate function fails.

You can use the **LPDDENUMCALLBACKEX** data type to declare a variable that can contain a pointer to this callback function.

If UNICODE is defined, the string values are returned as type **LPWSTR**, rather than **LPSTR**.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 98.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

See Also

Enumerating Devices on MultiMon Systems, Multiple-Monitor Systems

EnumModesCallback

The **EnumModesCallback** function is an application-defined callback function for the **IDirectDraw3::EnumDisplayModes** method and its counterparts in earlier interfaces.

This callback function is superseded by the **EnumModesCallback2** function that is used with the **IDirectDraw7::EnumDisplayModes** method.

**HRESULT WINAPI EnumModesCallback(**

**LPDDSURFACEDESC** *lpDDSurfaceDesc***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpDDSurfaceDesc*

Address of a read-only **DDSURFACEDESC** structure that provides the monitor frequency and the mode that can be created.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

Return Values

The callback function returns DDENUMRET\_OK to continue the enumeration.

It returns DDENUMRET\_CANCEL to stop the enumeration.

Remarks

You can use the **LPDDENUMMODESCALLBACK** data type to declare a variable that can contain a pointer to this callback function.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

EnumModesCallback2

The **EnumModesCallback2** function is an application-defined callback function for the **IDirectDraw7::EnumDisplayModes** method.

**HRESULT WINAPI EnumModesCallback2(**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpDDSurfaceDesc*

Address of a read-only **DDSURFACEDESC2** structure that provides the monitor frequency and the mode that can be created.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

Return Values

The callback function returns DDENUMRET\_OK to continue the enumeration.

It returns DDENUMRET\_CANCEL to stop the enumeration.

Remarks

You can use the **LPDDENUMMODESCALLBACK2** data type to declare a variable that can contain a pointer to this callback function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

EnumSurfacesCallback

The **EnumSurfacesCallback** function is an application-defined callback function for the **IDirectDraw2::EnumSurfaces**, **IDirectDrawSurface3::EnumAttachedSurfaces**, and **IDirectDrawSurface3::EnumOverlayZOrders** methods (and the versions from earlier interfaces).

**HRESULT WINAPI EnumSurfacesCallback(**

**LPDIRECTDRAWSURFACE** *lpDDSurface***,**

**LPDDSURFACEDESC** *lpDDSurfaceDesc***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpDDSurface*

Address of the **IDirectDrawSurface** interface for the attached surface.

*lpDDSurfaceDesc*

Address of a **DDSURFACEDESC** structure that describes the attached surface.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

Return Values

The callback function returns DDENUMRET\_OK to continue the enumeration.

It returns DDENUMRET\_CANCEL to stop the enumeration.

Remarks

You can use the **LPDDENUMSURFACESCALLBACK** data type to declare a variable that can contain a pointer to this callback function.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

EnumSurfacesCallback2

The **EnumSurfacesCallback2** function is an application-defined callback function for the **IDirectDrawSurface4::EnumAttachedSurfaces** and **IDirectDrawSurface4::EnumOverlayZOrders** methods.

**HRESULT WINAPI EnumSurfacesCallback2(**

**LPDIRECTDRAWSURFACE7** *lpDDSurface***,**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpDDSurface*

Address of the **IDirectDrawSurface4** interface of the attached surface.

*lpDDSurfaceDesc*

Address of a **DDSURFACEDESC2** structure that describes the attached surface.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

Return Values

The callback function returns DDENUMRET\_OK to continue the enumeration.

It returns DDENUMRET\_CANCEL to stop the enumeration.

Remarks

You can use the **LPDDENUMSURFACESCALLBACK2** data type to declare a variable that can contain a pointer to this callback function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

EnumSurfacesCallback7

The **EnumSurfacesCallback7** function is an application-defined callback function for the **IDirectDrawSurface7::EnumAttachedSurfaces** and **IDirectDrawSurface7::EnumOverlayZOrders** methods.

**HRESULT WINAPI EnumSurfacesCallback7(**

**LPDIRECTDRAWSURFACE7** *lpDDSurface***,**

**LPDDSURFACEDESC2** *lpDDSurfaceDesc***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpDDSurface*

Address of the **IDirectDrawSurface7** interface of the attached surface.

*lpDDSurfaceDesc*

Address of a **DDSURFACEDESC2** structure that describes the attached surface.

*lpContext*

Address of an application-defined structure to be passed to the callback function each time that the function is called.

Return Values

The callback function returns DDENUMRET\_OK to continue the enumeration.

It returns DDENUMRET\_CANCEL to stop the enumeration.

Remarks

You can use the **LPDDENUMSURFACESCALLBACK7** data type to declare a variable that can contain a pointer to this callback function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

EnumVideoCallback

The **EnumVideoCallback** function is an application-defined callback function for the **IDDVideoPortContainer::EnumVideoPorts** method.

**HRESULT WINAPI EnumVideoCallback(**

**LPDDVIDEOPORTCAPS** *lpDDVideoPortCaps***,**

**LPVOID** *lpContext*

**);**

Parameters

*lpDDVideoPortCaps*

Address of the **DDVIDEOPORTCAPS** structure that contains the video port information, including the ID and capabilities. This data is read-only.

*lpContext*

Address of a caller-defined structure that is passed to the member every time that it is called.

Return Values

The callback function returns DDENUMRET\_OK to continue the enumeration.

It returns DDENUMRET\_CANCEL to stop the enumeration.

Remarks

Video-port-related functions cannot be called from inside the **EnumVideoCallback** function. Attempts to do so fail, returning DDERR\_CURRENTLYNOTAVAIL.

You can use the **LPDDENUMVIDEOCALLBACK** data type to declare a variable that can contain a pointer to this callback function.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.  
**Import Library:** User-defined.

### Structures

This section contains information about the following structures used with DirectDraw:

**DDBLTBATCH**

**DDBLTFX**

**DDCAPS**

**DDCOLORCONTROL**

**DDCOLORKEY**

**DDDEVICEIDENTIFIER2**

**DDGAMMARAMP**

**DDOVERLAYFX**

**DDPIXELFORMAT**

**DDSCAPS**

**DDSCAPS2**

**DDSURFACEDESC**

**DDSURFACEDESC2**

**DDVIDEOPORTBANDWIDTH**

**DDVIDEOPORTCAPS**

**DDVIDEOPORTCONNECT**

**DDVIDEOPORTDESC**

**DDVIDEOPORTINFO**

**DDVIDEOPORTSTATUS**

Note

The memory for all DirectX structures should be initialized to 0 before the structure is used. In addition, all structures that contain a **dwSize** member should set the member to the size of the structure, in bytes, before the structure is used. The following example performs these tasks on a common structure, **DDCAPS**:

DDCAPS ddcaps; // Can't use this yet.

ZeroMemory(&ddcaps, sizeof(DDCAPS));

ddcaps.dwSize = sizeof(DDCAPS);

// Now the structure can be used.

.

.

DDBLTBATCH

The **DDBLTBATCH** structure passes bilt block transfer (blit) operations to the **IDirectDrawSurface7::BltBatch** method.

typedef struct \_DDBLTBATCH{

LPRECT lprDest;

LPDIRECTDRAWSURFACE lpDDSSrc;

LPRECT lprSrc;

DWORD dwFlags;

LPDDBLTFX lpDDBltFx;

} DDBLTBATCH,FAR \*LPDDBLTBATCH;

Members

**lprDest**

Address of a **RECT** structure that defines the destination for the blit.

**lpDDSSrc**

Address of a DirectDrawSurface object to be the source of the blit.

**lprSrc**

Address of a **RECT** structure that defines the source rectangle of the blit.

**dwFlags**

Optional control flags. The following values are defined:

DDBLT\_ALPHADEST

Uses either the alpha information in pixel format or the alpha channel surface attached to the destination surface as the alpha channel for this blit.

DDBLT\_ALPHADESTCONSTOVERRIDE

Uses the **dwAlphaDestConst** member of the **DDBLTFX** structure as the alpha channel for the destination surface for this blit.

DDBLT\_ALPHADESTNEG

The destination surface becomes more transparent as the alpha value increases (0 is opaque).

DDBLT\_ALPHADESTSURFACEOVERRIDE

Uses the **lpDDSAlphaDest** member of the **DDBLTFX** structure as the alpha channel for the destination surface for this blit.

DDBLT\_ALPHAEDGEBLEND

Uses the **dwAlphaEdgeBlend** member of the **DDBLTFX** structure as the alpha channel for the edges of the image that border the color key colors.

DDBLT\_ALPHASRC

Uses either the alpha information in pixel format or the alpha channel surface attached to the source surface as the alpha channel for this blit.

DDBLT\_ALPHASRCCONSTOVERRIDE

Uses the **dwAlphaSrcConst** member of the **DDBLTFX** structure as the source alpha channel for this blit.

DDBLT\_ALPHASRCNEG

The source surface becomes more transparent as the alpha value increases (0 is opaque).

DDBLT\_ALPHASRCSURFACEOVERRIDE

Uses the **lpDDSAlphaSrc** member of the **DDBLTFX** structure as the alpha channel source for this blit.

DDBLT\_ASYNC

Processes this blit asynchronously through the first in, first out (FIFO) hardware in the order received. If there is no room in the FIFO hardware, the call fails.

DDBLT\_COLORFILL

Uses the **dwFillColor** member of the **DDBLTFX** structure as the RGB color that fills the destination rectangle on the destination surface.

DDBLT\_DDFX

Uses the **dwDDFX** member of the **DDBLTFX** structure to specify the effects to be used for this blit.

DDBLT\_DDROPS

Uses the **dwDDROP** member of the **DDBLTFX** structure to specify the raster operations (ROPs) that are not part of the Win32 API.

DDBLT\_KEYDEST

Uses the color key associated with the destination surface.

DDBLT\_KEYDESTOVERRIDE

Uses the **ddckDestColorkey** member of the **DDBLTFX** structure as the color key for the destination surface.

DDBLT\_KEYSRC

Uses the color key associated with the source surface.

DDBLT\_KEYSRCOVERRIDE

Uses the **ddckSrcColorkey** member of the **DDBLTFX** structure as the color key for the source surface.

DDBLT\_ROP

Uses the **dwROP** member of the **DDBLTFX** structure for the ROP for this blit. The ROPs are the same as those defined in the Win32 API.

DDBLT\_ROTATIONANGLE

Uses the **dwRotationAngle** member of the **DDBLTFX** structure as the rotation angle (specified in 1/100s of a degree) for the surface.

DDBLT\_ZBUFFER

Performs a z-buffered blit, using the z-buffers attached to the source and destination surfaces and the **dwZBufferOpCode** member of the **DDBLTFX** structure as the z-buffer opcode.

DDBLT\_ZBUFFERDESTCONSTOVERRIDE

Performs a z-buffered blit, using the **dwZDestConst** and **dwZBufferOpCode** members of the **DDBLTFX** structure as the z-buffer and z-buffer opcode, respectively, for the destination.

DDBLT\_ZBUFFERDESTOVERRIDE

Performs a z-buffered blit, using the **lpDDSZBufferDest** and **dwZBufferOpCode** members of the **DDBLTFX** structure as the z-buffer and z-buffer opcode, respectively, for the destination.

DDBLT\_ZBUFFERSRCCONSTOVERRIDE

Performs a z-buffered blit, using the **dwZSrcConst** and **dwZBufferOpCode** members of the **DDBLTFX** structure as the z-buffer and z-buffer opcode, respectively, for the source.

DDBLT\_ZBUFFERSRCOVERRIDE

Performs a z-buffered blit, using the **lpDDSZBufferSrc** and **dwZBufferOpCode** members of the **DDBLTFX** structure as the z-buffer and z-buffer opcode, respectively, for the source.

**lpDDBltFx**

Address of a **DDBLTFX** structure specifying additional blit effects.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDBLTFX

The **DDBLTFX** structure passes raster operations (ROPs), effects, and override information to the **IDirectDrawSurface7::Blt** method. This structure is also part of the **DDBLTBATCH** structure used with the **IDirectDrawSurface7::BltBatch** method.

typedef struct \_DDBLTFX{

DWORD dwSize;

DWORD dwDDFX;

DWORD dwROP;

DWORD dwDDROP;

DWORD dwRotationAngle;

DWORD dwZBufferOpCode;

DWORD dwZBufferLow;

DWORD dwZBufferHigh;

DWORD dwZBufferBaseDest;

DWORD dwZDestConstBitDepth;

union

{

DWORD dwZDestConst;

LPDIRECTDRAWSURFACE lpDDSZBufferDest;

} DUMMYUNIONNAMEN(1);

DWORD dwZSrcConstBitDepth;

union

{

DWORD dwZSrcConst;

LPDIRECTDRAWSURFACE lpDDSZBufferSrc;

} DUMMYUNIONNAMEN(2);

DWORD dwAlphaEdgeBlendBitDepth;

DWORD dwAlphaEdgeBlend;

DWORD dwReserved;

DWORD dwAlphaDestConstBitDepth;

union

{

DWORD dwAlphaDestConst;

LPDIRECTDRAWSURFACE lpDDSAlphaDest;

} DUMMYUNIONNAMEN(3);

DWORD dwAlphaSrcConstBitDepth;

union

{

DWORD dwAlphaSrcConst;

LPDIRECTDRAWSURFACE lpDDSAlphaSrc;

} DUMMYUNIONNAMEN(4);

union

{

DWORD dwFillColor;

DWORD dwFillDepth;

DWORD dwFillPixel;

LPDIRECTDRAWSURFACE lpDDSPattern;

} DUMMYUNIONNAMEN(5);

DDCOLORKEY ddckDestColorkey;

DDCOLORKEY ddckSrcColorkey;

} DDBLTFX,FAR\* LPDDBLTFX;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure is used.

**dwDDFX**

Type of FX operations. The following types are defined:

DDBLTFX\_ARITHSTRETCHY

Uses arithmetic stretching along the y-axis for this blit.

DDBLTFX\_MIRRORLEFTRIGHT

Turns the surface on its y-axis. This blit mirrors the surface from left to right.

DDBLTFX\_MIRRORUPDOWN

Turns the surface on its x-axis. This blit mirrors the surface from top to bottom.

DDBLTFX\_NOTEARING

Schedules this blit to avoid tearing.

DDBLTFX\_ROTATE180

Rotates the surface 180 degrees clockwise during this blit.

DDBLTFX\_ROTATE270

Rotates the surface 270 degrees clockwise during this blit.

DDBLTFX\_ROTATE90

Rotates the surface 90 degrees clockwise during this blit.

DDBLTFX\_ZBUFFERBASEDEST

Adds the **dwZBufferBaseDest** member to each of the source z-values before comparing them with the destination z-values during this z-blit.

DDBLTFX\_ZBUFFERRANGE

Uses the **dwZBufferLow** and **dwZBufferHigh** members as range values to specify limits to the bits copied from a source surface during this z-blit.

**dwROP**

Win32 raster operations. You can retrieve a list of supported raster operations by calling the **IDirectDraw7::GetCaps** method.

**dwDDROP**

DirectDraw raster operations.

**dwRotationAngle**

Rotation angle for the blit.

**dwZBufferOpCode**

Z-buffer compares.

**dwZBufferLow**

Low limit of a z-buffer.

**dwZBufferHigh**

High limit of a z-buffer.

**dwZBufferBaseDest**

Destination base value of a z-buffer.

**dwZDestConstBitDepth**

Bit depth of the destination z-constant.

**dwZDestConst**

Constant used as the z-buffer destination.

**lpDDSZBufferDest**

Surface used as the z-buffer destination.

**dwZSrcConstBitDepth**

Bit depth of the source z-constant.

**dwZSrcConst**

Constant used as the z-buffer source.

**lpDDSZBufferSrc**

Surface used as the z-buffer source.

**dwAlphaEdgeBlendBitDepth**

Bit depth of the constant for an alpha edge blend.

**dwAlphaEdgeBlend**

Alpha constant used for edge blending.

**dwReserved**

Reserved for future use.

**dwAlphaDestConstBitDepth**

Bit depth of the destination alpha constant.

**dwAlphaDestConst**

Constant used as the alpha channel destination.

**lpDDSAlphaDest**

Surface used as the alpha channel destination.

**dwAlphaSrcConstBitDepth**

Bit depth of the source alpha constant.

**dwAlphaSrcConst**

Constant used as the alpha channel source.

**lpDDSAlphaSrc**

Surface used as the alpha channel source.

**dwFillColor**

Color used to fill a surface when DDBLT\_COLORFILL is specified. This value must be a pixel appropriate to the pixel format of the destination surface. For a palettized surface, it would be a palette index, and for a 16-bit RGB surface, it would be a 16-bit pixel value.

**dwFillDepth**

Depth value for the z-buffer.

**dwFillPixel**

Pixel value for RGBA or RGBZ fills. Applications that use RGBZ fills should use this member, not **dwFillColor** or **dwFillDepth**.

**lpDDSPattern**

Surface to use as a pattern. The pattern can be used in certain blit operations that combine a source and a destination.

**ddckDestColorkey**

Destination color key override.

**ddckSrcColorkey**

Source color key override.

Remarks

The unions in this structure have been updated to work with compilers that do not support nameless unions. If your compiler does not support nameless unions, define the NONAMELESSUNION token before including the Ddraw.h header file.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDCAPS

The **DDCAPS** structure represents the capabilities of the hardware exposed through the DirectDraw object. This structure contains a **DDSCAPS** structure used in this context to describe what kinds of DirectDrawSurface objects can be created. It might not be possible to create all the surfaces described by these capabilities simultaneously. This structure is used with the **IDirectDraw7::GetCaps** method.

The Ddraw.h header file contains multiple versions of this structure. For more information, see Remarks.

typedef struct \_DDCAPS {

DWORD dwSize;

DWORD dwCaps;

DWORD dwCaps2;

DWORD dwCKeyCaps;

DWORD dwFXCaps;

DWORD dwFXAlphaCaps;

DWORD dwPalCaps;

DWORD dwSVCaps;

DWORD dwAlphaBltConstBitDepths;

DWORD dwAlphaBltPixelBitDepths;

DWORD dwAlphaBltSurfaceBitDepths;

DWORD dwAlphaOverlayConstBitDepths;

DWORD dwAlphaOverlayPixelBitDepths;

DWORD dwAlphaOverlaySurfaceBitDepths;

DWORD dwZBufferBitDepths;

DWORD dwVidMemTotal;

DWORD dwVidMemFree;

DWORD dwMaxVisibleOverlays;

DWORD dwCurrVisibleOverlays;

DWORD dwNumFourCCCodes;

DWORD dwAlignBoundarySrc;

DWORD dwAlignSizeSrc;

DWORD dwAlignBoundaryDest;

DWORD dwAlignSizeDest;

DWORD dwAlignStrideAlign;

DWORD dwRops[DD\_ROP\_SPACE];

DDSCAPS ddsOldCaps;

DWORD dwMinOverlayStretch;

DWORD dwMaxOverlayStretch;

DWORD dwMinLiveVideoStretch;

DWORD dwMaxLiveVideoStretch;

DWORD dwMinHwCodecStretch;

DWORD dwMaxHwCodecStretch;

DWORD dwReserved1;

DWORD dwReserved2;

DWORD dwReserved3;

DWORD dwSVBCaps;

DWORD dwSVBCKeyCaps;

DWORD dwSVBFXCaps;

DWORD dwSVBRops[DD\_ROP\_SPACE];

DWORD dwVSBCaps;

DWORD dwVSBCKeyCaps;

DWORD dwVSBFXCaps;

DWORD dwVSBRops[DD\_ROP\_SPACE];

DWORD dwSSBCaps;

DWORD dwSSBCKeyCaps;

DWORD dwSSBFXCaps;

DWORD dwSSBRops[DD\_ROP\_SPACE];

DWORD dwMaxVideoPorts;

DWORD dwCurrVideoPorts;

DWORD dwSVBCaps2;

DWORD dwNLVBCaps;

DWORD dwNLVBCaps2;

DWORD dwNLVBCKeyCaps;

DWORD dwNLVBFXCaps;

DWORD dwNLVBRops[DD\_ROP\_SPACE];

DDSCAPS2 ddsCaps;

} DDCAPS,FAR\* LPDDCAPS;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure is used.

**dwCaps**

The following driver-specific capabilities:

DDCAPS\_3D

The display hardware has 3-D acceleration.

DDCAPS\_ALIGNBOUNDARYDEST

DirectDraw supports only those overlay destination rectangles with the x-axis aligned to the **dwAlignBoundaryDest** boundaries of the surface.

DDCAPS\_ALIGNBOUNDARYSRC

DirectDraw supports only those overlay source rectangles with the x-axis aligned to the **dwAlignBoundarySrc** boundaries of the surface.

DDCAPS\_ALIGNSIZEDEST

DirectDraw supports only those overlay destination rectangles whose x-axis sizes, in pixels, are **dwAlignSizeDest** multiples.

DDCAPS\_ALIGNSIZESRC

DirectDraw supports only those overlay source rectangles whose x-axis sizes, in pixels, are **dwAlignSizeSrc** multiples.

DDCAPS\_ALIGNSTRIDE

DirectDraw creates display memory surfaces that have a stride alignment equal to the **dwAlignStrideAlign** value.

DDCAPS\_ALPHA

The display hardware supports alpha-only surfaces. (See alpha channel)

DDCAPS\_BANKSWITCHED

The display hardware is bank-switched and is potentially very slow at random access to display memory.

DDCAPS\_BLT

Display hardware is capable of blit operations.

DDCAPS\_BLTCOLORFILL

Display hardware is capable of color filling with a blitter.

DDCAPS\_BLTDEPTHFILL

Display hardware is capable of depth filling z-buffers with a blitter.

DDCAPS\_BLTFOURCC

Display hardware is capable of color-space conversions during blit operations.

DDCAPS\_BLTQUEUE

Display hardware is capable of asynchronous blit operations.

DDCAPS\_BLTSTRETCH

Display hardware is capable of stretching during blit operations.

DDCAPS\_CANBLTSYSMEM

Display hardware is capable of blitting to or from system memory.

DDCAPS\_CANCLIP

Display hardware is capable of clipping with blitting.

DDCAPS\_CANCLIPSTRETCHED

Display hardware is capable of clipping while stretch blitting.

DDCAPS\_COLORKEY

Supports some form of color key in either overlay or blit operations. More specific color-key capability information can be found in the **dwCKeyCaps** member.

DDCAPS\_COLORKEYHWASSIST

The color key is partially hardware-assisted. This means that other resources (CPU or video memory) might be used. If this bit is not set, full hardware support is in place.

DDCAPS\_GDI

Display hardware is shared with GDI.

DDCAPS\_NOHARDWARE

There is no hardware support.

DDCAPS\_OVERLAY

Display hardware supports overlays.

DDCAPS\_OVERLAYCANTCLIP

Display hardware supports overlays but cannot clip them.

DDCAPS\_OVERLAYFOURCC

Overlay hardware is capable of color-space conversions during overlay operations.

DDCAPS\_OVERLAYSTRETCH

Overlay hardware is capable of stretching. The **dwMinOverlayStretch** and **dwMaxOverlayStretch** members contain valid data.

DDCAPS\_PALETTE

DirectDraw is capable of creating and supporting DirectDrawPalette objects for surfaces other than the primary surface.

DDCAPS\_PALETTEVSYNC

DirectDraw is capable of updating a palette synchronized with the vertical refresh.

DDCAPS\_READSCANLINE

Display hardware is capable of returning the current scan line.

DDCAPS\_VBI

Display hardware is capable of generating a vertical-blank interrupt.

DDCAPS\_ZBLTS

Supports the use of z-buffers with blit operations.

DDCAPS\_ZOVERLAYS

Supports the use of the **IDirectDrawSurface7::UpdateOverlayZOrder** method as a z-value for overlays to control their layering.

**dwCaps2**

The following driver-specific capabilities:

DDCAPS2\_AUTOFLIPOVERLAY

The overlay can be automatically flipped to the next surface in the flipping chain each time that a video port VSYNC occurs, allowing the video port and the overlay to double-buffer the video without CPU overhead. This option is only valid when the surface is receiving data from a video port. If the video port data is noninterlaced or noninterleaved, it flips on every VSYNC. If the data is being interleaved in memory, it flips on every other VSYNC.

DDCAPS2\_CANBOBHARDWARE

The overlay hardware can display each field of an interlaced video stream individually.

DDCAPS2\_CANBOBINTERLEAVED

The overlay hardware can display each field of an interlaced video stream individually while it is interleaved in memory without causing any artifacts that might normally occur without special hardware support. This option is only valid when the surface is receiving data from a video port and the video is zoomed at least twice in the vertical direction.

DDCAPS2\_CANBOBNONINTERLEAVED

The overlay hardware can display each field of an interlaced video stream individually while it is not interleaved in memory without causing any artifacts that might normally occur without special hardware support. This option is only valid when the surface is receiving data from a video port and the video is zoomed at least twice in the vertical direction.

DDCAPS2\_CANCALIBRATEGAMMA

The system has a calibrator installed that can automatically adjust the gamma ramp so that the result is identical on all systems that have a calibrator. To invoke the calibrator when setting new gamma levels, use the DDSGR\_CALIBRATE flag when calling the **IDirectDrawGammaControl::SetGammaRamp** method. Calibrating gamma ramps incurs some processing overhead and should not be used frequently.

DDCAPS2\_CANDROPZ16BIT

Sixteen-bit RGBZ values can be converted into 16-bit RGB values. (The system does not support 8-bit conversions.)

DDCAPS2\_CANFLIPODDEVEN

The driver is capable of performing odd and even flip operations, as specified by the DDFLIP\_ODD and DDFLIP\_EVEN flags used with the **IDirectDrawSurface7::Flip** method.

DDCAPS2\_CANMANAGETEXTURE

The Direct3D texture manager uses this capability to decide whether to put managed surfaces in nonlocal video memory. If the capability is set, the texture manager puts managed surfaces in nonlocal video memory. Drivers that cannot texture from local video memory should not set this capability.

DDCAPS2\_CANRENDERWINDOWED

The driver is capable of rendering in windowed mode.

DDCAPS2\_CERTIFIED

Display hardware is certified.

DDCAPS2\_COLORCONTROLPRIMARY

The primary surface contains color controls (for instance, gamma)

DDCAPS2\_COLORCONTROLOVERLAY

The overlay surface contains color controls (such as brightness and sharpness)

DDCAPS2\_COPYFOURCC

The driver supports blitting any FOURCC surface to another surface of the same FOURCC.

DDCAPS2\_FLIPINTERVAL

The driver responds to the DDFLIP\_INTERVAL\* flags. (see **IDirectDrawSurface7::Flip**).

DDCAPS2\_FLIPNOVSYNC

The driver responds to the DDFLIP\_NOVSYNC flag (see **IDirectDrawSurface7::Flip**).

DDCAPS2\_NO2DDURING3DSCENE

Two-dimensional operations such as **IDirectDrawSurface7::Blt** and **IDirectDrawSurface7::Lock** cannot be performed on any surfaces that Direct3D is using between calls to the **IDirect3DDevice7::BeginScene** and **IDirect3DDevice7::EndScene** methods.

DDCAPS2\_NONLOCALVIDMEM

The display driver supports surfaces in nonlocal video memory.

DDCAPS2\_NONLOCALVIDMEMCAPS

Blit capabilities for nonlocal video-memory surfaces differ from local video-memory surfaces. If this flag is present, the DDCAPS2\_NONLOCALVIDMEM flag is also present.

DDCAPS2\_NOPAGELOCKREQUIRED

DMA blit operations are supported on system-memory surfaces that are not page-locked.

DDCAPS2\_PRIMARYGAMMA

Supports dynamic gamma ramps for the primary surface. For more information, see Gamma and Color Controls.

DDCAPS2\_STEREO

New for DirectX 7.0. Turns on the ddcaps.dwSVCaps bit to support stereo mode. The driver can do stereo in at least one mode other than the current mode. The application can use **IDirectDraw7::GetDisplayMode** or **IDirectDraw7::EnumDisplayModes** to get per-mode stereo information.

DDCAPS2\_TEXMANINNONLOCALVIDMEM

New for DirectX 7.0. The Direct3D texture manager uses this capability to decide whether to put managed surfaces in nonlocal video memory. If the capability is set, the texture manager puts managed surfaces in nonlocal video memory. Drivers that cannot texture from local video memory should not set this capability.

DDCAPS2\_VIDEOPORT

Display hardware supports live video.

DDCAPS2\_WIDESURFACES

The display surface supports surfaces wider than the primary surface.

**dwCKeyCaps**

The following color-key capabilities:

DDCKEYCAPS\_DESTBLT

Supports transparent blitting with a color key that identifies the replaceable bits of the destination surface for RGB colors.

DDCKEYCAPS\_DESTBLTCLRSPACE

Supports transparent blitting with a color space that identifies the replaceable bits of the destination surface for RGB colors.

DDCKEYCAPS\_DESTBLTCLRSPACEYUV

Supports transparent blitting with a color space that identifies the replaceable bits of the destination surface for YUV colors.

DDCKEYCAPS\_DESTBLTYUV

Supports transparent blitting with a color key that identifies the replaceable bits of the destination surface for YUV colors.

DDCKEYCAPS\_DESTOVERLAY

Supports overlaying with color keying of the replaceable bits of the destination surface to be overlaid for RGB colors.

DDCKEYCAPS\_DESTOVERLAYCLRSPACE

Supports a color space as the color key for the destination of RGB colors.

DDCKEYCAPS\_DESTOVERLAYCLRSPACEYUV

Supports a color space as the color key for the destination of YUV colors.

DDCKEYCAPS\_DESTOVERLAYONEACTIVE

Supports only one active destination color key value for visible overlay surfaces .

DDCKEYCAPS\_DESTOVERLAYYUV

Supports overlaying, using color keying of the replaceable bits of the destination surface to be overlaid for YUV colors.

DDCKEYCAPS\_NOCOSTOVERLAY

Indicates that there are no bandwidth trade-offs for using the color key with an overlay.

DDCKEYCAPS\_SRCBLT

Supports transparent blitting, using the color key for the source with this surface for RGB colors.

DDCKEYCAPS\_SRCBLTCLRSPACE

Supports transparent blitting, using a color space for the source with this surface for RGB colors.

DDCKEYCAPS\_SRCBLTCLRSPACEYUV

Supports transparent blitting, using a color space for the source with this surface for YUV colors.

DDCKEYCAPS\_SRCBLTYUV

Supports transparent blitting, using the color key for the source with this surface for YUV colors.

DDCKEYCAPS\_SRCOVERLAY

Supports overlaying, using the color key for the source with this overlay surface for RGB colors.

DDCKEYCAPS\_SRCOVERLAYCLRSPACE

Supports overlaying, using a color space as the source color key for the overlay surface for RGB colors.

DDCKEYCAPS\_SRCOVERLAYCLRSPACEYUV

Supports overlaying, using a color space as the source color key for the overlay surface for YUV colors.

DDCKEYCAPS\_SRCOVERLAYONEACTIVE

Supports only one active source color key value for visible overlay surfaces.

DDCKEYCAPS\_SRCOVERLAYYUV

Supports overlaying, using the color key for the source with this overlay surface for YUV colors.

**dwFXCaps**

The following driver-specific stretching and effects capabilities:

DDFXCAPS\_BLTALPHA

Supports alpha-blended blit operations.

DDFXCAPS\_BLTARITHSTRETCHY

Uses arithmetic operations, rather than pixel-doubling techniques, to stretch and shrink surfaces during a blit operation. Occurs along the y-axis (vertically).

DDFXCAPS\_BLTARITHSTRETCHYN

Uses arithmetic operations, rather than pixel-doubling techniques, to stretch and shrink surfaces during a blit operation. Occurs along the y-axis (vertically), and works only for integer stretching (1, 2, and so on).

DDFXCAPS\_BLTFILTER

Driver can do surface-reconstruction filtering for warped blits.

DDFXCAPS\_BLTMIRRORLEFTRIGHT

Supports mirroring left to right in a blit operation.

DDFXCAPS\_BLTMIRRORUPDOWN

Supports mirroring top to bottom in a blit operation.

DDFXCAPS\_BLTROTATION

Supports arbitrary rotation in a blit operation.

DDFXCAPS\_BLTROTATION90

Supports 90-degree rotations in a blit operation.

DDFXCAPS\_BLTSHRINKX

Supports arbitrary shrinking of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSHRINKXN

Supports integer shrinking (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSHRINKY

Supports arbitrary shrinking of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTSHRINKYN

Supports integer shrinking (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHX

Supports arbitrary stretching of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHXN

Supports integer stretching (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHY

Supports arbitrary stretching of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHYN

Supports integer stretching (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTTRANSFORM

Supports geometric transformations (or warps) for blitted sprites. Transformations are not currently supported for explicit blit operations.

DDFXCAPS\_OVERLAYALPHA

Supports alpha blending for overlay surfaces.

DDFXCAPS\_OVERLAYARITHSTRETCHY

Uses arithmetic operations, rather than pixel-doubling techniques, to stretch and shrink overlay surfaces. Occurs along the y-axis (vertically).

DDFXCAPS\_OVERLAYARITHSTRETCHYN

Uses arithmetic operations, rather than pixel-doubling techniques, to stretch and shrink overlay surfaces. Occurs along the y-axis (vertically), and works only for integer stretching (1, 2, and so on).

DDFXCAPS\_OVERLAYFILTER

Supports surface-reconstruction filtering for warped overlay sprites. Filtering is not currently supported for explicitly displayed overlay surfaces (those displayed with calls to **IDirectDrawSurface7::UpdateOverlay**).

DDFXCAPS\_OVERLAYMIRRORLEFTRIGHT

Supports mirroring of overlays across the vertical axis.

DDFXCAPS\_OVERLAYMIRRORUPDOWN

Supports mirroring of overlays across the horizontal axis.

DDFXCAPS\_OVERLAYSHRINKX

Supports arbitrary shrinking of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSHRINKXN

Supports integer shrinking (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSHRINKY

Supports arbitrary shrinking of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSHRINKYN

Supports integer shrinking (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSTRETCHX

Supports arbitrary stretching of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYSTRETCHXN

Supports integer stretching (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYSTRETCHY

Supports arbitrary stretching of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYSTRETCHYN

Supports integer stretching (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYTRANSFORM

Supports geometric transformations (or warps) for overlay sprites. Transformations are not currently supported for explicitly displayed overlay surfaces (those displayed with calls to **IDirectDrawSurface7::UpdateOverlay**).

**dwFXAlphaCaps**

The following driver-specific alpha capabilities:

DDFXALPHACAPS\_BLTALPHAEDGEBLEND

Supports alpha blending around the edge of a source color-keyed surface. Used for blit operations.

DDFXALPHACAPS\_BLTALPHAPIXELS

Supports alpha information in pixel format. The bit depth of alpha information in the pixel format can be 1, 2, 4, or 8. The alpha value becomes more opaque as the alpha value increases. Regardless of the depth of the alpha information, 0 is always the fully transparent value. Used for blit operations.

DDFXALPHACAPS\_BLTALPHAPIXELSNEG

Supports alpha information in pixel format. The bit depth of alpha information in the pixel format can be 1, 2, 4, or 8. The alpha value becomes more transparent as the alpha value increases. Regardless of the depth of the alpha information, 0 is always the fully opaque value. This flag can be used only if DDCAPS\_ALPHA is set. Used for blit operations.

DDFXALPHACAPS\_BLTALPHASURFACES

Supports alpha-only surfaces. The bit depth of an alpha-only surface can be 1, 2, 4, or 8. The alpha value becomes more opaque as the alpha value increases. Regardless of the depth of the alpha information, 0 is always the fully transparent value. Used for blit operations.

DDFXALPHACAPS\_BLTALPHASURFACESNEG

Indicates that the alpha channel becomes more transparent as the alpha value increases. The depth of the alpha channel-data can be 1, 2, 4, or 8. Regardless of the depth of the alpha information, 0 is always the fully opaque value. This flag can be set only if DDCAPS\_ALPHA has been set. Used for blit operations.

DDFXALPHACAPS\_OVERLAYALPHAEDGEBLEND

Supports alpha blending around the edge of a source color-keyed surface. Used for overlays.

DDFXALPHACAPS\_OVERLAYALPHAPIXELS

Supports alpha information in pixel format. The bit depth of alpha information in pixel format can be 1, 2, 4, or 8. The alpha value becomes more opaque as the alpha value increases. Regardless of the depth of the alpha information, 0 is always the fully transparent value. Used for overlays.

DDFXALPHACAPS\_OVERLAYALPHAPIXELSNEG

Supports alpha information in pixel format. The bit depth of alpha information in pixel format can be 1, 2, 4, or 8. The alpha value becomes more transparent as the alpha value increases. Regardless of the depth of the alpha information, 0 is always the fully opaque value. This flag can be used only if DDCAPS\_ALPHA has been set. Used for overlays.

DDFXALPHACAPS\_OVERLAYALPHASURFACES

Supports alpha-only surfaces. The bit depth of an alpha-only surface can be 1, 2, 4, or 8. The alpha value becomes more opaque as the alpha value increases. Regardless of the depth of the alpha information, 0 is always the fully transparent value. Used for overlays.

DDFXALPHACAPS\_OVERLAYALPHASURFACESNEG

Indicates that the alpha channel becomes more transparent as the alpha value increases. The depth of the alpha-channel data can be 1, 2, 4, or 8. Regardless of the depth of the alpha information, 0 is always the fully opaque value. This flag can be used only if DDCAPS\_ALPHA has been set. Used for overlays.

**dwPalCaps**

The following palette capabilities:

DDPCAPS\_1BIT

Supports palettes that contain 1-bit color entries (two colors).

DDPCAPS\_2BIT

Supports palettes that contain 2-bit color entries (four colors).

DDPCAPS\_4BIT

Supports palettes that contain 4-bit color entries (16 colors).

DDPCAPS\_8BIT

Supports palettes that contain 8-bit color entries (256 colors).

DDPCAPS\_8BITENTRIES

Specifies an index to an 8-bit color index. This field is valid only when used with the DDPCAPS\_1BIT, DDPCAPS\_2BIT, or DDPCAPS\_4BIT capability and when the target surface is 8 bits per pixel (bpp). Each color entry is 1 byte long and is an index to an 8-bpp palette on the destination surface.

DDPCAPS\_ALPHA

Supports palettes that include an alpha component. For alpha-capable palettes, the **peFlags** member of each **PALETTEENTRY** structure that the palette contains is to be interpreted as a single 8-bit alpha value (in addition to the color data in the **peRed**, **peGreen**, and **peBlue** members). A palette created with this flag can be attached only to a texture surface.

DDPCAPS\_ALLOW256

Supports palettes that can have all 256 entries defined.

DDPCAPS\_PRIMARYSURFACE

The palette is attached to the primary surface. Changing the palette has an immediate effect on the display unless the DDPCAPS\_VSYNC capability is specified and supported.

DDPCAPS\_PRIMARYSURFACELEFT

The palette is attached to the primary surface on the left. Changing the palette has an immediate effect on the display unless the DDPCAPS\_VSYNC capability is specified and supported.

DDPCAPS\_VSYNC

The palette can be modified synchronously with the monitor's refresh rate.

**dwSVCaps**

The following stereo-vision capabilities:

DDSVCAPS\_RESERVED1, DDSVCAPS\_RESERVED2, DDSVCAPS\_RESERVED3, DDSVCAPS\_RESERVED4

Reserved flags.

DDSVCAPS\_STEREOSEQUENTIAL

New for DirectX 7.0. The driver can do stereo in at least one mode other than the current mode. The application can use **IDirectDraw7::GetDisplayMode** or **IDirectDraw7::EnumDisplayModes** to get per-mode stereo information.

**dwAlphaBltConstBitDepths**

DDBD\_2, DDBD\_4, or DDBD\_8. (Indicate 2, 4, or 8 bits per pixel.)

**dwAlphaBltPixelBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicate 1, 2, 4, or 8 bits per pixel.)

**dwAlphaBltSurfaceBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicate 1, 2, 4, or 8 bits per pixel.)

**dwAlphaOverlayConstBitDepths**

DDBD\_2, DDBD\_4, or DDBD\_8. (Indicate 2, 4, or 8 bits per pixel.)

**dwAlphaOverlayPixelBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicate 1, 2, 4, or 8 bits per pixel.)

**dwAlphaOverlaySurfaceBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicate 1, 2, 4, or 8 bits per pixel.)

**dwZBufferBitDepths**

DDBD\_8, DDBD\_16, DDBD\_24, or DDBD\_32. (Indicate 8, 16, 24, or 32 bits per pixel.) This member is obsolete for DirectX 6.0 and later. Use the **IDirect3D7::EnumZBufferFormats** to retrieve information about supported depth buffer formats.

**dwVidMemTotal**

Total amount of display memory on the device, in bytes, minus memory reserved for the primary surface and any private data structures reserved by the driver. (This value is the same as the total video memory reported by the **IDirectDraw7::GetAvailableVidMem** method.)

**dwVidMemFree**

Free display memory. This value equals the value in **dwVidMemTotal**, minus any memory currently allocated by the application for surfaces. Unlike the **GetAvailableVidMem** method, which reports the memory available for a particular type of surface (such as a texture), this value reflects the memory available for any type of surface.

**dwMaxVisibleOverlays**

Maximum number of visible overlays or overlay sprites.

**dwCurrVisibleOverlays**

Current number of visible overlays or overlay sprites.

**dwNumFourCCCodes**

Number of FourCC codes.

**dwAlignBoundarySrc**

Source-rectangle alignment for an overlay surface, in pixels.

**dwAlignSizeSrc**

Source-rectangle size alignment for an overlay surface, in pixels. Overlay source rectangles must have a pixel width that is a multiple of this value.

**dwAlignBoundaryDest**

Destination-rectangle alignment for an overlay surface, in pixels.

**dwAlignSizeDest**

Destination-rectangle size alignment for an overlay surface, in pixels. Overlay destination rectangles must have a pixel width that is a multiple of this value.

**dwAlignStrideAlign**

Stride alignment.

**dwRops[DD\_ROP\_SPACE]**

Raster operations supported.

**ddsOldCaps**

Obsolete. Prior to DirectX 6.0, this member contained general surface capabilities, which are now contained in the **ddsCaps** member (a **DDSCAPS2** structure).

**dwMinOverlayStretch** and **dwMaxOverlayStretch**

Minimum and maximum overlay stretch factors, multiplied by 1000. For example, 1.3 = 1300.

**dwMinLiveVideoStretch** and **dwMaxLiveVideoStretch**

Obsolete; do not use.

**dwMinHwCodecStretch** and **dwMaxHwCodecStretch**

Obsolete; do not use.

**dwReserved1**, **dwReserved2**, and **dwReserved3**

Reserved for future use.

**dwSVBCaps**

Driver-specific capabilities for blits from system memory to display memory. Valid flags are identical to the blit-related flags used with the **dwCaps** member.

**dwSVBCKeyCaps**

Driver color-key capabilities for blits from system memory to display memory. Valid flags are identical to the blit-related flags used with the **dwCKeyCaps** member.

**dwSVBFXCaps**

Driver FX capabilities for blits from system memory to display memory. Valid flags are identical to the blit-related flags used with the **dwFXCaps** member.

**dwSVBRops[DD\_ROP\_SPACE]**

Raster operations supported for blits from system memory to display memory.

**dwVSBCaps**

Driver-specific capabilities for blits from display memory to system memory. Valid flags are identical to the blit-related flags used with the **dwCaps** member.

**dwVSBCKeyCaps**

Driver color-key capabilities for blits from display memory to system memory. Valid flags are identical to the blit-related flags used with the **dwCKeyCaps** member.

**dwVSBFXCaps**

Driver FX capabilities for blits from display memory to system memory. Valid flags are identical to the blit-related flags used with the **dwFXCaps** member.

**dwVSBRops[DD\_ROP\_SPACE]**

Raster operations supported for blits from display memory to system memory.

**dwSSBCaps**

Driver-specific capabilities for blits from system memory to system memory. Valid flags are identical to the blit-related flags used with the **dwCaps** member.

**dwSSBCKeyCaps**

Driver color-key capabilities for blits from system memory to system memory. Valid flags are identical to the blit-related flags used with the **dwCKeyCaps** member.

**dwSSBFXCaps**

Driver FX capabilities for blits from system memory to system memory. Valid flags are identical to the blit-related flags used with the **dwFXCaps** member.

**dwSSBRops[DD\_ROP\_SPACE]**

Raster operations supported for blits from system memory to system memory.

**dwMaxVideoPorts**

Maximum number of live video ports.

**dwCurrVideoPorts**

Current number of live video ports.

**dwSVBCaps2**

More driver-specific capabilities for blits from system memory to video memory. Valid flags are identical to the blit-related flags used with the **dwCaps2** member.

**dwNLVBCaps**

Driver-specific capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **dwCaps** member.

**dwNLVBCaps2**

More driver-specific capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **dwCaps2** member.

**dwNLVBCKeyCaps**

Driver color-key capabilities for blits form nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **dwCKeyCaps** member.

**dwNLVBFXCaps**

Driver FX capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **dwFXCaps** member.

**dwNLVBRops[DD\_ROP\_SPACE]**

Raster operations supported for blits from nonlocal to local video memory.

**ddsCaps**

**DDSCAPS2** structure with general surface capabilities.

Remarks

For backward compatibility, the Ddraw.h header file contains multiple definitions of the **DDCAPS** structure. The version that passes the preprocessor is determined by the value of the DIRECTDRAW\_VERSION constant. For details, see Component Version Constants.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDCOLORCONTROL

The **DDCOLORCONTROL** structure defines the color controls associated with a DirectDrawVideoPortObject, an overlay surface, or a primary surface.

typedef struct \_DDCOLORCONTROL {

DWORD dwSize;

DWORD dwFlags;

LONG lBrightness;

LONG lContrast;

LONG lHue;

LONG lSaturation;

LONG lSharpness;

LONG lGamma;

LONG lColorEnable;

DWORD dwReserved1;

} DDCOLORCONTROL, FAR \*LPDDCOLORCONTROL;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure can be used.

**dwFlags**

The following flags specifying which structure members contain valid data . When the structure is returned by the **IDirectDrawColorControl::GetColorControls** method, it also indicates which options are supported by the device.

DDCOLOR\_BRIGHTNESS

The **lBrightness** member contains valid data.

DDCOLOR\_COLORENABLE

The **lColorEnable** member contains valid data.

DDCOLOR\_CONTRAST

The **lContrast** member contains valid data.

DDCOLOR\_GAMMA

The **lGamma** member contains valid data.

DDCOLOR\_HUE

The **lHue** member contains valid data.

DDCOLOR\_SATURATION

The **lSaturation** member contains valid data.

DDCOLOR\_SHARPNESS

The **lSharpness** member contains valid data.

**lBrightness**

Luminance intensity, in IRE units times 100. The valid range is from 0 through 10,000. The default is 750, which translates to 7.5 IRE.

**lContrast**

Relative difference between higher and lower intensity luminance values in IRE units times 100. The valid range is from 0 through 20,000. The default value is 10,000 (100 IRE). Higher values of contrast cause darker luminance values to tend toward black and lighter luminance values to tend toward white. Lower values of contrast cause all luminance values to move toward the middle of the scale.

**lHue**

Phase relationship of the chrominance components. Hue is specified in degrees, and the valid range is from –180 through 180, with a default of 0.

**lSaturation**

Color intensity, in IRE units times 100. The valid range is from 0 through 20,000. The default value is 10,000, which translates to 100 IRE.

**lSharpness**

Sharpness, in arbitrary units. The valid range is from 0 through 10, with a default of 5.

**lGamma**

Controls the amount of gamma correction applied to the luminance values. The valid range is from 1 through 500 gamma units, with a default of 1.

**lColorEnable**

Flag indicating whether color is used. If this member is 0, color is not used; if it is 1, color is used. The default value is 1.

**dwReserved1**

Reserved.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDCOLORKEY

The **DDCOLORKEY** structure describes a source color key, destination color key, or color space. A color key is specified if the low and high range values are the same. This structure is used with the **IDirectDrawSurface7::GetColorKey** and **IDirectDrawSurface7::SetColorKey** methods.

typedef struct \_DDCOLORKEY{

DWORD dwColorSpaceLowValue;

DWORD dwColorSpaceHighValue;

} DDCOLORKEY,FAR\* LPDDCOLORKEY;

Members

**dwColorSpaceLowValue**

Low value of the color range that is to be used as the color key.

**dwColorSpaceHighValue**

High value of the color range that is to be used as the color key.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDDEVICEIDENTIFIER2

The **DDDEVICEIDENTIFIER2** structure is passed to the **IDirectDraw7::GetDeviceIdentifier** method to obtain information about a device.

typedef struct tagDDDEVICEIDENTIFIER2 {

char szDriver[MAX\_DDDEVICEID\_STRING];

char szDescription[MAX\_DDDEVICEID\_STRING];

LARGE\_INTEGER liDriverVersion;

DWORD dwVendorId;

DWORD dwDeviceId;

DWORD dwSubSysId;

DWORD dwRevision;

GUID guidDeviceIdentifier;

DWORD dwWHQLLevel;

} DDDEVICEIDENTIFIER2, \* LPDDDEVICEIDENTIFIER2;

Members

**szDriver**

Name of the driver.

**szDescription**

Description of the driver.

**liDriverVersion**

Version of the driver. It is legal to do less than and greater than comparisons on all 64 bits. Caution should be exercised if you use this element to identify problematic drivers. Use **guidDeviceIdentifier** for this purpose.

The data takes the following form:

wProduct = HIWORD(liDriverVersion.HighPart)

wVersion = LOWORD(liDriverVersion.HighPart)

wSubVersion = HIWORD(liDriverVersion.LowPart)

wBuild = LOWORD(liDriverVersion.LowPart)

**dwVendorId**

Identifier of the manufacturer. Can be 0 if unknown.

**dwDeviceId**

Identifier of the type of chipset. Can be 0 if unknown.

**dwSubSysId**

Identifier of the subsystem. Typically, this means the particular board. Can be 0 if unknown.

**dwRevision**

Identifier of the revision level of the chipset. Can be 0 if unknown.

**guidDeviceIdentifier**

Unique identifier for the driver/chipset pair. Use this value if you want to track changes to the driver or chipset to reprofile the graphics subsystem. It can also be used to identify particular problematic drivers.

**dwWHQLLevel**

The Windows Hardware Quality Lab (WHQL) certification level for the device/driver pair.

Remarks

The values in **szDriver** and **szDescription** are for presentation to the user only. They should not be used to identify particular drivers because different strings might be associated with the same device, or the same driver from different vendors might be described differently.

The **dwVendorId, dwDeviceId**, **dwSubSysId**, and **dwRevision** members can be used to identify particular chipsets, but use extreme caution.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDGAMMARAMP

The **DDGAMMARAMP** structure contains red, green, and blue ramp data for the **IDirectDrawGammaControl::GetGammaRamp** and **IDirectDrawGammaControl::SetGammaRamp** methods.

typedef struct \_DDGAMMARAMP {

WORD red[256];

WORD green[256];

WORD blue[256];

} DDGAMMARAMP, FAR \* LPDDGAMMARAMP;

Members

**red**, **green**, and **blue**

Array of 256 **WORD** elements that describe the red, green, and blue gamma ramps.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

See Also

Gamma and Color Controls

DDOVERLAYFX

The **DDOVERLAYFX** structure passes override information to the **IDirectDrawSurface7::UpdateOverlay** method.

typedef struct \_DDOVERLAYFX{

DWORD dwSize;

DWORD dwAlphaEdgeBlendBitDepth;

DWORD dwAlphaEdgeBlend;

DWORD dwReserved;

DWORD dwAlphaDestConstBitDepth;

union

{

DWORD dwAlphaDestConst;

LPDIRECTDRAWSURFACE lpDDSAlphaDest;

} DUMMYUNIONNAMEN(1);

DWORD dwAlphaSrcConstBitDepth;

union

{

DWORD dwAlphaSrcConst;

LPDIRECTDRAWSURFACE lpDDSAlphaSrc;

} DUMMYUNIONNAMEN(2);

DDCOLORKEY dckDestColorkey;

DDCOLORKEY dckSrcColorkey;

DWORD dwDDFX;

DWORD dwFlags;

} DDOVERLAYFX,FAR \*LPDDOVERLAYFX;

Members

**dwSize**

Size of the structure, in bytes. This members must be initialized before the structure is used.

**dwAlphaEdgeBlendBitDepth**

Bit depth used to specify the constant for an alpha edge blend.

**dwAlphaEdgeBlend**

Constant to use as the alpha for an edge blend.

**dwReserved**

Reserved for future use.

**dwAlphaDestConstBitDepth**

Bit depth used to specify the alpha constant for a destination.

**dwAlphaDestConst**

Constant to use as the alpha channel for a destination.

**lpDDSAlphaDest**

Address of a surface to use as the alpha channel for a destination.

**dwAlphaSrcConstBitDepth**

Bit depth used to specify the alpha constant for a source.

**dwAlphaSrcConst**

Constant to use as the alpha channel for a source.

**lpDDSAlphaSrc**

Address of a surface to use as the alpha channel for a source.

**dckDestColorkey**

Destination color key override.

**dckSrcColorkey**

Source color key override.

**dwDDFX**

The following overlay FX flags:

DDOVERFX\_ARITHSTRETCHY

If stretching, use arithmetic stretching along the y-axis for this overlay.

DDOVERFX\_MIRRORLEFTRIGHT

Mirror the overlay around the vertical axis.

DDOVERFX\_MIRRORUPDOWN

Mirror the overlay around the horizontal axis.

**dwFlags**

Currently not used and must be set to 0.

Remarks

The unions in this structure have been updated to work with compilers that do not support nameless unions. If your compiler does not support nameless unions, define the NONAMELESSUNION token before including the Ddraw.h header file.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDPIXELFORMAT

The **DDPIXELFORMAT** structure describes the pixel format of a DirectDrawSurface object for the **IDirectDrawSurface7::GetPixelFormat** method.

typedef struct \_DDPIXELFORMAT{

DWORD dwSize;

DWORD dwFlags;

DWORD dwFourCC;

union

{

DWORD dwRGBBitCount;

DWORD dwYUVBitCount;

DWORD dwZBufferBitDepth;

DWORD dwAlphaBitDepth;

DWORD dwLuminanceBitCount;

DWORD dwBumpBitCount;

} DUMMYUNIONNAMEN(1);

union

{

DWORD dwRBitMask;

DWORD dwYBitMask;

DWORD dwStencilBitDepth;

DWORD dwLuminanceBitMask;

DWORD dwBumpDuBitMask;

} DUMMYUNIONNAMEN(2);

union

{

DWORD dwGBitMask;

DWORD dwUBitMask;

DWORD dwZBitMask;

DWORD dwBumpDvBitMask;

} DUMMYUNIONNAMEN(3);

union

{

DWORD dwBBitMask;

DWORD dwVBitMask;

DWORD dwStencilBitMask;

DWORD dwBumpLuminanceBitMask;

} DUMMYUNIONNAMEN(4);

union

{

DWORD dwRGBAlphaBitMask;

DWORD dwYUVAlphaBitMask;

DWORD dwLuminanceAlphaBitMask;

DWORD dwRGBZBitMask;

DWORD dwYUVZBitMask;

} DUMMYUNIONNAMEN(5);

} DDPIXELFORMAT, FAR\* LPDDPIXELFORMAT;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure is used.

**dwFlags**

The following optional control flags:

DDPF\_ALPHA

The pixel format describes an alpha-only surface.

DDPF\_ALPHAPIXELS

The surface has alpha channel information in the pixel format.

DDPF\_ALPHAPREMULT

The surface uses the premultiplied alpha format. That is, the color components in each pixel are premultiplied by the alpha component.

DDPF\_BUMPLUMINANCE

The luminance data in the pixel format is valid, and the **dwLuminanceBitMask** member describes valid luminance bits for a luminance-only or luminance-alpha surface.

DDPF\_BUMPDUDV

Bump-map data in the pixel format is valid. Bump-map information is in the **dwBumpBitCount**, **dwBumpDuBitMask**, **dwBumpDvBitMask**, and **dwBumpLuminanceBitMask** members.

DDPF\_COMPRESSED

The surface accepts pixel data in the specified format and compress it during the write operation.

DDPF\_FOURCC

The **dwFourCC** member is valid and contains a FOURCC code describing a non-RGB pixel format.

DDPF\_LUMINANCE

The pixel format describes a luminance-only or luminance-alpha surface.

DDPF\_PALETTEINDEXED1

DDPF\_PALETTEINDEXED2

DDPF\_PALETTEINDEXED4

DDPF\_PALETTEINDEXED8

The surface is 1-, 2-, 4-, or 8-bit color-indexed.

DDPF\_PALETTEINDEXEDTO8

The surface is 1-, 2-, or 4-bit color-indexed to an 8-bit palette.

DDPF\_RGB

The RGB data in the pixel format structure is valid.

DDPF\_RGBTOYUV

The surface accepts RGB data and translates it during the write operation to YUV data. The format of the data to be written is contained in the pixel format structure. The DDPF\_RGB flag is set.

DDPF\_STENCILBUFFER

The surface encodes stencil and depth information in each pixel of the z-buffer. This flag can be used only if the DDPF\_ZBUFFER flag is also specified.

DDPF\_YUV

The YUV data in the pixel format structure is valid.

DDPF\_ZBUFFER

The pixel format describes a z-buffer surface.

DDPF\_ZPIXELS

The surface contains z information in the pixels.

**dwFourCC**

FourCC code. For more information see, Four-Character Codes (FOURCC).

**dwRGBBitCount**

RGB bits per pixel (4, 8, 16, 24, or 32).

**dwYUVBitCount**

YUV bits per pixel (4, 8, 16, 24, or 32).

**dwZBufferBitDepth**

Z-buffer bit depth (8, 16, 24, or 32).

**dwAlphaBitDepth**

Alpha channel bit depth (1, 2, 4, or 8) for an alpha-only surface (DDPF\_ALPHA). For pixel formats that contain alpha information interleaved with color data (DDPF\_ALPHAPIXELS), count the bits in the **dwRGBAlphaBitMask** member to obtain the bit depth of the alpha component. For more information, see Remarks.

**dwLuminanceBitCount**

Total luminance bits per pixel. This member applies only to luminance-only and luminance-alpha surfaces.

**dwBumpBitCount**

Total bump-map bits per pixel in a bump-map surface.

**dwRBitMask**

Mask for red bits.

**dwYBitMask**

Mask for Y bits.

**dwStencilBitDepth**

Bit depth of the stencil buffer. This member specifies how many bits are reserved within each pixel of the z-buffer for stencil information (the total number of z-bits is equal to **dwZBufferBitDepth** minus **dwStencilBitDepth**).

**dwLuminanceBitMask**

Mask for luminance bits.

**dwBumpDuBitMask**

Mask for bump-map U-delta bits.

**dwGBitMask**

Mask for green bits.

**dwUBitMask**

Mask for U bits.

**dwZBitMask**

Mask for z bits.

**dwBumpDvBitMask**

Mask for bump-map V-delta bits.

**dwBBitMask**

Mask for blue bits.

**dwVBitMask**

Mask for V bits.

**dwStencilBitMask**

Mask for stencil bits within each z-buffer pixel.

**dwBumpLuminanceBitMask**

Mask for luminance in a bump-map pixel.

**dwRGBAlphaBitMask** and **dwYUVAlphaBitMask** and **dwLuminanceAlphaBitMask**

Masks for the alpha channel.

**dwRGBZBitMask** and **dwYUVZBitMask**

Masks for the z channel.

Remarks

The **dwAlphaBitDepth** member reflects the bit depth of an alpha-only pixel format (DDPF\_ALPHA). For pixel formats that include the alpha component with color components (DDPF\_ALPHAPIXELS), the alpha bit depth is obtained by counting the bits in the various mask members. The following code example returns the number of bits set in a given bitmask:

WORD GetNumberOfBits( DWORD dwMask )

{

WORD wBits = 0;

while( dwMask )

{

dwMask = dwMask & ( dwMask - 1 );

wBits++;

}

return wBits;

}

The unions in this structure have been updated to work with compilers that do not support nameless unions. If your compiler does not support nameless unions, define the NONAMELESSUNION token before including the Ddraw.h header file.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

See Also

Off-Screen Surface Formats

DDSCAPS

The **DDSCAPS** structure defines the capabilities of a DirectDrawSurface object. This structure is part of the **DDCAPS** and **DDSURFACEDESC** structures.

typedef struct \_DDSCAPS{

DWORD dwCaps;

} DDSCAPS, FAR\* LPDDSCAPS;

Members

**dwCaps**

Capabilities of the surface. One or more of the following flags:

DDSCAPS\_3D

Unsupported. Use DDSCAPS\_3DDEVICE, instead.

DDSCAPS\_3DDEVICE

This surface can be used for 3-D rendering. Applications can use this flag to ensure that a device that can render only to a certain heap has off-screen surfaces allocated from the correct heap. If this flag is set for a heap, the surface is not allocated from that heap.

DDSCAPS\_ALLOCONLOAD

Not used.

DDSCAPS\_ALPHA

This surface contains alpha-only information.

DDSCAPS\_BACKBUFFER

This surface is the back buffer of a surface flipping structure. Typically, this capability is set by the **CreateSurface** method when the DDSCAPS\_FLIP flag is used. Only the surface that immediately precedes the DDSCAPS\_FRONTBUFFER surface has this capability set. The other surfaces are identified as back buffers by the presence of the DDSCAPS\_FLIP flag, their attachment order, and the absence of the DDSCAPS\_FRONTBUFFER and DDSCAPS\_BACKBUFFER capabilities. If this capability is sent to the **CreateSurface** method, a stand-alone back buffer is being created. After this method is called, this surface could be attached to a front buffer, another back buffer, or both to form a flipping surface structure. For more information, see **IDirectDrawSurface7::AddAttachedSurface**. DirectDraw supports any number of surfaces in a flipping structure.

DDSCAPS\_COMPLEX

A complex surface is being described. A complex surface results in the creation of more than one surface. The additional surfaces are attached to the root surface. The complex surface can be destroyed only by destroying the root.

DDSCAPS\_FLIP

This surface is a part of a surface flipping structure. When this capability is passed to the **CreateSurface** method, a front buffer and one or more back buffers are created. DirectDraw sets the DDSCAPS\_FRONTBUFFER bit on the front-buffer surface and the DDSCAPS\_BACKBUFFER bit on the surface adjacent to the front-buffer surface. The **dwBackBufferCount** member of the **DDSURFACEDESC** structure must be set to at least 1 for the method call to succeed. The DDSCAPS\_COMPLEX capability must always be set when creating multiple surfaces by using the **CreateSurface** method.

DDSCAPS\_FRONTBUFFER

This surface is the front buffer of a surface flipping structure. This flag is typically set by the **CreateSurface** method when the DDSCAPS\_FLIP capability is set. If this capability is sent to the **CreateSurface** method, a stand-alone front buffer is created. This surface does not have the DDSCAPS\_FLIP capability. It can be attached to back buffers to form a flipping structure by using **IDirectDrawSurface7::AddAttachedSurface**.

DDSCAPS\_HWCODEC

This surface can have a stream decompressed to it by the hardware.

DDSCAPS\_LIVEVIDEO

This surface can receive live video.

DDSCAPS\_LOCALVIDMEM

This surface exists in true, local video memory, rather than nonlocal video memory. If this flag is specified, DDSCAPS\_VIDEOMEMORY must be specified, as well. This flag cannot be used with the DDSCAPS\_NONLOCALVIDMEM flag.

DDSCAPS\_MIPMAP

This surface is one level of a mipmap. This surface is attached to other DDSCAPS\_MIPMAP surfaces to form the mipmap. This can be done explicitly by creating a number of surfaces and attaching them by using the **IDirectDrawSurface7::AddAttachedSurface** method, or implicitly by the **CreateSurface** method. If this capability is set, DDSCAPS\_TEXTURE must also be set.

DDSCAPS\_MODEX

This surface is a 320200 or 320240 Mode X surface.

DDSCAPS\_NONLOCALVIDMEM

This surface exists in nonlocal video memory, rather than true, local video memory. If this flag is specified, the DDSCAPS\_VIDEOMEMORY flag must be specified, as well. This cannot be used with the DDSCAPS\_LOCALVIDMEM flag.

DDSCAPS\_OFFSCREENPLAIN

This surface is any off-screen surface that is not an overlay, texture, z-buffer, front-buffer, back-buffer, or alpha surface. It is used to identify plain surfaces.

DDSCAPS\_OPTIMIZED

Not currently implemented.

DDSCAPS\_OVERLAY

This surface is an overlay. It might or might not be directly visible, depending on whether it is currently being overlaid onto the primary surface. DDSCAPS\_VISIBLE can be used to determine if it is currently being overlaid.

DDSCAPS\_OWNDC

This surface has a device context (DC) association for a long period of time.

DDSCAPS\_PALETTE

This device driver allows unique DirectDrawPalette objects to be created and attached to this surface.

DDSCAPS\_PRIMARYSURFACE

The surface is the primary surface. It represents what is currently visible.

DDSCAPS\_STANDARDVGAMODE

This surface is a standard VGA mode surface, and not a Mode X surface. This flag cannot be used in combination with the DDSCAPS\_MODEX flag.

DDSCAPS\_SYSTEMMEMORY

This surface memory was allocated in system memory.

DDSCAPS\_TEXTURE

This surface can be used as a 3-D texture. It does not indicate whether the surface is currently being used for that purpose.

DDSCAPS\_VIDEOMEMORY

This surface exists in display memory.

DDSCAPS\_VIDEOPORT

This surface can receive data from a video port.

DDSCAPS\_VISIBLE

Changes made to this surface are immediately visible. It is always set for the primary surface, as well as for overlays while they are being overlaid and texture maps while they are being textured.

DDSCAPS\_WRITEONLY

Only write access is permitted to the surface. Read access from the surface can cause a general protection (GP) fault, but the read results from this surface would be meaningful.

DDSCAPS\_ZBUFFER

This surface is the z-buffer. The z-buffer contains information that cannot be displayed. Instead, it contains bit-depth information that is used to determine which pixels are visible and which are obscured.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDSCAPS2

The **DDSCAPS2** structure defines the capabilities of a DirectDrawSurface object. This structure is part of the **DDSURFACEDESC2** structure.

typedef struct \_DDSCAPS2 {

DWORD dwCaps;

DWORD dwCaps2;

DWORD dwCaps3;

DWORD dwCaps4;

} DDSCAPS2, FAR\* LPDDSCAPS2;

Members

**dwCaps**

One or more of the following flag values representing the capabilities of the surface. (The flags in this member are identical to those in the corresponding member of the **DDSCAPS** structure.)

DDSCAPS\_3D

Unsupported. Use the DDSCAPS\_3DDEVICE instead.

DDSCAPS\_3DDEVICE

This surface can be used for 3-D rendering. Applications can use this flag to ensure that a device that can render only to a certain heap has off-screen surfaces allocated from the correct heap. If this flag is set for a heap, the surface is not allocated from that heap.

DDSCAPS\_ALLOCONLOAD

Not used.

DDSCAPS\_ALPHA

This surface contains alpha-only information.

DDSCAPS\_BACKBUFFER

This surface is the back buffer of a surface flipping structure. Typically, this capability is set by the **CreateSurface** method when the DDSCAPS\_FLIP flag is used. Only the surface that immediately precedes the DDSCAPS\_FRONTBUFFER surface has this capability set. The other surfaces are identified as back buffers by the presence of the DDSCAPS\_FLIP flag, their attachment order, and the absence of DDSCAPS\_FRONTBUFFER and DDSCAPS\_BACKBUFFER capabilities. If this capability is sent to the **CreateSurface** method, a stand-alone back buffer is being created. After this method is called, this surface could be attached to a front buffer, another back buffer, or both to form a flipping surface structure. For more information, see **IDirectDrawSurface7::AddAttachedSurface**. DirectDraw supports any number of surfaces in a flipping structure.

DDSCAPS\_COMPLEX

A complex surface is being described. A complex surface results in the creation of more than one surface. The additional surfaces are attached to the root surface. The complex surface can be destroyed only by destroying the root.

DDSCAPS\_FLIP

This surface is a part of a surface-flipping structure. When this capability is passed to the **CreateSurface** method, a front buffer and one or more back buffers are created. DirectDraw sets the DDSCAPS\_FRONTBUFFER bit on the front-buffer surface and the DDSCAPS\_BACKBUFFER bit on the surface adjacent to the front-buffer surface. The **dwBackBufferCount** member of the **DDSURFACEDESC** structure must be set to at least 1 for the method call to succeed. The DDSCAPS\_COMPLEX capability must always be set when creating multiple surfaces by using the **CreateSurface** method.

DDSCAPS\_FRONTBUFFER

This surface is the front buffer of a surface-flipping structure. This flag is typically set by the **CreateSurface** method when the DDSCAPS\_FLIP capability is set. If this capability is sent to the **CreateSurface** method, a stand-alone front buffer is created. This surface does not have the DDSCAPS\_FLIP capability. It can be attached to back buffers to form a flipping structure by using **IDirectDrawSurface7::AddAttachedSurface**.

DDSCAPS\_HWCODEC

This surface can have a stream decompressed to it by the hardware.

DDSCAPS\_LIVEVIDEO

This surface can receive live video.

DDSCAPS\_LOCALVIDMEM

This surface exists in true, local video memory, rather than nonlocal video memory. If this flag is specified, DDSCAPS\_VIDEOMEMORY must be specified, as well. This flag cannot be used with the DDSCAPS\_NONLOCALVIDMEM flag.

DDSCAPS\_MIPMAP

This surface is one level of a mipmap. This surface is attached to other DDSCAPS\_MIPMAP surfaces to form the mipmap. This can be done explicitly by creating a number of surfaces and attaching them by using the **IDirectDrawSurface7::AddAttachedSurface** method, or implicitly by the **CreateSurface** method. If this capability is set, DDSCAPS\_TEXTURE must also be set.

DDSCAPS\_MODEX

This surface is a 320200 or 320240 Mode X surface.

DDSCAPS\_NONLOCALVIDMEM

This surface exists in nonlocal video memory, rather than true, local video memory. If this flag is specified, DDSCAPS\_VIDEOMEMORY flag must be specified, as well. This cannot be used with the DDSCAPS\_LOCALVIDMEM flag.

DDSCAPS\_OFFSCREENPLAIN

This surface is any off-screen surface that is not an overlay, texture, z-buffer, front-buffer, back-buffer, or alpha surface. It is used to identify plain surfaces.

DDSCAPS\_OPTIMIZED

Not currently implemented.

DDSCAPS\_OVERLAY

This surface is an overlay. It might or might not be directly visible, depending on whether it is currently being overlaid onto the primary surface. DDSCAPS\_VISIBLE can be used to determine if it is currently being overlaid.

DDSCAPS\_OWNDC

This surface has a device context (DC) association for a long period of time.

DDSCAPS\_PALETTE

This device driver allows unique DirectDrawPalette objects to be created and attached to this surface.

DDSCAPS\_PRIMARYSURFACE

The surface is the primary surface. It represents what is currently visible.

DDSCAPS\_STANDARDVGAMODE

This surface is a standard VGA mode surface, and not a Mode X surface. This flag cannot be used in combination with the DDSCAPS\_MODEX flag.

DDSCAPS\_SYSTEMMEMORY

This surface memory was allocated in system memory.

DDSCAPS\_TEXTURE

This surface can be used as a 3-D texture. It does not indicate whether the surface is currently being used for that purpose.

DDSCAPS\_VIDEOMEMORY

This surface exists in display memory.

DDSCAPS\_VIDEOPORT

This surface can receive data from a video port.

DDSCAPS\_VISIBLE

Changes made to this surface are immediately visible. It is always set for the primary surface, as well as for overlays while they are being overlaid and texture maps while they are being textured.

DDSCAPS\_WRITEONLY

Only write access is permitted to the surface. Read access from the surface can cause a general protection (GP) fault, and the read results from this surface would not be meaningful.

DDSCAPS\_ZBUFFER

This surface is the z-buffer. The z-buffer contains information that cannot be displayed. Instead, it contains bit-depth information that is used to determine which pixels are visible and which are obscured.

**dwCaps2**

Additional surface capabilities. This member can contain one or more of the following capability flags, or when using this structure with the **IDirectDrawSurface7::SetSurfaceDesc** method, this member can contain an additional flag to indicate how the surface memory was allocated:

**Capability flags**

DDSCAPS2\_CUBEMAP

New for DirectX 7.0. This surface is a cubic environment map. When using this flag, also specify which face or faces of the cubic environment map to create.

DDSCAPS2\_CUBEMAP\_POSITIVEX

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the positive X face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_NEGATIVEX

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the negative X face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_POSITIVEY

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the positive Y face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_NEGATIVEY

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the negative Y face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_POSITIVEZ

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the positive Z face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_NEGATIVEZ

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the negative Z face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_ALLFACES

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create all six faces of a cubic environment map.

DDSCAPS2\_D3DTEXTUREMANAGE

New for DirectX 7.0. The texture is always managed by Direct3D.

DDSCAPS2\_DONOTPERSIST

New for DirectX 7.0. The managed surface can be safely lost.

DDSCAPS2\_HARDWAREDEINTERLACE

This surface receives data from a video port, using the de-interlacing hardware. This allows the driver to allocate memory for any extra buffers that might be required. The DDSCAPS\_VIDEOPORT and DDSCAPS\_OVERLAY flags must also be set.

DDSCAPS2\_HINTANTIALIASING

The application intends to use antialiasing. Only valid if DDSCAPS\_3DDEVICE is also set. For more information, see Antialiasing.

DDSCAPS2\_HINTDYNAMIC

Indicates to the driver that this surface is locked very frequently (for procedural textures, dynamic light maps, and so on). This flag can only be used for texture surfaces (DDSCAPS\_TEXTURE flag set in the **dwCaps** member). This flag cannot be used with the DDSCAPS2\_HINTSTATIC or DDSCAPS2\_OPAQUE flags.

DDSCAPS2\_HINTSTATIC

Indicates to the driver that this surface can be reordered or retiled on load. This operation does not change the size of the texture. It is relatively fast and symmetrical, since the application can lock these bits (although it degrades performance when doing so). This flag can only be used for texture surfaces (DDSCAPS\_TEXTURE flag set in the **dwCaps** member). This flag cannot be used with the DDSCAPS2\_HINTDYNAMIC or DDSCAPS2\_OPAQUE flags.

DDSCAPS2\_MIPMAPSUBLEVEL

New for DirectX 7.0. It enables easier use of **GetAttachedSurface**, rather than **EnumAttachedSurfaces**, for surface constructs such as cube maps, in which there is more than one mipmap surface attached to the root surface. This should be set on all non-top-level surfaces in a mipmapped cube map so that a call to **GetAttachedSurface** can distinguish between top-level faces and attached mipmap levels. This capability bit is ignored by **CreateSurface**.

DDSCAPS2\_OPAQUE

Indicates to the driver that this surface will never be locked again. The driver is free to optimize this surface by retiling and compression. Such a surface cannot be locked or used in blit operations; attempts to lock or blit a surface with this capability fail. This flag can only be used for texture surfaces (DDSCAPS\_TEXTURE flag set in the **dwCaps** member). This flag cannot be used with the DDSCAPS2\_HINTDYNAMIC or DDSCAPS2\_HINTSTATIC flags.

DDSCAPS2\_STEREOSURFACELEFT

New for DirectX 7.0. This surface is part of a stereo flipping chain. When this flag is set during a **IDirectDraw7::CreateSurface** call, a pair of stereo surfaces are created for each buffer in the primary flipping chain. You must create a complex flipping chain (with back buffers). You cannot create a single set of stereo surfaces. The **IDirectDrawSurface7::Flip** method requires back buffers, so at least 4 surfaces must be created.

In addition, when this flag is set in a **DDSURFACEDESC** structure as the result of an **IDirectDraw7::EnumDisplayModes** or **IDirectDraw7::GetDisplayMode** call, it indicates support for stereo in that mode.

DDSCAPS2\_TEXTUREMANAGE

The client would like this texture surface to be managed by the driver if the driver is capable; otherwise, it is managed by Direct3D Immediate Mode (new in DirectX 7.0). This flag can be used only for texture surfaces (DDSCAPS\_TEXTURE flag set in the **dwCaps** member). For more information, see Automatic Texture Management in the Direct3D Immediate Mode documentation. Do not use this flag if your application uses Direct3D Retained Mode. Instead, create textures in system memory, and allow Retained Mode to manage them.

**dwCaps3** and **dwCaps4**

Not currently used.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDSURFACEDESC

The **DDSURFACEDESC** structure contains a description of a surface. This structure is passed to the **IDirectDraw2::CreateSurface** method. The relevant members differ for each potential type of surface.

When using the **IDirectDraw7** interface, this structure is superseded by the **DDSURFACEDESC2** structure.

typedef struct \_DDSURFACEDESC {

DWORD dwSize;

DWORD dwFlags;

DWORD dwHeight;

DWORD dwWidth;

union

{

LONG lPitch;

DWORD dwLinearSize;

};

DWORD dwBackBufferCount;

union

{

DWORD dwMipMapCount;

DWORD dwZBufferBitDepth;

DWORD dwRefreshRate;

};

DWORD dwAlphaBitDepth;

DWORD dwReserved;

LPVOID lpSurface;

DDCOLORKEY ddckCKDestOverlay;

DDCOLORKEY ddckCKDestBlt;

DDCOLORKEY ddckCKSrcOverlay;

DDCOLORKEY ddckCKSrcBlt;

DDPIXELFORMAT ddpfPixelFormat;

DDSCAPS ddsCaps;

} DDSURFACEDESC, FAR\* LPDDSURFACEDESC;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure is used.

**dwFlags**

Optional control flags. One or more of the following flags:

DDSD\_ALL

All input members are valid.

DDSD\_ALPHABITDEPTH

The **dwAlphaBitDepth** member is valid.

DDSD\_BACKBUFFERCOUNT

The **dwBackBufferCount** member is valid.

DDSD\_CAPS

The **ddsCaps** member is valid.

DDSD\_CKDESTBLT

The **ddckCKDestBlt** member is valid.

DDSD\_CKDESTOVERLAY

The **ddckCKDestOverlay** member is valid.

DDSD\_CKSRCBLT

The **ddckCKSrcBlt** member is valid.

DDSD\_CKSRCOVERLAY

The **ddckCKSrcOverlay** member is valid.

DDSD\_HEIGHT

The **dwHeight** member is valid.

DDSD\_LINEARSIZE

The **dwLinearSize** member is valid.

DDSD\_LPSURFACE

The **lpSurface** member is valid.

DDSD\_MIPMAPCOUNT

The **dwMipMapCount** member is valid.

DDSD\_PITCH

The **lPitch** member is valid.

DDSD\_PIXELFORMAT

The **ddpfPixelFormat** member is valid.

DDSD\_REFRESHRATE

The **dwRefreshRate** member is valid.

DDSD\_WIDTH

The **dwWidth** member is valid.

DDSD\_ZBUFFERBITDEPTH

The **dwZBufferBitDepth** member is valid.

**dwHeight** and **dwWidth**

Dimensions of the surface to be created, in pixels.

**lPitch**

Distance, in bytes, to the start of next line. When used with the **IDirectDrawSurface7::GetSurfaceDesc** method, this is a return value. When creating a surface from existing memory or when calling the **IDirectDrawSurface7::SetSurfaceDesc** method, this is an input value that must be a **DWORD** multiple.

**dwLinearSize**

Size of the buffer. Currently returned only for compressed texture surfaces.

**dwBackBufferCount**

Number of back buffers.

**dwMipMapCount**

Number of mipmap levels.

**dwZBufferBitDepth**

Depth of the z-buffer. This member is obsolete for DirectX 6.0 and later. Use the **IDirect3D7::EnumZBufferFormats** to retrieve information about supported depth-buffer formats.

**dwRefreshRate**

Refresh rate (used when the display mode is described). The value of 0 indicates an adapter default.

**dwAlphaBitDepth**

Depth of the alpha buffer.

**dwReserved**

Reserved.

**lpSurface**

Address of the associated surface memory. When calling **IDirectDrawSurface7::Lock**, this member contains a valid pointer to surface memory after the call returns. When creating a surface from existing memory or using the **IDirectDrawSurface7::SetSurfaceDesc** method, this member is an input value that is the address of system memory allocated by the calling application. Do not set this member if your application needs DirectDraw to allocate and manage surface memory.

**ddckCKDestOverlay**

**DDCOLORKEY** structure that describes the destination color key for an overlay surface.

**ddckCKDestBlt**

**DDCOLORKEY** structure that describes the destination color key for blit operations.

**ddckCKSrcOverlay**

**DDCOLORKEY** structure that describes the source color key for an overlay surface.

**ddckCKSrcBlt**

**DDCOLORKEY** structure that describes the source color key for blit operations.

**ddpfPixelFormat**

**DDPIXELFORMAT** structure that describes the surface's pixel format.

**ddsCaps**

**DDSCAPS** structure that contains the surface's capabilities.

Remarks

This structure is similar to the **DDSURFACEDESC2** structure, but contains a **DDSCAPS** structure as the **ddsCaps** member, rather than a **DDSCAPS2** structure. Unlike **DDSURFACEDESC2**, this structure contains the **dwZBufferBitDepth** member.

Requirements

**Windows NT/2000:** Requires Windows NT 4.0 SP3 or later.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDSURFACEDESC2

The **DDSURFACEDESC2** structure contains a description of a surface. This structure is used to pass surface parameters to the **IDirectDraw7::CreateSurface** and **IDirectDrawSurface7::SetSurfaceDesc** methods. It is also used to retrieve information about a surface in calls to **IDirectDrawSurface7::Lock** and **IDirectDrawSurface7::GetSurfaceDesc**. The relevant members differ for each potential type of surface.

typedef struct \_DDSURFACEDESC2 {

DWORD dwSize;

DWORD dwFlags;

DWORD dwHeight;

DWORD dwWidth;

union

{

LONG lPitch;

DWORD dwLinearSize;

} DUMMYUNIONNAMEN(1);

DWORD dwBackBufferCount;

union

{

DWORD dwMipMapCount;

DWORD dwRefreshRate;

} DUMMYUNIONNAMEN(2);

DWORD dwAlphaBitDepth;

DWORD dwReserved;

LPVOID lpSurface;

union

{

DDCOLORKEY ddckCKDestOverlay;

DWORD dwEmptyFaceColor;

} DUMMYUNIONNAMEN(3);

DDCOLORKEY ddckCKDestBlt;

DDCOLORKEY ddckCKSrcOverlay;

DDCOLORKEY ddckCKSrcBlt;

DDPIXELFORMAT ddpfPixelFormat;

DDSCAPS2 ddsCaps;

DWORD dwTextureStage;

} DDSURFACEDESC2, FAR\* LPDDSURFACEDESC2;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure is used.

**dwFlags**

Optional control flags. One or more of the following flags:

DDSD\_ALL

All input members are valid.

DDSD\_ALPHABITDEPTH

The **dwAlphaBitDepth** member is valid.

DDSD\_BACKBUFFERCOUNT

The **dwBackBufferCount** member is valid.

DDSD\_CAPS

The **ddsCaps** member is valid.

DDSD\_CKDESTBLT

The **ddckCKDestBlt** member is valid.

DDSD\_CKDESTOVERLAY

The **ddckCKDestOverlay** member is valid.

DDSD\_CKSRCBLT

The **ddckCKSrcBlt** member is valid.

DDSD\_CKSRCOVERLAY

The **ddckCKSrcOverlay** member is valid.

DDSD\_HEIGHT

The **dwHeight** member is valid.

DDSD\_LINEARSIZE

The **dwLinearSize** member is valid.

DDSD\_LPSURFACE

The **lpSurface** member is valid.

DDSD\_MIPMAPCOUNT

The **dwMipMapCount** member is valid.

DDSD\_PITCH

The **lPitch** member is valid.

DDSD\_PIXELFORMAT

The **ddpfPixelFormat** member is valid.

DDSD\_REFRESHRATE

The **dwRefreshRate** member is valid.

DDSD\_TEXTURESTAGE

The **dwTextureStage** member is valid.

DDSD\_WIDTH

The **dwWidth** member is valid.

DDSD\_ZBUFFERBITDEPTH

Obsolete; see Remarks.

**dwHeight** and **dwWidth**

Dimensions of the surface to be created, in pixels.

**lPitch**

Distance, in bytes, to the start of next line. When used with the **IDirectDrawSurface7::GetSurfaceDesc** method, this is a return value. When used with the **IDirectDrawSurface7::SetSurfaceDesc** method, this is an input value that must be a **DWORD** multiple. For more information, see Remarks.

**dwLinearSize**

Size of the buffer. Currently returned only for compressed texture surfaces.

**dwBackBufferCount**

Number of back buffers.

**dwMipMapCount**

Number of mipmap levels.

**dwRefreshRate**

Refresh rate (used when the display mode is described). The value of 0 indicates an adapter default.

**dwAlphaBitDepth**

Depth of the alpha buffer.

**dwReserved**

Reserved.

**lpSurface**

Address of the associated surface memory. When calling **IDirectDrawSurface7::Lock**, this member is a valid pointer to surface memory. When calling **IDirectDrawSurface7::SetSurfaceDesc**, this member is a pointer to system memory that the caller explicitly allocates for the DirectDrawSurface object. For more information, see Remarks.

**ddckCKDestOverlay**

**DDCOLORKEY** structure that describes the destination color key for an overlay surface.

**dwEmptyFaceColor**

Physical color for empty cubemap faces.

**ddckCKDestBlt**

**DDCOLORKEY** structure that describes the destination color key for blit operations.

**ddckCKSrcOverlay**

**DDCOLORKEY** structure that describes the source color key for an overlay surface.

**ddckCKSrcBlt**

**DDCOLORKEY** structure that describes the source color key for blit operations.

**ddpfPixelFormat**

**DDPIXELFORMAT** structure that describes the pixel format of the surface.

**ddsCaps**

**DDSCAPS2** structure that contains the capabilities of the surface.

**dwTextureStage**

Stage identifier used to bind a texture to a specific stage in a multitexture cascade 3-D device. Although not required for all hardware, setting this member is recommended for best performance on the largest variety of 3-D accelerators. Hardware that requires explicitly assigned textures exposes the D3DDEVCAPS\_SEPARATETEXTUREMEMORIES 3-D device capability in the **D3DDEVICEDESC** structure that is filled by the **IDirect3DDevice7::GetCaps** method.

Remarks

The **lPitch** and **lpSurface** members are output values when calling the **IDirectDrawSurface7::GetSurfaceDesc** method. When creating surfaces from existing memory or updating surface characteristics, these members are input values that describe the pitch and location of memory allocated by the calling application for use by DirectDraw. DirectDraw does not attempt to manage or free memory allocated by the application. For more information, see Creating Client Memory Surfaces and Updating Surface Characteristics.

This structure is nearly identical to the **DDSURFACEDESC** structure, but contains a **DDSCAPS2** structure as the **ddsCaps** member. Unlike **DDSURFACEDESC**, this structure does not contain the **dwZBufferBitDepth** member. Z-buffer depth is provided in the **ddpfPixelFormat** member.

The unions in this structure work with compilers that do not support nameless unions. If your compiler does not support nameless unions, define the NONAMELESSUNION token before including the Ddraw.h header file.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in ddraw.h.

DDVIDEOPORTBANDWIDTH

The **DDVIDEOPORTBANDWIDTH** structure describes the bandwidth characteristics of an overlay surface when used with a particular video-port and pixel-format configuration. This structure is used with the **IDirectDrawVideoPort::GetBandwidthInfo** method.

typedef struct \_DDVIDEOPORTBANDWIDTH {

DWORD dwSize;

DWORD dwCaps;

DWORD dwOverlay;

DWORD dwColorkey;

DWORD dwYInterpolate;

DWORD dwYInterpAndColorkey;

DWORD dwReserved1;

DWORD dwReserved2;

} DDVIDEOPORTBANDWIDTH,\*LPDDVIDEOPORTBANDWIDTH;

Members

**dwSize**

Size of this structure, in bytes. This member must be initialized before the structure is used.

**dwCaps**

Flag values specifying device dependency. This member can be one of the following values:

DDVPBCAPS\_DESTINATION

This device's capabilities are described in terms of the minimum stretch factor of the overlay. Bandwidth information provided for this device refers to the destination overlay size.

DDVPBCAPS\_SOURCE

This device's capabilities are described in terms of the required source overlay size. Bandwidth information provided for this device refers to the source overlay size.

**dwOverlay**

Stretch factor or overlay source size at which an overlay is supported, multiplied by 1000. For example 1.3 = 1300, or .75 = 750.

**dwColorkey**

Stretch factor or overlay source size at which an overlay with color keying is supported, multiplied by 1000. For example 1.3 = 1300, or .75 = 750.

**dwYInterpolate**

Stretch factor or overlay source size at which an overlay with y-axis interpolation is supported, multiplied by 1000. For example 1.3 = 1300, or .75 = 750.

**dwYInterpAndColorkey**

Stretch factor or overlay source size at which an overlay with y-axis interpolation and color keying is supported, multiplied by 1000. For example 1.3 = 1300, or .75 = 750.

**dwReserved1** and **dwReserved2**

Reserved; set to 0.

Remarks

When DDVPBCAPS\_DESTINATION is specified, the stretch factors described in the other members describe the minimum stretch factor required to display an overlay with the dimensions given when calling the **GetBandwidthInfo** method. Stretch factor values of less than 1000 mean that the video port is capable of shrinking an overlay when displayed, and values of more than 1000 mean that the overlay must be stretched larger than their source to be displayed.

When DDVPBCAPS\_SOURCE is specified, the stretch factors described in the other members describe how much you must shrink the overlay source for it to be displayed. In this case, the best possible value is 1000, meaning that no shrinking is required. Smaller values mean that the source rectangle that you specified when calling **GetBandwidthInfo** was too large. For example, if the stretch factor is 750 and you specified 320 pixels for the *dwWidth* parameter, you cannot display the overlay at that size. To display the overlay, you must use a source rectangle 240 pixels wide.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.

DDVIDEOPORTCAPS

The **DDVIDEOPORTCAPS** structure describes the capabilities and alignment restrictions of a video port. This structure is used with the **IDDVideoPortContainer::EnumVideoPorts** method.

typedef struct \_DDVIDEOPORTCAPS {

DWORD dwSize;

DWORD dwFlags;

DWORD dwMaxWidth;

DWORD dwMaxVBIWidth;

DWORD dwMaxHeight;

DWORD dwVideoPortID;

DWORD dwCaps;

DWORD dwFX;

DWORD dwNumAutoFlipSurfaces;

DWORD dwAlignVideoPortBoundary;

DWORD dwAlignVideoPortPrescaleWidth;

DWORD dwAlignVideoPortCropBoundary;

DWORD dwAlignVideoPortCropWidth;

DWORD dwPreshrinkXStep;

DWORD dwPreshrinkYStep;

DWORD dwNumVBIAutoFlipSurfaces;

DWORD dwNumPreferredAutoflip;

WORD wNumFilterTapsX;

WORD wNumFilterTapsY;

} DDVIDEOPORTCAPS, \*LPDDVIDEOPORTCAPS;

Members

**dwSize**

Size of the structure, in bytes. This must be initialized before the structure is used.

**dwFlags**

Flag values indicating the fields that contain valid data. The following flags are defined:

DDVPD\_AUTOFLIP

The **dwNumAutoFlipSurfaces** member is valid.

DDVPD\_ALIGN

The **dwAlignVideoPortBoundary**, **dwAlignVideoPortPrescaleWidth**, **dwAlignVideoPortCropBoundary**, and **dwAlignVideoPortCropWidth** are valid.

DDVPD\_CAPS

The **dwCaps** member is valid.

DDVPD\_FILTERQUALITY

The **wNumFilterTapsX** and **wNumFilterTapsY** members are valid.

DDVPD\_FX

The **dwFX** member is valid.

DDVPD\_HEIGHT

The **dwMaxHeight** member is valid.

DDVPD\_ID

The **dwVideoPortID** member is valid.

DDVPD\_PREFERREDAUTOFLIP

The **dwNumPreferredAutoflip** member is valid.

DDVPD\_WIDTH

The **dwMaxWidth** member is valid.

**dwMaxWidth**

Maximum width of the video port field.

**dwMaxVBIWidth**

Maximum width of the VBI data.

**dwMaxHeight**

Maximum height of the video port field.

**dwVideoPortID**

Zero-based index identifying the video port.

**dwCaps**

The following video-port capabilities:

DDVPCAPS\_AUTOFLIP

Flip can be performed automatically to avoid tearing when a VREF occurs. If the data is being interleaved in memory, it flips on every other VREF.

DDVPCAPS\_COLORCONTROL

Can perform color control operations on incoming data before writing to the frame buffer.

DDVPCAPS\_INTERLACED

Supports interlaced video.

DDVPCAPS\_NONINTERLACED

Supports noninterlaced video.

DDVPCAPS\_OVERSAMPLEDVBI

Accepts VBI data in a different format or width than regular video data.

DDVPCAPS\_READBACKFIELD

Supports the **IDirectDrawVideoPort::GetFieldPolarity** method.

DDVPCAPS\_READBACKLINE

Supports the **IDirectDrawVideoPort::GetVideoLine** method.

DDVPCAPS\_SHAREABLE

Supports two genlocked video streams that share the video port; one stream uses the even fields, and the other uses the odd fields. Separate parameters (including address, scaling, cropping, and so on) are maintained for each field.

DDVPCAPS\_SKIPEVENFIELDS

Even fields of video can be automatically discarded.

DDVPCAPS\_SKIPODDFIELDS

Odd fields of video can be automatically discarded.

DDVPCAPS\_SYNCMASTER

Can drive the graphics refresh rate, based on the video port sync.

DDVPCAPS\_SYSTEMMEMORY

Can write to surfaces created in system memory.

DDVPCAPS\_VBIANDVIDEOINDEPENDENT

The VBI and video portions of the video stream can be controlled by independent processes.

DDVPCAPS\_VBISURFACE

Data within the VBI can be written to a different surface.

**dwFX**

The following additional video-port capabilities:

DDVPFX\_CROPTOPDATA

Limited cropping is available to crop VBI data.

DDVPFX\_CROPX

Incoming data can be cropped in the x-direction before it is written to the surface.

DDVPFX\_CROPY

Incoming data can be cropped in the y-direction before it is written to the surface.

DDVPFX\_IGNOREVBIXCROP

The video port can ignore the left and right cropping coordinates when cropping oversampled VBI data.

DDVPFX\_INTERLEAVE

Supports interleaving interlaced fields in memory.

DDVPFX\_MIRRORLEFTRIGHT

Supports mirroring left to right as the video data is written into the frame buffer.

DDVPFX\_MIRRORUPDOWN

Supports mirroring top to bottom as the video data is written into the frame buffer.

DDVPFX\_PRESHRINKX

Data can be arbitrarily shrunk in the x-direction before it is written to the surface.

DDVPFX\_PRESHRINKY

Data can be arbitrarily shrunk in the y-direction before it is written to the surface.

DDVPFX\_PRESHRINKXB

Data can be binary shrunk (1/2, 1/4, 1/8, and so on) in the x-direction before it is written to the surface.

DDVPFX\_PRESHRINKYB

Data can be binary shrunk (1/2, 1/4, 1/8, and so on) in the y-direction before it is written to the surface.

DDVPCAPS\_PRESHRINKXS

Data can be shrunk in the x-direction by increments of 1*/x*, where *x* is specified in the **dwShrinkXStep** member.

DDVPCAPS\_PRESHRINKYS

Data can be shrunk in the y-direction by increments of 1*/y*, where *y* is specified in the **dwShrinkYStep**

DDVPFX\_PRESTRETCHX

Data can be arbitrarily stretched in the x-direction before it is written to the surface.

DDVPFX\_PRESTRETCHY

Data can be arbitrarily stretched in the y-direction before it is written to the surface.

DDVPFX\_PRESTRETCHXN

Data can be integer stretched in the x-direction before it is written to the surface. (1x, 2x, 3x, and so forth)

DDVPFX\_PRESTRETCHYN

Data can be integer stretched in the y-direction before it is written to the surface. (1x, 2x, 3x, and so forth)

DDVPFX\_VBICONVERT

Data within the VBI can be converted, independent of the remaining video data.

DDVPFX\_VBINOINTERLEAVE

Interleaving can be disabled for data within the VBI.

DDVPFX\_VBINOSCALE

Scaling can be disabled for data within the VBI.

**dwNumAutoFlipSurfaces**

Maximum number of autoflippable surfaces supported by the video port.

**dwAlignVideoPortBoundary**

Byte restriction of placement within the surface.

**dwAlignVideoPortPrescaleWidth**

Byte restriction of width after prescaling.

**dwAlignVideoPortCropBoundary**

Byte restriction of left cropping.

**dwAlignVideoPortCropWidth**

Byte restriction of cropping width.

**dwPreshrinkXStep**

Width can be shrunk in the x-direction in steps of 1/**dwPreshrinkXStep***.*

**dwPreshrinkYStep**

Height can be shrunk in the y-direction in steps of 1*/***dwPreshrinkYStep***.*

**dwNumVBIAutoFlipSurfaces**

Maximum number of autoflipping surfaces capable of receiving data transmitted during the vertical blanking interval (VBI), independent of the remainder of the video stream. When constructing the autoflipping chain, the number of VBI surfaces must equal the number of surfaces receiving the remainder of the video data.

**dwNumPreferredAutoflip**

Optimal number of autoflippable surfaces supported by the hardware.

**wNumFilterTapsX** and **wNumFilterTapsY**

Number of taps that the prescaler filter uses in the x- and y-directions. The value of 0 indicates that no prescaling is performed in that direction, 1 indicates that the prescaler performs replication, 2 indicates that the prescaler uses two taps, and so on.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.

DDVIDEOPORTCONNECT

The **DDVIDEOPORTCONNECT** structure describes a video port connection. This structure is used with the **IDDVideoPortContainer::GetVideoPortConnectInfo** method.

typedef struct \_DDVIDEOPORTCONNECT{

DWORD dwSize;

DWORD dwPortWidth;

GUID guidTypeID;

DWORD dwFlags;

ULONG\_PTR dwReserved1;

} DDVIDEOPORTCONNECT,\*LPDDVIDEOPORTCONNECT;

Members

**dwSize**

Size of the structure, in bytes. This member must be initialized before the structure is used.

**dwPortWidth**

Width of the video port. This value represents the number of physical pins on the video port, not the width of a surface in memory. This member must always be set, even when the value in the **guidTypeID** member assumes a certain size.

**guidTypeID**

A GUID that describes the sync characteristics of the video port. The following port types are predefined:

DDVPTYPE\_E\_HREFH\_VREFH

External syncs, where HREF is active high and VREF is active high.

DDVPTYPE\_E\_HREFH\_VREFL

External syncs, where HREF is active high and VREF is active low.

DDVPTYPE\_E\_HREFL\_VREFH

External syncs, where HREF is active low and VREF is active high.

DDVPTYPE\_E\_HREFL\_VREFL

External syncs, where HREF is active low and VREF is active low.

DDVPTYPE\_CCIR656

Sync information is embedded in the data stream, according to the CCIR656 specification.

DDVPTYPE\_BROOKTREE

Sync information is embedded in the data stream, using the Brooktree definition.

DDVPTYPE\_PHILIPS

Sync information is embedded in the data stream, using the Philips definition.

**dwFlags**

Flags describing the capabilities of the video-port connection. This member can be set by DirectDraw when connection information is being retrieved, or by the client when connection information is being set. This member can be a combination of the following flags:

DDVPCONNECT\_DOUBLECLOCK

The video port either supports double-clocking data or should double-clock data. This flag is only valid with an external sync.

DDVPCONNECT\_VACT

The video port either supports using an external VACT signal or should use the external VACT signal. This flag is only valid with an external sync.

DDVPCONNECT\_INVERTPOLARITY

The video port is capable of inverting the field polarities or is to invert field polarities.

When a video port inverts field polarities, it treats even fields as odd fields, and vice versa.

DDVPCONNECT\_DISCARDSVREFDATA

The video port discards any data written during the VREF period; it is not written to the frame buffer. This flag is read-only.

DDVPCONNECT\_HALFLINE

The video port writes half lines into the frame buffer, sometimes causing the data to be displayed incorrectly. This flag is read-only.

DDVPCONNECT\_INTERLACED

The signal is interlaced. This flag is used by the client only when creating a video port object.

DDVPCONNECT\_SHAREEVEN

The physical video port is sharable, and this video-port object uses the even fields. This flag is used by the client only when creating the video-port object.

DDVPCONNECT\_SHAREODD

The physical video port is sharable, and this video-port object uses the odd fields. This flag is used by the client only when creating the video-port object.

**dwReserved1**

Reserved; set to 0.

Remarks

This structure is used independently and as a member of the **DDVIDEOPORTDESC** structure.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.

DDVIDEOPORTDESC

The **DDVIDEOPORTDESC** structure describes a video-port object to be created. This structure is used with the **IDDVideoPortContainer::CreateVideoPort** method.

typedef struct \_DDVIDEOPORTDESC {

DWORD dwSize;

DWORD dwFieldWidth;

DWORD dwVBIWidth;

DWORD dwFieldHeight;

DWORD dwMicrosecondsPerField;

DWORD dwMaxPixelsPerSecond;

DWORD dwVideoPortID;

DWORD dwReserved1;

DDVIDEOPORTCONNECT VideoPortType;

ULONG\_PTR dwReserved2;

ULONG\_PTR dwReserved3;

} DDVIDEOPORTDESC, \*LPDDVIDEOPORTDESC;

Members

**dwSize**

Size of this structure, in bytes. This member must be initialized before the structure is used.

**dwFieldWidth**

Width of incoming video stream, in pixels.

**dwVBIWidth**

Width of the VBI data in the incoming video stream, in pixels.

**dwFieldHeight**

Field height, in scan lines, for fields in the incoming video stream.

**dwMicrosecondsPerField**

Time interval, in microseconds, between live video VREF periods. This number should be rounded up to the nearest microsecond.

**dwMaxPixelsPerSecond**

Maximum pixel rate per second.

**dwVideoPortID**

The zero-based ID of the physical video port to be used.

**dwReserved1**

Reserved; set to 0.

**VideoPortType**

**DDVIDEOPORTCONNECT** structure describing the connection characteristics of the video port.

**dwReserved2** and **dwReserved3**

Reserved; set to 0.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.

DDVIDEOPORTINFO

The **DDVIDEOPORTINFO** structure describes the transfer of video data to a surface. This structure is used with the **IDirectDrawVideoPort::StartVideo** method.

typedef struct \_DDVIDEOPORTINFO{

DWORD dwSize;

DWORD dwOriginX;

DWORD dwOriginY;

DWORD dwVPFlags;

RECT rCrop;

DWORD dwPrescaleWidth;

DWORD dwPrescaleHeight;

LPDDPIXELFORMAT lpddpfInputFormat;

LPDDPIXELFORMAT lpddpfVBIInputFormat;

LPDDPIXELFORMAT lpddpfVBIOutputFormat;

DWORD dwVBIHeight;

ULONG\_PTR dwReserved1;

ULONG\_PTR dwReserved2;

} DDVIDEOPORTINFO,\*LPDDVIDEOPORTINFO;

Members

**dwSize**

Size of this structure, in bytes. This member must be initialized before the structure is used.

**dwOriginX** and **dwOriginY**

X- and y-coordinates for the origin of the video data in the surface.

**dwVPFlags**

The following video-port options:

DDVP\_AUTOFLIP

Perform automatic flipping. For more information, see Autoflipping.

DDVP\_CONVERT

Perform conversion, using the information in the **lpddpfVBIOutputFormat** member.

DDVP\_CROP

Perform cropping, using the rectangle specified by the **rCrop** member.

DDVP\_IGNOREVBIXCROP

The video port should ignore left and right cropping coordinates when cropping oversampled VBI data.

DDVP\_INTERLEAVE

Interlaced fields should be interleaved in memory.

DDVP\_MIRRORLEFTRIGHT

Mirror image data from left to right as it is written into the frame buffer.

DDVP\_MIRRORUPDOWN

Mirror image data from top to bottom as it is written into the frame buffer.

DDVP\_OVERRIDEBOBWEAVE

Override automatic display method chosen by the driver, using only the display method set by the caller when creating the overlay surface.

DDVP\_PRESCALE

Perform prescaling or prezooming, based on the values in the **dwPrescaleHeight** and **dwPrescaleWidth** members.

DDVP\_SKIPEVENFIELDS

Ignore input of even fields.

DDVP\_SKIPODDFIELDS

Ignore input of odd fields.

DDVP\_SYNCMASTER

The video port VREF should drive the graphics VREF, locking the refresh rate to the video port.

DDVP\_VBICONVERT

The **lpddpfVBIOutputFormat** member contains data to be used to convert VBI data.

DDVP\_VBINOSCALE

VBI data should not be scaled.

DDVP\_VBINOINTERLEAVE

Interleaving can be disabled for data within the VBI.

**rCrop**

Cropping rectangle. This member is optional.

**dwPrescaleWidth**

Prescaling or zooming in the x-direction. This member is optional.

**dwPrescaleHeight**

Prescaling or zooming in the y-direction. This member is optional.

**lpddpfInputFormat**

**DDPIXELFORMAT** structure describing the pixel format to be written to the video port. This is often identical to the surface's pixel format, but can differ if the video port is to perform conversion.

**lpddpfVBIInputFormat** and **lpddpfVBIOutputFormat**

**DDPIXELFORMAT** structures describing the input and output pixel formats of the data within the vertical blanking interval.

**dwVBIHeight**

Amount of data within the vertical blanking interval, in scan lines.

**dwReserved1** and **dwReserved2**

Reserved; set to 0.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.

DDVIDEOPORTSTATUS

The **DDVIDEOPORTSTATUS** structure describes the status of a video-port object. This structure is used with the **IDDVideoPortContainer::QueryVideoPortStatus** method.

typedef struct \_DDVIDEOPORTSTATUS {

DWORD dwSize;

BOOL bInUse;

DWORD dwFlags;

DWORD dwReserved1;

DDVIDEOPORTCONNECT VideoPortType;

ULONG\_PTR dwReserved2;

ULONG\_PTR dwReserved3;

} DDVIDEOPORTSTATUS, \*LPDDVIDEOPORTSTATUS;

Members

**dwSize**

Size of this structure, in bytes. This member must be initialized before the structure is used.

**bInUse**

Value indicating the current status of the video port. This member is TRUE if the video port is currently being used, and FALSE otherwise.

**dwFlags**

One ore more of the following flags:

DDVPSTATUS\_VBIONLY

The video-port interface is controlling only the VBI portion of the video stream.

DDVPSTATUS\_VIDEOONLY

The video-port interface is controlling only the video portion of the video stream.

**dwReserved1**

Reserved; set to 0.

**VideoPortType**

**DDVIDEOPORTCONNECT** structure that receives information about the video-port connection.

**dwReserved2** and **dwReserved3**

Reserved; set to 0.

Requirements

**Windows NT/2000:** Requires Windows 2000.  
**Windows 95/98:** Requires Windows 95 or later. Available as a redistributable for Windows 95.  
**Header:** Declared in dvp.h.

### Return Values

Errors are represented by negative values and cannot be combined. This table lists the values that can be returned by all methods of the **IDirectDraw7**, **IDirectDrawSurface7**, **IDirectDrawPalette**, **IDirectDrawClipper**, **IDDVideoPortContainer**, and **IDirectDrawVideoPort** interfaces. For a list of the error codes that each method can return, see the method description.

DD\_OK

The request completed successfully.

DDERR\_ALREADYINITIALIZED

The object has already been initialized.

DDERR\_BLTFASTCANTCLIP

A DirectDrawClipper object is attached to a source surface that has passed into a call to the **IDirectDrawSurface7::BltFast** method.

DDERR\_CANNOTATTACHSURFACE

A surface cannot be attached to another requested surface.

DDERR\_CANNOTDETACHSURFACE

A surface cannot be detached from another requested surface.

DDERR\_CANTCREATEDC

Windows cannot create any more device contexts (DCs), or a DC has requested a palette-indexed surface when the surface had no palette and the display mode was not palette-indexed (in this case DirectDraw cannot select a proper palette into the DC).

DDERR\_CANTDUPLICATE

Primary and 3-D surfaces, or surfaces that are implicitly created, cannot be duplicated.

DDERR\_CANTLOCKSURFACE

Access to this surface is refused because an attempt was made to lock the primary surface without DCI support.

DDERR\_CANTPAGELOCK

An attempt to page-lock a surface failed. Page lock does not work on a display-memory surface or an emulated primary surface.

DDERR\_CANTPAGEUNLOCK

An attempt to page-unlock a surface failed. Page unlock does not work on a display-memory surface or an emulated primary surface.

DDERR\_CLIPPERISUSINGHWND

An attempt was made to set a clip list for a DirectDrawClipper object that is already monitoring a window handle.

DDERR\_COLORKEYNOTSET

No source color key is specified for this operation.

DDERR\_CURRENTLYNOTAVAIL

No support is currently available.

DDERR\_DDSCAPSCOMPLEXREQUIRED

New for DirectX 7.0. The surface requires the DDSCAPS\_COMPLEX flag.

DDERR\_DCALREADYCREATED

A device context (DC) has already been returned for this surface. Only one DC can be retrieved for each surface.

DDERR\_DEVICEDOESNTOWNSURFACE

Surfaces created by one DirectDraw device cannot be used directly by another DirectDraw device.

DDERR\_DIRECTDRAWALREADYCREATED

A DirectDraw object representing this driver has already been created for this process.

DDERR\_EXCEPTION

An exception was encountered while performing the requested operation.

DDERR\_EXCLUSIVEMODEALREADYSET

An attempt was made to set the cooperative level when it was already set to exclusive.

DDERR\_EXPIRED

The data has expired and is therefore no longer valid.

DDERR\_GENERIC

There is an undefined error condition.

DDERR\_HEIGHTALIGN

The height of the provided rectangle is not a multiple of the required alignment.

DDERR\_HWNDALREADYSET

The DirectDraw cooperative-level window handle has already been set. It cannot be reset while the process has surfaces or palettes created.

DDERR\_HWNDSUBCLASSED

DirectDraw is prevented from restoring state because the DirectDraw cooperative-level window handle has been subclassed.

DDERR\_IMPLICITLYCREATED

The surface cannot be restored because it is an implicitly created surface.

DDERR\_INCOMPATIBLEPRIMARY

The primary surface creation request does not match the existing primary surface.

DDERR\_INVALIDCAPS

One or more of the capability bits passed to the callback function are incorrect.

DDERR\_INVALIDCLIPLIST

DirectDraw does not support the provided clip list.

DDERR\_INVALIDDIRECTDRAWGUID

The globally unique identifier (GUID) passed to the **DirectDrawCreate** function is not a valid DirectDraw driver identifier.

DDERR\_INVALIDMODE

DirectDraw does not support the requested mode.

DDERR\_INVALIDOBJECT

DirectDraw received a pointer that was an invalid DirectDraw object.

DDERR\_INVALIDPARAMS

One or more of the parameters passed to the method are incorrect.

DDERR\_INVALIDPIXELFORMAT

The pixel format was invalid as specified.

DDERR\_INVALIDPOSITION

The position of the overlay on the destination is no longer legal.

DDERR\_INVALIDRECT

The provided rectangle was invalid.

DDERR\_INVALIDSTREAM

The specified stream contains invalid data.

DDERR\_INVALIDSURFACETYPE

The surface was of the wrong type.

DDERR\_LOCKEDSURFACES

One or more surfaces are locked, causing the failure of the requested operation.

DDERR\_MOREDATA

There is more data available than the specified buffer size can hold.

DDERR\_NEWMODE

New for DirectX 7.0. When **IDirectDraw7::StartModeTest** is called with the DDSMT\_ISTESTREQUIRED flag, it may return this value to denote that some or all of the resolutions can and should be tested. **IDirectDraw7::EvaluateMode** returns this value to indicate that the test has switched to a new display mode.

DDERR\_NO3D

No 3-D hardware or emulation is present.

DDERR\_NOALPHAHW

No alpha-acceleration hardware is present or available, causing the failure of the requested operation.

DDERR\_NOBLTHW

No blitter hardware is present.

DDERR\_NOCLIPLIST

No clip list is available.

DDERR\_NOCLIPPERATTACHED

No DirectDrawClipper object is attached to the surface object.

DDERR\_NOCOLORCONVHW

No color-conversion hardware is present or available.

DDERR\_NOCOLORKEY

The surface does not currently have a color key.

DDERR\_NOCOLORKEYHW

There is no hardware support for the destination color key.

DDERR\_NOCOOPERATIVELEVELSET

A create function was called without the **IDirectDraw7::SetCooperativeLevel** method.

DDERR\_NODC

No device context (DC) has ever been created for this surface.

DDERR\_NODDROPSHW

No DirectDraw raster-operation (ROP) hardware is available.

DDERR\_NODIRECTDRAWHW

Hardware-only DirectDraw object creation is not possible; the driver does not support any hardware.

DDERR\_NODIRECTDRAWSUPPORT

DirectDraw support is not possible with the current display driver.

DDERR\_NODRIVERSUPPORT

New for DirectX 7.0. Testing cannot proceed because the display adapter driver does not enumerate refresh rates.

DDERR\_NOEMULATION

Software emulation is not available.

DDERR\_NOEXCLUSIVEMODE

The operation requires the application to have exclusive mode, but the application does not have exclusive mode.

DDERR\_NOFLIPHW

Flipping visible surfaces is not supported.

DDERR\_NOFOCUSWINDOW

An attempt was made to create or set a device window without first setting the focus window.

DDERR\_NOGDI

No GDI is present.

DDERR\_NOHWND

Clipper notification requires a window handle, or no window handle has been previously set as the cooperative level window handle.

DDERR\_NOMIPMAPHW

No mipmap-capable texture mapping hardware is present or available.

DDERR\_NOMIRRORHW

No mirroring hardware is present or available.

DDERR\_NOMONITORINFORMATION

New for DirectX 7.0. Testing cannot proceed because the monitor has no associated EDID data.

DDERR\_NONONLOCALVIDMEM

An attempt was made to allocate nonlocal video memory from a device that does not support nonlocal video memory.

DDERR\_NOOPTIMIZEHW

The device does not support optimized surfaces.

DDERR\_NOOVERLAYDEST

The **IDirectDrawSurface7::GetOverlayPosition** method is called on an overlay that the **IDirectDrawSurface7::UpdateOverlay** method has not been called on to establish as a destination.

DDERR\_NOOVERLAYHW

No overlay hardware is present or available.

DDERR\_NOPALETTEATTACHED

No palette object is attached to this surface.

DDERR\_NOPALETTEHW

There is no hardware support for 16- or 256-color palettes.

DDERR\_NORASTEROPHW

No appropriate raster-operation hardware is present or available.

DDERR\_NOROTATIONHW

No rotation hardware is present or available.

DDERR\_NOSTEREOHARDWARE

There is no stereo hardware present or available.

DDERR\_NOSTRETCHHW

There is no hardware support for stretching.

DDERR\_NOSURFACELEFT

There is no hardware present that supports stereo surfaces.

DDERR\_NOT4BITCOLOR

The DirectDrawSurface object is not using a 4-bit color palette, and the requested operation requires a 4-bit color palette.

DDERR\_NOT4BITCOLORINDEX

The DirectDrawSurface object is not using a 4-bit color index palette, and the requested operation requires a 4-bit color index palette.

DDERR\_NOT8BITCOLOR

The DirectDrawSurface object is not using an 8-bit color palette, and the requested operation requires an 8-bit color palette.

DDERR\_NOTAOVERLAYSURFACE

An overlay component is called for a nonoverlay surface.

DDERR\_NOTEXTUREHW

The operation cannot be carried out because no texture-mapping hardware is present or available.

DDERR\_NOTFLIPPABLE

An attempt was made to flip a surface that cannot be flipped.

DDERR\_NOTFOUND

The requested item was not found.

DDERR\_NOTINITIALIZED

An attempt was made to call an interface method of a DirectDraw object created by **CoCreateInstance** before the object was initialized.

DDERR\_NOTLOADED

The surface is an optimized surface, but it has not yet been allocated any memory.

DDERR\_NOTLOCKED

An attempt was made to unlock a surface that was not locked.

DDERR\_NOTPAGELOCKED

An attempt was made to page-unlock a surface with no outstanding page locks.

DDERR\_NOTPALETTIZED

The surface being used is not a palette-based surface.

DDERR\_NOVSYNCHW

There is no hardware support for vertical blank–synchronized operations.

DDERR\_NOZBUFFERHW

The operation to create a z-buffer in display memory or to perform a blit, using a z-buffer cannot be carried out because there is no hardware support for z-buffers.

DDERR\_NOZOVERLAYHW

The overlay surfaces cannot be z-layered, based on the z-order because the hardware does not support z-ordering of overlays.

DDERR\_OUTOFCAPS

The hardware needed for the requested operation has already been allocated.

DDERR\_OUTOFMEMORY

DirectDraw does not have enough memory to perform the operation.

DDERR\_OUTOFVIDEOMEMORY

DirectDraw does not have enough display memory to perform the operation.

DDERR\_OVERLAPPINGRECTS

The source and destination rectangles are on the same surface and overlap each other.

DDERR\_OVERLAYCANTCLIP

The hardware does not support clipped overlays.

DDERR\_OVERLAYCOLORKEYONLYONEACTIVE

An attempt was made to have more than one color key active on an overlay.

DDERR\_OVERLAYNOTVISIBLE

The **IDirectDrawSurface7::GetOverlayPosition** method was called on a hidden overlay.

DDERR\_PALETTEBUSY

Access to this palette is refused because the palette is locked by another thread.

DDERR\_PRIMARYSURFACEALREADYEXISTS

This process has already created a primary surface.

DDERR\_REGIONTOOSMALL

The region passed to the **IDirectDrawClipper::GetClipList** method is too small.

DDERR\_SURFACEALREADYATTACHED

An attempt was made to attach a surface to another surface to which it is already attached.

DDERR\_SURFACEALREADYDEPENDENT

An attempt was made to make a surface a dependency of another surface on which it is already dependent.

DDERR\_SURFACEBUSY

Access to the surface is refused because the surface is locked by another thread.

DDERR\_SURFACEISOBSCURED

Access to the surface is refused because the surface is obscured.

DDERR\_SURFACELOST

Access to the surface is refused because the surface memory is gone. Call the **IDirectDrawSurface7::Restore** method on this surface to restore the memory associated with it.

DDERR\_SURFACENOTATTACHED

The requested surface is not attached.

DDERR\_TESTFINISHED

New for DirectX 7.0. When returned by the **IDirectDraw7::StartModeTest** method, this value means that no test could be initiated because all the resolutions chosen for testing already have refresh rate information in the registry. When returned by **IDirectDraw7::EvaluateMode**, the value means that DirectDraw has completed a refresh rate test.

DDERR\_TOOBIGHEIGHT

The height requested by DirectDraw is too large.

DDERR\_TOOBIGSIZE

The size requested by DirectDraw is too large. However, the individual height and width are valid sizes.

DDERR\_TOOBIGWIDTH

The width requested by DirectDraw is too large.

DDERR\_UNSUPPORTED

The operation is not supported.

DDERR\_UNSUPPORTEDFORMAT

The pixel format requested is not supported by DirectDraw.

DDERR\_UNSUPPORTEDMASK

The bitmask in the pixel format requested is not supported by DirectDraw.

DDERR\_UNSUPPORTEDMODE

The display is currently in an unsupported mode.

DDERR\_VERTICALBLANKINPROGRESS

A vertical blank is in progress.

DDERR\_VIDEONOTACTIVE

The video port is not active.

DDERR\_WASSTILLDRAWING

The previous blit operation that is transferring information to or from this surface is incomplete.

DDERR\_WRONGMODE

This surface cannot be restored because it was created in a different mode.

DDERR\_XALIGN

The provided rectangle was not horizontally aligned on a required boundary.

### Pixel Format Masks

This section contains information about the pixel formats supported by the hardware emulation layer (HEL). The following topics are discussed:

Texture-Map Formats

Off-Screen Surface Formats

#### Texture-Map Formats

A wide range of texture pixel formats are supported by the hardware emulation layer (HEL). The following table shows these formats. The Masks column contains the red, green, blue, and alpha masks for each set of pixel format flags and bit depths.

|  |  |  |
| --- | --- | --- |
| Pixel format flags | Bit depth | Masks |
|  | | |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED1 | 1 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED1 |  DDPF\_PALETTEINDEXEDTO8 | 1 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED2 | 2 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED2 |  DDPF\_PALETTEINDEXEDTO8 | 2 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED4 | 4 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED4 |  DDPF\_PALETTEINDEXEDTO8 | 4 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED8 | 8 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB | 8 | R: 0x000000E0  G: 0x0000001C  B: 0x00000003  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 16 | R: 0x00000F00  G: 0x000000F0  B: 0x0000000F  A: 0x0000F000 |
| DDPF\_RGB | 16 | R: 0x0000F800  G: 0x000007E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x0000001F  G: 0x000007E0  B: 0x0000F800  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 16 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  A: 0x00008000 |
| DDPF\_RGB | 24 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 24 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 32 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0xFF000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 32 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0xFF000000 |

The HEL can create these formats in system memory. The DirectDraw device driver for a 3-D-accelerated display card can create textures of other formats in display memory. Such a driver exports the DDSCAPS\_TEXTURE flag to indicate that it can create textures.

#### Off-Screen Surface Formats

The following table shows the pixel formats for off-screen plain surfaces supported by the DirectX hardware emulation layer (HEL). The Masks column contains the red, green, blue, and alpha masks for each set of pixel format flags and bit depths.

|  |  |  |
| --- | --- | --- |
| Pixel format flags | Bit depth | Masks |
|  | | |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED1 | 1 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED2 | 2 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED4 | 4 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED8 | 8 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x0000F800  G: 0x000007E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB | 24 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 24 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ZPIXELS | 32 | R: 0x0000F800  G: 0x000007E0  B: 0x0000001F  Z: 0xFFFF0000 |
| DDPF\_RGB |  DDPF\_ZPIXELS | 32 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  Z: 0xFFFF0000 |

In addition to supporting a wide range of off-screen surface formats, the HEL also supports surfaces intended for use by Direct3D, or other 3-D renderers.

### Four-Character Codes (FOURCC)

DirectDraw utilizes a special set of codes that are four characters in length. These codes, called four-character codes or FOURCCs, are stored in file headers of files that contain multimedia data, such as bitmap images, sound, or video. FOURCCs describe the software technology that was used to produce multimedia data. By implication, they also describe the format of the data itself.

DirectDraw applications use FOURCCs for image color and format conversion. If an application calls the **IDirectDrawSurface7::GetPixelFormat** method to request the pixel format of a surface whose format is not RGB, the **dwFourCC** member of the **DDPIXELFORMAT** structure identifies the FOURCC when the method returns.

In addition, the **biCompression** member of the **BITMAPINFOHEADER** structure can be set to a FOURCC to indicate the codec used to compress or decompress an image.

FOURCCs are registered with Microsoft by the vendors of the respective multimedia software technologies. Some common FOURCCs appear in the following list.

|  |  |  |
| --- | --- | --- |
| FOURCC | Company | Technology name |
|  | | |
| AUR2 | AuraVision Corporation | AuraVision Aura 2: YUV 422 |
| AURA | AuraVision Corporation | AuraVision Aura 1: YUV 411 |
| CHAM | Winnov, Inc. | MM\_WINNOV\_CAVIARA\_CHAMPAGNE |
| CVID | Supermac | Cinepak by Supermac |
| CYUV | Creative Labs, Inc. | Creative Labs YUV |
| DXT1 | Microsoft Corporation | DirectX Texture Compression Format 1 |
| DXT2 | Microsoft Corporation | DirectX Texture Compression Format 2 |
| DXT3 | Microsoft Corporation | DirectX Texture Compression Format 3 |
| DXT4 | Microsoft Corporation | DirectX Texture Compression Format 4 |
| DXT5 | Microsoft Corporation | DirectX Texture Compression Format 5 |
| FVF1 | Iterated Systems, Inc. | Fractal Video Frame |
| IF09 | Intel® Corporation | Intel Intermediate YUV9 |
| IV31 | Intel Corporation | Indeo 3.1 |
| JPEG | Microsoft Corporation | Still Image JPEG DIB |
| MJPG | Microsoft Corporation | Motion JPEG DIB Format |
| MRLE | Microsoft Corporation | Run Length Encoding |
| MSVC | Microsoft Corporation | Video 1 |
| PHMO | IBM Corporation | Photomotion |
| RT21 | Intel Corporation | Indeo 2.1 |
| ULTI | IBM Corporation | Ultimotion |
| V422 | Vitec Multimedia | 24-bit YUV 4:2:2 |
| V655 | Vitec Multimedia | 16-bit YUV 4:2:2 |
| VDCT | Vitec Multimedia | Video Maker Pro DIB |
| VIDS | Vitec Multimedia | YUV 4:2:2 CCIR 601 for V422 |
| YU92 | Intel Corporation | YUV |
| YUV8 | Winnov, Inc. | MM\_WINNOV\_CAVIAR\_YUV8 |
| YUV9 | Intel Corporation | YUV9 |
| YUYV | Canopus, Co., Ltd. | BI\_YUYV, Canopus |
| ZPEG | Metheus | Video Zipper |

## DirectDraw Visual Basic Reference

This section contains reference information for the API elements that Microsoft® DirectDraw® provides. Reference material is divided into the following categories:

Classes

Types

Enumerations

Error Codes

Pixel Format Masks

Four-Character Codes (FOURCC)

### Classes

This section contains reference information about the classes used with the DirectDraw component. The following classes are covered:

**DirectDraw7**

**DirectDrawClipper**

**DirectDrawColorControl**

**DirectDrawEnum**

**DirectDrawEnumModes**

**DirectDrawEnumSurfaces**

**DirectDrawGammaControl**

**DirectDrawIdentifier**

**DirectDrawPalette**

**DirectDrawSurface7**

**DirectX7**

**IFont**

DirectDraw7

[[1]](#footnote-1)# Applications use the methods of the **DirectDraw7** class to create DirectDraw objects and work with system-level variables. This section is a reference to the methods of this class. For a conceptual overview, see The DirectDraw Object.

The methods of the **DirectDraw7** class can be organized into the following groups:

|  |  |
| --- | --- |
| **Cooperative levels** | **SetCooperativeLevel** |
|  | **TestCooperativeLevel** |
| **Creating objects** | **CreateClipper** |
|  | **CreatePalette** |
|  | **CreateSurface** |
|  | **CreateSurfaceFromFile** |
|  | **CreateSurfaceFromResource** |
|  | **GetDirect3D** |
|  | **LoadPaletteFromBitmap** |
| **Device capabilities** | **GetCaps** |
| **Display modes** | **GetDisplayMode** |
|  | **GetDisplayModesEnum** |
|  | **GetMonitorFrequency** |
|  | **RestoreDisplayMode** |
|  | **SetDisplayMode** |
|  | **WaitForVerticalBlank** |
| **Display status** | **GetScanLine** |
|  | **GetVerticalBlankStatus** |
| **Miscellaneous** | **GetAvailableTotalMem** |
|  | **GetDeviceIdentifier** |
|  | **GetFourCCCodes** |
|  | **GetFreeMem** |
|  | **GetNumFourCCCodes** |
| **Surface management** | **DuplicateSurface** |
|  | **FlipToGDISurface** |
|  | **GetGDISurface** |
|  | **GetSurfaceFromDC** |
|  | **GetSurfacesEnum** |
|  | **RestoreAllSurfaces** |

The **DirectDraw7** class extends the features of previous versions of the class by offering methods enabling more flexible surface management than previous versions.

DirectDraw7.CreateClipper

[[2]](#footnote-2)# The **DirectDraw7.CreateClipper** method creates a **DirectDrawClipper** object.

*object***.CreateClipper(***flags* **As Long) As DirectDrawClipper**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*flags*

Currently not used and must be set to 0.

Return Values

If the method succeeds, it returns a **DirectDrawClipper** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_OUTOFMEMORY |

Remarks

The DirectDrawClipper object can be attached to a DirectDrawSurface and used during **DirectDrawSurface7.Blt** operations.

See Also

**DirectDrawSurface7.GetClipper**, **DirectDrawSurface7.SetClipper**

DirectDraw7.CreatePalette

[[3]](#footnote-3)# The **DirectDraw7.CreatePalette** method creates a **DirectDrawPalette** object for this DirectDraw object.

*object***.CreatePalette( \_**

*flags* **As CONST\_DDPCAPSFLAGS***,* \_

*pe()* **As PALETTEENTRY) As DirectDrawPalette**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*flags*

One or more of the constants of the **CONST\_DDPCAPSFLAGS** enumeration.

*pe()*

Array of 2, 4, 16, or 256 **PALETTEENTRY** types to initialize this **DirectDrawPalette** object.

Return Values

If the method succeeds, it returns a **DirectDrawPalette** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_OUTOFMEMORY |
| DDERR\_UNSUPPORTED |

DirectDraw7.CreateSurface

[[4]](#footnote-4)# The **DirectDraw7.CreateSurface** method creates a **DirectDrawSurface7** object for this DirectDraw object.

*object***.CreateSurface( \_**

*dd* **As DDSURFACEDESC2) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*dd*

**DDSURFACEDESC2** type that describes the requested surface. A **DDSCAPS2** type is a member of **DDSURFACEDESC2**.

Return Values

If the method succeeds, it returns a **DirectDrawSurface7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INCOMPATIBLEPRIMARY |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_NOALPHAHW |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_NOEMULATION |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOFLIPHW |
| DDERR\_NOMIPMAPHW |
| DDERR\_NOOVERLAYHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_OUTOFMEMORY |
| DDERR\_OUTOFVIDEOMEMORY |
| DDERR\_PRIMARYSURFACEALREADYEXISTS |
| DDERR\_UNSUPPORTEDMODE |

DirectDraw7.CreateSurfaceFromFile

[[5]](#footnote-5)# The **DirectDraw7.CreateSurfaceFromFile** method creates a **DirectDrawSurface7** object for this DirectDraw object and attaches the specified bitmap image to the **DirectDrawSurface** object.

*object***.CreateSurfaceFromFile( \_**

*file* **As String***,* \_

*dd* **As DDSURFACEDESC2) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*file*

Name of the bitmap image to load onto the surface that is created.

*dd*

**DDSURFACEDESC2** type that describes the requested surface. A **DDSCAPS2** type is a member of **DDSURFACEDESC2**.

Return Values

If the method succeeds, it returns a **DirectDrawSurface7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INCOMPATIBLEPRIMARY |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_NOALPHAHW |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_NOEMULATION |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOFLIPHW |
| DDERR\_NOMIPMAPHW |
| DDERR\_NOOVERLAYHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_OUTOFMEMORY |
| DDERR\_OUTOFVIDEOMEMORY |
| DDERR\_PRIMARYSURFACEALREADYEXISTS |
| DDERR\_UNSUPPORTEDMODE |

Remarks

If you are using 256 colors, set the display mode and the palette before you call this method to display correct palette information.

DirectDraw7.CreateSurfaceFromResource

[[6]](#footnote-6)# The **DirectDraw7.CreateSurfaceFromResource** method creates a **DirectDrawSurface7** object for this DirectDraw object and attaches the specified resource to the **DirectDrawSurface** object.

*object***.CreateSurfaceFromResource( \_**

*file* **As String***,* \_

*resName* **As String***,* \_

*ddsd* **As DDSURFACEDESC2) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*file*

Filename of the resource that is loaded onto the surface that is created. If the resource is part of the executable, specifying an empty string for this parameter locates the resource. This parameter can also be the name of an OCX in which the resource is located.

*resName*

Name of the resource that is loaded onto the surface that is created.

*ddsd*

**DDSURFACEDESC2** type that describes the requested surface. A **DDSCAPS2** type is a member of **DDSURFACEDESC2**.

Return Values

If the method succeeds, it returns a **DirectDrawSurface7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INCOMPATIBLEPRIMARY |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_NOALPHAHW |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_NODIRECTDRAWHW |
| DDERR\_NOEMULATION |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOFLIPHW |
| DDERR\_NOMIPMAPHW |
| DDERR\_NOOVERLAYHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_OUTOFMEMORY |
| DDERR\_OUTOFVIDEOMEMORY |
| DDERR\_PRIMARYSURFACEALREADYEXISTS |
| DDERR\_UNSUPPORTEDMODE |

Remarks

If you supply an empty string as the module name and run the application in the Microsoft® Visual Basic® environment, the resource cannot be found. Passing an empty string succeeds only if you are using a stand-alone executable.

The resource name needs to be a string, rather than a number. Place quotes around the resource name to make it a string, or the method fails.

DirectDraw7.DuplicateSurface

[[7]](#footnote-7)# The **DirectDraw7.DuplicateSurface** method duplicates a **DirectDrawSurface7** object.

*object***.DuplicateSurface( \_**

*ddIn* **As DirectDrawSurface7) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*ddIn*

**DirectDrawSurface7** object that is the surface to be duplicated.

Return Values

If the method succeeds, it returns a newly duplicated **DirectDrawSurface7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_CANTDUPLICATE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |
| DDERR\_SURFACELOST |

Remarks

This method creates a new **DirectDrawSurface7** object that points to the same surface memory as an existing DirectDrawSurface object. This duplicate can be used just like the original object. The surface memory is released after the last object that refers to it is released. A primary surface, 3-D surface or implicitly created surface cannot be duplicated.

DirectDraw7.FlipToGDISurface

[[8]](#footnote-8)# The **DirectDraw7.FlipToGDISurface** method makes the surface that the GDI writes to the primary surface.

*object***.FlipToGDISurface()**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |

Remarks

This method can be called at the end of a page-flipping application to ensure that the display memory that the GDI is writing to is visible.

This method disables stereo autoflipping.

See Also

**DirectDraw7.GetGDISurface**

DirectDraw7.GetAvailableTotalMem

[[9]](#footnote-9)# The **DirectDraw7.GetAvailableTotalMem** method retrieves the total amount of display memory available for a given type of surface.

*object***.GetAvailableTotalMem( \_**

*ddsCaps* **As DDSCAPS2) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*ddsCaps*

**DDSCAPS2** type that indicates the hardware capabilities of the proposed surface.

Return Values

If the method succeeds, it returns the amount of total memory.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NODIRECTDRAWHW |

Remarks

This method provides only a snapshot of the current display-memory state. The amount of free display memory is subject to change as surfaces are created and released. Therefore, you should use the free memory value only as an approximation. In addition, a particular display adapter card might make no distinction between two different memory types. For example, the adapter might use the same portion of display memory to store z-buffers and textures, so allocating one type of surface (for example, a z-buffer) can affect the amount of display memory available for another type of surface (textures). Therefore, it is best to first allocate an application's fixed resources (such as front and back buffers , and z-buffers) before determining how much memory is available for dynamic use (such as texture mapping).

DirectDraw7.GetCaps

[[10]](#footnote-10)# The **DirectDraw7.GetCaps** method fills in the capabilities of the device driver for the hardware and the hardware emulation layer (HEL).

*object***.GetCaps(***hwCaps* **As DDCAPS***, helCaps* **As DDCAPS)**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*hwCaps*

**DDCAPS** type to be filled with the capabilities of the hardware, as reported by the device driver.

*helCaps*

**DDCAPS** type to be filled with the capabilities of the HEL.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDraw7.GetDeviceIdentifier

[[11]](#footnote-11)# The **DirectDraw7.GetDeviceIdentifier** method returns a DirectDrawIdentifier object filled with information about the DirectDraw device driver.

*object.***GetDeviceIdentifier( \_**

*flags* **As CONST\_DDDEVICEIDFLAGS \_ )**

**As DirectDrawIdentifier**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*flags*

One of the constants of the **CONST\_DDDEVICEIDFLAGS** enumeration specifying information options.

Return Values

If the method succeeds, it returns a **DirectDrawIdentifier** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDraw7.GetDirect3D

[[12]](#footnote-12)# The **DirectDraw7.GetDirect3D** method creates a **Direct3D7** object.

*object.***GetDirect3D() As Direct3D7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Return Values

If the method succeeds, it returns a **Direct3D7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| E\_INVALIDINTERFACE |
| E\_OUTOFMEMORY |

For information on trapping errors, see Visual Basic Error Trapping.

Remarks

The object returned by a successful function call must be assigned to a **Direct3D7** object variable. For example:

Dim Direct3D as Direct3D7

Set Direct3D = *object*.GetDirect3D()

DirectDraw7.GetDisplayMode

[[13]](#footnote-13)# The **DirectDraw7.GetDisplayMode** method retrieves the current display mode.

*object***.GetDisplayMode(***surface* **As DDSURFACEDESC2)**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*surface*

**DDSURFACEDESC2** type to be filled with a description of the surface display mode.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTEDMODE |

Remarks

An application should not save the information returned by this method to restore the display mode on clean-up. The application should use the **DirectDraw7.RestoreDisplayMode** method to restore the mode on clean-up, thus avoiding mode-setting conflicts that could arise in a multiprocess environment.

See Also

**DirectDraw7.SetDisplayMode**, **DirectDraw7.RestoreDisplayMode**, **DirectDraw7.GetDisplayModesEnum**

DirectDraw7.GetDisplayModesEnum

[[14]](#footnote-14)# The **DirectDraw7.GetDisplayModesEnum** method returns a **DirectDrawEnumModes** object filled with display-mode information.

*object***.GetDisplayModesEnum( \_**

*flags* **As CONST\_DDEDMFLAGS***,* \_

*ddsd* **As DDSURFACEDESC2) As DirectDrawEnumModes**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*flags*

One of the constants of the **CONST\_DDEDMFLAGS** enumeration.

*ddsd*

**DDSURFACEDESC2** type to be filled with a description of the surface display mode.

Return Values

If the method succeeds, it returns a **DirectDrawEnumModes** object that you can then query for a description of the display modes.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| E\_OUTOFMEMORY |

Remarks

An application should not save the information returned by this method to restore the display mode on clean-up. The application should use the **DirectDraw7.RestoreDisplayMode** method to restore the mode on clean-up, thus avoiding mode-setting conflicts that could arise in a multiprocess environment.

See Also

**DirectDraw7.SetDisplayMode**, **DirectDraw7.RestoreDisplayMode**, **DirectDraw7.GetDisplayModesEnum**

DirectDraw7.GetFourCCCodes

[[15]](#footnote-15)# The **DirectDraw7.GetFourCCCodes** method retrieves the FOURCC codes supported by the DirectDraw object.

*object***.GetFourCCCodes(***ccCodes()* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*ccCodes*

Array of variables to be filled with the Four-Character Codes(FOURCC) supported by this DirectDraw object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

To retrieve the number of codes supported by a **DirectDraw7** object, use **DirectDraw7.GetNumFourCCCodes**.

DirectDraw7.GetFreeMem

[[16]](#footnote-16)# The **DirectDraw7.GetFreeMem** method retrieves the total amount of display memory currenty free.

*object***.GetFreeMem(***ddsCaps* **As DDSCAPS2) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*ddsCaps*

**DDSCAPS2** type that indicates the hardware capabilities of the proposed surface.

Return Values

If the method succeds, it returns the total amount of memory.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDCAPS |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NODIRECTDRAWHW |

Remarks

This method provides only a snapshot of the current display-memory state. The amount of free display memory is subject to change as surfaces are created and released. Therefore, you should use the free-memory value only as an approximation. In addition, a particular display adapter card might make no distinction between two different memory types. For example, the adapter might use the same portion of display memory to store z-buffers and textures. So, allocating one type of surface (for example, a z-buffer) can affect the amount of display memory available for another type of surface (textures). Therefore, it is best to first allocate an application's fixed resources (such as front and back buffers , and z-buffers) before determining how much memory is available for dynamic use (such as texture mapping).

DirectDraw7.GetGDISurface

[[17]](#footnote-17)# The **DirectDraw7.GetGDISurface** method retrieves the DirectDrawSurface object that currently represents the surface memory that the GDI is treating as the primary surface.

*object***.GetGDISurface() As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Return Values

If the method succeeds, it returns a **DirectDrawSurface7**.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |

See Also

**DirectDraw7.FlipToGDISurface**

DirectDraw7.GetMonitorFrequency

[[18]](#footnote-18)# The **DirectDraw7.GetMonitorFrequency** method retrieves the frequency of the monitor being driven by the DirectDraw object.

*object***.GetMonitorFrequency() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Return Values

If the method succeeds, it returns the monitor frequency, in Hz.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

DirectDraw7.GetNumFourCCCodes

[[19]](#footnote-19)# The **DirectDraw7.GetNumFourCCCodes** method retrieves the number of FOURCC codes supported by the **DirectDraw** object.

*object***.GetFourCCCodes() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Return Values

If the method succeeds, it returns the number of supported Four-Character Codes(FOURCC).

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method is typically called before calling **DirectDraw7.GetFourCCCodes**.

DirectDraw7.GetScanLine

[[20]](#footnote-20)# The **DirectDraw7.GetScanLine** method retrieves the scan line that is currently being drawn on the monitor.

*object***.GetScanLine(***lines* **As Long) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*lines*

Current scan line.

Return Values

If the method succeeds, it returns DD\_OK, indicating that the calling application can continue.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DDERR\_VERTICALBLANKINPROGRESS |

Remarks

Scan lines are reported as zero-based integers. The returned scan line value is in the range from 0 through *n*, where 0 is the first visible scan line on the screen and *n* is the last visible scan line, plus any scan lines that occur during the vertical blank period. Therefore, in a case in which an application is running at 640×480, and there are 12 scan lines during vblank, the values returned by this method range from 0 through 491.

See Also

**DirectDraw7.GetVerticalBlankStatus**, **DirectDraw7.WaitForVerticalBlank**

DirectDraw7.GetSurfaceFromDC

[[21]](#footnote-21)# The **DirectDraw7.GetSurfaceFromDC** method retrieves the **DirectDrawSurface7** object for a surface, based on its GDI device context handle.

*object***.GetSurfaceFromDC(***hdc* **As Long) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*hdc*

Handle of a display device context.

Return Values

If the method succeeds, it returns a **DirectDrawSurface7**.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |
| DDERR\_NOTFOUND |

Remarks

This method succeeds only for device context handles that identify surfaces already associated with the DirectDraw object.

See Also

Surfaces and Device Contexts

DirectDraw7.GetSurfacesEnum

[[22]](#footnote-22)# The **DirectDraw7.GetSurfacesEnum** method returns a **DirectDrawEnumSurfaces** object that is used to enumerate the attached surfaces of the DirectDraw7 object.

*object***.GetSurfacesEnum( \_**

*flags* **As CONST\_DDENUMSURFACESFLAGS, \_**

*desc* **As DDSURFACEDESC2) As DirectDrawEnumSurfaces**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*flags*

**CONST\_DDENUMSURFACESFLAGS** enumeration containing a combination of one search-type flag and one matching flag. The search-type flag determines how the method searches for matching surfaces; you can search for surfaces that can be created, using the description in the *desc* parameter, or you can search for existing surfaces that already match that description. The matching flag determines whether the method enumerates all surfaces, only those that match, or only those that do not match the description in the *desc* parameter.

*desc*

**DDSURFACEDESC2** type that defines the surface of interest.

Return Values

If the method succeeds, it returns a **DirectDrawEnumSurfaces** object that you can then query for a description of the attached surfaces.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| E\_OUTOFMEMORY |

Remarks

If the DDENUMSURFACES\_CANBECREATED flag is set, this method attempts to temporarily create a surface that meets the search criteria.

DirectDraw7.GetVerticalBlankStatus

[[23]](#footnote-23)# The **DirectDraw7.GetVerticalBlankStatus** method retrieves the status of the vertical blank.

*object***.GetVerticalBlankStatus() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Return Values

If the method succeeds, it returns the status of the vertical blank. This parameter is 0 if a vertical blank is occurring, and nonzero otherwise.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

To synchronize with the vertical blank, use the **DirectDraw7.WaitForVerticalBlank** method.

See Also

**DirectDraw7.GetScanLine**, **DirectDraw7.WaitForVerticalBlank**

DirectDraw7.LoadPaletteFromBitmap

[[24]](#footnote-24)# The **DirectDraw7.LoadPaletteFromBitmap** method creates a **DirectDrawPalette** object, based on the palette of the specified bitmap for this DirectDraw object.

*object***.LoadPaletteFromBitmap( \_**

*bName* **As String) As DirectDrawPalette**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*bName*

Name of the bitmap from which to load the palette.

Return Values

If the method succeeds, it returns a **DirectDrawPalette** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOOPERATIVELEVELSET |
| DDERR\_OUTOFMEMORY |
| DDERR\_UNSUPPORTED |

DirectDraw7.RestoreAllSurfaces

[[25]](#footnote-25)# The **DirectDraw7.RestoreAllSurfaces** method restores all the surfaces created for the DirectDraw object, in the order that they were created.

*object***.RestoreAllSurfaces()**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

This method is provided for convenience. Effectively, this method calls the **DirectDrawSurface7.Restore** method for each surface created by this DirectDraw object.

See Also

**DirectDrawSurface7.Restore**, Losing and Restoring Surfaces

DirectDraw7.RestoreDisplayMode

[[26]](#footnote-26)# The **DirectDraw7.RestoreDisplayMode** method resets the mode of the display device hardware for the primary surface to what it was before the **DirectDraw7.SetDisplayMode** method was called. Exclusive-level access is required to use this method.

*object***.RestoreDisplayMode()**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_LOCKEDSURFACES |
| DDERR\_NOEXCLUSIVEMODE |

See Also

**DirectDraw7.SetDisplayMode**, **DirectDrawEnumModes**, **DirectDraw7.SetCooperativeLevel**

DirectDraw7.SetCooperativeLevel

[[27]](#footnote-27)# The **DirectDraw7.SetCooperativeLevel** method determines the top-level behavior of the application.

*object***.SetCooperativeLevel( \_**

*hdl* **As Long,**\_

*flags* **As CONST\_DDSCLFLAGS)**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*hdl*

Window handle used for the application. Set to the calling application's top-level window handle (not a handle for any child windows created by the top-level window). This parameter can be 0 when the DDSCL\_NORMAL flag is specified in the *flags* parameter.

*flags*

One or more of the constants from the **CONST\_DDSCLFLAGS** enumeration.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_EXCLUSIVEMODEALREADYSET |
| DDERR\_HWNDALREADYSET |
| DDERR\_HWNDSUBCLASSED |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

This method must be called by the same thread that created the application window.

An application must set either the DDSCL\_EXCLUSIVE or the DDSCL\_NORMAL flag.

The DDSCL\_EXCLUSIVE flag must be set to call functions that can have drastic performance consequences for other applications. For more information, see Cooperative Levels.

See Also

**DirectDraw7.SetDisplayMode**, **DirectDraw7.GetDisplayModesEnum**, Mode X and Mode 13 Display Modes, Focus and Device Windows.

DirectDraw7.SetDisplayMode

[[28]](#footnote-28)# The **DirectDraw7.SetDisplayMode** method sets the mode of the display-device hardware.

*object***.SetDisplayMode( \_**

*w* **As Long, \_**

*h* **As Long, \_**

*bpp* **As Long, \_**

*ref* **As Long, \_**

*mode* **As CONST\_DDSDMFLAGS)**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*w* and *h*

Width and height of the new mode.

*bpp*

Resolution, in bits per pixel (bpp), of the new mode.

*ref*

Refresh rate of the new mode. Set this value to 0 to request the default refresh rate for the driver.

*mode*

One of the constants from the **CONST\_DDSDMFLAGS** enumeration describing additional options. Currently, the only valid flag is DDSDM\_STANDARDVGAMODE, which causes the method to set Mode 13, instead of Mode X 320x200x8 mode. If you set another resolution, bit depth, or a Mode X mode, do not use this flag; set the parameter to 0.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDMODE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_LOCKEDSURFACES |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_SURFACEBUSY |
| DDERR\_UNSUPPORTED |
| DDERR\_UNSUPPORTEDMODE |
| DDERR\_WASSTILLDRAWING |

Remarks

This method must be called by the same thread that created the application window.

If another application changes the display mode, the primary surface is lost, and the method returns DDERR\_SURFACELOST until the primary surface is recreated to match the new display mode.

See Also

**DirectDraw7.RestoreDisplayMode**, **DirectDraw7.GetDisplayModesEnum**, **DirectDraw7.SetCooperativeLevel**, Setting Display Modes, Restoring Display Modes

DirectDraw7.TestCooperativeLevel

[[29]](#footnote-29)# The **DirectDraw7.TestCooperativeLevel** method reports the current cooperative-level status of the DirectDraw device for a windowed or full-screen application.

*object***.TestCooperativeLevel() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

Return Values

If the method succeeds, it returns DD\_OK, indicating that the calling application can continue executing.

Error Codes

If the method fails or DD\_OK is not returned, an error is raised, and **Err.Number** can be set to one of the following values (see Remarks):

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_EXCLUSIVEMODEALREADYSET |
| DDERR\_NOEXCLUSIVEMODE |
| DD\_OK |
| DDERR\_WRONGMODE |

Remarks

This method is particularly useful to applications that use the WM\_ACTIVATEAPP and WM\_DISPLAYCHANGE system messages as a notification to restore surfaces or recreate DirectDraw objects. A 0 return value always indicates that the application can continue without restoring or recreating surfaces, but the error codes are interpreted differently, depending on the cooperative level that the application uses. For more information, see Testing Cooperative Levels.

DirectDraw7.WaitForVerticalBlank

[[30]](#footnote-30)# The **DirectDraw7.WaitForVerticalBlank** method helps the application synchronize itself with the vertical blank interval.

*object***.WaitForVerticalBlank( \_**

*flags* **As CONST\_DDWAITVBFLAGS, \_**

*handle* **As Long) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDraw7** object.

*flags*

One of the constants of the **CONST\_DDWAITVBFLAGS** enumeration specifying how long to wait for the vertical blank.

*handle*

Handle of the event to be triggered when the vertical blank begins. This parameter is not currently used.

Return Values

If the method succeeds, it returns DD\_OK, indicating that the calling application can continue.

Error Codes

If the method fails or the return value is not DD\_OK, an error is raised, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |
| DD\_OK |
| DDERR\_WASSTILLDRAWING |

See Also

**DirectDraw7.GetVerticalBlankStatus**, **DirectDraw7.GetScanLine**

DirectDrawClipper

[[31]](#footnote-31)# Applications use the methods of the **DirectDrawClipper** class to manage clip lists. This section is a reference to the methods of this class. For a conceptual overview, see Clippers.

The methods of the **DirectDrawClipper** class can be organized into the following groups:

|  |  |
| --- | --- |
| **Clip lists** | **GetClipList** |
|  | **GetClipListSize** |
|  | **IsClipListChanged** |
|  | **SetClipList** |
| **Handles** | **GetHWnd** |
|  | **SetHWnd** |

DirectDrawClipper.GetClipList

[[32]](#footnote-32)# The **DirectDrawClipper.GetClipList** method retrieves a copy of the clip list associated with a DirectDrawClipper object.

*object***.GetClipList(***rects()* **As RECT)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawClipper** object.

*rects()*

Array of **RECT** types filled with the clip list.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCLIPLIST |
| DDERR\_REGIONTOOSMALL |

See Also

**DirectDrawClipper.SetClipList**

DirectDrawClipper.GetClipListSize

[[33]](#footnote-33)# The **DirectDrawClipper.GetClipListSize** method retrieves the size of the clip list associated with a DirectDrawClipper object.

*object***.GetClipListSize() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawClipper** object.

Return Values

If the method succeeds, the size of the clip list, in bytes, is returned.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCLIPLIST |

DirectDrawClipper.GetHWnd

[[34]](#footnote-34)# The **DirectDrawClipper.GetHWnd** method retrieves the window handle previously associated with this DirectDrawClipper object by the **DirectDrawClipper.SetHWnd** method.

*object***.GetHWnd() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawClipper** object.

Return Values

If the method succeeds, it returns the window handle.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

See Also

**DirectDrawClipper.SetHWnd**

DirectDrawClipper.IsClipListChanged

[[35]](#footnote-35)# The **DirectDrawClipper.IsClipListChanged** method monitors the status of the clip list if a window handle is associated with a DirectDrawClipper object.

*object***.IsClipListChanged() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawClipper** object.

Return Values

If the method succeeds, it returns the status of the clip list. The result is nonzero if the clip list has changed and 0 if it has not.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDrawClipper.SetClipList

[[36]](#footnote-36)# The **DirectDrawClipper.SetClipList** method sets or deletes the clip list used by the **DirectDrawSurface7.Blt** method on surfaces to which the parent DirectDrawClipper object is attached.

*object***.SetClipList( \_**

*count* **As Long, \_**

*rects()* **as RECT)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawClipper** object.

*count*

Number of **RECT** types in the *rects( )* array.

*rects()*

Array of **RECT** types that describe the clip list.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_CLIPPERISUSINGHWND |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

The clip list cannot be set if a window handle is already associated with the DirectDrawClipper object. The **DirectDrawSurface7.BltFast** method cannot clip.

See Also

**DirectDrawClipper.GetClipList**, **DirectDrawSurface7.Blt**, **DirectDrawSurface7.BltFast**

DirectDrawClipper.SetHWnd

[[37]](#footnote-37)# The **DirectDrawClipper.SetHWnd** method sets the window handle to obtain the clipping information.

*object***.SetHWnd(***hdl* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawClipper** object.

*hdl*

Window handle to obtain the clipping information.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

See Also

**DirectDrawClipper.GetHWnd**

DirectDrawColorControl

[[38]](#footnote-38)# The **DirectDrawColorControl** class allows you to get and set color controls. This object is created with a call to **DirectDrawSurface7.GetDirectDrawColorControl**. There are two methods in this class:

|  |  |
| --- | --- |
| **Color controls** | **GetColorControls** |
|  | **SetColorControls** |

DirectDrawColorControl.GetColorControls

[[39]](#footnote-39)# The **DirectDrawColorControl.GetColorControls** method returns the current color control settings associated with the specified overlay or primary surface. The **IFlags** member of the **DDCOLORCONTROL** type indicates which of the color control options are supported.

*object***.GetColorControls(***colorControl* **As DDCOLORCONTROL)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawColorControl** object.

*colorControl*

**DDCOLORCONTROL** type to receive the current control settings of the specified surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

Remarks

This method fails if the DirectDraw device does not support color controls.

See Also

**DirectDrawColorControl.SetColorControls**, Using Color Controls, Gamma and Color Controls

DirectDrawColorControl.SetColorControls

[[40]](#footnote-40)# The **DirectDrawColorControl.SetColorControls** method sets the color-control settings associated with the specified overlay or primary surface.

*object***.SetColorControls(***colorControl* **As DDCOLORCONTROL)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawColorControl** object.

*colorControl*

**DDCOLORCONTROL** type that contains the new values to be applied to the specified surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_UNSUPPORTED |

See Also

**DirectDrawColorControl.GetColorControls**, Using Color Controls, Gamma and Color Controls

DirectDrawEnum

[[41]](#footnote-41)# Applications use the methods of the **DirectDrawEnum** class to obtain information on video driver display adapters that are installed on the computer. This object is created and filled with data by the **DirectX7.GetDDEnum** method.

|  |  |
| --- | --- |
| **DirectDraw enumeration** | **GetCount** |
|  | **GetDescription** |
|  | **GetGuid** |
|  | **GetMonitorHandle** |
|  | **GetName** |

DirectDrawEnum.GetCount

[[42]](#footnote-42)# The **DirectDrawEnum.GetCount** method returns the number of DirectDraw drivers installed on the system.

*object***.GetCount() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnum** object.

Return Values

If the method succeeds, it returns the number of entries in the enumeration object.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

Each entry represents a DirectDraw driver description. To get individual driver descriptions, use **DirectDrawEnum.GetDescription**, **DirectDrawEnum.GetGuid**, and **DirectDrawEnum.GetName**.

DirectDrawEnum.GetDescription

[[43]](#footnote-43)# The **DirectDrawEnum.GetDescription** method returns the driver description of the specified DirectDraw device.

*object***.GetDescription(***index* **As Long) As String**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnum** object.

*index*

Particular DirectDraw device in the DirectDrawEnum object.

Return Values

If the method succeeds, it returns the driver description of the device.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawEnum.GetGuid

[[44]](#footnote-44)# The **DirectDrawEnum.GetGuid** returns the unique identifier of the specified DirectDraw device.

*object***.GetGuid(***index* **As Long) As String**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnum** object.

*index*

Particular DirectDraw device in the DirectDrawEnum object.

Return Values

If the method succeeds, it returns the unique identifier of the device.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawEnum.GetMonitorHandle

[[45]](#footnote-45)# The **DirectDrawEnum.GetMonitorHandle** returns the monitor handle of the specified DirectDraw device.

*object***.GetName(***index* **As Long) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnum** object.

*index*

Particular DirectDraw device in the DirectDrawEnum object.

Return Values

If the method succeeds, it returns the monitor handle of the device.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawEnum.GetName

[[46]](#footnote-46)# The **DirectDrawEnum.GetName** returns the driver name of the specified DirectDraw device.

*object***.GetName(***index* **As Long) As String**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnum** object.

*index*

Particular DirectDraw device in the DirectDrawEnum object.

Return Values

If the method succeeds, it returns the driver name of the device.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawEnumModes

[[47]](#footnote-47)# Applications use the methods of the **DirectDrawEnumModes** class to enumerate the computer's available video modes. This object is created and filled with data by the **DirectDraw7.GetDisplayModesEnum** method.

|  |  |
| --- | --- |
| **DirectDraw mode enumeration** | **GetCount** |
|  | **GetItem** |

DirectDrawEnumModes.GetCount

[[48]](#footnote-48)# The **DirectDrawEnumModes.GetCount** method returns the number of available video modes.

*object***.GetCount() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnumModes** object.

Return Values

If the method succeeds, it returns the number of available video modes.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

Each entry represents a video mode. To get a description of an individual video mode, use **DirectDrawEnumModes.GetItem**.

DirectDrawEnumModes.GetItem

[[49]](#footnote-49)# The **DirectDrawEnumModes.GetItem** method returns a video mode description for the specified element in the enumeration object.

*object***.GetItem(***index* **As Long,** *info* **As DDSURFACEDESC2)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnumModes** object.

*index*

Number specifying which element of the array to be accessed. Each element is an available video mode.

*info*

**DDSURFACEDESC2** type to be filled with video-mode information.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The number of video modes in the **DirectDrawEnumModes** object can be obtained from the **DirectDrawEnumModes.GetCount**.

DirectDrawEnumSurfaces

[[50]](#footnote-50)# Applications use the methods of the **DirectDrawEnumSurfaces** class to enumerate all the created surfaces. This object is created and filled with data by the **DirectDrawSurface7.GetAttachedSurfaceEnum** method.

|  |  |
| --- | --- |
| **DirectDraw surface enumeration** | **GetCount** |
|  | **GetItem** |

DirectDrawEnumSurfaces.GetCount

[[51]](#footnote-51)# The **DirectDrawEnumSurfaces.GetCount** method returns the number of created surfaces.

*object***.GetCount() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnumSurfaces** object.

Return Values

If the method succeeds, it returns the number of created surfaces.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

Each entry represents created DirectDraw surfaces. To get a description of a surface, use **DirectDrawEnumSurfaces.GetItem**.

DirectDrawEnumSurfaces.GetItem

[[52]](#footnote-52)# The **DirectDrawEnumSurfaces.GetItem** method returns a specific surface from the list of created surfaces of the **DirectDrawEnumSurfaces** object.

*object***.GetItem(***index* **As Long) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawEnumSurfaces** object.

*index*

Number specifying which element of the array to be accessed. Each element represents a created surface.

Return Values

**DirectDrawSurface7** object describing the surface is returned.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

To obtain the number of created surfaces, call the **DirectDrawEnumSurfaces.GetCount** method.

DirectDrawGammaControl

[[53]](#footnote-53)# Applications use the methods of the **DirectDrawGammaControl** class to adjust the red, green, and blue gamma ramp levels of the primary surface. This section is a reference to the methods of this class. This object is created with a call to the **DirectDrawSurface7.GetDirectDrawGammaControl** method.

For a conceptual overview, see Gamma and Color Controls.

|  |  |
| --- | --- |
| **Gamma ramps** | **GetGammaRamp** |
|  | **SetGammaRamp** |

DirectDrawGammaControl.GetGammaRamp

[[54]](#footnote-54)# The **DirectDrawGammaControl.GetGammaRamp** method retrieves the red, green, and blue gamma ramps for the primary surface.

*object***.GetGammaRamp( \_**

*flags* **As CONST\_DDSGRFLAGS, \_**

*gammaRamp* **As DDGAMMARAMP)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawGammaControl** object.

*flags*

One of the constants of the **CONST\_DDSGRFLAGS** enumeration indicating if gamma calibration is desired. Set this parameter to DDSGR\_CALIBRATE to request that the calibrator adjust the gamma ramp according to the physical properties of the display, making the result identical on all systems. If calibration is not needed, set this parameter to 0.

*gammaRamp*

**DDGAMMARAMP** type to be filled with the current red, green, and blue gamma ramps. This type maps color values in the frame buffer to the color values to be passed to the digital-to-analog converter (DAC).

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

See Also

**DirectDrawGammaControl.SetGammaRamp**, Gamma and Color Controls

DirectDrawGammaControl.SetGammaRamp

[[55]](#footnote-55)# The **DirectDrawGammaControl.SetGammaRamp** method sets the red, green, and blue gamma ramps for the primary surface.

*object***.SetGammaRamp( \_**

*flags* **As CONST\_DDSGRFLAGS***, \_*

*gammaRamp* **As DDGAMMARAMP)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawGammaControl** object.

*flags*

One of the constants of the **CONST\_DDSGRFLAGS** enumeration indicating whether gamma calibration is desired. Set this parameter DDSGR\_CALIBRATE to request that the calibrator adjust the gamma ramp according to the physical properties of the display, making the result identical on all systems. If calibration is not needed, set this parameter to 0.

*gammaRamp*

**DDGAMMARAMP** type that contains the new red, green, and blue gamma ramp entries. Each array maps color values in the frame buffer to the color values to be passed to the digital-to-analog converter (DAC).

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |

Remarks

Not all systems support gamma calibration. To determine whether gamma calibration is supported, call **DirectDraw7.GetCaps**, and examine the **lCaps2** member of the associated **DDCAPS** type after the method returns. If the DDCAPS\_CANCALIBRATEGAMMA capability flag is present, gamma calibration is supported.

Calibrating gamma ramps incurs some processing overhead and should not be used frequently.

Including the DDSGR\_CALIBRATE flag in the *flags* parameter when running on systems that do not support gamma calibration does not cause this method to fail. The method succeeds, setting new gamma ramp values without calibration.

See Also

**DirectDrawGammaControl.GetGammaRamp**, Gamma and Color Controls

DirectDrawIdentifier

[[56]](#footnote-56)# Applications use the methods of the **DirectDrawIdentifier** class to obtain information about the DirectDraw driver. This object can be used, with caution, to recognize specific hardware installations to implement workarounds for poor driver or chipset behavior. This object is created with a call to the **IDirectDraw7.GetDeviceIdentifier** method.

The methods of the **DirectDrawIdentifier** can be organized into the following group:

|  |  |
| --- | --- |
| **Driver information** | **GetDescription** |
|  | **GetDeviceId** |
|  | **GetDeviceIdentifier** |
|  | **GetDriver** |
|  | **GetDriverSubVersion** |
|  | **GetDriverVersion** |
|  | **GetRevision** |
|  | **GetSubSysId** |
|  | **GetVendorId** |
|  | **GetWHQLLevel** |

DirectDrawIdentifier.GetDescription

[[57]](#footnote-57)# The **DirectDrawIdentifier.GetDescription** method returns the description of the driver.

*object***.GetDescription() As String**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the driver description.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawIdentifier.GetDeviceId

[[58]](#footnote-58)# The **DirectDrawIdentifier.GetDeviceId** method returns the identifier of the type of chipset.

*object***.GetDeviceId() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the identifier of the type of chipset. Can be 0 if unknown.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawIdentifier.GetDeviceIdentifier

[[59]](#footnote-59)# The **DirectDrawIdentifier.GetDeviceIndentifier** method returns the unique identifier for the driver/chipset pair.

*object***.GetDeviceIndentifier() As String**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the GUID for the driver/chipset pair. This can be 0 if unknown.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

Use the returned GUID if you wish to track changes to the driver or chipset to reprofile the graphics subsystem. It can also be used to identify particular problematic drivers.

DirectDrawIdentifier.GetDriver

[[60]](#footnote-60)# The **DirectDrawIdentifier.GetDriver** method returns the name of the DirectDraw device driver.

*object***.GetDriver() As String**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the driver name.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawIdentifier.GetDriverSubVersion

[[61]](#footnote-61)# The **DirectDrawIdentifier.GetDriverSubVersion** method returns the low part of the driver version.

*object***.GetDriverSubVersion() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the low part of the driver version.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

Caution should be exercised if you use this element to identify problematic drivers. It is recommended that the device identifier be used for this purpose.

DirectDrawIdentifier.GetDriverVersion

[[62]](#footnote-62)# The **DirectDrawIdentifier.GetDriverVersion** method returns the high part of the driver version.

*object***.GetDriverVersion() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the high part of the driver version.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

Caution should be exercised if you use this element to identify problematic drivers. It is recommended that the device identifier be used for this purpose.

DirectDrawIdentifier.GetRevision

[[63]](#footnote-63)# The **DirectDrawIdentifier.GetRevision** method returns the revision level of the chipset.

*object***.GetRevision() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the identifier of the revision level of the chipset. This can be 0 if unknown.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawIdentifier.GetSubSysId

[[64]](#footnote-64)# The **DirectDrawIdentifier.GetSubSysId** method returns the identifier of the subsystem.

*object***.GetSubSysId() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the identifier of the subsystem. Typically, this means the particular board. This can be 0 if unknown.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawIdentifier.GetVendorId

[[65]](#footnote-65)# The **DirectDrawIdentifier.GetVendorId** method returns the identifier of the manufacturer.

*object***.GetVendorId() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the identifier of the manufacturer. This can be 0 if unknown.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawIdentifier.GetWHQLLevel

[[66]](#footnote-66)# The **DirectDrawIdentifier.GetWHQLLevel** method retrieves the Windows Hardware Quality Lab (WHQL) certification level for the device/driver pair.

*object***.GetWHQLLevel() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawIdentifier** object.

Return Values

If the method succeeds, it returns the Windows Hardware Quality Lab (WHQL) certification level for the device/driver pair.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawPalette

[[67]](#footnote-67)# Applications use the methods of the **DirectDrawPalette** class to create DirectDrawPalette objects and work with system-level variables. A DirectDrawPalette object is created with a call to the **DirectDrawSurface7.GetPalette** method.

This section is a reference to the methods of this class. For a conceptual overview, see Palettes.

The methods of the **DirectDrawPalette** class can be organized into the following groups:

|  |  |
| --- | --- |
| **Palette capabilities** | **GetCaps** |
| **Palette entries** | **GetEntries** |
|  | **SetEntries** |

DirectDrawPalette.GetCaps

[[68]](#footnote-68)# The **DirectDrawPalette.GetCaps** method retrieves the capabilities of this palette object.

*object***.GetCaps() As CONST\_DDPCAPSFLAGS**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawPalette** object.

Return Values

If the method succeeds, it returns one of the constants of the **CONST\_DDPCAPSFLAGS** enumeration indicating the capabilities of the palette object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDrawPalette.GetEntries

[[69]](#footnote-69)# The **DirectDrawPalette.GetEntries** method queries palette values from a DirectDrawPalette object.

*object***.GetEntries( \_**

*start* **As Long, \_**

*count* **As Long, \_**

*val()* **As PALETTEENTRY)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawPalette** object.

*start*

Start of the entries to be retrieved sequentially.

*count*

Number of palette entries that can fit in the address specified in *val()*. The colors of each palette entry are returned in sequence, from the value of the *start* parameter through the value of the *count* parameter minus 1. (These parameters are set by **DirectDrawPalette.SetEntries**.)

*val()*

Array of variables of type **PALETTEENTRY**. The palette entries are 1 byte each if the DDPCAPS\_8BITENTRIES flag was set in the flags parameter of the **DirectDraw7.CreatePalette**, and 4 bytes otherwise. Each field is a color description.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTPALETTIZED |

See Also

**DirectDrawPalette.SetEntries**

DirectDrawPalette.SetEntries

[[70]](#footnote-70)# The **DirectDrawPalette.SetEntries** method changes entries in a DirectDrawPalette object immediately.

*object***.SetEntries( \_**

*start* **As Long, \_**

*count* **As Long, \_**

*val()* **As PALETTEENTRY)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawPalette** object.

*start*

First entry to be set.

*count*

Number of palette entries to be changed.

*val()*

Array of variables of type **PALETTEENTRY**. The palette entries are 1 byte each if the DDPCAPS\_8BITENTRIES flag was set in the flags parameter of the **DirectDraw7.CreatePalette**, and 4 bytes otherwise. Each field is a color description.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOPALETTEATTACHED |
| DDERR\_NOTPALETTIZED |
| DDERR\_UNSUPPORTED |

See Also

**DirectDrawPalette.GetEntries**, **DirectDrawSurface7.SetPalette**

DirectDrawSurface7

[[71]](#footnote-71)# Applications use the methods of the **DirectDrawSurface7** class to create DirectDrawSurface objects and work with system-level variables. This section is a reference to the methods of this class. For a conceptual overview, see Surfaces.

The methods of the **DirectDrawSurface7** class can be organized into the following groups:

|  |  |
| --- | --- |
| **Allocating memory** | **IsLost** |
|  | **Restore** |
| **Attaching surfaces** | **AddAttachedSurface** |
|  | **DeleteAttachedSurface** |
|  | **GetAttachedSurface** |
|  | **GetAttachedSurfaceEnum** |
| **Blitting** | **Blt** |
|  | **BltColorFill** |
|  | **BltFast** |
|  | **BltFx** |
|  | **BltToDC** |
|  | **GetBltStatus** |
| **Color keying** | **GetColorKey** |
|  | **SetColorKey** |
| **Device contexts** | **GetDC** |
|  | **ReleaseDC** |
| **Drawing and text** | **DrawBox** |
|  | **DrawCircle** |
|  | **DrawEllipse** |
|  | **DrawLine** |
|  | **DrawRoundedBox** |
|  | **DrawText** |
|  | **GetDrawStyle** |
|  | **GetDrawWidth** |
|  | **GetFillColor** |
|  | **GetFillStyle** |
|  | **GetFontBackColor** |
|  | **GetFontTransparency** |
|  | **GetForeColor** |
|  | **SetDrawStyle** |
|  | **SetDrawWidth** |
|  | **SetFillColor** |
|  | **SetFillStyle** |
|  | **SetFont** |
|  | **SetFontBackColor** |
|  | **SetFontTransparency** |
|  | **SetForeColor** |
| **Flipping** | **Flip** |
|  | **GetFlipStatus** |
| **Locking** | **GetLockedArray** |
|  | **GetLockedPixel** |
|  | **Lock** |
|  | **SetLockedPixel** |
|  | **Unlock** |
| **Miscellaneous** | **GetDirectDraw** |
|  | **GetDirectDrawColorControl** |
|  | **GetDirectDrawGammaControl** |
| **Overlays** | **GetOverlayPosition** |
|  | **GetOverlayZOrdersEnum** |
|  | **SetOverlayPosition** |
|  | **UpdateOverlay** |
|  | **UpdateOverlayFx** |
|  | **UpdateOverlayZOrder** |
| **Surface capabilities** | **GetCaps** |
| **Surface clipper** | **GetClipper** |
|  | **SetClipper** |
| **Surface characteristics** | **ChangeUniquenessValue** |
|  | **GetPixelFormat** |
|  | **GetSurfaceDesc** |
|  | **GetUniquenessValue** |
| **Surface palettes** | **GetPalette** |
|  | **SetPalette** |
| **Textures** | **GetLOD** |
|  | **GetPriority** |
|  | **SetLOD** |
|  | **SetPriority** |

DirectDrawSurface7.AddAttachedSurface

[[72]](#footnote-72)# The **DirectDrawSurface7.AddAttachedSurface** method attaches the specified surface to this surface.

*object***.AddAttachedSurface(***ddS* **As DirectDrawSurface7)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*ddS*

**DirectDrawSurface7** object for the surface to be attached.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_CANNOTATTACHSURFACE |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACEALREADYATTACHED |
| DDERR\_SURFACELOST |
| DDERR\_WASSTILLDRAWING |

Remarks

You can explicitly unattach the surface by using the **DirectDrawSurface7.DeleteAttachedSurface** method. Unlike complex surfaces that you create with a single call to **DirectDraw7.CreateSurface**, surfaces attached with this method are not automatically released. It is the application's responsibility to release such surfaces.

Possible attachments include z-buffers, alpha channels, and back buffers. Some attachments automatically break other attachments. For example, the 3-D z-buffer can be attached to only one back buffer at a time. Attachment is not bidirectional, and a surface cannot be attached to itself. Emulated surfaces (in system memory) cannot be attached to nonemulated surfaces. Unless one surface is a texture map, the two attached surfaces must be the same size. A flipping surface cannot be attached to another flipping surface of the same type; however, attaching two surfaces of different types is allowed. For example, a flipping z-buffer can be attached to a regular flipping surface. If a nonflipping surface is attached to another nonflipping surface of the same type, the two surfaces become a flipping chain. If a nonflipping surface is attached to a flipping surface, it becomes part of the existing flipping chain. Additional surfaces can be added to this chain, and each call to the **DirectDrawSurface7.Flip** method advances one step through the surfaces.

See Also

**DirectDrawSurface7.DeleteAttachedSurface**, **DirectDrawSurface7.GetAttachedSurfaceEnum**

DirectDrawSurface7.Blt

[[73]](#footnote-73)# The **DirectDrawSurface7.Blt** method performs a bit block transfer (blit). This method does not support z-buffering or alpha blending (see alpha channel) during blit operations.

*object***.Blt( \_**

*destRect* **As RECT, \_**

*ddS* **As DirectDrawSurface7, \_**

*srcRect* **As RECT, \_**

*flags* **As CONST\_DDBLTFLAGS) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*destRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit to on the destination surface. If this parameter is an empty **RECT** type, the entire destination surface is used.

*ddS*

**DirectDrawSurface7** object for the DirectDrawSurface object that is the source of the blit.

*srcRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit from on the source surface. If this parameter is an empty **RECT**, the entire source surface is used.

*flags*

Combination of constants from the **CONST\_DDBLTFLAGS** enumeration that determines the valid members of the associated **DDBLTFX** type, which specify color key information, or request special behavior from the method.

Error Codes

If the method fails, it can return one of the following:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOALPHAHW |
| DDERR\_NOBLTHW |
| DDERR\_NOCLIPLIST |
| DDERR\_NODDROPSHW |
| DDERR\_NOMIRRORHW |
| DDERR\_NORASTEROPHW |
| DDERR\_NOROTATIONHW |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method is capable of synchronous or asynchronous blits (the latter is the default behavior), either display memory to display memory, display memory to system memory, system memory to display memory, or system memory to system memory. The blits can be performed by using source color keys and destination color keys. Arbitrary stretching or shrinking is performed if the source and destination rectangles are not the same size.

Typically, **DirectDrawSurface7.Blt** returns immediately with an error if the blitter is busy and the blit could not be set up. Specify the DDBLT\_WAIT flag to request a synchronous blit. When you include the DDBLT\_WAIT flag, the method waits until the blit can be set up or another error occurs before it returns.

Note that *dstRect* and *srcRect* parameters are defined so that the **right** and **bottom** members are exclusive—therefore, **right** minus **left** equals the width of the rectangle, not one less than the width.

Because this method often generates an error, instead of setting an error in the error object, the method returns the error code.

DirectDrawSurface7.BltColorFill

[[74]](#footnote-74)# The **DirectDrawSurface7.BltColorFill** method performs a bit block transfer (blit) of a single color to the specified destination rectangle.

*object***.BltColorFill( \_**

*destRect* **As RECT, \_**

*fillvalue* **As Long) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*destRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit to on the destination surface. If this parameter is an empty **RECT** type, the entire destination surface is used.

*fillvalue*

Color to blit.

Error Codes

If the method fails, it can return one of the following:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOALPHAHW |
| DDERR\_NOBLTHW |
| DDERR\_NOCLIPLIST |
| DDERR\_NODDROPSHW |
| DDERR\_NOMIRRORHW |
| DDERR\_NORASTEROPHW |
| DDERR\_NOROTATIONHW |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

Because this method often generates an error, instead of setting an error in the error object, the method returns the error code.

DirectDrawSurface7.BltFast

[[75]](#footnote-75)# The **DirectDrawSurface7.BltFast** method performs a source copy blit or transparent blit by using a source color key or destination color key.

*object***.BltFast( \_**

*dx* **As Long,** \_

*dy* **As Long, \_**

*ddS* **As DirectDrawSurface7, \_**

*srcRect* **As RECT, \_**

*trans* **As CONST\_DDBLTFASTFLAGS) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*dx* and *dy*

X- and y-coordinates to blit to on the destination surface.

*ddS*

**DirectDrawSurface7** object for the DirectDrawSurface object that is the source of the blit.

*srcRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit from on the source surface.

*trans*

One of the constants from the **CONST\_DDBLTFASTFLAGS** enumeration that identifies the type of transfer.

Error Codes

If the method fails, it can return one of the following:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOBLTHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method always attempts an asynchronous blit if it is supported by the hardware.

This method works only on display memory surfaces and cannot clip when blitting. If you use this method on a surface with an attached clipper, the call fails, and the method returns DDERR\_UNSUPPORTED.

The software implementation of **DirectDrawSurface7.BltFast** is 10 percent faster than the **DirectDrawSurface7.Blt** method. However, there is no speed difference between the two if display hardware is being used.

Typically, **DirectDrawSurface7.BltFast** returns immediately with an error if the blitter is busy and the blit cannot be set up. You can use the DDBLTFAST\_WAIT flag, however, if you want this method not to return until either the blit can be set up or another error occurs.

Because this method often generates an error, instead of setting an error in the error object, the method returns the error code.

DirectDrawSurface7.BltFx

[[76]](#footnote-76)# The **DirectDrawSurface7.BltFx** method performs a bit block transfer with additional blit effect behavior specified in the *BltFx* parameter.

*object***.BltFx( \_**

*destRect* **As RECT***,* \_

*ddS* **As DirectDrawSurface7***,* \_

*srcRect* **As RECT***,* \_

*flags* **As CONST\_DDBLTFLAGS***,* \_

*BltFx* **As DDBLTFX) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*destRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit to on the destination surface. If this parameter is an empty **RECT** type, the entire destination surface is used.

*ddS*

**DirectDrawSurface7** object that is the source for the blit.

*srcRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit from on the source surface. If this parameter is an empty **RECT**, the entire source surface is used.

*flags*

Combination of constants of the **CONST\_DDBLTFLAGS** enumeration that determines the valid members of the associated **DDBLTFX** type, specifies color-key information, or requesta special behavior from the method.

*BltFx*

**DDBLTFX** type specifying additional blit effect operations to be performed.

Error Codes

If the method fails, it can return one of the following:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOALPHAHW |
| DDERR\_NOBLTHW |
| DDERR\_NOCLIPLIST |
| DDERR\_NODDROPSHW |
| DDERR\_NOMIRRORHW |
| DDERR\_NORASTEROPHW |
| DDERR\_NOROTATIONHW |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

Because this method often generates an error, instead of setting an error in the error object, the method returns the error code.

DirectDrawSurface7.BltToDC

[[77]](#footnote-77)# The **DirectDrawSurface7.BltToDC** method performs a bit block transfer (blit) to the specified device context.

*object***.BltToDC( \_**

*hdc* **As LONG***,* \_

*srcRect* **As RECT***,* \_

*destRect* **As RECT)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*hdc*

Handle of a device context.

*srcRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit from on the source surface. If this parameter is an empty **RECT** type, the entire source surface is used.

*destRect*

**RECT** type that defines the upper-left and lower-right points of the rectangle to blit to on the destination surface. If this parameter is an empty **RECT**, the entire source surface is used.

Error Codes

If the method fails, it can return one of the following:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDCLIPLIST |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOALPHAHW |
| DDERR\_NOBLTHW |
| DDERR\_NOCLIPLIST |
| DDERR\_NODDROPSHW |
| DDERR\_NOMIRRORHW |
| DDERR\_NORASTEROPHW |
| DDERR\_NOROTATIONHW |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOZBUFFERHW |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

Because this method often generates an error, instead of setting an error in the error object, the method returns the error code.

DirectDrawSurface7.ChangeUniquenessValue

[[78]](#footnote-78)# The **DirectDrawSurface7.ChangeUniquenessValue** method manually updates the uniqueness value for this surface.

*object***.ChangeUniquenessValue()**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_EXCEPTION |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

DirectDraw automatically updates uniqueness values whenever the contents of a surface change.

See Also

**DirectDrawSurface7.GetUniquenessValue**

DirectDrawSurface7.DeleteAttachedSurface

[[79]](#footnote-79)# The **DirectDrawSurface7.DeleteAttachedSurface** method detaches two attached surfaces.

*object***.DeleteAttachedSurface(***ddS* **As DirectDrawSurface7)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*ddS*

**DirectDrawSurface7** object for the DirectDrawSurface object to be detached. If this parameter is Nothing, all attached surfaces are detached.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_CANNOTDETACHSURFACE |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |
| DDERR\_SURFACENOTATTACHED |

Remarks

Implicit attachments, those formed by DirectDraw, rather than the **DirectDrawSurface7.AddAttachedSurface** method, cannot be detached. Detaching surfaces from a flipping chain can alter other surfaces in the chain. If a front buffer is detached from a flipping chain, the next surface in the chain becomes the front buffer, and the following surface becomes the back buffer. If a back buffer is detached from a chain, the following surface becomes a back buffer. If a plain surface is detached from a chain, the chain simply becomes shorter. If a flipping chain has only two surfaces and they are detached, the chain is destroyed, and both surfaces return to their previous designations.

See Also

**DirectDrawSurface7.Flip**

DirectDrawSurface7.DrawBox

[[80]](#footnote-80)# The **DirectDrawSurface7.DrawBox** method draws a box on the surface.

*object***.DrawBox( \_**

*x1* **As Long, \_**

*y1* **As Long, \_**

*x2* **As Long, \_**

*y2* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x1, y1, x2, y2*

Upper-left and bottom-right points of the box to be drawn.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw style is a solid line, and the default fill style is set to transparent. Both styles can be changed with a call to **DirectDrawSurface7.SetDrawStyle** and **DirectDrawSurface7.SetFillStyle**, respectively.

DirectDrawSurface7.DrawCircle

[[81]](#footnote-81)# The **DirectDrawSurface7.DrawCircle** method draws a circle on the surface.

*object***.DrawCircle( \_**

*x1* **As Long, \_**

*y1* **As Long, \_**

*r* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x1, y1, r*

Center point and radius of the circle to be drawn.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw style is a solid line, and the default fill style is set to transparent. Both styles can be changed with a call to **DirectDrawSurface7.SetDrawStyle** and **DirectDrawSurface7.SetFillStyle**, respectively.

DirectDrawSurface7.DrawEllipse

[[82]](#footnote-82)# The **DirectDrawSurface7.DrawEllipse** method draws an ellipse on the surface.

*object***.DrawEllipse(***x1* **As Long, \_**

*y1* **As Long, \_**

*x2* **As Long, \_**

*y2* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x1, y1, x2, y2*

Upper-left and lower-right corners of the bounding rectangle of the ellipse to be drawn.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw style is a solid line, and the default fill style is set to transparent. Both styles can be changed with a call to **DirectDrawSurface7.SetDrawStyle** and **DirectDrawSurface7.SetFillStyle**, respectively.

DirectDrawSurface7.DrawLine

[[83]](#footnote-83)# The **DirectDrawSurface7.DrawLine** method draws a line on the surface.

*object***.DrawLine( \_**

*x1* **As Long, \_**

*y1* **As Long, \_**

*x2* **As Long, \_**

*y2* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x1, y1, x2, y2*

End points of the line to be drawn.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw style is a solid line; this can be changed with a call to **DirectDrawSurface7.SetDrawStyle**.

DirectDrawSurface7.DrawRoundedBox

[[84]](#footnote-84)# The **DirectDrawSurface7.DrawRoundedBox** method draws a rounded box on the surface.

*object***.DrawRoundedBox( \_**

*x1* **As Long, \_**

*y1* **As Long, \_**

*x2* **As Long, \_**

*y2* **As Long, \_**

*rw* **As Long, \_**

*rh* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x1, y1, x2, y2*

Upper-left and lower-right points of the rectangle.

*rw*

Width of the ellipse used to draw the rounded corners.

*rh*

Height of the ellipse used to draw the rounded corners.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw style is a solid line, and the default fill style is set to transparent. Both styles can be changed with a call to **DirectDrawSurface7.SetDrawStyle** and **DirectDrawSurface7.SetFillStyle**, respectively.

DirectDrawSurface7.DrawText

[[85]](#footnote-85)# The **DirectDrawSurface7.DrawText** method draws text on the surface.

*object***.DrawText( \_**

*x* **As Long, \_**

*y* **As Long, \_**

*text* **As String, \_**

*b* **As Boolean)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x, y*

Location on the surface to draw text.

*text*

Text to display.

*b*

Boolean value indicating whether to draw to the current cursor position. See Remarks.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

To append text to the end of the last call to **DirectDrawSurface7.DrawText**, pass 0,0 as the x- and y-coordinates, and declare *b* as True. If you declare *b* as False, calling this method causes text to be displayed at the specified x- and y-coordinates.

DirectDrawSurface7.Flip

[[86]](#footnote-86)# The **DirectDrawSurface7.Flip** method makes the surface memory associated with the DDSCAPS\_BACKBUFFER surface become associated with the front-buffer surface.

*object***.Flip( \_**

*ddS* **As DirectDrawSurface7,**\_

*flags* **As CONST\_DDFLIPFLAGS)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*ddS*

**DirectDrawSurface7** object for an arbitrary surface in the flipping chain. The default for this parameter is Nothing, in which case DirectDraw cycles through the buffers in the order that they are attached to each other. If this parameter is not Nothing, DirectDraw flips to the specified surface, instead of the next surface in the flipping chain. The method fails if the specified surface is not a member of the flipping chain.

*flags*

One or more constants of the **CONST\_DDFLIPFLAGS** enumeration specifying flip options.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOFLIPHW |
| DDERR\_NOTFLIPPABLE |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method can be called only for a surface that has the DDSCAPS\_FLIP and DDSCAPS\_FRONTBUFFER capabilities. The display memory previously associated with the front buffer is associated with the back buffer.

The *ddS* parameter is used in rare cases when the back buffer is not the buffer that should become the front buffer. Typically, this parameter is Nothing.

The **DirectDrawSurface7.Flip** method is always synchronized with the vertical blank. If the surface has been assigned to a video port, this method updates the visible overlay surface and the video port's target surface.

For more information, see Flipping Surfaces.

See Also

**DirectDrawSurface7.GetFlipStatus**

DirectDrawSurface7.GetAttachedSurface

[[87]](#footnote-87)# The **DirectDrawSurface7.GetAttachedSurface** method obtains the attached surface that has the specified capabilities.

*object***.GetAttachedSurface( \_**

*caps* **As DDSCAPS2) As DirectDrawSurface7**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*caps*

**DDSCAPS2** type that contains the hardware capabilities of the surface.

Return Values

If the method succeeds, a **DirectDrawSurface7** object is returned. The retrieved surface is the one that matches the description, according to the *caps* parameter.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTFOUND |
| DDERR\_SURFACELOST |

Remarks

Attachments are used to connect multiple DirectDrawSurface objects into complex types, like the ones needed to support 3-D page flipping with z-buffers. This method fails if more than one surface is attached that matches the capabilities requested. In this case, the application must use the **DirectDrawSurface7.GetAttachedSurfaceEnum** method to obtain the attached surfaces.

The object returned by a successful function call must be assigned to a **DirectDrawSurface7** object variable. For example:

Dim DDrawSurface as DirectDrawSurface7

Set DDrawSurface = *object*.GetAttachedSurface()

DirectDrawSurface7.GetAttachedSurfaceEnum

[[88]](#footnote-88)# The **DirectDrawSurface7.GetAttachedSurfaceEnum** method returns a **DirectDrawEnumSurfaces** object that is filled with attached surfaces information .

*object***.GetAttachedSurfaceEnum() As DirectDrawEnumSurfaces**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns a **DirectDrawEnumSurfaces** enumeration interface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |

Remarks

The number of attached surfaces is obtained with a call to **DirectDrawEnumSurfaces.GetCount**, and a description of the attached surface is obtained with a call to **DirectDrawEnumSurfaces.GetItem**

The object returned by a successful function call must be assigned to a **DirectDrawEnumSurfaces** object variable. For example:

Dim SurfaceEnum as DirectDrawEnumSurfaces

Set SurfaceEnum = *object*.GetAttachedSurfacesEnum()

DirectDrawSurface7.GetBltStatus

[[89]](#footnote-89)# The **DirectDrawSurface7.GetBltStatus** method obtains the blitter status.

*object***.GetBltStatus(***flags* **As CONST\_DDGBSFLAGS) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*flags*

One of the constants of the **CONST\_DDGBSFLAGS** enumeration.

Return Values

If the method succeeds, depending on which constant is specified in the *flags* parameter, 0 is returned for False and nonzero for True.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to DDERR\_WASSTILLDRAWING if the surface has not finished its flipping process, or one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DD\_OK |
| DDERR\_UNSUPPORTED |

DirectDrawSurface7.GetCaps

[[90]](#footnote-90)# The **DirectDrawSurface7.GetCaps** method retrieves the capabilities of the surface. These capabilities are not necessarily related to the capabilities of the display device.

*object***.GetCaps(***caps* **As DDSCAPS2)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*caps*

**DDSCAPS2** type to be filled with the hardware capabilities of the surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDrawSurface7.GetClipper

[[91]](#footnote-91)# The **DirectDrawSurface7.GetClipper** method retrieves the DirectDrawClipper object associated with this surface.

*object***.GetClipper() As DirectDrawClipper**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns a **DirectDrawClipper** object associated with the surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCLIPPERATTACHED |

See Also

**DirectDrawSurface7.SetClipper**

Remarks

The object returned by a successful function call must be assigned to a **DirectDrawClipper** object variable. For example:

Dim Clipper as DirectDrawClipper

Set Clipper = *object*.GetClipper()

DirectDrawSurface7.GetColorKey

[[92]](#footnote-92)# The **DirectDrawSurface7.GetColorKey** method retrieves the color key value for the DirectDrawSurface object.

*object***.GetColorKey(***flags* **As Long,** *val* **As DDCOLORKEY)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*flags*

Color key requested. One of the following:

DDCKEY\_DESTBLT

A color key or color space to be used as a destination color key for blit operations.

DDCKEY\_DESTOVERLAY

A color key or color space to be used as a destination color key for overlay operations.

DDCKEY\_SRCBLT

A color key or color space to be used as a source color key for blit operations.

DDCKEY\_SRCOVERLAY

A color key or color space to be used as a source color key for overlay operations.

*val*

**DDCOLORKEY** type to be filled with the current values for the specified color key of the DirectDrawSurface object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOCOLORKEY |
| DDERR\_NOCOLORKEYHW |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

See Also

**DirectDrawSurface7.SetColorKey**

DirectDrawSurface7.GetDC

[[93]](#footnote-93)# The **DirectDrawSurface7.GetDC** method creates a GDI-compatible handle of a device context for the surface.

*object***.GetDC() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the handle to a device context.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_DCALREADYCREATED |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

This method uses an internal version of the **DirectDrawSurface7.Lock** method to lock the surface. The surface remains locked until the **DirectDrawSurface7.ReleaseDC** method is called.

See Also

**DirectDrawSurface7.Lock**

DirectDrawSurface7.GetDirectDraw

[[94]](#footnote-94)# The **DirectDrawSurface7.GetDirectDraw** method retrieves the DirectDraw object that was used to create the surface.

*object***.GetDirectDraw() As DirectDraw7**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns a **DirectDraw7** object.

Error Codes

If the method fails, itr raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

The object returned by a successful function call must be assigned to a **DirectDraw7** object variable. For example:

Dim DDrawObject as DirectDraw7

Set DDrawObject = *object*.GetDDInterface()

DirectDrawSurface7.GetDirectDrawColorControl

[[95]](#footnote-95)# The **DirectDrawSurface7.GetDirectDrawColorControl** method returns the DirectDrawColorControl object used with the surface.

*object***.GetDirectDrawColorControl() As DirectDrawColorControl**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns a **DirectDrawColorControl** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDrawSurface7.GetDirectDrawGammaControl

[[96]](#footnote-96)# The **DirectDrawSurface7.GetDirectDrawGammaControl** method returns the **DirectDrawGammaControl** object used with the surface.

*object***.GetDirectDrawGammaControl() As DirectDrawGammaControl**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns a **DirectDrawGammaControl** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDrawSurface7.GetDrawStyle

[[97]](#footnote-97)# The **DirectDrawSurface7.GetDrawStyle** returns the style set by **DirectDrawSurface7.SetDrawStyle**.

*object***.GetDrawStyle() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

The style set by **DirectDrawSurface7.SetDrawStyle**.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw style is a solid line.

DirectDrawSurface7.GetDrawWidth

[[98]](#footnote-98)# The **DirectDrawSurface7.GetDrawWidth** returns the width set by **DirectDrawSurface7.SetDrawWidth**.

*object***.GetDrawWidth() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

The width set by **DirectDrawSurface7.SetDrawWidth**.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default draw width is 1.

DirectDrawSurface7.GetFillColor

[[99]](#footnote-99)# The **DirectDrawSurface7.GetFillColor** returns the fill color set by **DirectDrawSurface7.SetFillColor**.

*object***.GetFillColor() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the fill color value set by **DirectDrawSurface7.SetFillColor**.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default fill color is black.

DirectDrawSurface7.GetFillStyle

[[100]](#footnote-100)# The **DirectDrawSurface7.GetFillStyle** returns the fill style set by **DirectDrawSurface7.SetFillStyle**.

*object***.GetFillStyle() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the fill style set by **DirectDrawSurface7.SetFillStyle**.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

The default fill style is transparent.

DirectDrawSurface7.GetFlipStatus

[[101]](#footnote-101)# The **DirectDrawSurface7.GetFlipStatus** method indicates whether the surface has finished its flipping process.

*object***.GetFlipStatus(***flags* **As CONST\_DDGFSFLAGS) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*flags*

One of the constants of the **CONST\_DDGFSFLAGS** enumeration.

Return Values

If the method succeeds, depending on which constant is specified in the *flags* parameter, 0 is returned for False and nonzero for True.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to DDERR\_WASSTILLDRAWING if the surface has not finished its flipping process, or one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DD\_OK |
| DDERR\_UNSUPPORTED |

See Also

**DirectDrawSurface7.Flip**

DirectDrawSurface7.GetFontBackColor

[[102]](#footnote-102)# The **DirectDrawSurface7.GetFontBackColor** returns the background color for the font.

*object***.GetFontBackColor() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the background color for the font.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

See Also

**DirectDrawSurface7.SetFontBackColor**

DirectDrawSurface7.GetFontTransparency

[[103]](#footnote-103)# The **DirectDrawSurface7.GetFontTransparency** method returns the font transparency set by **DirectDrawSurface7.SetFontTransparency**.

*object***.GetFontTransparency() As Boolean**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the font is set to be transparent, nonzero is returned and 0 if the font is not set to be transparent.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawSurface7.GetForeColor

[[104]](#footnote-104)# The **DirectDrawSurface7.GetForeColor** returns the foreground color set by **DirectDrawSurface7.SetForeColor**.

*object***.GetForeColor() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the foreground color set by **DirectDrawSurface7.SetForeColor**.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawSurface7.GetLockedArray

[[105]](#footnote-105)# The **DirectDrawSurface7.GetLockedArray** method returns a pointer to the array of locked pixels after a call to **DirectDrawSurface7.Lock**.

*object***.GetLockedArray( \_**

*array()* **As Byte)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*array()*

Array of locked pixels, in bytes.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

This method is provided for advanced users. Use this method only between **DirectDrawSurface7.Lock** and **DirectDrawSurface7.Unlock** calls. On some display cards, the pitch is not equal to the width of the surface; be sure not to write in memory beyond the array.

DirectDrawSurface7.GetLockedPixel

[[106]](#footnote-106)# The **DirectDrawSurface7.GetLockedPixel** method returns the specified pixel set by **DirectDrawSurface7.SetLockedPixel**.

*object***.GetLockedPixel( \_**

*x* **As Long, \_**

*y* **As Long) As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x* and *y*

Coordinates of the locked pixel.

Return Values

If the method succeeds, it returns the color of the locked pixel. This value is in the same format as the pixel format.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawSurface7.GetLOD

[[107]](#footnote-107)# The **DirectDrawSurface7.GetLOD** method retrieves the maximum level of detail currently set for a managed mipmap surface. This method succeeds only on managed textures (see Remarks).

*object.***GetLOD() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the maximum level of detail for the mipmap chain.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDOBJECT |

Remarks

Applications can call this method only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and raise the DDERR\_INVALIDOBJECT error.

This method communicates to the Direct3D texture manager the most detailed mipmap in this chain that it should load into local video memory. For example, in a five-level mipmap chain, a return value of 2 indicates that the texture manager only loads mipmap levels 2 through 4 into local video memory at any given time. Likewise, if the most detailed mipmap in the chain has the dimensions 256×256, a return value of 2 means that the largest mipmap ever present in video memory has dimensions 64×64.

See Also

**DirectDrawSurface7.SetLOD**, Texture Filtering With Mipmaps, Automatic Texture Management, Textures

DirectDrawSurface7.GetOverlayPosition

[[108]](#footnote-108)# Given a visible, active overlay surface (DDSCAPS\_OVERLAY flag set), the **DirectDrawSurface7.GetOverlayPosition** method returns the display coordinates of the surface.

*object***.GetOverlayPosition(***x* **As Long,** *y* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x* and *y*

Addresses of the x and y display coordinates.

Return Values

If the method succeeds, it returns the display coordinates of the active overlay surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPOSITION |
| DDERR\_NOOVERLAYDEST |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OVERLAYNOTVISIBLE |
| DDERR\_SURFACELOST |

See Also

**DirectDrawSurface7.SetOverlayPosition**, **DirectDrawSurface7.UpdateOverlay**

DirectDrawSurface7.GetOverlayZOrdersEnum

[[109]](#footnote-109)# The **DirectDrawSurface7::GetOverlayZOrdersEnum** method returns a **DirectDrawEnumSurfaces** object that is used to enumerate the overlay surfaces on the specified destination. The overlays can be enumerated in front-to-back or back-to-front order.

*object***.(***flags* **As CONST\_DDENUMOVERLAYZFLAGS) \_**

**As DirectDrawEnumSurfaces**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*flags*

One of the constants of the **CONST\_DDENUMOVERLAYZFLAGS** enumeration specifying enumeration options.

Return Values

If the method succeeds, it returns a **DirectDrawEnumSurfaces** object that you can then query for overlay surface z-order information.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

See Also

**DirectDrawSurface7.UpdateOverlayZOrder**

DirectDrawSurface7.GetPalette

[[110]](#footnote-110)# The **DirectDrawSurface7.GetPalette** method retrieves the DirectDrawPalette object associated with this surface.

*object***.GetPalette() As DirectDrawPalette**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns a **DirectDrawPalette** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOPALETTEATTACHED |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

The object returned by a successful function call must be assigned to a **DirectDrawPalette** object variable. For example:

Dim DDPalette as DirectDrawPalette

Set DDPalette = *object*.GetPalette()

See Also

**DirectDrawSurface7.SetPalette**

DirectDrawSurface7.GetPixelFormat

[[111]](#footnote-111)# The **DirectDrawSurface7.GetPixelFormat** method retrieves the color and pixel format of the surface.

*object***.GetPixelFormat(***pf* **As DDPIXELFORMAT)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*pf*

**DDPIXELFORMAT** type to be filled with a detailed description of the current pixel and color space format of the surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |

DirectDrawSurface7.GetPriority

[[112]](#footnote-112)# The **DirectDrawSurface7.GetPriority** method retrieves the texture management priority for this texture. This method succeeds only on managed textures (see Remarks).

*object.***GetPriority()** **As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the texture priority.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to DDERR\_INVALIDOBJECT if the parameter is invalid or if the texture is not managed by Direct3D.

Remarks

Priorities are used to determine when managed textures are to be removed from memory. A texture assigned a low priority is removed before a texture with a high priority. If two textures have the same priority, the texture that was used more recently is kept in memory; the other texture is removed.

Applications can only set and retrieve priorities for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT

See Also

**DirectDrawSurface7.SetPriority**, Automatic Texture Management

DirectDrawSurface7.GetSurfaceDesc

[[113]](#footnote-113)# The **DirectDrawSurface7.GetSurfaceDesc** method retrieves a description of the surface in its current condition.

*object***.GetSurfaceDesc(***surface* **As DDSURFACEDESC2)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*surface*

**DDSURFACEDESC2** type to be filled with the current description of this surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

DirectDrawSurface7.GetUniquenessValue

[[114]](#footnote-114)# The **DirectDrawSurface7.GetUniquenessValue** method retrieves the current uniqueness value for this surface.

*object***.GetUniquenessValue() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns the current uniqueness value of the surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

The only defined uniqueness value is 0, to indicate that the surface is likely to be changing beyond the control of DirectDraw. Other uniqueness values are only significant if they differ from a previously cached uniqueness value. If the current value is different than a cached value, the contents of the surface have changed.

See Also

**DirectDrawSurface7.ChangeUniquenessValue**

DirectDrawSurface7.IsLost

[[115]](#footnote-115)# The **DirectDrawSurface7.IsLost** method determines whether the surface memory associated with a DirectDrawSurface object has been freed.

*object***.IsLost() As Long**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Return Values

If the method succeeds, it returns 0 (False), indicating that the surface has not been freed and nonzero if it has been freed.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |

Remarks

You can use this method to find out whether you need to reallocate surface memory by calling the **DirectDrawSurface7.Restore** method. When a DirectDrawSurface object loses its surface memory, most methods return DDERR\_SURFACELOST and perform no other action.

Surfaces can lose their memory when the mode of the display card is changed or an application receives exclusive access to the display card and frees all surface memory currently allocated on the display card.

See Also

**DirectDrawSurface7.Restore**, Losing and Restoring Surfaces

DirectDrawSurface7.Lock

[[116]](#footnote-116)# The **DirectDrawSurface7.Lock** method obtains a pointer to the surface memory.

*object***.Lock( \_**

*r* **As RECT,**\_

*desc* **As DDSURFACEDESC2, \_**

*flags* **As CONST\_DDLOCKFLAGS, \_**

*hnd* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*r*

**RECT** type that defines the upper-left and lower-right points of the rectangle that identifies the region of surface that is being locked. If this is an empty **RECT**, the entire surface is locked.

*desc*

**DDSURFACEDESC2** type to be filled with the relevant details about the surface.

*flags*

One or more of the constants of the **CONST\_DDLOCKFLAGS** enumeration that describes the type of lock to be performed.

*hnd*

Not used and must be set to 0.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_OUTOFMEMORY |
| DDERR\_SURFACEBUSY |
| DDERR\_SURFACELOST |
| DDERR\_WASSTILLDRAWING |

Remarks

For more information on using this method, see Accessing Surface Memory Directly.

After retrieving a surface memory pointer, you can access the surface memory until a corresponding **DirectDrawSurface7.Unlock** method is called. When the surface is unlocked, the pointer to the surface memory is invalid.

Do not call DirectDraw blit functions to blit from a locked region of a surface. If you do, the blit returns either DDERR\_SURFACEBUSY or DDERR\_LOCKEDSURFACES. GDI blit functions also silently fail when used on a locked video-memory surface.

This method often causes DirectDraw to hold the Win16Mutex (also known as Win16Lock) until you call the **DirectDrawSurface7.Unlock** method. GUI debuggers cannot operate while the Win16Mutex is held.

See Also

**DirectDrawSurface7.Unlock**, **DirectDrawSurface7.GetDC**, **DirectDrawSurface7.ReleaseDC**

DirectDrawSurface7.ReleaseDC

[[117]](#footnote-117)# The **DirectDrawSurface7.ReleaseDC** method releases the handle of a device context previously obtained by using the **DirectDrawSurface7.GetDC** method.

*object***.ReleaseDC(***hdc* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*hdc*

Handle of a device context previously obtained by **DirectDrawSurface7.GetDC**.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

This method also unlocks the surface previously locked when the **DirectDrawSurface7.GetDC** method was called.

See Also

**DirectDrawSurface7.GetDC**

DirectDrawSurface7.Restore

[[118]](#footnote-118)# The **DirectDrawSurface7.Restore** method restores a surface that has been lost. This occurs when the surface memory associated with the DirectDrawSurface object has been freed.

*object***.Restore()**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_IMPLICITLYCREATED |
| DDERR\_INCOMPATIBLEPRIMARY |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_OUTOFMEMORY |
| DDERR\_UNSUPPORTED |
| DDERR\_WRONGMODE |

Remarks

This method restores the memory allocated for a surface, but does not reload any bitmaps that might have existed in the surface before it was lost. Only surfaces that were created with the DDSCAPS2\_PERSISTENTCONTENT flag have their contents automatically restored. When surfaces without this capability are lost, you must completely reconstitute the graphics that they once held after you restore their memory.

Surfaces can be lost because the mode of the display card was changed or an application received exclusive access to the display card and freed all surface memory currently allocated on the card. When a DirectDrawSurface object loses its surface memory, many methods return DDERR\_SURFACELOST and perform no other function. The **DirectDrawSurface7.Restore** method reallocates surface memory and reattaches it to the DirectDrawSurface object.

A single call to this method restores a DirectDrawSurface object's associated implicit surfaces (back buffers, and so on). An attempt to restore an implicitly created surface results in an error. **DirectDrawSurface7.Restore** does not work across explicit attachments created by using the **DirectDrawSurface7.AddAttachedSurface** method—each of these surfaces must be restored individually.

See Also

**DirectDrawSurface7.IsLost**

DirectDrawSurface7.SetClipper

[[119]](#footnote-119)# The **DirectDrawSurface7.SetClipper** method attaches a clipper object to, or deletes one from, a surface.

*object***.SetClipper(***val* **As DirectDrawClipper)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*val*

**DirectDrawClipper** object for the DirectDrawClipper object to be attached to the DirectDrawSurface object. If this parameter is Nothing, the current DirectDrawClipper object is detached.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOCLIPPERATTACHED |

Remarks

If you pass Nothing as the *val* parameter, the clipper is removed from the surface. This method is primarily used by surfaces that are being overlaid on or blitted to the primary surface. However, it can be used on any surface. After a DirectDrawClipper object has been attached and a clip list is associated with it, the DirectDrawClipper object is used for the **DirectDrawSurface7.Blt** operations involving the parent DirectDrawSurface object. This method can also detach a DirectDrawSurface object's current DirectDrawClipper object.

See Also

**DirectDrawSurface7.GetClipper**

DirectDrawSurface7.SetColorKey

[[120]](#footnote-120)# The **DirectDrawSurface7.SetColorKey** method sets the color key value for the DirectDrawSurface object if the hardware supports color keys on a per-surface basis.

*object***.SetColorKey( \_**

*flags* **As CONST\_DDCKEYFLAGS,** \_

*val* **As DDCOLORKEY)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*flags*

One of the constants of the **CONST\_DDCKEYFLAGS** enumeration specifying the type of color key requested.

*val*

**DDCOLORKEY** type that contains the new color key values for the DirectDrawSurface object. This value can be Nothing to remove a previously set color key.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOOVERLAYHW |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_WASSTILLDRAWING |

Remarks

For transparent blits and overlays, set destination color on the destination surface and source color on the source surface.

See Also

**DirectDrawSurface7.GetColorKey**

DirectDrawSurface7.SetDrawStyle

[[121]](#footnote-121)# The **DirectDrawSurface7.SetDrawStyle** sets the draw style.

*object***.SetDrawStyle(***drawStyle* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*drawStyle*

One of the following draw styles to be set.

|  |  |
| --- | --- |
| Setting | Description |
|  | |
| 0 | (Default) Solid |
| 1 | Dash |
| 2 | Dot |
| 3 | Dash-dot |
| 4 | Dash-dot-dot |
| 5 | Transparent |
| 6 | Inside solid |

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

See Also

**DirectDrawSurface7.GetDrawStyle**

DirectDrawSurface7.SetDrawWidth

[[122]](#footnote-122)# The **DirectDrawSurface7.SetDrawWidth** sets the width of the line used in drawing methods.

*object***.setDrawWidth(***drawWidth* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*drawWidth*

Width of the line used in drawing methods. The default value is 1. Any value in the range from 1 through 32,767 is valid.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

See Also

**DirectDrawSurface7.GetDrawWidth**

DirectDrawSurface7.SetFillColor

[[123]](#footnote-123)# The **DirectDrawSurface7.SetFillColor** specifies the fill color used in drawing methods.

*object***.SetFillColor(***color* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*color*

RGB value to be used as the fill color in drawing methods. The default value is black (&H00000000).

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

See Also

**DirectDrawSurface7.GetFillColor**

DirectDrawSurface7.SetFillStyle

[[124]](#footnote-124)# The **DirectDrawSurface7.SetFillStyle** specifies the fill style used in the drawing methods.

*object***.SetFillStyle(***fillStyle* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*fillStyle*

One of the following fill styles to be used in drawing methods.

|  |  |
| --- | --- |
| Setting | Description |
|  | |
| 0 | (Default) Solid |
| 1 | Transparent |
| 2 | Horizontal line |
| 3 | Vertical line |
| 4 | Upward diagonal |
| 5 | Downward diagonal |
| 6 | Cross |
| 7 | Diagonal cross |

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

See Also

**DirectDrawSurface7.GetFillStyle**

DirectDrawSurface7.SetFont

[[125]](#footnote-125)# The **DirectDrawSurface7.SetFont** specifies the font to be used in **DirectDrawSurface7.DrawText**.

*object***.SetFont(***font* **As IFont)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*font*

Font, as specified in the **IFont** class.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawSurface7.SetFontBackColor

[[126]](#footnote-126)# The **DirectDrawSurface7.SetFontBackColor** method sets the back color of the font.

*object***.SetFontBackColor(***color* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*color*

Back color of the font.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawSurface7.SetFontTransparency

[[127]](#footnote-127)# The **DirectDrawSurface7.SetFontTransparency** specifies whether the font to be used when the **DirectDrawSurface7.DrawText** called is transparent.

*object***.SetFontTransparency(***b* **As Boolean)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*b*

Set to D\_TRUE if the font is transparent, or D\_FALSE if the font is not transparent.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

DirectDrawSurface7.SetForeColor

[[128]](#footnote-128)# The **DirectDrawSurface7.SetForeColor** method sets the foreground color used in drawing methods.

*object***.SetForeColor(***color* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*color*

RGB value to set as the foreground color.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

See Also

**DirectDrawSurface7.GetForeColor**

DirectDrawSurface7.SetLockedPixel

[[129]](#footnote-129)# The **DirectDrawSurface7.SetLockedPixel** method sets a single pixel to the specified color and updates the locked surface.

*object***.SetLockedPixel( \_**

*x* **As Long, \_**

*y* **As Long, \_**

*col* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x* and *y*

Coordinates of the pixel to set.

*col*

RGB value for the set pixel.

Error Codes

If the method fails, it raises an error, and **Err.Number** is set.

Remarks

You must first lock the surface with a call to **DirectDrawSurface7.Lock**.

See Also

**DirectDrawSurface7.GetLockedPixel**

DirectDrawSurface7.SetLOD

[[130]](#footnote-130)# The **DirectDrawSurface7.SetLOD** method sets the maximum level of detail for a managed mipmap surface. This method succeeds only on managed textures (see Remarks).

*object.***SetLOD(***lod* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*lod*

Maximum level-of-detail value to be set for the mipmap chain if the call succeeds.

Return Values

If the method succeeds, it return DD\_OK.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |

Remarks

Applications can call this method only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT

This method communicates to the Direct3D texture manager the most detailed mipmap in this chain that it should load into local video memory. For example, in a five-level mipmap chain, setting *lod* to 2 indicates that the texture manager should only load mipmap levels 2 through 4 into local video memory at any given time. Likewise, if the most detailed mipmap in the chain has the dimensions 256×256, setting the maximum level to 2 means that the largest mipmap ever present in video memory has dimensions 64×64.

See Also

**DirectDrawSurface7.GetLOD**, Texture Filtering With Mipmaps, Automatic Texture Management , Textures

DirectDrawSurface7.SetOverlayPosition

[[131]](#footnote-131)# The **DirectDrawSurface7.SetOverlayPosition** method changes the display coordinates of an overlay surface.

*object***.SetOverlayPosition(***x* **As Long,** *y* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*x* and *y*

New x- and y-display coordinates.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPOSITION |
| DDERR\_NOOVERLAYDEST |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OVERLAYNOTVISIBLE |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

See Also

**DirectDrawSurface7.GetOverlayPosition**

DirectDrawSurface7.SetPalette

[[132]](#footnote-132)# The **DirectDrawSurface7.SetPalette** method attaches a palette object to (or detaches one from) a surface. The surface uses this palette for all subsequent operations. The palette change takes place immediately, without regard to refresh timing.

*object***.SetPalette(***ddp* **As DirectDrawPalette)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*ddp*

**DirectDrawPalette** object for the palette object to be used with this surface. If this parameter is Nothing, the current palette is detached.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDPIXELFORMAT |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOEXCLUSIVEMODE |
| DDERR\_NOPALETTEATTACHED |
| DDERR\_NOPALETTEHW |
| DDERR\_NOT8BITCOLOR |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |

Remarks

If you pass Nothing as the *ddp* parameter, the palette is removed from the surface.

See Also

**DirectDrawSurface7.GetPalette**, **DirectDraw7.CreatePalette**

DirectDrawSurface7.SetPriority

[[133]](#footnote-133)# The **DirectDrawSurface7.SetPriority** method assigns the texture management priority for this texture. This method succeeds only on managed textures (see Remarks).

*object.***SetPriority(***Priority* **As Long)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*Priority*

Value specifying the new texture-management priority for the texture.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to DDERR\_INVALIDOBJECT if the parameter is invalid or the texture is not managed by Direct3D.

Remarks

Priorities are used to determine when managed textures are to be removed from memory. A texture assigned a low priority is removed before a texture with a high priority. If two textures have the same priority, the texture that was used more recently is kept in memory; the other texture is removed.

Applications can set and retrieve priorities only for managed textures (those that were created with the DDSCAPS2\_TEXTUREMANAGE flag). Calling this method on a nonmanaged texture causes the method to fail and return DDERR\_INVALIDOBJECT.

See Also

**DirectDrawSurface7.GetPriority**, Automatic Texture Management

DirectDrawSurface7.Unlock

[[134]](#footnote-134)# The **DirectDrawSurface7.Unlock** method notifies DirectDraw that the direct surface manipulations are complete.

*object***.Unlock(***r* **As RECT)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*r*

**RECT** type that is used to lock the surface in the corresponding call to the **DirectDrawSurface7.Lock** method. This parameter can be Nothing only if the entire surface was locked by passing Nothing in the *r* parameter of the corresponding call to the **DirectDrawSurface7.Lock** method.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_GENERIC |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_NOTLOCKED |
| DDERR\_SURFACELOST |

Remarks

Because it is possible to call **DirectDrawSurface7.Lock** multiple times for the same surface with different destination rectangles, the *r* parameter links the calls to the **DirectDrawSurface7.Lock** and **DirectDrawSurface7.Unlock** methods.

See Also

**DirectDrawSurface7.Lock**

DirectDrawSurface7.UpdateOverlay

[[135]](#footnote-135)# The **DirectDrawSurface7.UpdateOverlay** method repositions or modifies the visual attributes of an overlay surface. These surfaces must have the DDSCAPS\_OVERLAY flag set.

*object***.UpdateOverlay(***RECT* **As RECT, \_**

*ddS* **As DirectDrawSurface7, \_**

*rectD* **As RECT, \_**

*flags* **As CONST\_DDOVERFLAGS)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*RECT*

**RECT** type that defines the x, y, width, and height of the region on the source surface being used as the overlay. This parameter can be an empty **RECT** when hiding an overlay or to indicate that the entire overlay surface is to be used and the overlay surface conforms to any boundary and size alignment restrictions imposed by the device driver.

*ddS*

**DirectDrawSurface7** object for the surface that is being overlaid.

*rectD*

**RECT** type that defines the x, y, width, and height of the region on the destination surface that the overlay should be moved to. This parameter can be an empty **RECT** when hiding the overlay.

*flags*

One or more constants of the **CONST\_DDOVERFLAGS** enumeration.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_DEVICEDOESNTOWNSURFACE |
| DDERR\_GENERIC |
| DDERR\_HEIGHTALIGN |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OUTOFCAPS |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_XALIGN |

DirectDrawSurface7.UpdateOverlayFx

[[136]](#footnote-136)# The **DirectDrawSurface7.UpdateOverlayFx** method repositions or modifies the visual attributes of an overlay surface, using special overlay effects. These surfaces must have the DDSCAPS\_OVERLAY flag set.

*object***.UpdateOverlayFx(***RECT* **As RECT, \_**

*ddS* **As DirectDrawSurface7, \_**

*rectD* **As RECT, \_**

*flags* **As CONST\_DDOVERFLAGS, \_**

*ddoverfx* **As DDOVERLAYFX)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*RECT*

**RECT** type that defines the x, y, width, and height of the region on the source surface being used as the overlay. This parameter can be an empty **RECT** when hiding an overlay or to indicate that the entire overlay surface is to be used and the overlay surface conforms to any boundary and size alignment restrictions imposed by the device driver.

*ddS*

**DirectDrawSurface7** object for the surface that is being overlaid.

*rectD*

**RECT** type that defines the x, y, width, and height of the region on the destination surface that the overlay should be moved to. This parameter can be an empty **RECT** when hiding the overlay.

*flags*

One or more constants of the **CONST\_DDOVERFLAGS** enumeration. You must specify the DDOVER\_DDFX flag to apply the effects set by the *ddoverfx* parameter.

*ddoverfx*

**DDOVERLAYFX** type describing additional effects to be applied to an overlay surface.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_DEVICEDOESNTOWNSURFACE |
| DDERR\_GENERIC |
| DDERR\_HEIGHTALIGN |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_INVALIDRECT |
| DDERR\_INVALIDSURFACETYPE |
| DDERR\_NOSTRETCHHW |
| DDERR\_NOTAOVERLAYSURFACE |
| DDERR\_OUTOFCAPS |
| DDERR\_SURFACELOST |
| DDERR\_UNSUPPORTED |
| DDERR\_XALIGN |

DirectDrawSurface7.UpdateOverlayZOrder

[[137]](#footnote-137)# The **DirectDrawSurface7.UpdateOverlayZOrder** method sets the z-order of an overlay.

*object***.UpdateOverlayZOrder( \_**

*flags* **As CONST\_DDOVERZFLAGS, \_**

*ddS* **As DirectDrawSurface7)**

Parameters

*object*

**Object** expression that resolves to a **DirectDrawSurface7** object.

*flags*

One of the constants of the **CONST\_DDOVERZFLAGS** enumeration describing where to position the overlay.

*ddS*

**DirectDrawSurface7** object for the DirectDraw surface to be used as a relative position in the overlay chain. This parameter is needed only for DDOVERZ\_INSERTINBACKOF and DDOVERZ\_INSERTINFRONTOF.

Error Codes

If the method fails, it raises an error, and **Err.Number** can be set to one of the following values:

|  |
| --- |
| DDERR\_INVALIDOBJECT |
| DDERR\_INVALIDPARAMS |
| DDERR\_NOTAOVERLAYSURFACE |

IFont

[[138]](#footnote-138)# The **IFont** class is used by the **DirectDrawSurface7.SetFont** method to specify the font used in the **DirectDrawSurface7.DrawText** method.

For information on this class and its associated methods, see the Font class documentation in Visual Basic.

DirectDraw Global Methods

[[139]](#footnote-139)# The **DirectX7** class is the main class of any DirectX for Visual Basic application. This class has methods that are used with all the DirectX components. The methods pertaining to DirectDraw are:

**DirectX7.DirectDrawCreate**

**DirectX7.GetDDEnum**

### Types

This section contains information about the following types used with DirectDraw:

**DDBLTFX**

**DDCAPS**

**DDCOLORCONTROL**

**DDCOLORKEY**

**DDGAMMARAMP**

**DDOVERLAYFX**

**DDPIXELFORMAT**

**DDSCAPS2**

**DDSURFACEDESC2**

**PALETTEENTRY**

**RECT**

DDBLTFX

[[140]](#footnote-140)# The **DDBLTFX** type passes raster operations, effects, and override information to the **DirectDrawSurface7.Blt** method.

Type DDBLTFX

ddckDestColorKey\_high As Long

ddckDestColorKey\_low As Long

ddckSrcColorKey\_high As Long

ddckSrcColorKey\_low As Long

lAlphaDestConst As Long

lAlphaDestConstBitDepth As Long

lAlphaEdgeBlend As Long

lAlphaEdgeBlendBitDepth As Long

lAlphaSrcConst As Long

lAlphaSrcConstBitDepth As Long

lDDFX As CONST\_DDBLTFXFLAGS

lDDROP As Long

lFill As Long

lReserved As Long

lROP As Long

lRotationAngle As Long

lZBufferBaseDest As Long

lZBufferHigh As Long

lZBufferLow As Long

lZBufferOpCode As Long

lZDestConst As Long

lZDestConstBitDepth As Long

lZSrcConst As Long

lZSrcConstBitDepth As Long

End Type

Members

**ddckDestColorKey\_high**

High value of the color range that is to be used as the destination color key.

**ddckDestColorKey\_low**

Low value of the color range that is to be used as the destination color key.

**ddckSrcColorKey\_high**

High value of the color range that is to be used as the source color key.

**ddckSrcColorKey\_low**

Low value of the color range that is to be used as the source color key.

**lAlphaDestConst**

Constant used as the alpha channel destination.

**lAlphaDestConstBitDepth**

Bit depth of the destination alpha constant.

**lAlphaEdgeBlend**

Alpha constant used for edge blending.

**lAlphaEdgeBlendBitDepth**

Bit depth of the constant for an alpha edge blend.

**lAlphaSrcConst**

Constant used as the alpha channel source.

**lAlphaSrcConstBitDepth**

Bit depth of the source alpha constant.

**lDDFX**

Type of FX operations. One of the constants of the **CONST\_DDBLTFXFLAGS** enumeration.

**lDDROP**

DirectDraw raster operations.

**lFill**

Color used to fill a surface when DDBLT\_COLORFILL is specified. This value must be a pixel appropriate to the pixel format of the destination surface. For a palettized surface, it would be a palette index, and for a 16-bit RGB surface, it would be a 16-bit pixel value.

**lReserved**

Reserved for future use.

**lROP**

Win32 raster operations. You can retrieve a list of supported raster operations by calling the **DirectDraw7.GetCaps** method.

**lRotationAngle**

Rotation angle for the blit.

**lZBufferBaseDest**

Destination base value of a z-buffer.

**lZBufferHigh**

High limit of a z-buffer.

**lZBufferLow**

Low limit of a z-buffer.

**lZBufferOpCode**

Z-buffer compares.

**lZDestConst**

Constant used as the z-buffer destination.

**lZDestConstBitDepth**

Bit depth of the destination z-constant.

**lZSrcConst**

Constant used as the z-buffer source.

**lZSrcConstBitDepth**

Bit depth of the source z-constant.

DDCAPS

[[141]](#footnote-141)# The **DDCAPS** type represents the capabilities of the hardware exposed through the DirectDraw object. This type contains a **DDSCAPS2** type used in this context to describe what kinds of DirectDrawSurface objects can be created. It might not be possible to simultaneously create all the surfaces described by these capabilities. This type is used with the **DirectDraw7.GetCaps** method.

Type DDCAPS

ddsCaps As DDSCAPS2

lAlignBoundaryDest As Long

lAlignBoundarySrc As Long

lAlignSizeDest As Long

lAlignSizeSrc As Long

lAlignStrideAlign As Long

lAlphaBltConstBitDepths As Long

lAlphaBltPixelBitDepths As Long

lAlphaBltSurfaceBitDepths As Long

lAlphaOverlayConstBitDepths As Long

lAlphaOverlayPixelBitDepths As Long

lAlphaOverlaySurfaceBitDepths As Long

lCaps As CONST\_DDCAPS1FLAGS

lCaps2 As CONST\_DDCAPS2FLAGS

lCKeyCaps As CONST\_DDCKEYCAPSFLAGS

lCurrVideoPorts As Long

lCurrVisibleOverlays As Long

lFXCaps As CONST\_DDFXCAPSFLAGS

lMaxHwCodecStretch As Long

lMaxLiveVideoStretch As Long

lMaxOverlayStretch As Long

lMaxVideoPorts As Long

lMaxVisibleOverlays As Long

lMinHwCodecStretch As Long

lMinLiveVideoStretch As Long

lMinOverlayStretch As Long

lNLVBCaps As CONST\_DDCAPS1FLAGS

lNLVBCaps2 As CONST\_DDCAPS2FLAGS

lNLVBCKeyCaps As CONST\_DDCKEYCAPSFLAGS

lNLVBFXCaps As CONST\_DDFXCAPSFLAGS

lNLVBRops (0 To 7) As Long

lNumFourCCCodes As Long

lPalCaps As CONST\_DDPCAPSFLAGS

lReserved1 As Long

lReserved2 As Long

lReserved3 As Long

lReservedCaps As Long

lRops (0 To 7) As Long

lSSBCaps As CONST\_DDCAPS1FLAGS

lSSBCKeyCaps As CONST\_DDCKEYCAPSFLAGS

lSSBFXCaps As CONST\_DDFXCAPSFLAGS

lSSBRops (0 To 7) As Long

lSVBCaps As CONST\_DDCAPS1FLAGS

lSVBCaps2 As CONST\_DDCAPS2FLAGS

lSVBCKeyCaps As CONST\_DDCKEYCAPSFLAGS

lSVBFXCaps As CONST\_DDFXCAPSFLAGS

lSVBRops (0 To 7) As Long

lSVCaps As CONST\_DDSTEREOCAPSFLAGS

lVidMemFree As Long

lVidMemTotal As Long

lVSBCaps As CONST\_DDCAPS1FLAGS

lVSBCKeyCaps As CONST\_DDCKEYCAPSFLAGS

lVSBFXCaps As CONST\_DDFXCAPSFLAGS

lVSRops (0 To 7) As Long

lZBufferBitDepths As Long

End Type

Members

**ddsCaps**

**DDSCAPS2** type used for further capability descriptions.

**lAlignBoundaryDest**

Destination rectangle alignment for an overlay surface, in pixels.

**lAlignBoundarySrc**

Source rectangle alignment for an overlay surface, in pixels.

**lAlignSizeDest**

Destination rectangle size alignment for an overlay surface, in pixels. Overlay destination rectangles must have a pixel width that is a multiple of this value.

**lAlignSizeSrc**

Source rectangle size alignment for an overlay surface, in pixels. Overlay source rectangles must have a pixel width that is a multiple of this value.

**lAlignStrideAlign**

Stride alignment.

**lAlphaBltConstBitDepths**

DDBD\_2, DDBD\_4, or DDBD\_8. (Indicates 2, 4, or 8 bits per pixel.)

**lAlphaBltPixelBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicates 1, 2, 4, or 8 bits per pixel.)

**lAlphaBltSurfaceBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicates 1, 2, 4, or 8 bits per pixel.)

**lAlphaOverlayConstBitDepths**

DDBD\_2, DDBD\_4, or DDBD\_8. (Indicates 2, 4, or 8 bits per pixel.)

**lAlphaOverlayPixelBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicates 1, 2, 4, or 8 bits per pixel.)

**lAlphaOverlaySurfaceBitDepths**

DDBD\_1, DDBD\_2, DDBD\_4, or DDBD\_8. (Indicates 1, 2, 4, or 8 bits per pixel.)

**lCaps**

Constants of the **CONST\_DDCAPS1FLAGS** enumeration describing driver-specific capabilities.

**lCaps2**

Constants of the **CONST\_DDCAPS2FLAGS** enumeration describing more driver-specific capabilities.

**lCKeyCaps**

Constants of the **CONST\_DDCKEYCAPSFLAGS** enumeration describing color-key capabilities.

**lCurrVideoPorts**

Current number of live video ports.

**lCurrVisibleOverlays**

Current number of visible overlays or overlay sprites.

**lFXCaps**

Constants of the **CONST\_DDFXCAPSFLAGS** enumeration describing driver-specific stretching and effects capabilities.

**lMinHwCodecStretch** and **lMaxHwCodecStretch**

Obsolete; do not use.

**lMinLiveVideoStretch** and **lMaxLiveVideoStretch**

Obsolete; do not use.

**lMinOverlayStretch** and **lMaxOverlayStretch**

Minimum and maximum overlay stretch factors, multiplied by 1000. For example, 1.3 = 1300.

**lMaxVideoPorts**

Maximum number of live video ports.

**lMaxVisibleOverlays**

Maximum number of visible overlays or overlay sprites.

**lNLVBCaps**

Constants of the **CONST\_DDCAPS1FLAGS** enumeration describing driver-specific capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **lCaps** member.

**lNLVBCaps2**

Constants of the **CONST\_DDCAPS2FLAGS** enumeration describing more driver-specific capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **lCaps2** member.

**lNLVBCKeyCaps**

Constants of the **CONST\_DDCKEYCAPSFLAGS** enumeration describing driver color-key capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with for the **lCKeyCaps** member.

**lNLVBFXCaps**

Constants of the **CONST\_DDFXCAPSFLAGS** enumeration describing driver FX capabilities for blits from nonlocal to local video memory. Valid flags are identical to the blit-related flags used with the **lFXCaps** member.

**lNLVBRops[**0 to 7**]**

Raster operations supported for blits from nonlocal to local video memory.

**lNumFourCCCodes**

Number of FourCC codes.

**lPalCaps**

Constants of the **CONST\_DDPCAPSFLAGS** enumeration describing palette capabilities.

**lReserved1**, **lReserved2**, **lReserved3**, and **lReservedCaps**

Reserved for future use.

**lRops[**0 To 7**]**

Raster operations supported.

**lSSBCaps**

Constants of the **CONST\_DDCAPS1FLAGS** enumeration describing driver-specific capabilities for blits from system memory to system memory. Valid flags are identical to the blit-related flags used with the **lCaps** member.

**lSSBCKeyCaps**

Constants of the **CONST\_DDCKEYCAPSFLAGS** enumeration describing driver color-key capabilities for blits from system memory to system memory. Valid flags are identical to the blit-related flags used with the **lCKeyCaps** member.

**lSSBFXCaps**

Constants of the **CONST\_DDFXCAPSFLAGS** enumeration describing driver FX capabilities for blits from system memory to system memory. Valid flags are identical to the blit-related flags used with the **lFXCaps** member.

**lSSBRops[**0 To 7**]**

Raster operations supported for blits from system memory to system memory.

**lSVBCaps**

Constants of the **CONST\_DDCAPS1FLAGS** enumeration describing driver-specific capabilities for blits from system memory to display memory. Valid flags are identical to the blit-related flags used with the **lCaps** member.

**lSVBCaps2**

Constants of the **CONST\_DDCAPS2FLAGS** enumeration describing more driver-specific capabilities for blits from system memory to video memory. Valid flags are identical to the blit-related flags used with the **lCaps2** member.

**lSVBCKeyCaps**

Constants of the **CONST\_DDCKEYCAPSFLAGS** enumeration describing driver color-key capabilities for blits from system memory to display memory. Valid flags are identical to the blit-related flags used with for the **lCKeyCaps** member.

**lSVBFXCaps**

Constants of the **CONST\_DDFXCAPSFLAGS** enumeration describing driver FX capabilities for blits from system memory to display memory. Valid flags are identical to the blit-related flags used with the **lFXCaps** member.

**lSVBRops[**0 To 7**]**

Raster operations supported for blits from system memory to display memory.

**lSVCaps**

Constants of the **CONST\_DDSTEREOCAPSFLAGS** enumeration describing stereo vision capabilities.

**lVidMemFree**

Amount of free display memory.

**lVidMemTotal**

Total amount of display memory.

**lVSBCaps**

Constants of the **CONST\_DDCAPS1FLAGS** enumeration describing driver-specific capabilities for blits from display memory to system memory. Valid flags are identical to the blit-related flags used with the **lCaps** member.

**lVSBCKeyCaps**

Constants of the **CONST\_DDCKEYCAPSFLAGS** enumeration describing driver color-key capabilities blits from for display memory to system-memory. Valid flags are identical to the blit-related flags used with for the **lCKeyCaps** member.

**lVSBFXCaps**

Constants of the **CONST\_DDFXCAPSFLAGS** enumeration describing driver FX capabilities for blits from display memory to system memory. Valid flags are identical to the blit-related flags used with the **lFXCaps** member.

**lVSRops[**0 To 7**]**

Raster operations supported for blits from display memory to system-memory.

**lZBufferBitDepths**

DDBD\_8, DDBD\_16, or DDBD\_24. (Indicates 8, 16, and 24 bits per pixel.) 32-bit z-buffers are not supported.

DDCOLORCONTROL

[[142]](#footnote-142)# The **DDCOLORCONTROL** type defines the color controls associated with a DirectDrawVideoPortObject or a primary surface.

Type DDCOLORCONTROL

lBrightness As Long

lColorEnable As Long

lContrast As Long

lFlags As CONST\_DDCOLORFLAGS

lGamma As Long

lHue As Long

lReserved1 As Long

lSaturation As Long

lSharpness As Long

End Type

Members

**lBrightness**

Luminance intensity, in IRE units times 100. The valid range is from 0 through 10,000. The default is 750, which translates to 7.5 IRE.

**lColorEnable**

Flag indicating whether color is used. If this member is 0, color is not used; if it is 1, color is used. The default value is 1.

**lContrast**

Relative difference between higher and lower intensity luminance values, in IRE units times 100. The valid range is from 0 through 20,000. The default value is 10,000 (100 IRE). Higher values of contrast cause darker luminance values to tend toward black and lighter luminance values to tend toward white. Lower values of contrast cause all luminance values to move toward the middle of the scale.

**lFlags**

Constants of the **CONST\_DDCOLORFLAGS** enumeration specifying which type members contain valid data . When the type is returned by the **DirectDrawColorControl.GetColorControls** method, it also indicates which options are supported by the device.

**lGamma**

Controls the amount of gamma correction applied to the luminance values. The valid range is from 1 through 500 gamma units, with a default of 1.

**lHue**

Phase relationship of the chrominance components. Hue is specified in degrees, and the valid range is from –180 through 180. The default is 0.

**lReserved1**

Reserved.

**lSaturation**

Color intensity, in IRE units times 100. The valid range is from 0 through 20,000. The default value is 10,000, which translates to 100 IRE.

**lSharpness**

Sharpness, in arbitrary units. The valid range is from 0 trhough 10. The default value is 5.

DDCOLORKEY

[[143]](#footnote-143)# The **DDCOLORKEY** type describes a source color key, destination color key, or color space. A color key is specified if the low and high range values are the same. This type is used with the **DirectDrawSurface7.GetColorKey** and **DirectDrawSurface7.SetColorKey** methods.

Type COLORKEY

high As Long

low As Long

End Type

Members

**high**

High value of the color range that is to be used as the color key.

**low**

Low value of the color range that is to be used as the color key.

DDGAMMARAMP

[[144]](#footnote-144)# The **DDGAMMARAMP** type contains red, green, and blue ramp data for the **DirectDrawGammaControl.GetGammaRamp** and **DirectDrawGammaControl.SetGammaRamp** methods.

Type DDGAMMARAMP

blue(0 To 255) As Integer

green(0 To 255) As Integer

red(0 To 255) As Integer

End Type

Members

**red**, **green**, and **blue**

Red, green, and blue gamma ramps.

See Also

Gamma and Color Controls

DDOVERLAYFX

[[145]](#footnote-145)# The **DDOVERLAYFX** type passes override information to the **DirectDrawSurface7.UpdateOverlay** method.

type DDOVERLAYFX

dckDestColorkey As DDCOLORKEY

dckSrcColorkey As DDCOLORKEY

lAlphaDestConst As Long

lAlphaDestConstBitDepth As Long

lAlphaEdgeBlend As Long

lAlphaEdgeBlendBitDepth As Long

lAlphaSrcConst As Long

lAlphaSrcConstBitDepth As Long

lDDFX As CONST\_DDOVERFXFLAGS

lFlags As Long

End Type

Members

**dckDestColorkey**

Destination color key override.

**dckSrcColorkey**

Source color key override.

**lAlphaDestConst**

Constant to use as the alpha channel for a destination.

**lAlphaDestConstBitDepth**

Bit depth used to specify the alpha constant for a destination.

**lAlphaEdgeBlend**

Constant to use as the alpha for an edge blend.

**lAlphaEdgeBlendBitDepth**

Bit depth used to specify the constant for an alpha edge blend.

**lAlphaSrcConst**

Constant to use as the alpha channel for a source.

**lAlphaSrcConstBitDepth**

Bit depth used to specify the alpha constant for a source.

**lDDFX**

One of the constants of the **CONST\_DDOVERFXFLAGS** enumeration.

**lFlags**

Currently not used and must be set to 0.

DDPIXELFORMAT

[[146]](#footnote-146)# The **DDPIXELFORMAT** type describes the pixel format of a DirectDrawSurface object for the **DirectDrawSurface7.GetPixelFormat** method.

Type DDPIXELFORMAT

lAlphaBitDepth As Long

lBBitMask As Long

lBumpBitCount As Long

lBumpDuBitMask As Long

lBumpDvBitMask As Long

lBumpLuminanceBitMask As Long

lFlags As CONST\_DDPIXELFORMATFLAGS

lFourCC As Long

lGBitMask As Long

lLuminanceAlphaBitMask As Long

lLuminanceBitCount As Long

lLuminanceBitMask As Long

lRBitMask As Long

lRGBAlphaBitMask As Long

lRGBBitCount As Long

lRGBZBitMask As Long

lStencilBitDepth As Long

lStencilBitMask As Long

lUBitMask As Long

lVBitMask As Long

lYBitMask As Long

lYUVAlphaBitMask As Long

lYUVBitCount As Long

lYUVZBitMask As Long

lZBitMask As Long

lZBufferBitDepth As Long

End Type

Members

**lAlphaBitDepth**

Alpha channel bit depth (1, 2, 4, or 8) for an alpha-only surface (DDPF\_ALPHA). For pixel formats that contain alpha information interleaved with color data (DDPF\_ALPHAPIXELS), you must count the bits in the **lRGBAlphaBitMask** member to obtain the bit depth of the alpha component.

**lBBitMask**

Mask for blue bits.

**lBumpBitCount**

Total bump-map bits per pixel in a bump-map surface.

**lBumpDuBitMask**

Mask for bump-map U-delta bits

**lBumpDvBitMask**

Mask for bump-map V-delta bits.

**lBumpLuminanceBitMask**

Mask for luminance in a bump-map pixel.

**lFlags**

Constants of the **CONST\_DDPIXELFORMATFLAGS** enumeration describing optional control flags.

**lFourCC**

FourCC code. For more information see, Four-Character Codes (FOURCC).

**lGBitMask**

Mask for green bits.

**lRGBAlphaBitMask** and **lYUVAlphaBitMask** and **lLuminanceAlphaBitMask**

Masks for the alpha channel.

**lLuminanceBitCount**

Total luminance bits per pixel. This member applies only to luminance-only and luminance-alpha surfaces.

**lLuminanceBitMask**

Mask for luminance bits.

**lRBitMask**

Mask for red bits.

**lRGBAlphaBitMask** and **lYUVAlphaBitMask**

Masks for the alpha channel.

**lRGBBitCount**

RGB bits per pixel (4, 8, 16, 24, or 32).

**lRGBZBitMask** and **lYUVZBitMask**

Masks for z channel.

**lStencilBitDepth**

Bit depth of the stencil buffer. This member specifies how many bits are reserved within each pixel of the z-buffer for stencil information (the total number of z-bits is equal to **lZBufferBitDepth** minus **lStencilBitDepth**).

**lStencilBitMask**

Mask for stencil bits within each z-buffer pixel.

**lUBitMask**

Mask for U bits.

**lVBitMask**

Mask for V bits.

**lYBitMask**

Mask for Y bits.

**lYUVBitCount**

YUV bits per pixel (4, 8, 16, 24, or 32).

**lZBitMask**

Mask for z bits.

**lZBufferBitDepth**

Z-buffer bit depth (8, 16, or 24); 32-bit z-buffers are not supported.

DDSCAPS2

[[147]](#footnote-147)# The **DDSCAPS2** type defines the capabilities of a DirectDrawSurface object. This type is part of the **DDSURFACEDESC2** type.

Type DDSCAPS2

lCaps As CONST\_DDSURFACECAPSFLAGS

lCaps2 As CONST\_DDSURFACECAPS2FLAGS

lCaps3 As Long

lCaps4 As Long

End Type

Members

**lCaps**

One or more constants of the **CONST\_DDSURFACECAPSFLAGS** enumeration representing the capabilities of the surface.

**lCaps2**

Additional surface capabilities. This member can contain one or more of the capability constants of the **CONST\_DDSURFACECAPS2FLAGS** enumeration and can contain an additional flag to indicate how the surface memory was allocated:

**lCaps3** and **lCaps4**

Not currently used.

DDSURFACEDESC2

[[148]](#footnote-148)# The **DDSURFACEDESC2** type contains a description of a surface. This type is passed to the **DirectDraw7.CreateSurface** method. The relevant members differ for each potential type of surface.

Type DDSURFACEDESC2

ddckCKDestBlt As DDCOLORKEY

ddckCKDestOverlay As DDCOLORKEY

ddckCKSrcBlt As DDCOLORKEY

ddckCKSrcOverlay As DDCOLORKEY

ddpfPixelFormat As DDPIXELFORMAT

ddsCaps As DDSCAPS2

lAlphaBitDepth As Long

lBackBufferCount As Long

lFlags As CONST\_DDSURFACEDESCFLAGS

lHeight As Long

lLinearSize As Long

lMipMapCount As Long

lPitch As Long

lRefreshRate As Long

lTextureStage As Long

lWidth As Long

lZBufferBitDepth As Long

End Type

Members

**ddckCKDestBlt**

**DDCOLORKEY** type that describes the destination color key for blit operations.

**ddckCKDestOverlay**

**DDCOLORKEY** type that describes the destination color key to be used for an overlay surface.

**ddckCKSrcBlt**

**DDCOLORKEY** type that describes the source color key for blit operations.

**ddckCKSrcOverlay**

**DDCOLORKEY** type that describes the source color key to be used for an overlay surface.

**ddpfPixelFormat**

**DDPIXELFORMAT** type that describes the surface's pixel format.

**ddsCaps**

**DDSCAPS2** type that contains the capabilities of the surface.

**lAlphaBitDepth**

Depth of alpha buffer.

**lBackBufferCount**

Number of back buffers.

**lFlags**

Optional control flags. One or more of the constants of the **CONST\_DDSURFACEDESCFLAGS** enumeration.

**lHeight** and **lWidth**

Dimensions of the surface to be created, in pixels.

**lLinearSize**

Not currently used.

**lMipMapCount**

Number of mipmap levels.

**lPitch**

Distance, in bytes, to the start of next line. When used with the **DirectDrawSurface7.GetSurfaceDesc** method, this is a return value. When creating a surface from existing memory, this is an input value that must be a multiple.

**lRefreshRate**

Refresh rate (used when the display mode is described). The value of 0 indicates an adapter default.

**lTextureStage**

Stage identifier used to bind a texture to a specific stage in the multitexture cascade of a 3-D device. Although not required for all hardware, setting this member is recommended for best performance on the largest variety of 3-D accelerators. Hardware that requires explicitly assigned textures exposes the D3DDEVCAPS\_SEPARATETEXTUREMEMORIES 3-D device capability in the **D3DDEVICEDESC** structure that is filled by the **Direct3DDevice7.GetCaps** method.

**lZBufferBitDepth**

Depth of z-buffer; 32-bit z-buffers are not supported.

Remarks

The **lPitch** member is an output values when calling the **DirectDrawSurface7.GetSurfaceDesc** method. When creating surfaces from existing memory, or updating surface characteristics, these members are input values that describe the pitch and location of memory allocated by the calling application for use by DirectDraw. DirectDraw does not attempt to manage or free memory allocated by the application. For more information, see Creating Client Memory Surfaces and Updating Surface Characteristics.

PALETTEENTRY

[[149]](#footnote-149)# The **PALETTEENTRY** type specifies the color and usage of an entry in a logical color palette.

Type PALETTEENTRY

blue As Byte

flags As Byte

green As Byte

red As Byte

End Type

Members

**blue**

Specifies a blue intensity value for the palette entry.

**flags**

Specifies how the palette entry is to be used. The **flags** member can be set to Nothing or one of the following values:

|  |  |
| --- | --- |
| Value | Meaning |
|  | |
| PC\_EXPLICIT | The low-order word of the logical palette entry designates a hardware palette index. This flag allows the application to show the contents of the display device palette. |
| PC\_NOCOLLAPSE | The color should be placed in an unused entry in the system palette, instead of being matched to an existing color in the system palette. If there are no unused entries in the system palette, the color is matched normally. Once this color is in the system palette, colors in other logical palettes can be matched to this color. |
| PC\_RESERVED | The logical palette entry be used for palette animation. This flag prevents other windows from matching colors to the palette entry since the color frequently changes. If an unused system-palette entry is available, the color is placed in that entry. Otherwise, the color is not available for animation. |

**green**

Green intensity value for the palette entry.

**red**

Red intensity value for the palette entry.

RECT

[[150]](#footnote-150)# The **RECT** type defines the coordinates of the upper-left and lower-right corners of a rectangle.

Type RECT

Bottom As Long

Left As Long

Right As Long

Top As Long

End Type

Members

**Bottom**

Y-coordinate of the lower-right corner of the rectangle.

**Left**

X-coordinate of the upper-left corner of the rectangle.

**Right**

X-coordinate of the lower-right corner of the rectangle.

**Top**

Y-coordinate of the upper-left corner of the rectangle.

### Enumerations

DirectDraw uses enumerations to group constants and take advantage of the statement-completion feature of Visual Basic. The enumerations used in DirectDraw are the following:

**CONST\_DDBITDEPTHFLAGS**

**CONST\_DDBLTFASTFLAGS**

**CONST\_DDBLTFLAGS**

**CONST\_DDBLTFXFLAGS**

**CONST\_DDCAPS1FLAGS**

**CONST\_DDCAPS2FLAGS**

**CONST\_DDCKEYCAPSFLAGS**

**CONST\_DDCKEYFLAGS**

**CONST\_DDCOLORFLAGS**

**CONST\_DDDEVICEIDFLAGS**

**CONST\_DDEDMFLAGS**

**CONST\_DDENUMOVERLAYZFLAGS**

**CONST\_DDENUMSURFACESFLAGS**

**CONST\_DDFLIPFLAGS**

**CONST\_DDFXCAPSFLAGS**

**CONST\_DDGBSFLAGS**

**CONST\_DDGFSFLAGS**

**CONST\_DDLOCKFLAGS**

**CONST\_DDOVERFLAGS**

**CONST\_DDOVERFXFLAGS**

**CONST\_DDOVERZFLAGS**

**CONST\_DDPALFLAGS**

**CONST\_DDPCAPSFLAGS**

**CONST\_DDPIXELFORMATFLAGS**

**CONST\_DDRAW**

**CONST\_DDRAWERR**

**CONST\_DDSCLFLAGS**

**CONST\_DDSDMFLAGS**

**CONST\_DDSGRFLAGS**

**CONST\_DDSTEREOCAPSFLAGS**

**CONST\_DDSURFACECAPS2FLAGS**

**CONST\_DDSURFACECAPSFLAGS**

**CONST\_DDSURFACEDESCFLAGS**

**CONST\_DDWAITVBFLAGS**

CONST\_DDBITDEPTHFLAGS

[[151]](#footnote-151)# The **CONST\_DDBITDEPTHFLAGS** enumeration is used to specify the bit depth.

Enum CONST\_DDBITDEPTHFLAGS

DDBD\_1 = 16384

DDBD\_16 = 1024

DDBD\_2 = 8192

DDBD\_24 = 512

DDBD\_32 = 256

DDBD\_4 = 4096

DDBD\_8 = 2048

End Enum

DDBD\_1 to 32

Bits per pixel.

CONST\_DDBLTFASTFLAGS

[[152]](#footnote-152)# The **CONST\_DDBLTFASTFLAGS** enumeration is used in the *trans* parameter of the **DirectDrawSurface7.BltFast** method to determine the type of transfer.

Enum CONST\_DDBLTFASTFLAGS

DDBLTFAST\_DESTCOLORKEY = 2

DDBLTFAST\_DONOTWAIT = 32

DDBLTFAST\_NOCOLORKEY = 0

DDBLTFAST\_SRCCOLORKEY = 1

DDBLTFAST\_WAIT = 16

End Enum

DDBLTFAST\_DESTCOLORKEY

Transparent blit that uses the destination's color key.

DDBLTFAST\_DONOTWAIT

Does not wait to blit if the blitter is busy and returns without blitting.

DDBLTFAST\_NOCOLORKEY

Normal copy blit with no transparency.

DDBLTFAST\_SRCCOLORKEY

Transparent blit that uses the source's color key.

DDBLTFAST\_WAIT

Postpones the DDERR\_WASSTILLDRAWING message if the blitter is busy, and returns as soon as the blit can be set up or another error occurs.

CONST\_DDBLTFLAGS

[[153]](#footnote-153)# The **CONST\_DDBLTFLAGS** enumeration is used in the flags parameter of the **DirectDrawSurface7.Blt** and **DirectDrawSurface7.BltFx** methods to determine the valid members of the associated **DDBLTFX** type. The **DDBLTFX** type specifies color-key information or requests special behavior from the methods.

Enum CONST\_DDBLTFLAGS

DDBLT\_ASYNC = 512

DDBLT\_COLORFILL = 1024

DDBLT\_DDFX = 2048

DDBLT\_DDROPS = 4096

DDBLT\_DEPTHFILL = 33554432

DDBLT\_DONOTWAIT = 134217728

DDBLT\_KEYDEST = 8192

DDBLT\_KEYDESTOVERRIDE = 16384

DDBLT\_KEYSRC = 32768

DDBLT\_KEYSRCOVERRIDE = 65536

DDBLT\_ROP = 131072

DDBLT\_ROTATIONANGLE = 262144

DDBLT\_WAIT = 16777216

End Enum

**Validation flags**

DDBLT\_COLORFILL

Uses the **lFill** member of the **DDBLTFX** structure as the RGB color that fills the destination rectangle on the destination surface.

DDBLT\_DDFX

Uses the **lDDFX** member of the **DDBLTFX** structure to specify the effects to use for this blit.

DDBLT\_DDROPS

Uses the **lROP** member of the **DDBLTFX** structure to specify the raster operations (ROPS) that are not part of the Win32 API.

DDBLT\_DEPTHFILL

Uses the **lFill** member of the **DDBLTFX** structure as the depth value with which to fill the destination rectangle on the destination z-buffer surface.

DDBLT\_DONOTWAIT

If the blitter is busy, does not wait for the blitter to become available but returns without blitting.

DDBLT\_KEYDESTOVERRIDE

Uses the **ddckDestColorKey\_high** and **ddckDestColorKey\_low** members of the **DDBLTFX** structure as the color key for the destination surface.

DDBLT\_KEYSRCOVERRIDE

Uses the **ddckSrcColorKey\_high** and **ddckSrcColorKey\_low** members of the **DDBLTFX** structure as the color key for the source surface.

DDBLT\_ROP

Uses the **lROP** member of the **DDBLTFX** structure for the ROP for this blit. These ROPs are the same as those defined in the Win32 API.

DDBLT\_ROTATIONANGLE

Uses the **lRotationAngle** member of the **DDBLTFX** structure as the rotation angle (specified in 1/100s of a degree) for the surface.

**Color key flags**

DDBLT\_KEYDEST

Uses the color key associated with the destination surface.

DDBLT\_KEYSRC

Uses the color key associated with the source surface.

**Behavior flags**

DDBLT\_ASYNC

Performs this blit asynchronously through the first in, first out (FIFO) hardware in the order received. If no room is available in the FIFO hardware, the call fails.

DDBLT\_WAIT

Postpones the DDERR\_WASSTILLDRAWING return value if the blitter is busy, and returns as soon as the blit can be set up or another error occurs.

CONST\_DDBLTFXFLAGS

[[154]](#footnote-154)# The **CONST\_DDBLTFXFLAGS** enumeration is used in the **lDDFX** member of the **DDBLTFX** type to specify the type of FX operation.

Enum CONST\_DDBLTFXFLAGS

DDBLTFX\_ARITHSTRETCHY = 1

DDBLTFX\_MIRRORLEFTRIGHT = 2

DDBLTFX\_MIRRORUPDOWN = 4

DDBLTFX\_NOTEARING = 8

DDBLTFX\_ROTATE180 = 16

DDBLTFX\_ROTATE270 = 32

DDBLTFX\_ROTATE90 = 64

DDBLTFX\_ZBUFFERBASEDEST = 256

DDBLTFX\_ZBUFFERRANGE = 128

End Enum

DDBLTFX\_ARITHSTRETCHY

Uses arithmetic stretching along the y-axis for this blit.

DDBLTFX\_MIRRORLEFTRIGHT

Turns the surface on its y-axis. This blit mirrors the surface from left to right.

DDBLTFX\_MIRRORUPDOWN

Turns the surface on its x-axis. This blit mirrors the surface from top to bottom.

DDBLTFX\_NOTEARING

Schedules this blit to avoid tearing.

DDBLTFX\_ROTATE180

Rotates the surface 180 degrees clockwise during this blit.

DDBLTFX\_ROTATE270

Rotates the surface 270 degrees clockwise during this blit.

DDBLTFX\_ROTATE90

Rotates the surface 90 degrees clockwise during this blit.

DDBLTFX\_ZBUFFERBASEDEST

Adds the **lZBufferBaseDest** member of the **DDBLTFX** type to each of the source z-values before comparing them with the destination z-values during this z-blit.

DDBLTFX\_ZBUFFERRANGE

Uses the **lZBufferLow** and **lZBufferHigh** members of the **DDBLTFX** type as range values to specify limits to the bits copied from a source surface during this z-blit.

CONST\_DDCAPS1FLAGS

[[155]](#footnote-155)# The **CONST\_DDCAPS1FLAGS** enumeration is used by the **lCaps**, **lNLVBCaps**, **lSSBCaps**, **lSVBCaps**, and the **lVSBCaps** members of the **DDCAPS** type to describe hardware capabilities.

Enum CONST\_DDCAPS1FLAGS

DDCAPS\_3D = 1

DDCAPS\_ALIGNBOUNDARYDEST = 2

DDCAPS\_ALIGNBOUNDARYSRC = 8

DDCAPS\_ALIGNSIZEDEST = 4

DDCAPS\_ALIGNSIZESRC = 16

DDCAPS\_ALIGNSTRIDE = 32

DDCAPS\_ALPHA = 8388608

DDCAPS\_BANKSWITCHED = 134217728

DDCAPS\_BLT = 64

DDCAPS\_BLTCOLORFILL = 67108864

DDCAPS\_BLTDEPTHFILL = 268435456

DDCAPS\_BLTFOURCC = 256

DDCAPS\_BLTQUEUE = 128

DDCAPS\_BLTSTRETCH = 512

DDCAPS\_CANBLTSYSMEM = -2147483648

DDCAPS\_CANCLIP = 536870912

DDCAPS\_CANCLIPSTRETCHED = 1073741824

DDCAPS\_COLORKEY = 4194304

DDCAPS\_COLORKEYHWASSIST = 16777216

DDCAPS\_GDI = 1024

DDCAPS\_NOHARDWARE = 33554432

DDCAPS\_OVERLAY = 2048

DDCAPS\_OVERLAYCANTCLIP = 4096

DDCAPS\_OVERLAYFOURCC = 8192

DDCAPS\_OVERLAYSTRETCH = 16384

DDCAPS\_PALETTE = 32768

DDCAPS\_PALETTEVSYNC = 65536

DDCAPS\_READSCANLINE = 131072

DDCAPS\_VBI = 524288

DDCAPS\_ZBLTS = 1048576

DDCAPS\_ZOVERLAYS = 2097152

End Enum

DDCAPS\_3D

The display hardware has 3-D acceleration.

DDCAPS\_ALIGNBOUNDARYDEST

DirectDraw supports only those overlay destination rectangles with the x-axis aligned to the **lAlignBoundaryDest** boundaries of the surface.

DDCAPS\_ALIGNBOUNDARYSRC

DirectDraw supports only those overlay source rectangles with the x-axis aligned to the **lAlignBoundarySrc** boundaries of the surface.

DDCAPS\_ALIGNSIZEDEST

DirectDraw supports only those overlay destination rectangles whose x-axis sizes, in pixels, are **lAlignSizeDest** multiples.

DDCAPS\_ALIGNSIZESRC

DirectDraw supports only those overlay source rectangles whose x-axis sizes, in pixels, are **lAlignSizeSrc** multiples.

DDCAPS\_ALIGNSTRIDE

DirectDraw creates display memory surfaces that have a stride alignment equal to the **lAlignStrideAlign** value.

DDCAPS\_ALPHA

The display hardware supports alpha-only surfaces. (See alpha channel)

DDCAPS\_BANKSWITCHED

The display hardware is bank-switched and is potentially very slow at random access to display memory.

DDCAPS\_BLT

Display hardware is capable of blit operations.

DDCAPS\_BLTCOLORFILL

Display hardware is capable of color filling with a blitter.

DDCAPS\_BLTDEPTHFILL

Display hardware is capable of depth filling z-buffers with a blitter.

DDCAPS\_BLTFOURCC

Display hardware is capable of color-space conversions during blit operations.

DDCAPS\_BLTQUEUE

Display hardware is capable of asynchronous blit operations.

DDCAPS\_BLTSTRETCH

Display hardware is capable of stretching during blit operations.

DDCAPS\_CANBLTSYSMEM

Display hardware is capable of blitting to or from system memory.

DDCAPS\_CANCLIP

Display hardware is capable of clipping with blitting.

DDCAPS\_CANCLIPSTRETCHED

Display hardware is capable of clipping while stretch blitting.

DDCAPS\_COLORKEY

Supports some form of color key in either overlay or blit operations. More specific color key capability information can be found in the **lCKeyCaps** member.

DDCAPS\_COLORKEYHWASSIST

The color key is partially hardware assisted. This means that other resources (CPU or video memory) might be used. If this bit is not set, full hardware support is in place.

DDCAPS\_GDI

Display hardware is shared with the GDI.

DDCAPS\_NOHARDWARE

There is no hardware support.

DDCAPS\_OVERLAY

Display hardware supports overlays.

DDCAPS\_OVERLAYCANTCLIP

Display hardware supports overlays but cannot clip them.

DDCAPS\_OVERLAYFOURCC

Overlay hardware is capable of color-space conversions during overlay operations.

DDCAPS\_OVERLAYSTRETCH

Overlay hardware is capable of stretching. The **lMinOverlayStretch** and **lMaxOverlayStretch** members contain valid data.

DDCAPS\_PALETTE

DirectDraw is capable of creating and supporting DirectDrawPalette objects for more surfaces than only the primary surface.

DDCAPS\_PALETTEVSYNC

DirectDraw is capable of updating a palette synchronized with the vertical refresh.

DDCAPS\_READSCANLINE

Display hardware is capable of returning the current scan line.

DDCAPS\_VBI

Display hardware is capable of generating a vertical-blank interrupt.

DDCAPS\_ZBLTS

Supports the use of z-buffers with blit operations.

DDCAPS\_ZOVERLAYS

Supports the use of the **DirectDrawSurface7.UpdateOverlayZOrder** method as a z-value for overlays to control their layering.

CONST\_DDCAPS2FLAGS

[[156]](#footnote-156)# The **CONST\_DDCAPS2FLAGS** enumeration is used in the **lCaps2**, **lNLVBCaps2**, **lSVBCaps2** members of the **DDCAPS** type to describe additional driver-specific capabilities.

Enum CONST\_DDCAPS2FLAGS

DDCAPS2\_AUTOFLIPOVERLAY = 8

DDCAPS2\_CANBOBHARDWARE = 16384

DDCAPS2\_CANBOBINTERLEAVED = 16

DDCAPS2\_CANBOBNONINTERLEAVED = 32

DDCAPS2\_CANCALIBRATEGAMMA = 1048576

DDCAPS2\_CANDROPZ16BIT = 256

DDCAPS2\_CANFLIPODDEVEN = 8192

DDCAPS2\_CANMANAGETEXTURE = 8388608

DDCAPS2\_CANRENDERWINDOWED = 524288

DDCAPS2\_CERTIFIED = 1

DDCAPS2\_COLORCONTROLOVERLAY = 64

DDCAPS2\_COLORCONTROLPRIMARY = 128

DDCAPS2\_COPYFOURCC = 32768

DDCAPS2\_FLIPINTERVAL = 2097152

DDCAPS2\_FLIPNOVSYNC = 4194304

DDCAPS2\_NO2DDURING3DSCENE = 2

DDCAPS2\_NONLOCALVIDMEM = 512

DDCAPS2\_NONLOCALVIDMEMCAPS = 1024

DDCAPS2\_NOPAGELOCKREQUIRED = 2048

DDCAPS2\_PRIMARYGAMMA = 131072

DDCAPS2\_STEREO = 33554432

DDCAPS2\_VIDEOPORT = 4

DDCAPS2\_WIDESURFACES = 4096

End Enum

DDCAPS2\_AUTOFLIPOVERLAY

The overlay can be automatically flipped to the next surface in the flip chain each time a video port VSYNC occurs, allowing the video port and the overlay to double-buffer the video without CPU overhead. This option is valid only when the surface is receiving data from a video port. If the video port data is noninterlaced or noninterleaved, it flips on every VSYNC. If the data is being interleaved in memory, it flips on every other VSYNC.

DDCAPS2\_CANBOBHARDWARE

The overlay hardware can display each field of an interlaced video stream individually.

DDCAPS2\_CANBOBINTERLEAVED

The overlay hardware can display each field of an interlaced video stream individually while it is interleaved in memory without causing any artifacts that might normally occur without special hardware support. This option is only valid when the surface is receiving data from a video port and the video is zoomed at least two times in the vertical direction.

DDCAPS2\_CANBOBNONINTERLEAVED

The overlay hardware can display each field of an interlaced video stream individually while it is not interleaved in memory without causing any artifacts that might normally occur without special hardware support. This option is valid only when the surface is receiving data from a video port and the video is zoomed at least two times in the vertical direction.

DDCAPS2\_CANCALIBRATEGAMMA

The system has a calibrator installed that can automatically adjust the gamma ramp so that the result is identical on all systems that have a calibrator. To invoke the calibrator when setting new gamma levels, use the DDSGR\_CALIBRATE flag when calling the **DirectDrawGammaControl.SetGammaRamp** method. Calibrating gamma ramps incurs some processing overhead and should not be used frequently.

DDCAPS2\_CANDROPZ16BIT

Sixteen-bit RGBZ values can be converted into 16-bit RGB values. (The system does not support 8-bit conversions.)

DDCAPS2\_CANFLIPODDEVEN

The driver is capable of performing odd and even flip operations, as specified by the DDFLIP\_ODD and DDFLIP\_EVEN flags used with the **DirectDrawSurface7.Flip** method.

DDCAPS2\_CANMANAGETEXTURE

The Microsoft® Direct3D® texture manager uses this capability to decide whether to put managed surfaces in nonlocal video memory. If the capability is set, the texture manager puts managed surfaces in nonlocal video memory. Drivers that cannot texture from local video memory should not set this capability.

DDCAPS2\_CANRENDERWINDOWED

The driver is capable of rendering in windowed mode.

DDCAPS2\_CERTIFIED

Display hardware is certified.

DDCAPS2\_COLORCONTROLOVERLAY

The overlay surface contains color controls (such as brightness and sharpness)

DDCAPS2\_COLORCONTROLPRIMARY

The primary surface contains color controls (for instance, gamma)

DDCAPS2\_COPYFOURCC

The driver supports blitting any FOURCC surface to another surface of the same FOURCC.

DDCAPS2\_FLIPINTERVAL

The driver responds to the DDFLIP\_INTERVAL\* flags. (see **DirectDrawSurface7.Flip**).

DDCAPS2\_FLIPNOVSYNC

The driver responds to the DDFLIP\_NOVSYNC flag (see **DirectDrawSurface7.Flip**).

DDCAPS2\_NO2DDURING3DSCENE

Two-dimensional operations such as **DirectDrawSurface7.Blt** and **DirectDrawSurface7.Lock** cannot be performed on any surfaces that Direct3D is using between calls to the **Direct3DDevice7.BeginScene** and **Direct3DDevice7.EndScene** methods.

DDCAPS2\_NONLOCALVIDMEM

The display driver supports surfaces in nonlocal video memory.

DDCAPS2\_NONLOCALVIDMEMCAPS

Blit capabilities for nonlocal video-memory surfaces differ from local video memory surfaces. If this flag is present, the DDCAPS2\_NONLOCALVIDMEM flag is also present.

DDCAPS2\_NOPAGELOCKREQUIRED

DMA blit operations are supported on system-memory surfaces that are not page-locked.

DDCAPS2\_PRIMARYGAMMA

Dynamic gamma ramps are supported for the primary surface. For more information, see Gamma and Color Controls.

DDCAPS2\_STEREO

New for DirectX 7.0. Turns on the ddcaps.dwSVCaps bit to support stereo mode. The driver can do stereo in at least one mode other than the current mode. The application can use **DirectDraw7.GetDisplayMode** or **DirectDraw7.GetDisplayModesEnum** to get per-mode stereo information.

DDCAPS2\_VIDEOPORT

Display hardware supports live video.

DDCAPS2\_WIDESURFACES

The display surface supports surfaces wider than the primary surface.

CONST\_DDCKEYCAPSFLAGS

[[157]](#footnote-157)# The **CONST\_DDCKEYCAPSFLAGS** enumeration is used by the **lCKeyCaps**, **lNLVBCKeyCaps**, **lSSBCKeyCaps**, **lSVBCKeyCaps**, and **lVSBCKeyCaps** members of the **DDCAPS** type to describe the color-key capabilities of the hardware.

Enum CONST\_DDCKEYCAPSFLAGS

DDCKEYCAPS\_DESTBLT = 1

DDCKEYCAPS\_DESTBLTCLRSPACE = 2

DDCKEYCAPS\_DESTBLTCLRSPACEYUV = 4

DDCKEYCAPS\_DESTBLTYUV = 8

DDCKEYCAPS\_DESTOVERLAY = 16

DDCKEYCAPS\_DESTOVERLAYCLRSPACE = 32

DDCKEYCAPS\_DESTOVERLAYCLRSPACEYUV = 64

DDCKEYCAPS\_DESTOVERLAYONEACTIVE = 128

DDCKEYCAPS\_DESTOVERLAYYUV = 256

DDCKEYCAPS\_NOCOSTOVERLAY = 262144

DDCKEYCAPS\_SRCBLT = 512

DDCKEYCAPS\_SRCBLTCLRSPACE = 1024

DDCKEYCAPS\_SRCBLTCLRSPACEYUV = 2048

DDCKEYCAPS\_SRCBLTYUV = 4096

DDCKEYCAPS\_SRCOVERLAY = 8192

DDCKEYCAPS\_SRCOVERLAYCLRSPACE = 16384

DDCKEYCAPS\_SRCOVERLAYCLRSPACEYUV = 32768

DDCKEYCAPS\_SRCOVERLAYONEACTIVE = 65536

DDCKEYCAPS\_SRCOVERLAYYUV = 131072

End Enum

DDCKEYCAPS\_DESTBLT

Supports transparent blitting with a color key that identifies the replaceable bits of the destination surface for RGB colors.

DDCKEYCAPS\_DESTBLTCLRSPACE

Supports transparent blitting with a color space that identifies the replaceable bits of the destination surface for RGB colors.

DDCKEYCAPS\_DESTBLTCLRSPACEYUV

Supports transparent blitting with a color space that identifies the replaceable bits of the destination surface for YUV colors.

DDCKEYCAPS\_DESTBLTYUV

Supports transparent blitting with a color key that identifies the replaceable bits of the destination surface for YUV colors.

DDCKEYCAPS\_DESTOVERLAY

Supports overlaying with color keying of the replaceable bits of the destination surface being overlaid for RGB colors.

DDCKEYCAPS\_DESTOVERLAYCLRSPACE

Supports a color space as the color key for the destination of RGB colors.

DDCKEYCAPS\_DESTOVERLAYCLRSPACEYUV

Supports a color space as the color key for the destination of YUV colors.

DDCKEYCAPS\_DESTOVERLAYONEACTIVE

Supports only one active destination color key value for visible overlay surfaces .

DDCKEYCAPS\_DESTOVERLAYYUV

Supports overlaying, using color keying of the replaceable bits of the destination surface being overlaid for YUV colors.

DDCKEYCAPS\_NOCOSTOVERLAY

There are no BANDWIDTH trade-offs for using the color key with an overlay.

DDCKEYCAPS\_SRCBLT

Supports transparent blitting, using the color key for the source with this surface for RGB colors.

DDCKEYCAPS\_SRCBLTCLRSPACE

Supports transparent blitting, using a color space for the source with this surface for RGB colors.

DDCKEYCAPS\_SRCBLTCLRSPACEYUV

Supports transparent blitting, using a color space for the source with this surface for YUV colors.

DDCKEYCAPS\_SRCBLTYUV

Supports transparent blitting, using the color key for the source with this surface for YUV colors.

DDCKEYCAPS\_SRCOVERLAY

Supports overlaying, using the color key for the source with this overlay surface for RGB colors.

DDCKEYCAPS\_SRCOVERLAYCLRSPACE

Supports overlaying, using a color space as the source color key for the overlay surface for RGB colors.

DDCKEYCAPS\_SRCOVERLAYCLRSPACEYUV

Supports overlaying, using a color space as the source color key for the overlay surface for YUV colors.

DDCKEYCAPS\_SRCOVERLAYONEACTIVE

Supports only one active source color key value for visible overlay surfaces.

DDCKEYCAPS\_SRCOVERLAYYUV

Supports overlaying, using the color key for the source with this overlay surface for YUV colors.

CONST\_DDCKEYFLAGS

[[158]](#footnote-158)# The **CONST\_DDCKEYFLAGS** enumeration is used in the *flags* parameter of the **DirectDrawSurface7.SetColorKey** method to specify the type of color key requested.

Enum CONST\_DDCKEYFLAGS

DDCKEY\_COLORSPACE = 1

DDCKEY\_DESTBLT = 2

DDCKEY\_DESTOVERLAY = 4

DDCKEY\_SRCBLT = 8

DDCKEY\_SRCOVERLAY = 16

End Enum

DDCKEY\_COLORSPACE

Color space. Not set if the type contains a single color key.

DDCKEY\_DESTBLT

Color key or color space to be used as a destination color key for blit operations.

DDCKEY\_DESTOVERLAY

Color key or color space to be used as a destination color key for overlay operations.

DDCKEY\_SRCBLT

Color key or color space to be used as a source color key for blit operations.

DDCKEY\_SRCOVERLAY

Color key or color space to be used as a source color key for overlay operations.

CONST\_DDCOLORFLAGS

[[159]](#footnote-159)# The **CONST\_DDCOLORFLAGS** enumeration is used in the **lFlags** member of the **DDCOLORCONTROL** type to specify which members of the **DDCOLORCONTROL** type contain valid data.

Enum CONST\_DDCOLORFLAGS

DDCOLOR\_BRIGHTNESS = 1

DDCOLOR\_COLORENABLE = 64

DDCOLOR\_CONTRAST = 2

DDCOLOR\_GAMMA = 32

DDCOLOR\_HUE = 4

DDCOLOR\_SATURATION = 8

DDCOLOR\_SHARPNESS = 16

End Enum

DDCOLOR\_BRIGHTNESS

The **lBrightness** member contains valid data.

DDCOLOR\_COLORENABLE

The **lColorEnable** member contains valid data.

DDCOLOR\_CONTRAST

The **lContrast** member contains valid data.

DDCOLOR\_GAMMA

The **lGamma** member contains valid data.

DDCOLOR\_HUE

The **lHue** member contains valid data.

DDCOLOR\_SATURATION

The **lSaturation** member contains valid data.

DDCOLOR\_SHARPNESS

The **lSharpness** member contains valid data.

CONST\_DDDEVICEIDFLAGS

[[160]](#footnote-160)# The **CONST\_DDDEVICEIDFLAGS** enumeration is used in the *flags* parameter of the **DirectDraw7.GetDeviceIdentifier** method to return information about the host (typically 2-D) adapter in a system equipped with a stacked secondary 3-D adapter.

Enum CONST\_DDDEVICEIDFLAGS

DDGDI\_DEFAULT = 0

DDGDI\_GETHOSTIDENTIFIER = 1

End Enum

DDGDI\_DEFAULT

Perform a normal enumeration on the host adapter.

DDGDI\_GETHOSTIDENTIFIER

Causes the method to return information about the host (typically 2-D) adapter in a system equipped with a stacked secondary 3-D adapter. Such an adapter appears to the application as if it were part of the host adapter, but is typically located on a separate card. When the *dwFlags* parameter is 0, the stacked secondary's information is returned because this most accurately reflects the qualities of the DirectDraw object involved.

CONST\_DDEDMFLAGS

[[161]](#footnote-161)# The **CONST\_DDEDMFLAGS** enumeration is used in the *flags* parameter of the **DirectDraw7.GetDisplayModesEnum** method to specify the type of enumeration.

Enum CONST\_DDEDMFLAGS

DDEDM\_DEFAULT = 0

DDEDM\_REFRESHRATES = 1

DDEDM\_STANDARDVGAMODES = 2

End Enum

DDEDM\_DEFAULT

Performs a normal enumeration of the display modes.

DDEDM\_REFRESHRATES

Enumerates modes with different refresh rates. This guarantees that a particular mode is enumerated only once. This flag specifies whether the refresh rate is taken into account when determining if a mode is unique.

DDEDM\_STANDARDVGAMODES

Enumerates Mode 13 in addition to the 320x200x8 Mode X mode.

CONST\_DDENUMOVERLAYZFLAGS

[[162]](#footnote-162)# The **CONST\_DDENUMOVERLAYZFLAGS** enumeration is used by the *flags* parameter of the **DirectDrawSurface7.GetOverlayZOrdersEnum** method to control how the method enumerates the overlay z-order.

Enum CONST\_DDENUMSURFACESFLAGS

DDENUMOVERLAYZ\_BACKTOFRONT = 0

DDENUMOVERLAYZ\_FRONTTOBACK = 1

End Enum

DDENUMOVERLAYZ\_BACKTOFRONT

Enumerates overlays back to front.

DDENUMOVERLAYZ\_FRONTTOBACK

Enumerates overlays front to back.

CONST\_DDENUMSURFACESFLAGS

[[163]](#footnote-163)# The **CONST\_DDENUMSURFACESFLAGS** enumeration is used by the **DirectDraw7.GetSurfacesEnum** method to control how the method enumerates attached surfaces.

Enum CONST\_DDENUMSURFACESFLAGS

DDENUMSURFACES\_ALL = 1

DDENUMSURFACES\_CANBECREATED = 8

DDENUMSURFACES\_DOESEXIST = 16

DDENUMSURFACES\_MATCH = 2

DDENUMSURFACES\_NOMATCH = 4

End Enum

**Search type flags**

DDENUMSURFACES\_CANBECREATED

Enumerates the first surface that can be created and meets the search criterion. This flag can only be used with the DDENUMSURFACES\_MATCH flag.

DDENUMSURFACES\_DOESEXIST

Enumerates the already existing surfaces that meet the search criterion.

**Matching flags**

DDENUMSURFACES\_ALL

Enumerates all the surfaces that meet the search criterion. This flag can only be used with the DDENUMSURFACES\_DOESEXIST search type flag.

DDENUMSURFACES\_MATCH

Searches for any surface that matches the surface description.

DDENUMSURFACES\_NOMATCH

Searches for any surface that does not match the surface description.

CONST\_DDFLIPFLAGS

[[164]](#footnote-164)# The **CONST\_DDFLIPFLAGS** enumeration is used in the *flags* parameter of the **DirectDrawSurface7.Flip** method to specify flip options.

Enum CONST\_DDFLIPFLAGS

DDFLIP\_DONOTWAIT = 32

DDFLIP\_EVEN = 2

DDFLIP\_INTERFVAL2 = 536870912

DDFLIP\_INTERFVAL3 = 805306368

DDFLIP\_INTERFVAL4 = 1073741824

DDFLIP\_NOVSYNC = 8

DDFLIP\_ODD = 4

DDFLIP\_WAIT = 1

DDFLIP\_STEREO = 16

End Enum

DDFLIP\_DONOTWAIT

The default is DDFLIP\_WAIT. If you want to override the default and use time when the accelerator is busy (as denoted by the DDERR\_WASSTILLDRAWING error value), use DDFLIP\_DONOTWAIT.

DDFLIP\_EVEN

For use only when displaying video in an overlay surface. The new surface contains data from the even field of a video signal. This flag cannot be used with the DDFLIP\_ODD flag.

DDFLIP\_INTERFVAL2, DDFLIP\_INTERFVAL3,

DDFLIP\_INTERFVAL4

These flags indicate how many vertical retraces to wait between each flip. The default is 1. DirectDraw returns DERR\_WASSTILLDRAWING for each surface involved in the flip until the specified number of vertical retraces has occurred. If DDFLIP\_INTERFVAL2 is set, DirectDraw flips on every second vertical sync; if DDFLIP\_INTERFVAL3, on every third sync; and if DDFLIP\_INTERFVAL4, on every fourth sync.

These flags are effective only if DDCAPS2\_FLIPINTERVAL is set in the **DDCAPS** type returned for the device.

DDFLIP\_NOVSYNC

Causes DirectDraw to perform the physical flip as close as possible to the next scan line. Subsequent operations involving the two flipped surfaces do not check to see if the physical flip has finished—that is, they do not return DDERR\_WASSTILLDRAWING for that reason (but may for other reasons). This allows an application to perform flips at a higher frequency than the monitor refresh rate, but might introduce visible artifacts.

If DDCAPS2\_FLIPNOVSYNC is not set in the **DDCAPS** type returned for the device, DDFLIP\_NOVSYNC has no effect.

DDFLIP\_ODD

For use only when displaying video in an overlay surface. The new surface contains data from the odd field of a video signal. This flag cannot be used with the DDFLIP\_EVEN flag.

DDFLIP\_STEREO

DirectDraw flips and displays a main stereo surface. When this flag is set, stereo autoflipping is enabled. The hardware automatically flips between the left and right buffers during each screen refresh.

DDFLIP\_WAIT

Typically, if the flip cannot be set up because the state of the display hardware is not appropriate, the DDERR\_WASSTILLDRAWING error returns immediately, and no flip occurs. Setting this flag causes the method to continue trying to flip if it receives the DDERR\_WASSTILLDRAWING error from the hardware abstraction layer (HAL). The method does not return until the flipping operation has been successfully set up, or another error, such as DDERR\_SURFACEBUSY, is returned.

CONST\_DDFXCAPSFLAGS

[[165]](#footnote-165)# The **CONST\_DDFXCAPSFLAGS** enumeration is used in the **lFXCaps**, **lNLVBFXCaps**, **lSSBFXCaps**, **lSVBFXCaps**, and **lVSBFXCaps** members of the **DDCAPS** type to describe driver-specific stretching and effects capabilities, nonlocal-to-local video-memory blit capabilities, system-memory-to-system-memory blit capabilities, system-memory-to-display-memory blit capabilities, and display-memory-to-system-memory blit capabilities.

Enum CONST\_DDFXCAPSFLAGS

DDFXCAPS\_BLTALPHA = 1

DDFXCAPS\_BLTARITHSTRETCHY = 32

DDFXCAPS\_BLTARITHSTRETCHYN = 16

DDFXCAPS\_BLTFILTER = 32

DDFXCAPS\_BLTMIRRORLEFTRIGHT = 64

DDFXCAPS\_BLTMIRRORUPDOWN = 128

DDFXCAPS\_BLTROTATION = 256

DDFXCAPS\_BLTROTATION90 = 512

DDFXCAPS\_BLTSHRINKX = 1024

DDFXCAPS\_BLTSHRINKXN = 2048

DDFXCAPS\_BLTSHRINKY = 4096

DDFXCAPS\_BLTSHRINKYN = 8192

DDFXCAPS\_BLTSTRETCHX = 16384

DDFXCAPS\_BLTSTRETCHXN = 32768

DDFXCAPS\_BLTSTRETCHY = 65536

DDFXCAPS\_BLTSTRETCHYN = 131072

DDFXCAPS\_BLTTRANSFORM = 2

DDFXCAPS\_OVERLAYALPHA = 4

DDFXCAPS\_OVERLAYARITHSTRETCHY = 262144

DDFXCAPS\_OVERLAYARITHSTRETCHYN = 8

DDFXCAPS\_OVERLAYFILTER = 262144

DDFXCAPS\_OVERLAYMIRRORLEFTRIGHT = 134217728

DDFXCAPS\_OVERLAYMIRRORUPDOWN = 268435456

DDFXCAPS\_OVERLAYSHRINKX = 524288

DDFXCAPS\_OVERLAYSHRINKXN = 1048576

DDFXCAPS\_OVERLAYSHRINKY = 2097152

DDFXCAPS\_OVERLAYSHRINKYN = 4194304

DDFXCAPS\_OVERLAYSTRETCHX = 8388608

DDFXCAPS\_OVERLAYSTRETCHXN = 16777216

DDFXCAPS\_OVERLAYSTRETCHY = 33554432

DDFXCAPS\_OVERLAYSTRETCHYN = 67108864

DDFXCAPS\_OVERLAYTRANSFORM = 536870912

End Enum

DDFXCAPS\_BLTALPHA

Supports alpha-blended blit operations.

DDFXCAPS\_BLTARITHSTRETCHY

Uses arithmetic operations, rather than pixel-doubling techniques, to stretch and shrink surfaces during a blit operation. Occurs along the y-axis (vertically).

DDFXCAPS\_BLTARITHSTRETCHYN

Uses arithmetic operations, rather than pixel-doubling techniques, to stretch and shrink surfaces during a blit operation. Occurs along the y-axis (vertically), and works only for integer stretching (1, 2, and so on).

DDFXCAPS\_BLTFILTER

Driver can do surface-reconstruction filtering for warped blits.

DDFXCAPS\_BLTMIRRORLEFTRIGHT

Supports mirroring left to right in a blit operation.

DDFXCAPS\_BLTMIRRORUPDOWN

Supports mirroring top to bottom in a blit operation.

DDFXCAPS\_BLTROTATION

Supports arbitrary rotation in a blit operation.

DDFXCAPS\_BLTROTATION90

Supports 90-degree rotations in a blit operation.

DDFXCAPS\_BLTSHRINKX

Supports arbitrary shrinking of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSHRINKXN

Supports integer shrinking (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSHRINKY

Supports arbitrary shrinking of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTSHRINKYN

Supports integer shrinking (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHX

Supports arbitrary stretching of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHXN

Supports integer stretching (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHY

Supports arbitrary stretching of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTSTRETCHYN

Supports integer stretching (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for blit operations.

DDFXCAPS\_BLTTRANSFORM

Supports geometric transformations (or warps) for blitted sprites. Transformations are not currently supported for explicit blit operations.

DDFXCAPS\_OVERLAYALPHA

Supports alpha blending for overlay surfaces.

DDFXCAPS\_OVERLAYARITHSTRETCHY

Supports arbitrary stretching of a surface along the y-axis (vertically) for overlays.

DDFXCAPS\_OVERLAYARITHSTRETCHYN

Supports integer stretching (x1, x2, and so on) of an overlay surface along the y-axis (vertically)

DDFXCAPS\_OVERLAYFILTER

Supports surface-reconstruction filtering for warped overlay sprites. Filtering is not currently supported for explicitly displayed overlay surfaces (those displayed with calls to **DirectDrawSurface7.UpdateOverlay**).

DDFXCAPS\_OVERLAYMIRRORLEFTRIGHT

Supports mirroring of overlays across the vertical axis.

DDFXCAPS\_OVERLAYMIRRORUPDOWN

Supports mirroring of overlays across the horizontal axis.

DDFXCAPS\_OVERLAYSHRINKX

Supports arbitrary shrinking of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSHRINKXN

Supports integer shrinking (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSHRINKY

Supports arbitrary shrinking of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSHRINKYN

Supports integer shrinking (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that shrinking is available.

DDFXCAPS\_OVERLAYSTRETCHX

Supports arbitrary stretching of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYSTRETCHXN

Supports integer stretching (1, 2, and so on) of a surface along the x-axis (horizontally). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYSTRETCHY

Supports arbitrary stretching of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYSTRETCHYN

Supports integer stretching (1, 2, and so on) of a surface along the y-axis (vertically). This flag is valid only for DDSCAPS\_OVERLAY surfaces. This flag indicates only the capabilities of a surface; it does not indicate that stretching is available.

DDFXCAPS\_OVERLAYTRANSFORM

Supports geometric transformations (or warps) for overlay sprites. Transformations are not currently supported for explicitly displayed overlay surfaces (those displayed with calls to **DirectDrawSurface7.UpdateOverlay**).

CONST\_DDGBSFLAGS

[[166]](#footnote-166)# The **CONST\_DDGBSFLAGS** enumeration is used by the *flags* parameter of the **DirectDrawSurface7.GetBltStatus** method to specify what type of status to obtain.

Enum CONST\_DDGBSFLAGS

DDGBS\_CANBLT = 1

DDGBS\_ISBLTDONE = 2

End Enum

DDGBS\_CANBLT

Inquires whether a blit involving this surface can occur immediately, and returns DD\_OK if the blit can be completed.

DDGBS\_ISBLTDONE

Inquires whether the blit is done, and returns DD\_OK if the last blit on this surface has completed.

CONST\_DDGFSFLAGS

[[167]](#footnote-167)# The **CONST\_DDGFSFLAGS** enumeration is used by the *flags* parameter of the **DirectDrawSurface7.GetFlipStatus** method to specify the type of flip status to obtain.

Enum CONST\_DDGFSFLAGS

DDGFS\_CANFLIP = 1

DDGFS\_ISFLIPDONE = 2

End Enum

DDGFS\_CANFLIP

Inquires whether this surface can be flipped immediately, and returns DD\_OK if the flip can be completed.

DDGFS\_ISFLIPDONE

Inquires whether the flip has finished, and returns DD\_OK if the last flip on this surface has completed.

CONST\_DDLOCKFLAGS

[[168]](#footnote-168)# The **CONST\_DDLOCKFLAGS** enumeration is used by the *flags* parameter of the **DirectDrawSurface7.Lock** and **Direct3DVertexBuffer7.Lock** methods to indicate how the lock is to be performed.

Enum CONST\_DDLOCKFLAGS

DDLOCK\_DONOTWAIT = 16384

DDLOCK\_EVENT = 2

DDLOCK\_NOSYSLOCK = 2048

DDLOCK\_READONLY = 16

DDLOCK\_SURFACEMEMORYPTR = 0

DDLOCK\_WAIT = 1

DDLOCK\_WRITEONLY = 32

End Enum

DDLOCK\_DONOTWAIT

The default is DDLOCK\_WAIT. If you wish to override the default and use time when the accelerator is busy (as denoted by the DDERR\_WASSTILLDRAWING error value). use DDLOCK\_DONOTWAIT.

DDLOCK\_EVENT

Not currently implemented.

DDLOCK\_NOSYSLOCK

If possible, do not take the Win16Mutex (also known as Win16Lock). This flag is ignored when locking the primary surface.

DDLOCK\_READONLY

The surface being locked is read-only.

DDLOCK\_SURFACEMEMORYPTR

A valid memory pointer to the top of the specified rectangle should be returned. If no rectangle is specified, a pointer to the top of the surface is returned. This is the default.

DDLOCK\_WAIT

If a lock cannot be obtained because a blit operation is in progress, the method retries until a lock is obtained or another error occurs, such as DDERR\_SURFACEBUSY.

DDLOCK\_WRITEONLY

The surface being locked is write-enabled.

CONST\_DDOVERFLAGS

[[169]](#footnote-169)# The flags in the **CONST\_DDOVERFLAGS** enumeration are used by the *flags* member of the **DirectDrawSurface7.UpdateOverlay** method to modify the visual attributes on an overlay.

Enum CONST\_DDOVERFLAGS

DDOVER\_ADDDIRTYRECT = 32768

DDOVER\_ALPHADEST = 1

DDOVER\_ALPHADESTCONSTOVERRIDE = 2

DDOVER\_ALPHADESTNEG = 4

DDOVER\_ALPHADESTSURFACEOVERRIDE = 8

DDOVER\_ALPHAEDGEBLEND = 16

DDOVER\_ALPHASRC = 32

DDOVER\_ALPHASRCCONSTOVERRIDE = 64

DDOVER\_ALPHASRCNEG = 128

DDOVER\_ALPHASRCSURFACEOVERRIDE = 256

DDOVER\_ARGBSCALEFACTORS = 33554432

DDOVER\_AUTOFLIP = 1048576

DDOVER\_BOB = 2097152

DDOVER\_DDFX = 524288

DDOVER\_DEGRADEARGBSCALING = 67108864

DDOVER\_HIDE = 512

DDOVER\_INTERLEAVED = 8388608

DDOVER\_KEYDEST = 1024

DDOVER\_KEYDESTOVERRIDE = 2048

DDOVER\_KEYSRC = 4096

DDOVER\_KEYSRCOVERRIDE = 8192

DDOVER\_OVERRIDEBOBWEAVE = 4194304

DDOVER\_REFRESHALL = 131072

DDOVER\_REFRESHDIRTYRECTS = 65536

DDOVER\_SHOW = 16384

End Enum

DDOVER\_ADDDIRTYRECT

Adds a dirty rectangle to an emulated overlay surface.

DDOVER\_ALPHADEST

Obsolete.

DDOVER\_ALPHADESTCONSTOVERRIDE

Uses the **lAlphaDestConst** member of the **DDOVERLAYFX** type as the destination alpha channel for this overlay.

DDOVER\_ALPHADESTNEG

The destination surface becomes more transparent as the alpha value increases (0 is opaque).

DDOVER\_ALPHADESTSURFACEOVERRIDE

Uses the **lpDDSAlphaDest** member of the **DDOVERLAYFX** type as the alpha channel destination for this overlay.

DDOVER\_ALPHAEDGEBLEND

Uses the **lAlphaEdgeBlend** member of the **DDOVERLAYFX** type as the alpha channel for the edges of the image that border the color key colors.

DDOVER\_ALPHASRC

Uses either the alpha information in pixel format or the alpha channel surface attached to the source surface as the source alpha channel for this overlay.

DDOVER\_ALPHASRCCONSTOVERRIDE

Uses the **lAlphaSrcConst** member of the **DDOVERLAYFX** type as the source alpha channel for this overlay.

DDOVER\_ALPHASRCNEG

The source surface becomes more transparent as the alpha value increases (0 is opaque).

DDOVER\_ALPHASRCSURFACEOVERRIDE

Uses the **lpDDSAlphaSrc** member of the **DDOVERLAYFX** structure as the alpha channel source for this overlay.

DDOVER\_ARGBSCALEFACTORS

New for DirectX 7.0. Overlay FX structure contains valid ARGB scaling factors.

DDOVER\_AUTOFLIP

Automatically flips to the next surface in the flip chain each time a video port VSYNC occurs.

DDOVER\_BOB

Displays each field of the interlaced video stream individually without causing any artifacts.

DDOVER\_DDFX

When calling the **DirectDrawSurface7.UpdateOverlayFx**, setting this flag uses the flags set in the *ddoverfx* parameter to define special overlay effects. This flag must be set, or the *ddoverfx* parameter is ignored.

DDOVER\_DEGRADEARGBSCALING

New for DirectX 7.0. ARGB scaling factors can be degraded to fit driver capabilities.

DDOVER\_HIDE

Turns off this overlay.

DDOVER\_INTERLEAVED

The surface memory is composed of interleaved fields.

DDOVER\_KEYDEST

Uses the color key associated with the destination surface.

DDOVER\_KEYDESTOVERRIDE

Uses the **dckDestColorkey** member of the **DDOVERLAYFX** type as the color key for the destination surface.

DDOVER\_KEYSRC

Uses the color key associated with the source surface.

DDOVER\_KEYSRCOVERRIDE

Uses the **dckSrcColorkey** member of the **DDOVERLAYFX** type as the color key for the source surface.

DDOVER\_OVERRIDEBOBWEAVE

Bob and weave decisions should not be overridden by other interfaces.

DDOVER\_REFRESHALL

Redraws the entire surface on an emulated overlayed surface.

DDOVER\_REFRESHDIRTYRECTS

Redraws all dirty rectangles on an emulated overlayed surface.

DDOVER\_SHOW

Turns on this overlay.

CONST\_DDOVERFXFLAGS

[[170]](#footnote-170)# The flags in the **CONST\_DDOVERFXFLAGS** enumeration are used by the *lDDFX* member in the **DDOVERLAYFX** type to specify how the overlay is used.

Enum CONST\_DDPALFLAGS

DDOVERFX\_ARITHSTRETCHY = 1

DDOVERFX\_MIRRORLEFTRIGHT = 2

DDOVERFX\_MIRRORUPDOWN = 4

End Enum

DDOVERFX\_ARITHSTRETCHY

If stretching, use arithmetic stretching along the y-axis for this overlay.

DDOVERFX\_MIRRORLEFTRIGHT

Mirror the overlay around the vertical axis.

DDOVERFX\_MIRRORUPDOWN

Mirror the overlay around the horizontal axis.

CONST\_DDOVERZFLAGS

[[171]](#footnote-171)# The flags in the **CONST\_DDOVERZFLAGS** enumeration are used by the *flags* member in the **DirectDrawSurface7.UpdateOverlayZOrder** type to set the z-order of an overlay.

Enum CONST\_DDPALFLAGS

DDOVERZ\_INSERTINBACKOF = 5

DDOVERZ\_INSERTINFRONTOF = 4

DDOVERZ\_MOVEBACKWARD = 3

DDOVERZ\_MOVEFORWARD = 2

DDOVERZ\_SENDTOBACK = 1

DDOVERZ\_SENDTOFRONT = 0

End Enum

DDOVERZ\_INSERTINBACKOF

Inserts this overlay in the overlay chain behind the reference overlay.

DDOVERZ\_INSERTINFRONTOF

Inserts this overlay in the overlay chain in front of the reference overlay.

DDOVERZ\_MOVEBACKWARD

Moves this overlay one position backward in the overlay chain.

DDOVERZ\_MOVEFORWARD

Moves this overlay one position forward in the overlay chain.

DDOVERZ\_SENDTOBACK

Moves this overlay to the back of the overlay chain.

DDOVERZ\_SENDTOFRONT

Moves this overlay to the front of the overlay chain.

CONST\_DDPALFLAGS

[[172]](#footnote-172)# The flags in the **CONST\_DDPALFLAGS** enumeration are used by the *flags* member in the **PALETTEENTRY** type to specify how the palette entry is used.

Enum CONST\_DDPALFLAGS

PC\_DEFAULT = 0

PC\_EXPLICIT = 2

PC\_NOCOLLAPSE = 4

PC\_RESERVED = 1

End Enum

PC\_DEFAULT

The palette entry is to be used without modification from the flags below.

PC\_EXPLICIT

The low-order word of the logical palette entry designates a hardware palette index. This flag allows the application to show the contents of the display device palette.

PC\_NOCOLLAPSE

The color is placed in an unused entry in the system palette, instead of being matched to an existing color in the system palette. If there are no unused entries in the system palette, the color is matched normally. Once this color is in the system palette, colors in other logical palettes can be matched to this color.

PC\_RESERVED

The logical palette entry is used for palette animation. This flag prevents other windows from matching colors to the palette entry since the color frequently changes. If an unused system-palette entry is available, the color is placed in that entry. Otherwise, the color is not available for animation.

Remarks

The type library defines the flags member of **PALETTEENTRY** to be a byte, rather than this enumeration; therefore, autocompletion is not enabled. The flags in this enumeration are valid for the *flags* member and can be specified to modify behavior.

CONST\_DDPCAPSFLAGS

[[173]](#footnote-173)# The **CONST\_DDPCAPSFLAGS** enumeration is used by the *flags* parameter of **DirectDraw7.CreatePalette** as a return value for **DirectDrawPalette.GetCaps** and by the **lPalCaps** member of **DDCAPS** to describe the capabilities of the palette.

Enum CONST\_DDPCAPSFLAGS

DDPCAPS\_1BIT = 256

DDPCAPS\_2BIT = 512

DDPCAPS\_4BIT = 1

DDPCAPS\_8BIT = 4

DDPCAPS\_8BITENTRIES = 2

DDPCAPS\_ALLOW256 = 64

DDPCAPS\_ALPHA = 1024

DDPCAPS\_INITIALIZE = 8

DDPCAPS\_PRIMARYSURFACE = 16

DDPCAPS\_PRIMARYSURFACELEFT = 32

DDPCAPS\_VSYNC = 128

End Enum

DDPCAPS\_1BIT

The index is 1 bit. There are two entries in the color table.

DDPCAPS\_2BIT

The index is 2 bits. There are four entries in the color table.

DDPCAPS\_4BIT

The index is 4 bits. There are 16 entries in the color table.

DDPCAPS\_8BIT

The index is 8 bits. There are 256 entries in the color table\_dx\_color\_table\_glos.

DDPCAPS\_8BITENTRIES

The index refers to an 8-bit color index. This flag is valid only when used with the DDPCAPS\_1BIT, DDPCAPS\_2BIT, or DDPCAPS\_4BIT flag and when the target surface is 8 bpp. Each color entry is 1 byte long and is an index to a destination surface's 8-bpp palette.

DDPCAPS\_ALLOW256

This palette can have all 256 entries defined.

DDPCAPS\_ALPHA

The **flags** member of the associated **PALETTEENTRY** type is to be interpreted as a single 8-bit alpha value. A palette created with this flag can be attached only to a texture (a surface created with the DDSCAPS\_TEXTURE capability flag).

DDPCAPS\_INITIALIZE

Obsolete and ignored by DirectDraw.

DDPCAPS\_PRIMARYSURFACE

This palette is attached to the primary surface. Changing this palette's color table immediately affects the display unless DDPSETPAL\_VSYNC is specified and supported.

DDPCAPS\_PRIMARYSURFACELEFT

This palette is the one attached to the left-eye primary surface. Changing this palette's color table immediately affects the left-eye display unless DDPSETPAL\_VSYNC is specified and supported.

DDPCAPS\_VSYNC

This palette can have modifications to it synchronized with the monitors refresh rate.

CONST\_DDPIXELFORMATFLAGS

[[174]](#footnote-174)# The **CONST\_DDPIXELFORMATFLAGS** enumeration is used by the *lFlags* member of the **DDPIXELFORMAT** type to specify optional control flags.

Enum CONST\_DDPIXELFORMATFLAGS

DDPF\_ALPHA = 2

DDPF\_ALPHAPIXELS = 1

DDPF\_ALPHAPREMULT = 32768

DDPF\_BUMPDUDV = 524288

DDPF\_BUMPLUMINANCE = 262144

DDPF\_COMPRESSED = 128

DDPF\_FOURCC = 4

DDPF\_LUMINANCE = 131072

DDPF\_PALETTEINDEXED1 = 2048

DDPF\_PALETTEINDEXED2 = 4096

DDPF\_PALETTEINDEXED4 = 8

DDPF\_PALETTEINDEXED8 = 32

DDPF\_PALETTEINDEXEDTO8 = 16

DDPF\_RGB = 64

DDPF\_RGBTOYUV = 256

DDPF\_STENCILBUFFER = 16384

DDPF\_YUV = 512

DDPF\_ZBUFFER = 1024

DDPF\_ZPIXELS = 8192

End Enum

DDPF\_ALPHA

The pixel format describes an alpha-only surface.

DDPF\_ALPHAPIXELS

The surface has alpha channel information in the pixel format.

DDPF\_ALPHAPREMULT

The surface uses the premultiplied alpha format. That is, the color components in each pixel are premultiplied by the alpha component.

DDPF\_BUMPDUDV

Bump-map data in the pixel format is valid. Bump-map information is in the **lBumpBitCount**, **lBumpDuBitMask**, **lBumpDvBitMask**, and **lBumpLuminanceBitMask** members.

DDPF\_BUMPLUMINANCE

The luminance data in the pixel format is valid, and the **lLuminanceBitMask** member descibes valid luminance bits for a luminance-only or luminance-alpha surface.

DDPF\_COMPRESSED

The surface accepts pixel data in the specified format and compresses it during the write operation.

DDPF\_FOURCC

The **lFourCC** member is valid and contains a FOURCC code describing a non-RGB pixel format.

DDPF\_LUMINANCE

The pixel format describes a luminance-only or luminance-alpha surface.

DDPF\_PALETTEINDEXED1

DDPF\_PALETTEINDEXED2

DDPF\_PALETTEINDEXED4

DDPF\_PALETTEINDEXED8

The surface is 1-, 2-, 4-, or 8-bit color indexed.

DDPF\_PALETTEINDEXEDTO8

The surface is 1-, 2-, or 4-bit color indexed to an 8-bit palette.

DDPF\_RGB

The RGB data in the pixel format type is valid.

DDPF\_RGBTOYUV

The surface accepts RGB data and translates it during the write operation to YUV data. The format of the data to be written is contained in the pixel format type. The DDPF\_RGB flag is set.

DDPF\_STENCILBUFFER

The surface encodes stencil and depth information in each pixel of the z-buffer.

DDPF\_YUV

The YUV data in the pixel format type is valid.

DDPF\_ZBUFFER

The pixel format describes a z-buffer-only surface.

DDPF\_ZPIXELS

The surface contains z information in the pixels.

CONST\_DDRAW

[[175]](#footnote-175)# The **CONST\_DDRAW** enumeration contains constants used throughout DirectDraw.

Enum CONST\_DDRAW

DD\_ROP\_SPACE = 8

End Enum

DD\_ROP\_SPACE

The default Win32 raster operations.

CONST\_DDRAWERR

[[176]](#footnote-176)# For information on error values in DirectDraw see Error Codes.

CONST\_DDSCLFLAGS

[[177]](#footnote-177)# The **CONST\_DDSCLFLAGS** enumeration is used in the *flags* parameter of the **DirectDraw7.SetCooperativeLevel** method to determine the top-level behavior of the application.

Enum CONST\_DDSCLFLAGS

DDSCL\_ALLOWMODEX = 64

DDSCL\_ALLOWREBOOT = 2

DDSCL\_CREATEDEVICEWINDOW = 512

DDSCL\_EXCLUSIVE = 16

DDSCL\_FULLSCREEN = 1

DDSCL\_MULTITHREADED = 1024

DDSCL\_NORMAL = 8

DDSCL\_NOWINDOWCHANGES = 4

DDSCL\_SETDEVICEWINDOW = 256

DDSCL\_SETFOCUSWINDOW = 128

End Enum

DDSCL\_ALLOWMODEX

Allows the use of Mode X display modes. This flag can only be used if the DDSCL\_EXCLUSIVE and DDSCL\_FULLSCREEN flags are present.

DDSCL\_ALLOWREBOOT

Allows CTRL+ALT+DEL to function while in exclusive (full-screen) mode.

DDSCL\_CREATEDEVICEWINDOW

This flag is supported in Windows 98 and Windows 2000 only. Indicates that DirectDraw is to create and manage a default device window for this DirectDraw object. For more information, see Focus and Device Windows.

DDSCL\_EXCLUSIVE

Requests the exclusive level. This flag must be used with the DDSCL\_FULLSCREEN flag.

DDSCL\_FULLSCREEN

Indicates that the exclusive-mode owner is responsible for the entire primary surface. The GDI can be ignored. This flag must be used with the DDSCL\_EXCLUSIVE flag.

DDSCL\_MULTITHREADED

Requests multithread-safe DirectDraw behavior. This causes Direct3D to take the global critical section more frequently.

DDSCL\_NORMAL

The application functions as a regular Windows application. This flag cannot be used with the DDSCL\_ALLOWMODEX, DDSCL\_EXCLUSIVE, or DDSCL\_FULLSCREEN flags.

DDSCL\_NOWINDOWCHANGES

DirectDraw is not allowed to minimize or restore the application window on activation.

DDSCL\_SETDEVICEWINDOW

This flag is supported in Windows 98 and Windows 2000 only. Indicates that the *hdl* parameter is the window handle of the device window for this DirectDraw object. This flag cannot be used with the DDSCL\_SETFOCUSWINDOW flag.

DDSCL\_SETFOCUSWINDOW

This flag is supported in Windows 98 and Windows 2000 only. Indicates that the *hdl* parameter is the window handle of the focus window for this DirectDraw object. This flag cannot be used with the DDSCL\_SETDEVICEWINDOW flag.

CONST\_DDSDMFLAGS

[[178]](#footnote-178)# The **CONST\_DDSDMFLAGS** enumeration is used in the *flags* parameter of the **DirectDraw7.SetDisplayMode** method to set the mode of the display-device hardware.

Enum CONST\_DDSDMFLAGS

DDSDM\_DEFAULT = 0

DDSDM\_STANDARDVGAMODE = 1

End Enum

DDSDM\_DEFAULT

Sets the mode without substituting Mode 13 for Mode X.

DDSDM\_STANDARDVGAMODE

Causes the method to set Mode 13, instead of Mode X 320x200x8 mode. If you are setting another resolution, bit depth, or a Mode X mode, do not use this flag, and set the parameter to 0.

CONST\_DDSGRFLAGS

[[179]](#footnote-179)# The **CONST\_DDSGRFLAGS** enumeration is used in the *flags* parameter of the **DirectDrawGammaControl.SetGammaRamp** method to indicate that gamma calibration is desired.

Enum CONST\_DDSGRFLAGS

DDSGR\_CALIBRATE = 1

DDSGR\_DEFAULT = 0

End Enum

DDSGR\_DEFAULT

Sets the gamma ramp without calibrating the gamma ramp to the physical properties of the display.

DDSGR\_CALIBRATE

Requests that the calibrator adjust the gamma ramp according to the physical properties of the display, making the result identical on all systems. If calibration is not needed, set this parameter to 0.

CONST\_DDSTEREOCAPSFLAGS

[[180]](#footnote-180)# The **CONST\_DDSTEREOCAPSFLAGS** enumeration is used by the **lSVCaps** member of the **DDCAPS** type to describe stereo-vision capabilities.

Enum CONST\_DDSTEREOCAPSFLAGS

DDSVCAPS\_ENIGMA = 1

DDSVCAPS\_FLICKER = 2

DDSVCAPS\_REDBLUE = 4

DDSVCAPS\_SPLIT = 8

DDSVCAPS\_STEREOSEQUENTIAL = 16

End Enum

DDSVCAPS\_ENIGMA

The stereo view is accomplished using Enigma encoding.

DDSVCAPS\_FLICKER

The stereo view is accomplished using high-frequency flickering.

DDSVCAPS\_REDBLUE

The stereo view is accomplished when the viewer looks at the image through red and blue filters placed over the left and right eyes. All images must adapt their color spaces for this process.

DDSVCAPS\_SPLIT

The stereo view is accomplished with split-screen technology.

DDSVCAPS\_STEREOSEQUENTIAL

The driver can do stereo in at least one mode other than the current mode. The application can use **DirectDraw7.GetDisplayMode** or **DirectDraw7.GetDisplayModesEnum** to get per-mode stereo information.

CONST\_DDSURFACECAPS2FLAGS

[[181]](#footnote-181)# The **CONST\_DDSURFACECAPS2FLAGS** enumeration is used by the **lCaps2** member of the **DDSCAPS2** type to describe additional surface capabilities.

Enum CONST\_DDSURFACECAPS2FLAGS

DDSCAPS2\_CUBEMAP = 512

DDSCAPS2\_CUBEMAP\_ALLFACES = 65024

DDSCAPS2\_CUBEMAP\_NEGATIVEX = 2048

DDSCAPS2\_CUBEMAP\_NEGATIVEY = 8192

DDSCAPS2\_CUBEMAP\_NEGATIVEZ = 32768

DDSCAPS2\_CUBEMAP\_POSITIVEX = 1024

DDSCAPS2\_CUBEMAP\_POSITIVEY = 4096

DDSCAPS2\_CUBEMAP\_POSITIVEZ = 16384

DDSCAPS2\_D3DTEXTUREMANAGE = 131072

DDSCAPS2\_HARDWAREDEINTERLACE = 2

DDSCAPS2\_HINTANTIALIASING = 256

DDSCAPS2\_HINTDYNAMIC = 4

DDSCAPS2\_HINTSTATIC = 8

DDSCAPS2\_MIPMAPSUBLEVEL = 65536

DDSCAPS2\_OPAQUE = 128

DDSCAPS2\_STEREOSURFACELEFT = 524288

DDSCAPS2\_TEXTUREMANAGE = 16

End Enum

**Capability flags**

DDSCAPS2\_CUBEMAP

New for DirectX 7.0. This surface is a cubic environment map.

DDSCAPS2\_CUBEMAP\_ALLFACES

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create all six faces of a cubic environment map.

DDSCAPS2\_CUBEMAP\_NEGATIVEX

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the negative X face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_NEGATIVEY

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the negative Y face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_NEGATIVEZ

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the negative Z face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_POSITIVEX

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the positive X face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_POSITIVEY

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the positive Y face of a cubic environment map.

DDSCAPS2\_CUBEMAP\_POSITIVEZ

New for DirectX 7.0. This flag is used with the DDSCAPS2\_CUBEMAP flag to create the positive Z face of a cubic environment map.

DDSCAPS2\_D3DTEXTUREMANAGE

New for DirectX 7.0. The texture is always managed by Direct3D.

DDSCAPS2\_HARDWAREDEINTERLACE

This surface receives data from a video port using the de-interlacing hardware. This allows the driver to allocate memory for any extra buffers that might be required. The DDSCAPS\_VIDEOPORT and DDSCAPS\_OVERLAY flags must also be set.

DDSCAPS2\_HINTANTIALIASING

The application intends to use antialiasing. Only valid if DDSCAPS\_3DDEVICE is also set.

DDSCAPS2\_HINTDYNAMIC

Indicates to the driver that this surface is locked very frequently (for procedural textures, dynamic lightmaps, and so on). This flag can only be used for texture surfaces (the DDSCAPS\_TEXTURE flag set in the **lCaps2** member). This flag cannot be used with the DDSCAPS2\_HINTSTATIC or DDSCAPS2\_OPAQUE flags.

DDSCAPS2\_HINTSTATIC

Indicates to the driver that this surface can be reordered or retiled on load. This operation does not change the size of the texture. It is relatively fast and symmetrical, since the application can lock these bits (although it degrades performance when doing so). This flag can be used only for texture surfaces (the DDSCAPS\_TEXTURE flag set in the **lCaps2** member). This flag cannot be used with the DDSCAPS2\_HINTDYNAMIC or DDSCAPS2\_OPAQUE flags.

DDSCAPS2\_MIPMAPSUBLEVEL

New for DirectX 7.0. Enables easier use of **GetAttachedSurface**, rather than **EnumAttachedSurfaces**, for surface constructs such as cube maps in which there is more than one mipmap surface attached to the root surface. This should be set on all non-top-level surfaces in a mipmapped cubemap so that a call to **GetAttachedSurface** can distinguish between top-level faces and attached mipmap levels. This capabilities bit is ignored by **CreateSurface**.

DDSCAPS2\_OPAQUE

Indicates to the driver that this surface will never be locked again. The driver is free to optimize this surface by retiling and compression. Such a surface cannot be locked or used in blit operations; attempts to lock or blit a surface with this capability fail. This flag can only be used for texture surfaces (DDSCAPS\_TEXTURE flag set in the **lCaps2** member). This flag cannot be used with the DDSCAPS2\_HINTDYNAMIC or the DDSCAPS2\_HINTSTATIC flag.

DDSCAPS2\_STEREOSURFACELEFT

New for DirectX 7.0. This surface is part of a stereo flipping chain. When this flag is set during a **DirectDraw7.CreateSurface** call, a pair of stereo surfaces is created for each buffer in the primary flipping chain. You must create a complex flipping chain (with back-buffers). You cannot create a single set of stereo surfaces. The **DirectDrawSurface7.Flip** method requires that you have back-buffers (at least four surfaces are created).

In addition, when this flag is set in a **DDSURFACEDESC2** type as the result of an **DirectDraw7.GetDisplayModesEnum** or **DirectDraw7.GetDisplayMode** call, it indicates support for stereo in that mode.

DDSCAPS2\_TEXTUREMANAGE

The client would like this texture surface to be managed by the driver if the driver is capable; otherwise, it is managed by Direct3D Immediate Mode (new in DirectX 7.0). This flag can be used only for texture surfaces (DDSCAPS\_TEXTURE flag set in the **lCaps2** member). For more information, see Automatic Texture Management in the Direct3D Immediate Mode documentation. Do not use this flag if your application uses Direct3D Retained Mode. Instead, create textures in system memory, and allow Retained Mode to manage them.

CONST\_DDSURFACECAPSFLAGS

[[182]](#footnote-182)# The **CONST\_DDSURFACECAPSFLAGS** enumeration is used in the **lCaps** member of the **DDSCAPS2** type to describe the capabilities of the surface.

Enum CONST\_DDSURFACECAPSFLAGS

DDSCAPS\_3DDEVICE = 8192

DDSCAPS\_ALLOCONLOAD = 67108864

DDSCAPS\_ALPHA = 2

DDSCAPS\_BACKBUFFER = 4

DDSCAPS\_COMPLEX = 8

DDSCAPS\_FLIP = 16

DDSCAPS\_FRONTBUFFER = 32

DDSCAPS\_HWCODEC = 1048576

DDSCAPS\_LIVEVIDEO = 524288

DDSCAPS\_LOCALVIDMEM = 268435456

DDSCAPS\_MIPMAP = 4194304

DDSCAPS\_MODEX = 2097152

DDSCAPS\_NONLOCALVIDMEM = 536870912

DDSCAPS\_OFFSCREENPLAIN = 64

DDSCAPS\_OPTIMIZED = -2147483648

DDSCAPS\_OVERLAY = 128

DDSCAPS\_OWNDC = 262144

DDSCAPS\_PALETTE = 256

DDSCAPS\_PRIMARYSURFACE = 512

DDSCAPS\_RESERVED2 = 8388608

DDSCAPS\_STANDARDVGAMODE = 1073741824

DDSCAPS\_SYSTEMMEMORY = 2048

DDSCAPS\_TEXTURE = 4096

DDSCAPS\_VIDEOMEMORY = 16384

DDSCAPS\_VIDEOPORT = 134217728

DDSCAPS\_VISIBLE = 32768

DDSCAPS\_WRITEONLY = 65536

DDSCAPS\_ZBUFFER = 131072

End Enum

DDSCAPS\_3DDEVICE

This surface can be used for 3-D rendering. Applications can use this flag to ensure that a device that can render only to a certain heap has off-screen surfaces allocated from the correct heap. If this flag is set for a heap, the surface is not allocated from that heap.

DDSCAPS\_ALLOCONLOAD

Not used; ignored by DirectDraw and Direct3D.

DDSCAPS\_ALPHA

This surface contains alpha-only information.

DDSCAPS\_BACKBUFFER

This surface is the back buffer of a surface flipping type. Typically, this capability is set by the **CreateSurface** method when the DDSCAPS\_FLIP flag is used. Only the surface that immediately precedes the DDSCAPS\_FRONTBUFFER surface has this capability set. The other surfaces are identified as back buffers by the presence of the DDSCAPS\_FLIP flag, their attachment order, and the absence of the DDSCAPS\_FRONTBUFFER and DDSCAPS\_BACKBUFFER capabilities. If this capability is sent to the **CreateSurface** method, a stand-alone back buffer is being created. After this method is called, this surface could be attached to a front buffer, another back buffer, or both to form a flipping surface type. For more information, see **DirectDrawSurface7.AddAttachedSurface**. DirectDraw supports an arbitrary number of surfaces in a flipping type.

DDSCAPS\_COMPLEX

A complex surface is being described. A complex surface results in the creation of more than one surface. The additional surfaces are attached to the root surface. The complex type can be destroyed only by destroying the root.

DDSCAPS\_FLIP

This surface is a part of a surface flipping type. When this capability is passed to the **CreateSurface** method, a front buffer and one or more back buffers are created. DirectDraw sets the DDSCAPS\_FRONTBUFFER bit on the front-buffer surface and the DDSCAPS\_BACKBUFFER bit on the surface adjacent to the front-buffer surface. The **lBackBufferCount** member of the **DDSURFACEDESC2** type must be set to at least 1 for the method call to succeed. The DDSCAPS\_COMPLEX capability must always be set when creating multiple surfaces by using the **CreateSurface** method.

DDSCAPS\_FRONTBUFFER

This surface is the front buffer of a surface flipping type. This flag is typically set by the **CreateSurface** method when the DDSCAPS\_FLIP capability is set. If this capability is sent to the **CreateSurface** method, a stand-alone front buffer is created. This surface does not have the DDSCAPS\_FLIP capability. It can be attached to other back buffers to form a flipping type by using **DirectDrawSurface7.AddAttachedSurface**.

DDSCAPS\_HWCODEC

This surface can have a stream decompressed to it by the hardware.

DDSCAPS\_LIVEVIDEO

This surface can receive live video.

DDSCAPS\_LOCALVIDMEM

This surface exists in true, local video memory, rather than nonlocal video memory. If this flag is specified, DDSCAPS\_VIDEOMEMORY must be specified, as well. This flag cannot be used with the DDSCAPS\_NONLOCALVIDMEM flag.

DDSCAPS\_MIPMAP

This surface is one level of a mipmap. This surface is attached to other DDSCAPS\_MIPMAP surfaces to form the mipmap. This can be done explicitly by creating a number of surfaces and attaching them by using the **DirectDrawSurface7.AddAttachedSurface** method, or implicitly by the **CreateSurface** method. If this capability is set, DDSCAPS\_TEXTURE must also be set.

DDSCAPS\_MODEX

This surface is a 320200 or 320240 Mode X surface.

DDSCAPS\_NONLOCALVIDMEM

This surface exists in nonlocal video memory, rather than true, local video memory. If this flag is specified, DDSCAPS\_VIDEOMEMORY flag must be specified, as well. This cannot be used with the DDSCAPS\_LOCALVIDMEM flag.

DDSCAPS\_OFFSCREENPLAIN

This surface is any off-screen surface that is not an overlay, texture, z-buffer, front-buffer, back-buffer, or alpha surface. It is used to identify plain surfaces.

DDSCAPS\_OPTIMIZED

Not currently implemented.

DDSCAPS\_OVERLAY

This surface is an overlay. It might or might not be directly visible, depending on whether it is currently being overlaid onto the primary surface. DDSCAPS\_VISIBLE can be used to determine if it is currently being overlaid.

DDSCAPS\_OWNDC

This surface has a device context (DC) association for a long period of time.

DDSCAPS\_PALETTE

This device driver allows unique DirectDrawPalette objects to be created and attached to this surface.

DDSCAPS\_PRIMARYSURFACE

Surface is the primary surface. It represents what is currently visible.

DDSCAPS\_RESERVED2

Reserved for future use.

DDSCAPS\_STANDARDVGAMODE

This surface is a standard VGA mode surface, and not a Mode X surface. This flag cannot be used in combination with the DDSCAPS\_MODEX flag.

DDSCAPS\_SYSTEMMEMORY

This surface memory was allocated in system memory.

DDSCAPS\_TEXTURE

This surface can be used as a 3-D texture. This member does not indicate whether the surface is being used for that purpose.

DDSCAPS\_VIDEOMEMORY

This surface exists in display memory.

DDSCAPS\_VIDEOPORT

This surface can receive data from a video port.

DDSCAPS\_VISIBLE

Changes made to this surface are immediately visible. It is always set for the primary surface, as well as for overlays while they are being overlaid and texture maps while they are being textured.

DDSCAPS\_WRITEONLY

Only write access is permitted to the surface. Read access from the surface can generate a general protection (GP) fault, but the read results from this surface are not meaningful.

DDSCAPS\_ZBUFFER

This surface is the z-buffer. The z-buffer contains information that cannot be displayed. Instead, it contains bit-depth information that is used to determine which pixels are visible and which are obscured.

CONST\_DDSURFACEDESCFLAGS

[[183]](#footnote-183)# The **CONST\_DDSURFACEDESCFLAGS** enumeration is used in the **lFlags** member of the **DDSURFACEDESC2** type to specify which members of **DDSURFACEDESC2** contain valid data.

Enum CONST\_DDSURFACEDESCFLAGS

DDSD\_ALL = 1047022

DDSD\_ALPHABITDEPTH = 128

DDSD\_BACKBUFFERCOUNT = 32

DDSD\_CAPS = 1

DDSD\_CKDESTBLT = 16384

DDSD\_CKDESTOVERLAY = 8192

DDSD\_CKSRCBLT = 65536

DDSD\_CKSRCOVERLAY = 32768

DDSD\_HEIGHT = 2

DDSD\_LINEARSIZE = 524288

DDSD\_LPSURFACE = 2048

DDSD\_MIPMAPCOUNT = 131072

DDSD\_PITCH = 8

DDSD\_PIXELFORMAT = 4096

DDSD\_REFRESHRATE = 262144

DDSD\_TEXTURESTAGE = 1048576

DDSD\_WIDTH = 4

DDSD\_ZBUFFERBITDEPTH = 64

End Enum

DDSD\_ALL

All input members are valid.

DDSD\_ALPHABITDEPTH

The **lAlphaBitDepth** member is valid.

DDSD\_BACKBUFFERCOUNT

The **lBackBufferCount** member is valid.

DDSD\_CAPS

The **ddsCaps** member is valid.

DDSD\_CKDESTBLT

The **ddckCKDestBlt** member is valid.

DDSD\_CKDESTOVERLAY

The **ddckCKDestOverlay** member is valid.

DDSD\_CKSRCBLT

The **ddckCKSrcBlt** member is valid.

DDSD\_CKSRCOVERLAY

The **ddckCKSrcOverlay** member is valid.

DDSD\_HEIGHT

The **lHeight** member is valid.

DDSD\_LINEARSIZE

Not used.‹This will be implemented sometime after DX6 and beyond Indicates that lLinearSize member is valid.›

DDSD\_LPSURFACE

The **lpSurface** member is valid.

DDSD\_MIPMAPCOUNT

The **lMipMapCount** member is valid.

DDSD\_PITCH

The **lPitch** member is valid.

DDSD\_PIXELFORMAT

The **ddpfPixelFormat** member is valid.

DDSD\_REFRESHRATE

The **lRefreshRate** member is valid.

DDSD\_TEXTURESTAGE

The **lTextureStage** member is valid.

DDSD\_WIDTH

The **lWidth** member is valid.

DDSD\_ZBUFFERBITDEPTH

The **lZBufferBitDepth** member is valid.

CONST\_DDWAITVBFLAGS

[[184]](#footnote-184)# The **CONST\_DDWAITVBFLAGS** enumeration is used by the *flags* parameter of the **DirectDraw7.WaitForVerticalBlank** method to specify how long to wait for the vertical blank.

Enum CONST\_DDWAITVBFLAGS

DDWAITVB\_BLOCKBEGIN = 1

DDWAITVB\_BLOCKBEGINEVENT = 2

DDWAITVB\_BLOCKEND = 4

End Enum

DDWAITVB\_BLOCKBEGIN

Returns when the vertical-blank interval begins.

DDWAITVB\_BLOCKBEGINEVENT

Triggers an event when the vertical blank begins. This value is not currently supported.

DDWAITVB\_BLOCKEND

Returns when the vertical-blank interval ends and the display begins.

### Error Codes

Errors are represented by negative values and cannot be combined. This table lists the values that can be returned by all methods of the **DirectDraw7**, **DirectDrawSurface7**, **DirectDrawPalette**, and **DirectDrawClipper** objects. For a list of the error codes that each method can return, see the method description.

DD\_OK

The request completed successfully.

DDERR\_ALREADYINITIALIZED

The object has already been initialized.

DDERR\_BLTFASTCANTCLIP

A DirectDrawClipper object is attached to a source surface that has passed into a call to the **DirectDrawSurface7.BltFast** method.

DDERR\_CANNOTATTACHSURFACE

A surface cannot be attached to another requested surface.

DDERR\_CANNOTDETACHSURFACE

A surface cannot be detached from another requested surface.

DDERR\_CANTCREATEDC

Windows cannot create any more device contexts (DCs), or a DC was requested for a palette-indexed surface when the surface had no palette and the display mode was not palette-indexed (in this case DirectDraw cannot select a proper palette into the DC).

DDERR\_CANTDUPLICATE

Primary and 3-D surfaces, or surfaces that are implicitly created, cannot be duplicated.

DDERR\_CANTLOCKSURFACE

Access to this surface is refused because an attempt was made to lock the primary surface without DCI support.

DDERR\_CANTPAGELOCK

An attempt to page-lock a surface failed. Page lock does not work on a display-memory surface or an emulated primary surface.

DDERR\_CANTPAGEUNLOCK

An attempt to page-unlock a surface failed. Page unlock does not work on a display-memory surface or an emulated primary surface.

DDERR\_CLIPPERISUSINGHWND

An attempt was made to set a clip list for a DirectDrawClipper object that is already monitoring a window handle.

DDERR\_COLORKEYNOTSET

No source color key is specified for this operation.

DDERR\_CURRENTLYNOTAVAIL

No support is currently available.

DDERR\_DCALREADYCREATED

A device context (DC) has already been returned for this surface. Only one DC can be retrieved for each surface.

DDERR\_DEVICEDOESNTOWNSURFACE

Surfaces created by one DirectDraw device cannot be used directly by another DirectDraw device.

DDERR\_DIRECTDRAWALREADYCREATED

A DirectDraw object representing this driver has already been created for this process.

DDERR\_EXCEPTION

An exception was encountered while performing the requested operation.

DDERR\_EXCLUSIVEMODEALREADYSET

An attempt was made to set the cooperative level when it was already set to exclusive.

DDERR\_EXPIRED

The data has expired and is therefore no longer valid.

DDERR\_GENERIC

There is an undefined error condition.

DDERR\_HEIGHTALIGN

The height of the provided rectangle is not a multiple of the required alignment.

DDERR\_HWNDALREADYSET

The DirectDraw cooperative level window handle has already been set. It cannot be reset while the process has surfaces or palettes created.

DDERR\_HWNDSUBCLASSED

DirectDraw is prevented from restoring state because the DirectDraw cooperative level window handle has been subclassed.

DDERR\_IMPLICITLYCREATED

The surface cannot be restored because it is an implicitly created surface.

DDERR\_INCOMPATIBLEPRIMARY

The primary surface creation request does not match with the existing primary surface.

DDERR\_INVALIDCAPS

One or more of the capability bits passed to the callback function are incorrect.

DDERR\_INVALIDCLIPLIST

DirectDraw does not support the provided clip list.

DDERR\_INVALIDDIRECTDRAWGUID

The globally unique identifier (GUID) passed to the **DirectX7.DirectDrawCreate** function is not a valid DirectDraw driver identifier.

DDERR\_INVALIDMODE

DirectDraw does not support the requested mode.

DDERR\_INVALIDOBJECT

DirectDraw received a pointer that was an invalid DirectDraw object.

DDERR\_INVALIDPARAMS

One or more of the parameters passed to the method are incorrect.

DDERR\_INVALIDPIXELFORMAT

The pixel format was invalid as specified.

DDERR\_INVALIDPOSITION

The position of the overlay on the destination is no longer legal.

DDERR\_INVALIDRECT

The provided rectangle was invalid.

DDERR\_INVALIDSTREAM

The specified stream contains invalid data.

DDERR\_INVALIDSURFACETYPE

The requested operation could not be performed because the surface was of the wrong type.

DDERR\_LOCKEDSURFACES

One or more surfaces are locked.

DDERR\_MOREDATA

There is more data available than the specified buffer size can hold.

DDERR\_NO3D

No 3-D hardware or emulation is present.

DDERR\_NOALPHAHW

No alpha acceleration hardware is present or available.

DDERR\_NOBLTHW

No blitter hardware is present.

DDERR\_NOCLIPLIST

No clip list is available.

DDERR\_NOCLIPPERATTACHED

No DirectDrawClipper object is attached to the surface object.

DDERR\_NOCOLORCONVHW

No color-conversion hardware is present or available.

DDERR\_NOCOLORKEY

The surface does not currently have a color key.

DDERR\_NOCOLORKEYHW

There is no hardware support for the destination color key.

DDERR\_NOCOOPERATIVELEVELSET

A create function was called when the **DirectDraw7.SetCooperativeLevel** method had not been called.

DDERR\_NODC

No DC has ever been created for this surface.

DDERR\_NODDROPSHW

No DirectDraw raster operation (ROP) hardware is available.

DDERR\_NODIRECTDRAWHW

Hardware-only DirectDraw object creation is not possible; the driver does not support any hardware.

DDERR\_NODIRECTDRAWSUPPORT

DirectDraw support is not possible with the current display driver.

DDERR\_NOEMULATION

Software emulation is not available.

DDERR\_NOEXCLUSIVEMODE

The operation requires the application to have exclusive mode, but the application does not have exclusive mode.

DDERR\_NOFLIPHW

Flipping visible surfaces is not supported.

DDERR\_NOFOCUSWINDOW

An attempt was made to create or set a device window without first setting the focus window.

DDERR\_NOGDI

No GDI is present.

DDERR\_NOHWND

Clipper notification requires a window handle, or no window handle was previously set as the cooperative level window handle.

DDERR\_NOMIPMAPHW

No mipmap-capable texture mapping hardware is present or available.

DDERR\_NOMIRRORHW

No mirroring hardware is present or available.

DDERR\_NONONLOCALVIDMEM

An attempt was made to allocate nonlocal video memory from a device that does not support nonlocal video memory.

DDERR\_NOOPTIMIZEHW

The device does not support optimized surfaces.

DDERR\_NOOVERLAYHW

No overlay hardware is present or available.

DDERR\_NOPALETTEATTACHED

No palette object is attached to this surface.

DDERR\_NOPALETTEHW

There is no hardware support for 16- or 256-color palettes.

DDERR\_NORASTEROPHW

No appropriate raster operation hardware is present or available.

DDERR\_NOROTATIONHW

No rotation hardware is present or available.

DDERR\_NOSTEREOHARDWARE

No stereo hardware is present or available.

DDERR\_NOSTRETCHHW

There is no hardware support for stretching.

DDERR\_NOSURFACELEFT

No hardware is present that supports stereo surfaces.

DDERR\_NOT4BITCOLOR

The DirectDrawSurface object is not using a 4-bit color palette, and the requested operation requires a 4-bit color palette.

DDERR\_NOT4BITCOLORINDEX

The DirectDrawSurface object is not using a 4-bit color index palette, and the requested operation requires a 4-bit color index palette.

DDERR\_NOT8BITCOLOR

The DirectDrawSurface object is not using an 8-bit color palette, and the requested operation requires an 8-bit color palette.

DDERR\_NOTAOVERLAYSURFACE

An overlay component was called for a non-overlay surface.

DDERR\_NOTEXTUREHW

No texture-mapping hardware is present or available.

DDERR\_NOTFLIPPABLE

An attempt was made to flip a surface that cannot be flipped.

DDERR\_NOTFOUND

The requested item was not found.

DDERR\_NOTINITIALIZED

An attempt was made to call an interface method of a DirectDraw object created by **CoCreateInstance** before the object was initialized.

DDERR\_NOTLOADED

The surface is an optimized surface, but it has not yet been allocated any memory.

DDERR\_NOTLOCKED

An attempt was made to unlock a surface that was not locked.

DDERR\_NOTPAGELOCKED

An attempt was made to page-unlock a surface with no outstanding page locks.

DDERR\_NOTPALETTIZED

The surface being used is not a palette-based surface.

DDERR\_NOVSYNCHW

There is no hardware support for vertical blank synchronized operations.

DDERR\_NOZBUFFERHW

There is no hardware support for z-buffers.

DDERR\_NOZOVERLAYHW

The hardware does not support z-ordering of overlays.

DDERR\_OUTOFCAPS

The hardware needed for the requested operation has already been allocated.

DDERR\_OUTOFMEMORY

DirectDraw does not have enough memory to perform the operation.

DDERR\_OUTOFVIDEOMEMORY

DirectDraw does not have enough display memory to perform the operation.

DDERR\_OVERLAPPINGRECTS

The source and destination rectangles are on the same surface and overlap each other.

DDERR\_OVERLAYCANTCLIP

The hardware does not support clipped overlays.

DDERR\_OVERLAYCOLORKEYONLYONEACTIVE

An attempt was made to have more than one color key active on an overlay.

DDERR\_OVERLAYNOTVISIBLE

The method was called on a hidden overlay.

DDERR\_PALETTEBUSY

Access to this palette is refused because the palette is locked by another thread.

DDERR\_PRIMARYSURFACEALREADYEXISTS

This process has already created a primary surface.

DDERR\_REGIONTOOSMALL

The region passed to the **DirectDrawClipper.GetClipList** method is too small.

DDERR\_SURFACEALREADYATTACHED

An attempt was made to attach a surface to another surface to which it is already attached.

DDERR\_SURFACEALREADYDEPENDENT

An attempt was made to make a surface a dependency of another surface on which it is already dependent.

DDERR\_SURFACEBUSY

Access to the surface is refused because the surface is locked by another thread.

DDERR\_SURFACEISOBSCURED

Access to the surface is refused because the surface is obscured.

DDERR\_SURFACELOST

Access to the surface is refused because the surface memory is gone. Call the **DirectDrawSurface7.Restore** method on this surface to restore the memory associated with it.

DDERR\_SURFACENOTATTACHED

The requested surface is not attached.

DDERR\_TOOBIGHEIGHT

The height requested by DirectDraw is too large.

DDERR\_TOOBIGSIZE

The size requested by DirectDraw is too large. However, the individual height and width are valid sizes.

DDERR\_TOOBIGWIDTH

The width requested by DirectDraw is too large.

DDERR\_UNSUPPORTED

The operation is not supported.

DDERR\_UNSUPPORTEDFORMAT

The FourCC format requested is not supported by DirectDraw.

DDERR\_UNSUPPORTEDMASK

The bitmask in the pixel format requested is not supported by DirectDraw.

DDERR\_UNSUPPORTEDMODE

The display is currently in an unsupported mode.

DDERR\_VERTICALBLANKINPROGRESS

A vertical blank is in progress.

DDERR\_VIDEONOTACTIVE

The video port is not active.

DDERR\_WASSTILLDRAWING

The previous blit operation that is transferring information to or from this surface is incomplete.

DDERR\_WRONGMODE

This surface cannot be restored because it was created in a different mode.

DDERR\_XALIGN

The provided rectangle was not horizontally aligned on a required boundary.

E\_INVALIDINTERFACE

The specified interface is invalid or does not exist.

E\_OUTOFMEMORY

Not enough free memory to complete the method.

### Pixel Format Masks

This section contains information about the pixel formats supported by the hardware emulation layer (HEL). The following topics are discussed:

Texture-Map Formats

Off-Screen Surface Formats

#### Texture-Map Formats

A wide range of texture pixel formats are supported by the HEL. The following table shows these formats. The Masks column contains the red, green, blue, and alpha masks for each set of pixel format flags and bit depths.

|  |  |  |
| --- | --- | --- |
| Pixel format flags | Bit depth | Masks |
|  | | |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED1 | 1 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED1 |  DDPF\_PALETTEINDEXEDTO8 | 1 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED2 | 2 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED2 |  DDPF\_PALETTEINDEXEDTO8 | 2 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED4 | 4 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED4 |  DDPF\_PALETTEINDEXEDTO8 | 4 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED8 | 8 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB | 8 | R: 0x000000E0  G: 0x0000001C  B: 0x00000003  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 16 | R: 0x00000F00  G: 0x000000F0  B: 0x0000000F  A: 0x0000F000 |
| DDPF\_RGB | 16 | R: 0x0000F800  G: 0x000007E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x0000001F  G: 0x000007E0  B: 0x0000F800  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 16 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  A: 0x00008000 |
| DDPF\_RGB | 24 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 24 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 32 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0xFF000000 |
| DDPF\_RGB |  DDPF\_ALPHAPIXELS | 32 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0xFF000000 |

The HEL can create these formats in system memory. The DirectDraw device driver for a 3-D-accelerated display card can create textures of other formats in display memory. Such a driver exports the DDSCAPS\_TEXTURE flag to indicate that it can create textures.

#### Off-Screen Surface Formats

The following table shows the pixel formats for off-screen plain surfaces supported by the DirectX 5.0 HEL. The Masks column contains the red, green, blue, and alpha masks for each set of pixel format flags and bit depths.

|  |  |  |
| --- | --- | --- |
| Pixel format flags | Bit depth | Masks |
|  | | |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED1 | 1 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED2 | 2 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED4 | 4 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_PALETTEINDEXED8 | 8 | R: 0x00000000  G: 0x00000000  B: 0x00000000  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x0000F800  G: 0x000007E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB | 16 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  A: 0x00000000 |
| DDPF\_RGB | 24 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 24 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x00FF0000  G: 0x0000FF00  B: 0x000000FF  A: 0x00000000 |
| DDPF\_RGB | 32 | R: 0x000000FF  G: 0x0000FF00  B: 0x00FF0000  A: 0x00000000 |
| DDPF\_RGB |  DDPF\_ZPIXELS | 32 | R: 0x0000F800  G: 0x000007E0  B: 0x0000001F  Z: 0xFFFF0000 |
| DDPF\_RGB |  DDPF\_ZPIXELS | 32 | R: 0x00007C00  G: 0x000003E0  B: 0x0000001F  Z: 0xFFFF0000 |

In addition to supporting a wide range of off-screen surface formats, the HEL also supports surfaces intended for use by Direct3D, or other 3-D renderers.

### Four-Character Codes (FOURCC)

DirectDraw utilizes a special set of codes that are four characters in length. These codes, called four-character codes (FOURCCs), are stored in file headers of files containing multimedia data such as bitmap images, sound, or video. FOURCCs describe the software technology that was used to produce multimedia data. By implication, they also describe the format of the data itself.

DirectDraw applications use FOURCCs for image color and format conversion. If an application calls the **DirectDrawSurface7.GetPixelFormat** method to request the pixel format of a surface whose format is not RGB, the **lFourCC** member of the **DDPIXELFORMAT** type identifies the FOURCC when the method returns.

In addition, the **biCompression** member of the **BITMAPINFOHEADER** type can be set to a FOURCC to indicate the codec used to compress or decompress an image.

FOURCCs are registered with Microsoft by the vendors of the respective multimedia software technologies. Some common FOURCCs appear in the following list.

|  |  |  |
| --- | --- | --- |
| FOURCC | Company | Technology name |
|  |  |  |
| AUR2 | AuraVision Corporation | AuraVision Aura 2: YUV 422 |
| AURA | AuraVision Corporation | AuraVision Aura 1: YUV 411 |
| CHAM | Winnov, Inc. | MM\_WINNOV\_CAVIARA\_CHAMPAGNE |
| CVID | Supermac | Cinepak by Supermac |
| CYUV | Creative Labs, Inc. | Creative Labs YUV |
| FVF1 | Iterated Systems, Inc. | Fractal Video Frame |
| IF09 | Intel® Corporation | Intel Intermediate YUV9 |
| IV31 | Intel Corporation | Indeo 3.1 |
| JPEG | Microsoft Corporation | Still Image JPEG DIB |
| MJPG | Microsoft Corporation | Motion JPEG DIB Format |
| MRLE | Microsoft Corporation | Run Length Encoding |
| MSVC | Microsoft Corporation | Video 1 |
| PHMO | IBM Corporation | Photomotion |
| RT21 | Intel Corporation | Indeo 2.1 |
| ULTI | IBM Corporation | Ultimotion |
| V422 | Vitec Multimedia | 24-bit YUV 4:2:2 |
| V655 | Vitec Multimedia | 16-bit YUV 4:2:2 |
| VDCT | Vitec Multimedia | Video Maker Pro DIB |
| VIDS | Vitec Multimedia | YUV 4:2:2 CCIR 601 for V422 |
| YU92 | Intel Corporation | YUV |
| YUV8 | Winnov, Inc. | MM\_WINNOV\_CAVIAR\_YUV8 |
| YUV9 | Intel Corporation | YUV9 |
| YUYV | Canopus, Co., Ltd. | BI\_YUYV, Canopus |
| ZPEG | Metheus | Video Zipper |

# DirectDraw Tools and Samples

This section describes sample applications included with the DirectX SDK that demonstrate the use of DirectDraw and aid in the development of DirectDraw applications. Descriptions are organized as follows:

DirectDraw Tools

DirectDraw C/C++ Samples

DirectDraw Visual Basic Samples

## DirectDraw Tools

This section describes applications included with the DirectX SDK that can be used in the development of applications using DirectDraw. The following tools are described:

DirectDraw Caps

DirectDraw Test

DirectX Texture Tool

KillHelp

### DirectDraw Caps

Description

This utility allows you to examine the DirectDraw capabilities of a device and to test different screen resolutions.

Path

Executable: *(SDK root)*\bin\DXUtils\DDCaps.exe

User's Guide

Choose from the **Driver** and **HEL** menus to see a list of capabilities. Turn off capabilities in the hardware or in the emulation layer by deselecting check boxes.

To check capabilities for a different resolution, double-click on the desired resolution. If the capabilities dialog box is still open, click **Refresh**.

Your default screen resolution is restored when you close the program.

### DirectDraw Test

Description

The DirectDraw Test application allows you to create and manipulate surfaces, blit between surfaces, time certain operations, and perform a variety of other tests.

Path

Executable: *(SDK root)*\Bin\DXUtils\DDTest.exe

User's Guide

First click **Options** select a device, then click **Connect** in order to connect to the DirectDraw system. Create one or more surfaces by clicking the **Create** button and selecting the desired capabilities. Note that an error appears in the message list if creation was not successful.

Select a surface from the drop-down list and manipulate it by using the various buttons. Choose **Blt** in order to blit from one surface to another using various flags.

Perform timing tests by clicking **Timing**. You can check the speed of operations at different screen resolutions by clicking **Set Mode** and choosing a different resolution before running the test.

### DirectX Texture Tool

Description

The purpose of this tool is to allow developers to create texture maps that use the new DXT*n* compression formats. Creating a compressed texture is actually not that difficult to do: the **IDirectDrawSurface7::Blt** method can do the conversion for you. Advanced developers will probably want to write their own tools that meet their specific needs, but this tool provides the following useful basic functionality:

Opens BMP and DDS files (See the User's Guide section for a description of the DDS file format).

Opens BMP files as alpha channel.

Saves textures in DDS format.

Supports conversion to all five DXT*n* compression formats.

Supports generation of mipmaps (using a box filter).

Supports visualization of alpha channel as a gray-scale image or by means of a user-selectable background color.

Supports easy visual comparison of image quality between formats.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\DXTex

Executable: *(SDK root)*\Bin\DxUtils\Dxtex.exe

User's Guide

DirectX Texture Tool uses a multidocument interface. Each texture map is a document, and several documents can be open at a time.

Each open document can hold the texture in either one format or two formats at once. For instance, you could import a BMP file, which would automatically create a 32-bit ARGB texture. You could then choose to convert the texture to DXT1 format. The document now remembers the image in both formats, and the user can flip between the formats by clicking in the window or by choosing **Original** or **New** from the **View** menu. This makes it easy for the user to spot any artifacts introduced by image compression, and to try several different compression formats without progressive degradation of the image

If this technique were not used and the user converted an image from ARGB to DXT1, all but one bit of alpha would be lost. If the user then decided to convert to DXT2, there would still be only two alpha levels. With the system used by Direct Texture Tool, the second conversion is done from the original ARGB format, and the DXT2 image will contain all 16 levels of alpha supported by DXT2. When the image is saved, the original format is discarded, and only the new format is stored.

This system has a few consequences that must be remembered:

If no format conversion has been requested since the document was opened, the one format is the "original" format and that is the format in which the image will be written when the document is saved.

If format conversion has been requested since the document was opened, the converted format is the "new" format and that is the format in which the image will be written when the document is saved.

If a second format conversion is requested, the "new" format from the first conversion is replaced with the second format. The "original" format will be unchanged.

Generating of mipmaps applies to both formats simultaneously.

If the original format has multiple mipmaps, and conversion to a new format is requested, the new format will automatically have multiple mipmaps as well.

To create mipmaps, choose **Generate MipMaps** from the **Format** menu. The width and height of the source image must both be powers of 2. Filtering is done by a simple box filter—that is, the four nearest pixels are averaged to produce each destination pixel.

DirectX Texture Tool fully supports alpha in textures. When importing a BMP file, if two files exist and one has an "\_a" at the end of the name (for example, tex.bmp and tex\_a.bmp), the second file will be loaded as an alpha channel. The blue channel of the second .bmp is stored in the alpha channel.

Once a document is open, the user can explicitly load a .bmp file as the alpha channel by using **Open As Alpha Channel** on the **File** menu.

To view the alpha channel directly without the RGB channels, choose **Alpha Channel Only** from the **View** menu. The alpha channel will appear as a gray-scale image. Note that if no alpha channel has been loaded, the alpha channel will be 100 percent throughout and the image will appear solid white when **Alpha Channel Only** is selected.

In the normal view, the effect of the alpha channel is visible because the window has a solid background color which shows through the texture where the alpha channel is less than 100 percent. The user can change this background color by choosing **Change Background Color** from the **View** menu. This choice does not affect the texture itself or the data that is written when the file is saved.

The DXT2 and DXT4 formats use premultiplied alpha, which means that the red, green, and blue values stored in the surface are already multiplied by the corresponding alpha value. DirectDraw cannot blit from a surface containing premultiplied alpha to one containing non-premultiplied alpha, so some operations (Open as Alpha Channel, conversion to DXT3, and conversion to DXT5) are not possible on DXT2 and DXT4 formats. Supporting textures using these formats is difficult on Direct3D devices which do not support DXT*n* textures, because DirectDraw cannot handle blitting them to a traditional ARGB surface either (unless that ARGB surface uses premultiplied alpha as well, which is rare). So you may find it easier to use DXT3 rather than DXT2 and DXT5 rather than DXT4 when possible.

Command-line options can be used to pass input files, an output file name, and processing options to DirectX Texture Tool. If an output file name is specified, the program exits automatically after writing the output file, and no user interface is presented.

dxtex [infilename] [-a alphaname] [-m] [DXT1|DXT2|DXT3|DXT4|DXT5] [outfilename]

*infilename*

The name of the file to load. This can be a .bmp or .dds file.

*-a alphaname*

If "-a" is specified, the next parameter is the name of a .bmp file to load as the alpha channel. If no alpha filename is specified, the application will still look for a file named *infilename*\_a.bmp and, if it exists, use that as the alpha channel.

*-m*

If this option is specified, mipmaps are generated.

*DXT1 | DXT2 | DXT3 | DXT4 | DXT5*

Specifies compression format. If no format is specified, the image will be in ARGB-8888.

*outfilename*

Specifies the name of the destination file. If this is not specified, the user interface will show the current file and all requested operations. If an *outfilename* is specified, the application will exit after saving the processed file without presenting a user interface.

See Also

For more information on the DDS file format, see Compress Sample.

### KillHelp

Description

KillHelp shuts down Ddhelp.exe, which in turn unloads Ddraw.dll from memory.

Path

Executable: *(SDK root)*\Bin\DXUtils\Killhelp.exe

User's Guide

This program should be used only by developers of device drivers.

When Ddraw.dll is first loaded by a DirectDraw application, it in turn loads Ddhelp.exe, which enables DirectDraw to restore the proper screen resolution and perform other cleanup tasks in the event that an application fails to do so. KillHelp is the only way to remove Ddraw.dll and Ddhelp.exe from memory without actually restarting the system.

## DirectDraw C/C++ Samples

[Visual Basic]

This section pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

This section gives brief descriptions of sample applications in the DirectX SDK primarily intended to demonstrate the DirectDraw component. The following sample programs are included:

DDEnum Sample

DDEx1 Sample

DDEx2 Sample

DDEx3 Sample

DDEx4 Sample

DDEx5 Sample

DDOverlay Sample

Font Sample

FSWindow Sample

ModeTest Sample

Mosquito Sample

Multimon Sample

Space Donuts Sample

Stretch Sample

Switcher Sample

Wormhole Sample

Although DirectX samples include Microsoft® Visual C++® project workspace files, you might need to verify other settings in your development environment to ensure that the samples compile properly. For more information, see Compiling DirectX Samples and Other DirectX Applications.

### DDEnum Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This sample shows how to enumerate the current DirectDraw devices and how to get information using the **IDirectDraw7::GetDeviceIdentifier** method.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\DDEnum

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\DDEnum.exe

User's Guide

The user interface is a simple dialog box. Two buttons, **Prev** and **Next**, display information for the previous or next device that was enumerated. Click the **Close** button to exit the application.

### DDEx1 Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

DDEx1 demonstrates the tasks required to initialize and run a DirectDraw application.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Ddex1

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Ddex1.exe

User's Guide

DDEx1 requires no user input. Press the F12 key or the ESC key to quit the program.

Programming Notes

This program shows how to initialize DirectDraw and create a DirectDraw surface. It creates a back buffer and uses page flipping to alternately display the contents of the front and back buffers. Other techniques demonstrated include color fills and using GDI functions on a DirectDraw surface.

### DDEx2 Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

The DDEx2 program is an extension of DDEx1 that adds a bitmap.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Ddex2

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Ddex2.exe

User's Guide

DDEx2 requires no user input. Press F12 or ESC to quit the program.

Programming Notes

DDEx2 shows how to set a palettized video mode. Routines in DDutil.cpp load a bitmap file and copy it to a DirectDraw surface.

### DDEx3 Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

The DDEx3 program is an extension of DDEx2. This example demonstrates the use of off-screen surfaces.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Ddex3

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Ddex3.exe

User's Guide

DDEx3 requires no user input. Press F12 or ESC to quit the program.

The program requires at least 1.2 MB of video RAM.

Programming Notes

In addition to the front and back buffers, the program creates two off-screen surfaces and loads bitmaps into them. It calls the **IDirectDrawSurface7::BltFast** method to copy the contents of an off-screen surface to the back buffer, alternating the source surface on each frame. After it blits the bitmap to the back buffer, DDEx3 flips the front and back buffers.

### DDEx4 Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

The DDEx4 program is an extension of DDEx3. It demonstrates a simple animation technique.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Ddex4

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Ddex4.exe

User's Guide

DDEx4 requires no user input. Press F12 or ESC to quit the program.

This program requires at least 1.2 MB of video RAM.

Programming Notes

Unlike DDEx3, the DDEx4 program creates only one off-screen surface. It loads a bitmap containing a series of animation images onto this surface. To create the animation, it blits portions of the off-screen surface to the back buffer, then flips the front and back buffers.

The blitting routines illustrate the use of a source color key to create a sprite with a transparent background.

### DDEx5 Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

The DDEx5 program is an extension of DDEx4. It demonstrates a simple palette manipulation.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Ddex5

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Ddex5.exe

User's Guide

DDEx4 requires no user input. Press F12 or ESC to quit the program.

This program requires at least 1.2 MB of video RAM.

Programming Notes

The program uses **IDirectDrawPalette::GetEntries** to read a palette, modifies the entries, and then uses **IDirectDrawPalette::SetEntries** to update the palette.

### DDOverlay Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This sample application demonstrates the use of overlays in a windowed DirectDraw application.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\DDovrly

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Ddovrly.exe

User's Guide

Your hardware must support overlays in order for the program to run.

Try moving, resizing, and minimizing and restoring the window. Press ALT+F4 or click the **Close** button to quit.

Programming Notes

The program checks for overlay support, loads a bitmap into an overlay surface, and updates the window from the overlay surface in response to Windows messages.

### Font Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This sample program shows how to directly lock and access video memory, using text generated from a GDI font. There are much better ways to draw text into a DirectDrawSurface, and the only point of this sample is to show exactly how to lock and access the video memory directly.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Font

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Font.exe

User's Guide

The program repeatedly updates a text string in the Arial font and moves it randomly about the screen. No user input is required. Quit by closing the window.

Programming Notes

The program creates a font in a memory device context and a DIB section, and uses them to get access to the pixels once GDI has drawn them. The text bitmap is then put on the primary surface with a straight memory copy. It could easily be moved instead to an off-screen surface which could then be blitted as needed, transparently or not.

### FSWindow Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This sample shows how you can bring up a dialog box, or any other type of window, while your application is running DirectDraw in full-screen exclusive mode. Even devices that are non-GDI are detected and supported by creating a bitmap from their window contents and then blitting that to the device.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\FSWindow

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\FSWindow.exe

User's Guide

If you have more than one device, the sample starts by displaying a dialog box so that you can select which device to run the sample on. It then switches to full-screen exclusive mode and displays a dialog box and the mouse cursor.

Click on the **Cancel** or **OK** button to close the dialog and hide the mouse cursor. Press the F1 key to bring the dialog and cursor back. Press the Esc key to exit the program when the dialog is no longer displayed.

Programming Notes

Most of the important code is in the Fswindow.cpp file.

The sample uses just the dynamic content mode, which constantly refreshes the dialog box to show which controls have focus, text in the edit field, and so on. The static content mode consumes less CPU time and would be good for pop-up windows that display help messages, for example.

It is important to understand that the content window can be any type of window. It could be an HTML Help window, or a window with a rich edit control to display formatted text. The window does not need to have a square clipping region; it could have a complex clipping region that fits the shape of the window you want to display.

### ModeTest Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This example demonstrates basic usage of the **IDirectDraw7::StartModeTest** and **IDirectDraw7::EvaluateMode** methods. Together, these methods allow an application to explore what display modes and refresh rates the monitor connected to the display device is able to display Applications can use these methods when they are interested in using higher refresh rates.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\ModeTest

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\ModeTest.exe

User's Guide

The user interface is a simple dialog box. First select the DirectDraw display device. Then select one or more modes from the left-hand list box and click **Test**. Each display mode is tested, and you can specify whether the mode appears correctly or note. If you make a mistake, click **Reset** and try again. Click **Close** to exit the application.

Programming Notes

DirectDraw sets up a list of modes to be tested, based on the list the application passed in, and then sequentially tests them under application control.

The application calls **IDirectDraw7::EvaluateMode** continuously. DirectDraw takes care of setting the modes. All the application has to do is set the cooperative level beforehand, and then handle surface loss and drawing the interface that asks the user if the current mode is displaying correctly. DirectDraw returns enough information from **EvalulateMode** to allow the application to know when to do these things, and when to stop testing.

The application can pass a flag to **EvaluateMode** if the user approves the mode, which will cause DirectDraw to mark the mode as good and move on. DirectDraw may also decide that time has run out and give up on a certain mode.

DirectDraw uses information at its disposal from any automated means to make the testing process as short as possible, and applications only need to test modes they are interested in.

### Mosquito Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This program demonstrates DirectDraw animation using overlays.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Mosquito

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Mosquito.exe

User's Guide

To run the Mosquito application, you must have a display adapter that supports overlays. On a computer with overlay support, the program creates a large mosquito that flies around the screen. If your display adapter card doesn't support source color keying for overlays, you'll see an ugly, black, rectangular background around the mosquito.

Some cards have better overlay support in certain resolutions that others. If you know your card has overlay support through DirectDraw, but the Mosquito program is having problems creating or displaying the overlay, try switching to a lower screen resolution or color depth and restarting the application.

Programming Notes

The program creates a complex overlay surface and animates by flipping.

### Multimon Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This program demonstrates some of the techniques that can be used in writing an application that takes advantage of multiple monitors.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Multimon

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Multimon.exe

User's Guide

The application does not require input. Click anywhere or press ESC to quit.

Programming Notes

To use the multimonitor functions such as **GetMonitorInfo** and **MonitorFromRect** on Windows 95, you can include the file Multimon.h. In addition, in one of the C or C++ files, you need to define COMPILE\_MULTIMON\_STUBS before including Multimon.h. This allows the multimon functions to return reasonable values when running on Windows 95.

When enumerating DirectDraw devices, you can use either **DirectDrawEnumerate** or **DirectDrawEnumerateEx**. **DirectDrawEnumerateEx** is available on Windows 98 systems with DirectX 5.0 and later, and all other systems with DirectX 6.0 or later.

Because not all systems can be assumed to have **DirectDrawEnumerateEx**, DirectDraw was formerly set up so developers had to use **LoadLibrary** and **GetProcAddress** to check for its presence. In DirectX 7.0 this restriction has been removed, so you can call **DirectDrawEnumerateEx** directly, but you should note that this will prevent your program from running on a system which does not have DirectX 7.0 or later installed. This sample shows how to do the **LoadLibrary**/**GetProcAddress** technique, and how to fall back on **DirectDrawEnumerate** if **DirectDrawEnumerateEx** is not available.

Full-screen, multimonitor applications need to deal with focus and device windows. The focus window receives user input messages, and the device windows are used to cover each screen. This program shows how to call **IDirectDraw7::SetCooperativeLevel** to properly create and assign these windows.

Each screen gets its own DirectDraw interface, and DirectDrawSurfaces created on one DirectDraw interface cannot be used by any other DirectDraw interface. So creating graphics that span multiple monitors takes some extra work.

This sample demonstrates two techniques. For best performance, video memory surfaces should be used. A separate video memory DirectDrawSurface must be created on each screen. For the cases where a system memory surface is required or desired, one must still create separate DirectDrawSurfaces for each screen, but they can be configured to point to the same surface data memory. The **IDirectDrawSurface7::SetSurfaceDesc** method can be used to accomplish this. Doing this has no performance impact, but it avoids unnecessary consumption of system memory.

**IDirectDrawSurface7::Blt** calls usually fail when they would cause data to be written outside the borders of the destination surface. This failure can be avoided by attaching clipper objects to the destinations. This sample shows how to create a clipper for each screen and attach it to the front and back buffers so that the sprite surfaces can be blitted without being manually clipped by the application first.

### Space Donuts Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This simple game shows how to combine DirectDraw, DirectInput, and DirectSound. Although it demonstrates other DirectX components, it is primarily intended to show how to animate multiple sprites.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Donuts

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Donuts.exe

User's Guide

Input is from the keyboard by default, but you can select a joystick from the **Game** menu.

The commands are listed on the opening screen. All numbers must be entered from the numeric keypad. "Joy" refers to a joystick button.

|  |  |
| --- | --- |
| Key | Command |
|  | |
| ESC, F12 | Quit |
| 4 | Turn left |
| 6 | Turn right |
| 5 (Joy 3) | Stop |
| 8 | Accelerate forward |
| 2 | Accelerate backward |
| 7 (Joy 2) | Shield |
| SPACEBAR (Joy 1) | Fire |
| ENTER | Start game |
| F1 | Toggle trailing afterimage effect on/off |
| F3 | Turn audio on/off |
| F5 | Toggle frame rate display on/off |
| F10 | Main menu |

Space Donuts defaults to 640x480 at 256 colors. You can specify a different resolution and pixel depth on the command line.

The game uses the following command line switches, which are case-sensitive:

|  |  |
| --- | --- |
| e | Use software emulation, not hardware acceleration |
| t | Test mode, no input required |
| x | Stress mode. Never stop if you can help it |
| S | Turn sound off/on |

These switches may be followed by three option numbers representing x-resolution, y-resolution, and bits per pixel. For example:

donuts -S 800 600 16

Programming Notes

This game demonstrates many of the features of DirectDraw. It takes advantage of hardware acceleration if it is supported by the driver.

The program requires less than 1 MB of video RAM.

The sound code is deliberately designed to stress the DirectSound API. It is not intended to be a demonstration of how to use DirectSound API efficiently. For example, each bullet on the screen uses a different sound buffer. Space Donuts creates over 70 sound buffers (including duplicates), and between 20 to 25 may be playing at any time.

The sounds are implemented using the helper functions in Dsutil.h and Dsutil.c (found in the Sdk\Samples\Misc directory). These functions might help you to add sound to your application quickly and easily.

### Stretch Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

The Stretch sample application program illustrates stretching and clipping while blitting a bitmap image.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Stretch

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Stretch.exe

User's Guide

Stretch must be run in a video mode that uses 8 bits per pixel. It will not work properly in other video modes.

The program displays a red torus moving in its client window. Control the rotational speed with the **Stop**, **Slow**, and **Fast** options in the **Rotation** menu. Alter the size of the window by selecting items from the **Size** menu, or by resizing the window with the mouse.

Programming Notes

Any time you resize the Stretch program window to a size other than 1x1, you are using the image stretching capabilities of the DirectDraw blitting methods.

The clipper for the primary surface is set to the client window. To demonstrate clipping, partially overlap another window over the Stretch program's window. When Stretch blits the bitmap, the portion of the bitmap that would fall within the other window is clipped.

### Switcher Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This sample shows how to switch between the normal and exclusive cooperative levels in DirectDraw.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Switcher

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Switcher.exe

User's Guide

Press ALT+ENTER to switch between full-screen and windowed mode. Quit the program by pressing ESC.

Programming Notes

In normal (windowed) mode, the sample assigns a clipper, shows the mouse cursor, and handles window moves, WM\_PAINT messages, and pausing caused by losing focus to other applications. In exclusive (full-screen) mode it uses page flipping rather than blitting to update the scene.

### Wormhole Sample

[Visual Basic]

This topic pertains only to application development in C and C++. See DirectDraw Visual Basic Samples.

[C++]

Description

This sample program shows how palette changes can create an animated effect.

Path

Source: *(SDK root)*\Samples\Multimedia\DDraw\Src\Wormhole

Executable: *(SDK root)*\Samples\Multimedia\DDraw\Bin\Wormhole.exe

User's Guide

Press F12 or ESC to quit the program.

Programming Notes

Imagine a 4x4 display using 4 colors. We could set the colors up to look something like this:



Now we can cycle all of the colors in each row to the right. The one on the right will wrap around to the left.



If we continue this cycling we would get animated lines moving to the right. The same can be done to animate the lines going down:



Now if we expand our palette to 16 color we can combine moving down and right at the same time.

Move right:



Move down:



Move right and down:



Now if you tile these 4x4 blocks end to end and cycle the colors as shown, you get a moving checkerboard. Wormhole does the same thing, except that it uses 15x15 blocks (225 colors) and instead of tiling the blocks end to end on a flat plane, it tiles them in 3-D converging at the center of the wormhole.

The following code will generate the 3-D wormhole using the aforementioned 15x15 grids:

//Do all the work!

//convert r,theta,z to x,y,x to screen x,y

//plot the point

//z=-1.0+(log(2.0\*j/DIVS) is the line that sets the math eqn for plot

//Feel free to try other functions!

//Cylindrical coordinates, e.g. z=f(r,theta)

#define STRETCH 25

#define PI 3.14159265358979323846

#define XCENTER 160

#define YCENTER 50

#define DIVS 1200

#define SPOKES 2400

void transarray(void)

{

float x,y,z;

int i,j,color;

for(j=1;j<DIVS+1;j++)

for(i=0;i<SPOKES;i++)

{

z=-1.0+(log(2.0\*j/DIVS));

x=(320.0\*j/DIVS\*cos(2\*PI\*i/SPOKES));

y=(240.0\*j/DIVS\*sin(2\*PI\*i/SPOKES));

y=y-STRETCH\*z;

x+=XCENTER;

y+=YCENTER;

color=((i/8)%15)+15\*((j/6)%15)+1;

if ((x>=0)&&(x<=320)&&(y>=0)&&(y<=200))

plot((int) x,(int) y,color);

}

}

After loading the bitmap to a DirectDraw surface, all that is left to do is rotate the colors and you have a wormhole.

1. # IDH\_DirectDraw7\_ddraw\_vb [↑](#footnote-ref-1)
2. # IDH\_DirectDraw7.CreateClipper\_ddraw\_vb [↑](#footnote-ref-2)
3. # IDH\_DirectDraw7.CreatePalette\_ddraw\_vb [↑](#footnote-ref-3)
4. # IDH\_DirectDraw7.CreateSurface\_ddraw\_vb [↑](#footnote-ref-4)
5. # IDH\_DirectDraw7.CreateSurfaceFromFile\_ddraw\_vb [↑](#footnote-ref-5)
6. # IDH\_DirectDraw7.CreateSurfaceFromResource\_ddraw\_vb [↑](#footnote-ref-6)
7. # IDH\_DirectDraw7.DuplicateSurface\_ddraw\_vb [↑](#footnote-ref-7)
8. # IDH\_DirectDraw7.FlipToGDISurface\_ddraw\_vb [↑](#footnote-ref-8)
9. # IDH\_DirectDraw7.GetAvailableTotalMem\_ddraw\_vb [↑](#footnote-ref-9)
10. # IDH\_DirectDraw7.GetCaps\_ddraw\_vb [↑](#footnote-ref-10)
11. # IDH\_DirectDraw7.GetDeviceIdentifier\_ddraw\_vb [↑](#footnote-ref-11)
12. # IDH\_DirectDraw7.GetDirect3D\_ddraw\_vb [↑](#footnote-ref-12)
13. # IDH\_DirectDraw7.GetDisplayMode\_ddraw\_vb [↑](#footnote-ref-13)
14. # IDH\_DirectDraw7.GetDisplayModesEnum\_ddraw\_vb [↑](#footnote-ref-14)
15. # IDH\_DirectDraw7.GetFourCCCodes\_ddraw\_vb [↑](#footnote-ref-15)
16. # IDH\_DirectDraw7.GetFreeMem\_ddraw\_vb [↑](#footnote-ref-16)
17. # IDH\_DirectDraw7.GetGDISurface\_ddraw\_vb [↑](#footnote-ref-17)
18. # IDH\_DirectDraw7.GetMonitorFrequency\_ddraw\_vb [↑](#footnote-ref-18)
19. # IDH\_DirectDraw7.GetNumFourCCCodes\_ddraw\_vb [↑](#footnote-ref-19)
20. # IDH\_DirectDraw7.GetScanLine\_ddraw\_vb [↑](#footnote-ref-20)
21. # IDH\_DirectDraw7.GetSurfaceFromDC\_ddraw\_vb [↑](#footnote-ref-21)
22. # IDH\_DirectDraw7.GetSurfacesEnum\_ddraw\_vb [↑](#footnote-ref-22)
23. # IDH\_DirectDraw7.GetVerticalBlankStatus\_ddraw\_vb [↑](#footnote-ref-23)
24. # IDH\_DirectDraw7.LoadPaletteFromBitmap\_ddraw\_vb [↑](#footnote-ref-24)
25. # IDH\_DirectDraw7.RestoreAllSurfaces\_ddraw\_vb [↑](#footnote-ref-25)
26. # IDH\_DirectDraw7.RestoreDisplayMode\_ddraw\_vb [↑](#footnote-ref-26)
27. # IDH\_DirectDraw7.SetCooperativeLevel\_ddraw\_vb [↑](#footnote-ref-27)
28. # IDH\_DirectDraw7.SetDisplayMode\_ddraw\_vb [↑](#footnote-ref-28)
29. # IDH\_DirectDraw7.TestCooperativeLevel\_ddraw\_vb [↑](#footnote-ref-29)
30. # IDH\_DirectDraw7.WaitForVerticalBlank\_ddraw\_vb [↑](#footnote-ref-30)
31. # IDH\_DirectDrawClipper\_ddraw\_vb [↑](#footnote-ref-31)
32. # IDH\_DirectDrawClipper.GetClipList\_ddraw\_vb [↑](#footnote-ref-32)
33. # IDH\_DirectDrawClipper.GetClipListSize\_ddraw\_vb [↑](#footnote-ref-33)
34. # IDH\_DirectDrawClipper.GetHWnd\_ddraw\_vb [↑](#footnote-ref-34)
35. # IDH\_DirectDrawClipper.IsClipListChanged\_ddraw\_vb [↑](#footnote-ref-35)
36. # IDH\_DirectDrawClipper.SetClipList\_ddraw\_vb [↑](#footnote-ref-36)
37. # IDH\_DirectDrawClipper.SetHWnd\_ddraw\_vb [↑](#footnote-ref-37)
38. # IDH\_DirectDrawColorControl\_ddraw\_vb [↑](#footnote-ref-38)
39. # IDH\_DirectDrawColorControl.GetColorControls\_ddraw\_vb [↑](#footnote-ref-39)
40. # IDH\_DirectDrawColorControl.SetColorControls\_ddraw\_vb [↑](#footnote-ref-40)
41. # IDH\_DirectDrawEnum\_ddraw\_vb [↑](#footnote-ref-41)
42. # IDH\_DirectDrawEnum.GetCount\_ddraw\_vb [↑](#footnote-ref-42)
43. # IDH\_DirectDrawEnum.GetDescription\_ddraw\_vb [↑](#footnote-ref-43)
44. # IDH\_DirectDrawEnum.GetGuid\_ddraw\_vb [↑](#footnote-ref-44)
45. # IDH\_DirectDrawEnum.GetMonitorHandle\_ddraw\_vb [↑](#footnote-ref-45)
46. # IDH\_DirectDrawEnum.GetName\_ddraw\_vb [↑](#footnote-ref-46)
47. # IDH\_DirectDrawEnumModes\_ddraw\_vb [↑](#footnote-ref-47)
48. # IDH\_DirectDrawEnumModes.GetCount\_ddraw\_vb [↑](#footnote-ref-48)
49. # IDH\_DirectDrawEnumModes.GetItem\_ddraw\_vb [↑](#footnote-ref-49)
50. # IDH\_DirectDrawEnumSurfaces\_ddraw\_vb [↑](#footnote-ref-50)
51. # IDH\_DirectDrawEnumSurfaces.GetCount\_ddraw\_vb [↑](#footnote-ref-51)
52. # IDH\_DirectDrawEnumSurfaces.GetItem\_ddraw\_vb [↑](#footnote-ref-52)
53. # IDH\_DirectDrawGammaControl\_ddraw\_vb [↑](#footnote-ref-53)
54. # IDH\_DirectDrawGammaControl.GetGammaRamp\_ddraw\_vb [↑](#footnote-ref-54)
55. # IDH\_DirectDrawGammaControl.SetGammaRamp\_ddraw\_vb [↑](#footnote-ref-55)
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57. # IDH\_DirectDrawIdentifier.GetDescription\_ddraw\_vb [↑](#footnote-ref-57)
58. # IDH\_DirectDrawIdentifier.GetDeviceId\_ddraw\_vb [↑](#footnote-ref-58)
59. # IDH\_DirectDrawIdentifier.GetDeviceIdentifier\_ddraw\_vb [↑](#footnote-ref-59)
60. # IDH\_DirectDrawIdentifier.GetDriver\_ddraw\_vb [↑](#footnote-ref-60)
61. # IDH\_DirectDrawIdentifier.GetDriverSubVersion\_ddraw\_vb [↑](#footnote-ref-61)
62. # IDH\_DirectDrawIdentifier.GetDriverVersion\_ddraw\_vb [↑](#footnote-ref-62)
63. # IDH\_DirectDrawIdentifier.GetRevision\_ddraw\_vb [↑](#footnote-ref-63)
64. # IDH\_DirectDrawIdentifier.GetSubSysId\_ddraw\_vb [↑](#footnote-ref-64)
65. # IDH\_DirectDrawIdentifier.GetVendorId\_ddraw\_vb [↑](#footnote-ref-65)
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69. # IDH\_DirectDrawPalette.GetEntries\_ddraw\_vb [↑](#footnote-ref-69)
70. # IDH\_DirectDrawPalette.SetEntries\_ddraw\_vb [↑](#footnote-ref-70)
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